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SyncServer S600

SyncServer S650

User's Guide

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How to Use This Guide

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

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- [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](#)

Purpose of This Guide

The *SyncServer S6x0 User's Guide* describes the procedures for unpacking, installing, using, maintaining, and troubleshooting the Microsemi SyncServer S6x0. It also includes appendixes that describe alarms and events, the languages that you use to communicate with the SyncServer S6x0, 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. Chapters 2 through 5 contain detailed information and instructions 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 SyncServer S6x0. Cross-references in this chapter direct you to detailed system information in other chapters as appropriate.
- **Installation Engineers** – [Chapter 2](#) through [Chapter 7](#) and the appendixes provide detailed information and procedures to ensure proper installation, operation, configuration, and testing of the SyncServer S6x0.
- **Maintenance Engineers** – [Chapter 7](#) and the appendixes provide preventive and corrective maintenance guidelines, as well as procedures for diagnosing and troubleshooting fault indications and alarms.

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, Keypad / Display Interface	Describes the Keypad / Display interface.
Chapter 4, Web Interface	Describes the Web Interface.

Chapter, Title	Description
Chapter 5, Command Line Interface (CLI)	Describes the CLI command conventions, functions, and features.
Chapter 6, Provisioning	Describes the commands and procedures required to provision the SyncServer S6x0 after installing the unit.
Chapter 7, Maintenance, Troubleshooting & Part Numbers	Contains preventive and corrective maintenance, and troubleshooting procedures for the product. Also contains part number and ordering information and procedures for returning the SyncServer S6x0.
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 SyncServer S6x0.
Appendix C, Installing GNSS Antennas	Provides details about GNSS Antenna kits and procedures for installing the GNSS antenna.
Appendix D, Software Licenses	Contains licensing information for third party software.
Appendix E, IP Port Details	Provides details about Ethernet, Management, and Timing ports.

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:
SyncServer S6x0 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.
<i>qualified personnel</i>	A word or term being emphasized.
Microsemi 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.

Where to Find Answers to Product and Document Questions

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

When this manual is updated the updated version will be available for downloading from Microsemi'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.microsemi.com/ftdsupport

What's New In This Guide

The following corrections and additions have been made to the SyncServer S6x0 User's Guide with Rev. E:

- Added Galileo and QZSS constellations to the GNSS license.
- Updated [Figure 4-37](#) for Reference > GNSS Config.
- Added [PTP Client List Window](#) section to Chapter 4.
- Updated [Figure 4-29](#), screen image for Timing > Input Control page.
- Updated screen captures in Chapter 4.
- Added [Provisioning the PTP Server - PTP Output Power Profiles](#)
- Added [Provisioning Programmable Pulse Output](#)
- Added [Making Time-Interval or Event Timestamp Measurements](#)
- Added NTP monitoring
- Added descriptions of Timing I/O module with Telecom I/O, Timing I/O module with HaveQuick/PTTI, Timing I/O module with Fiber Input, and Timing I/O module with Fiber Outputs to Chapter 1.
- Added procedures for [Provisioning T1/E1 Input on Timing I/O Telecom Module](#), [Provisioning HaveQuick Input on Timing I/O HaveQuick/PTTI Module](#), [Provisioning Outputs on Timing I/O with Telecom Module](#), and [Provisioning Outputs on Timing I/O HaveQuick/PTTI Module](#) in Chapter 6.
- Added specifications for Telecom inputs ([Table B-14](#)) and outputs ([Table B-21](#)), HaveQuick inputs ([Table B-15](#)) and outputs ([Table B-22](#) and [Table B-23](#)), and PTTI outputs ([Table B-24](#)).

- Added [Chapter F, PQL Mapping](#).

The following corrections and additions have been made to the SyncServer S6x0 User's Guide with Rev. D1:

- Added section with [10 GbE Input/Output Connections](#) to Chapter 1.
- Added [Table 2-3](#) with recommended and supported SFP+ (10 GbE) Transceivers.
- Added details about Dynamic Position Mode to [References - Reference GNSS Window](#).
- Updated [Figure 4-15](#), screen image for Network > SNMP page,
- Updated [Figure 4-29](#), screen image for Timing > Input Control page,
- Added specifications for Operating Altitude and Storage Altitude to [Table B-2](#).
- Added Timing Accuracy for Inputs with [Table B-16](#).
- Added details to [Compliance & Certifications](#) section in Appendix B about Voluntary Control Council for Interference by Information Technology Equipment (VCCI) and VCCI-A.
- Added voltage range to the power specifications in [Table B-3](#)
- Added details about PTP to [Timing Port Rules](#), on page 396.
- Added procedure to [Add NTP Server Association using Autokey Authentication](#).

The following corrections and additions have been made to the SyncServer S6x0 User's Guide with Rev. D:

- Updated screen images for some Web Interface windows to reflect changes to the GUI.
- Added details about new Low Phase Noise Module and Ultra Low Phase Noise Module Chapter 1, Chapter 2 and Appendix B.
- Added details about dual DC power supplies to Chapter 1, Chapter 2 and Appendix B.
- Added new alarms to Appendix A.
- Updated Software License information to include new licenses and new features to existing license.
- Added new procedures to Chapter 6.

The following corrections and additions have been made to the SyncServer S6x0 User's Guide with Rev. C, in addition to other changes.

- Added [Configuring Network Timing Services](#), [Mapping a Network Timing Service to a LAN Port](#), [Observing Status of Network Timing Services](#) and [Monitoring Network Packets](#) to [Provisioning Outputs](#) section in Chapter 6.
- Added information about IRIG with Flex Port Option
- Added PTP input/output details
- Added GPS/GLONASS/BeiDou antenna information
- Added GPS/GLONASS/BeiDou splitter information

The following corrections and additions have been made to the SyncServer S6x0 User's Guide with Rev. B:

- Added v1.1 feature information NTP Reflector in [NTP / PTP Services Configuration Window](#) section and in [Security Features](#) section.
- Updated image for [Upgrading the Firmware](#) section to show new Authentication file required for firmware upgrade.
- Added new CLI commands for configuring serial timing output with NENA format: `set nena active`, `set nena-format`, and `show nena-format`.
- Updated screen images for some Web Interface windows to reflect changes to the GUI.

Related Documents and Information

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

To order any accessory, contact the Microsemi Sales Department. See www.microsemi.com/sales-contacts/0 for sales support contact information. If you encounter any difficulties installing or using the product, contact Microsemi Frequency and Time Division (FTD) Services and Support:

U.S.A. Call Center:

including Americas, Asia and Pacific Rim
Frequency and Time Division
3870 N 1st St.
San Jose, CA 95134

Toll-free in North America: 1-888-367-7966
Telephone: 408-428-7907
Fax: 408-428-7998
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ftd.emea_sales@microsemi.com

Chapter 1 Overview

This chapter provides introductory information for the SyncServer S6x0.

In This Chapter

- [Overview](#)
 - [SyncServer S6x0 Key Features](#)
 - [Software Options](#)
 - [Security Features](#)
- [Physical Description](#)
- [Functional Description](#)
- [Configuration Management](#)
- [Alarms](#)

Overview

SyncServer S600

Modern networks require accurate, secure and reliable time services as provided by the Microsemi SyncServer S600. The security hardened S600 network time server is purpose built to deliver exact hardware-based NTP time stamps. The unparalleled accuracy and security is rounded out with outstanding ease-of-use features for reliable network time services ready to meet the needs of your network and business operations today and tomorrow.

SyncServer S650

The modular Microsemi SyncServer S650 combines the best of time and frequency instrumentation with unique flexibility and powerful network/security based features.

The base Timing I/O module with 8 BNC connectors comes standard with the most popular timing I/O signals (IRIG B, 10MHz, 1PPS, etc.). When more flexibility is required, the unique Microsemi FlexPort™ Technology option enables 6 of the BNCs to output any supported signal (time codes, sine waves, programmable rates, etc.) all configurable in real time via the secure web interface. This incredibly flexible BNC by BNC configuration makes very efficient and cost effective use of the 1U space available. Similar functionality is applied to the two input BNCs as well. Unlike legacy modules with fixed count BNCs outputting fixed signal types per module, with FlexPort™ Technology you can have up to 12 BNCs output any combination of supported signal types.

This level of timing signal flexibility is unprecedented and can even eliminate the need for additional signal distribution chassis and there is no degradation in the precise quality of the coherent signals.

SyncServer S650i

The Microsemi SyncServer S650i is a S650 base chassis with no GNSS receiver. The S650i also includes a single installed Timing I/O module. All software upgrade options are applicable except GLONASS/BEIDOU/SBAS.

SyncServer S6x0 Key Features

- <15ns RMS to UTC(USNO) for S650
- 1×10^{-12} Frequency accuracy
- Modular timing architecture with unique and innovative FlexPort™ technology (optional)

- Most popular timing signal inputs/outputs are standard in the base Timing I/O module (IRIG B, 10MHz, 1PPS, etc.) available for the S650.
- Four (4) GbE ports standard, all with NTP hardware time stamping
- Ultra high-bandwidth NTP time server
- Stratum 1 Operation via GNSS satellites
- DoS detection/protection (optional)
- Web-based management with high security cipher suite
- TACACS+, RADIUS, LDAP, and more (optional)
- -20C to +65C operating temperature (Standard and OCXO)
- IPv6/ IPv4 on all ports
- Rubidium Atomic clock or OCXO oscillator upgrades
- Dual power supply option
- PTP and GLONASS/Galileo/QZSS/Beidou/SBAS (optional)
- Dual 10G Ethernet module option
- Low Phase Noise (LPN) module option
- Ultra Low Phase Noise (ULPN) module option
- Telecom Inputs/Outputs module option
- Timing I/O module with HaveQuick/PTTI option
- Timing I/O module with fiber outputs option
- Timing I/O module with fiber input option
- Dual DC power supply option

Software Options

The SyncServer S600/S650 includes built-in hardware features enabled via software license keys.

- Security Protocol License Option: The SyncServer S600/S650 can be seriously hardened from both an NTP perspective and an authentication perspective via this option. This license option includes:
 - NTP Reflector - high capacity and accuracy
 - Per port packet monitoring and limiting
- FlexPort Timing License Option: The FlexPort™ Technology option enables the 6 output BNCs (J3-J8) to output any supported signal (time codes, sine waves, programmable rates, and so on.) all configurable in real time through the secure web interface. The 2 input BNCs (J1-J2) can support a wide variety of input signal types.

- GNSS License Option: This option enables the SyncServer S600/S650 to use GPS, GLONASS, SBAS, and BEIDOU signals.
- PTP Master Output License Option: This option enables PTP default profile, PTP Enterprise profile and PTP Telecom-2008 profile master functionality.
- PTP Client License: This option enable PTP client to be configured on an Ethernet port.
- 1PPS TI Measurement License:: This license enable 1PPS measurements to be made on the J1 port of a timing card.
- Programmable Pulse Option: This license enables the programmable pulse feature on J7 of selected timing cards.

See [SyncServer S6x0 Part Numbers](#), on page 289 for all available options.

Activation keys are associated with the serial number of the device on which the keys are stored and travel with that device. The user must enter key(s) with web interface via LAN1 port to gain access to the licensed software options web page.

Security Features

Security is an inherent part of the SyncServer S600/S650 architecture. In addition to standard security features related to the hardening of the web interface, NTP and server access, unsecure access protocols are deliberately omitted from the S6x0 while remaining services can be disabled. Advanced authentication services such as TACACS+, RADIUS, and LDAP are optionally available.

The four (4) standard GbE ports, and optional two (2) 10GbE ports, combined easily handle more than 10,000 NTP requests per second using hardware time stamping and compensation (360,000 is max capacity for NTP reflector, 13,000 is max capacity for NTPd). All traffic to the S6x0 CPU is bandwidth limited for protection against DoS (denial of service) attacks.

Physical Description

The SyncServer S6x0 consists of a 19-inch (48 cm) rack-mountable chassis, plug-in modules (S650 only), and hardware.

All connections for the SyncServer S6x0 are on the rear panel. [Figure 1-1](#) is a front view of the SyncServer S600 version showing LEDs, display screen, navigation buttons and entry buttons. [Figure 1-2](#) and [Figure 1-3](#) show the rear panel connections for the Single AC versions of the SyncServer S600. [Figure 1-4](#) and [Figure 1-5](#) show the rear panel connections for the Dual AC versions of the SyncServer S600. [Figure 1-6](#) and [Figure 1-7](#) shows the rear panel connections for the Dual DC versions of the SyncServer S600.

Figure 1-8 is a front view of the SyncServer S650 version showing LEDs, display screen, navigation buttons and entry buttons. Figure 1-9 and Figure 1-10 show the rear panel connections for the Single AC versions of the SyncServer S600. Figure 1-11 and Figure 1-12 show the rear panel connections for the Dual AC versions of the SyncServer S600. Figure 1-13 and Figure 1-14 show the rear panel connections for the Dual AC versions of the SyncServer S600.

Figure 1-15 is a front view of the SyncServer S650 version showing LEDs, display screen, navigation buttons and entry buttons. Figure 1-16 shows the rear panel connections for the Single AC version of the SyncServer S600. Figure 1-17 shows the rear panel connections for the Dual AC version of the SyncServer S600.

Figure 1-1. SyncServer S600 Front Panel

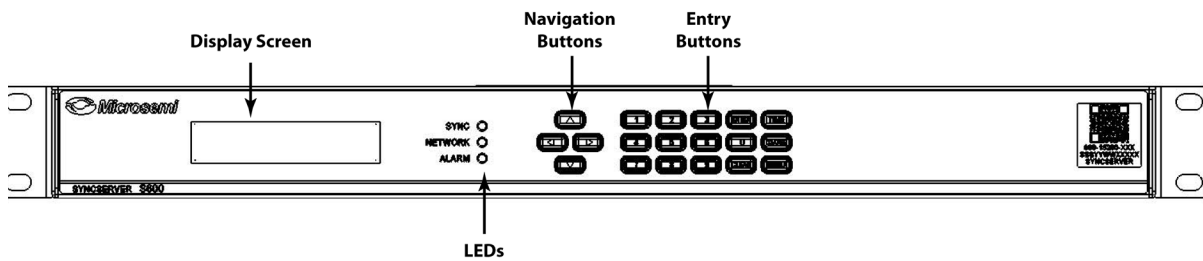


Figure 1-2. SyncServer S600 Rear Panel - Single AC Version

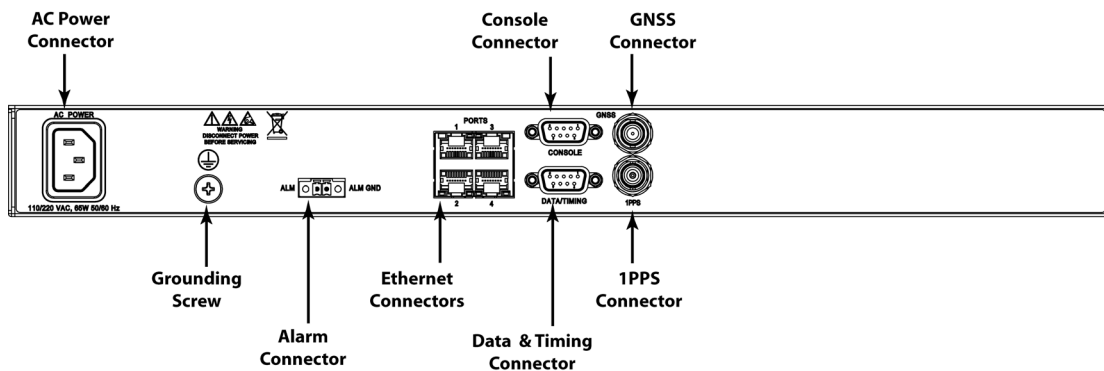


Figure 1-3. SyncServer S650 Rear Panel - Single AC Version with 10 GbE

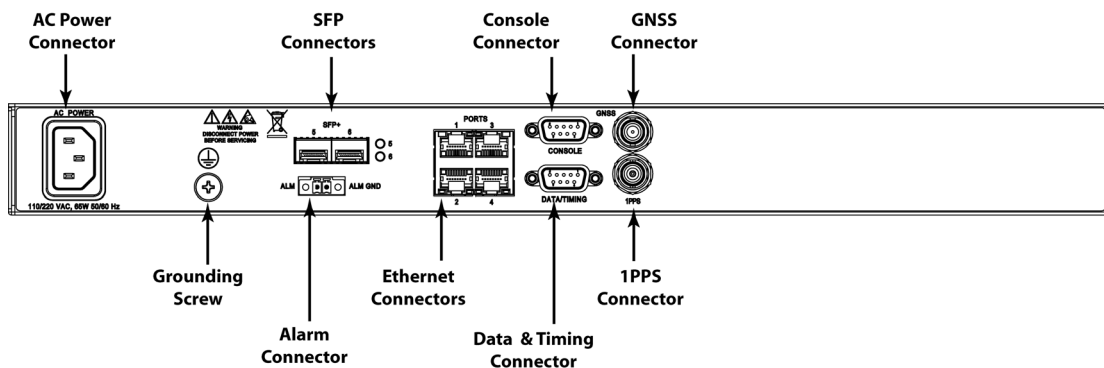


Figure 1-4. SyncServer S600 Rear Panel - Dual AC Version

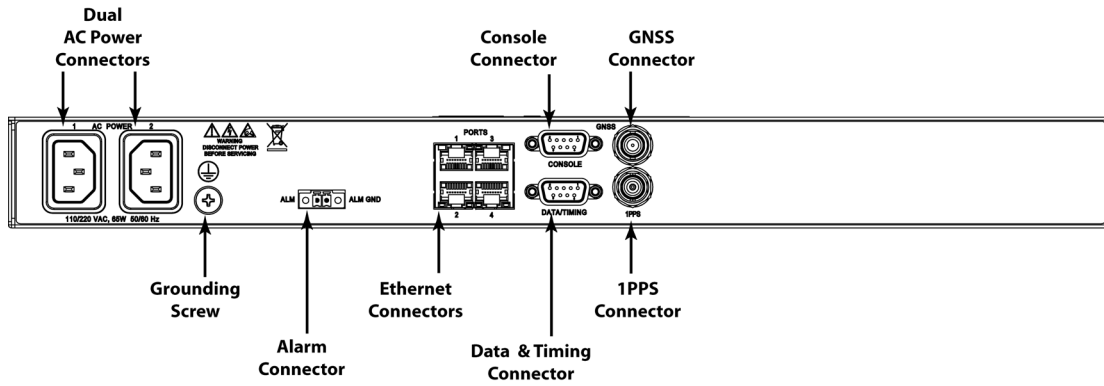


Figure 1-5. SyncServer S600 Rear Panel - Dual AC Version with 10 GbE

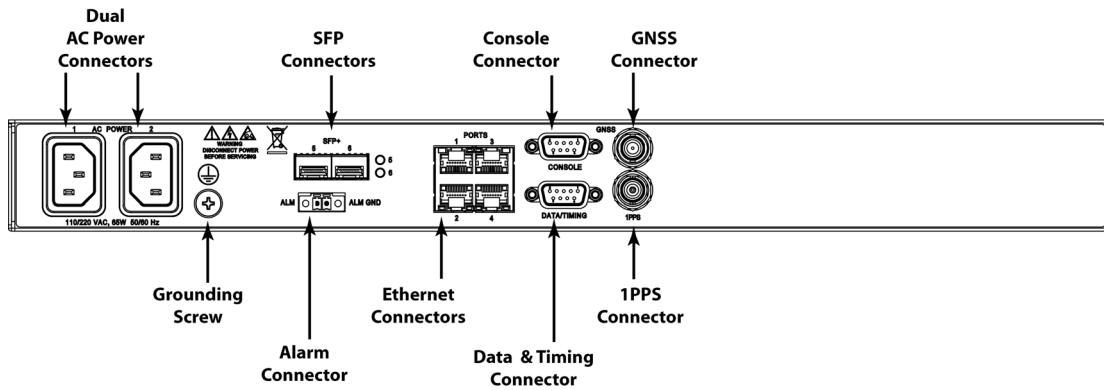


Figure 1-6. SyncServer S600 Rear Panel - Dual DC Version

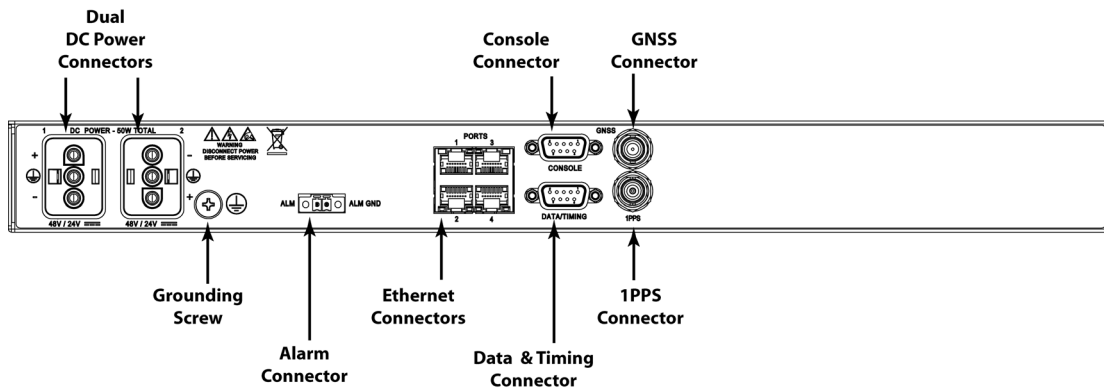


Figure 1-10. SyncServer S650 Rear Panel - Single AC Version with 10 GbE

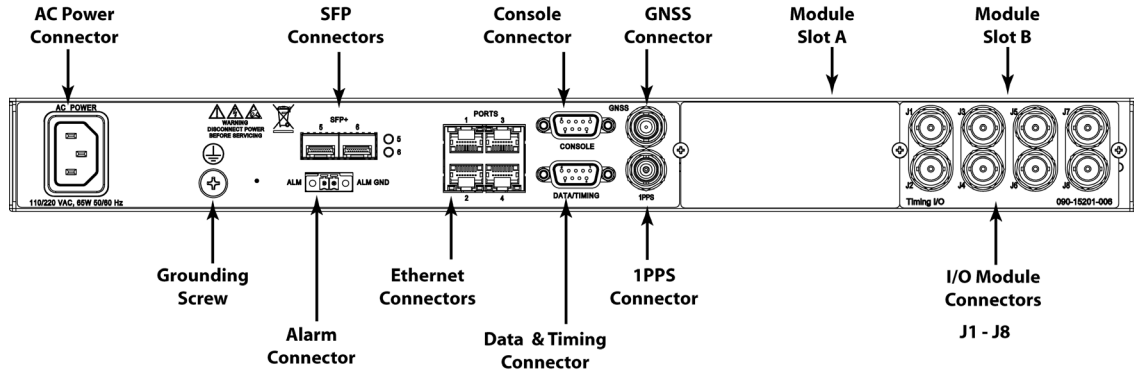


Figure 1-11. SyncServer S650 Rear Panel - Dual AC Version

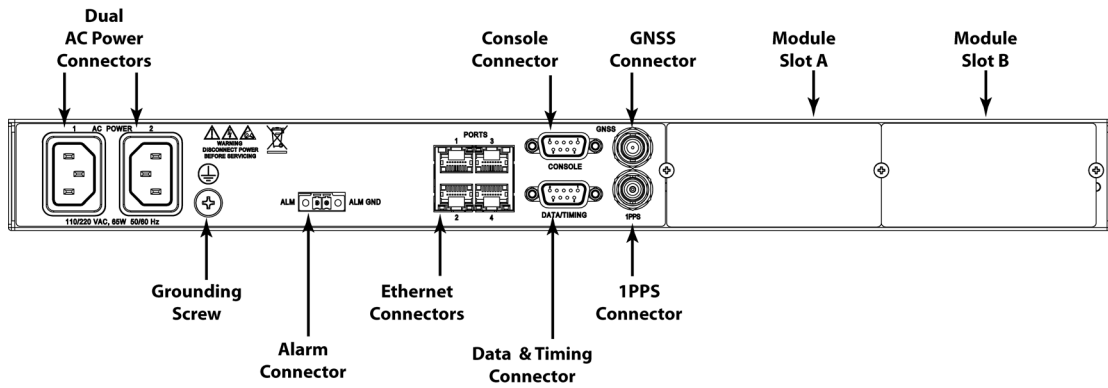


Figure 1-12. SyncServer S650 Rear Panel - Dual AC Version with 10GbE

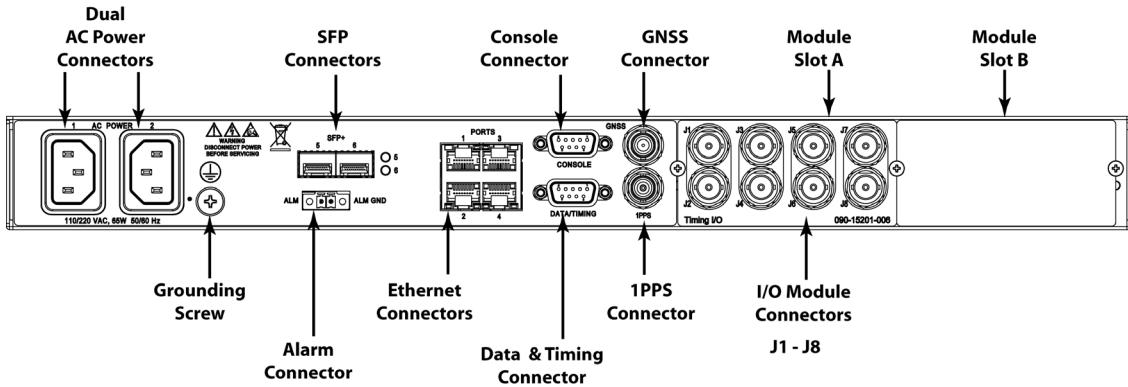


Figure 1-13. SyncServer S650 Rear Panel - Dual DC Version

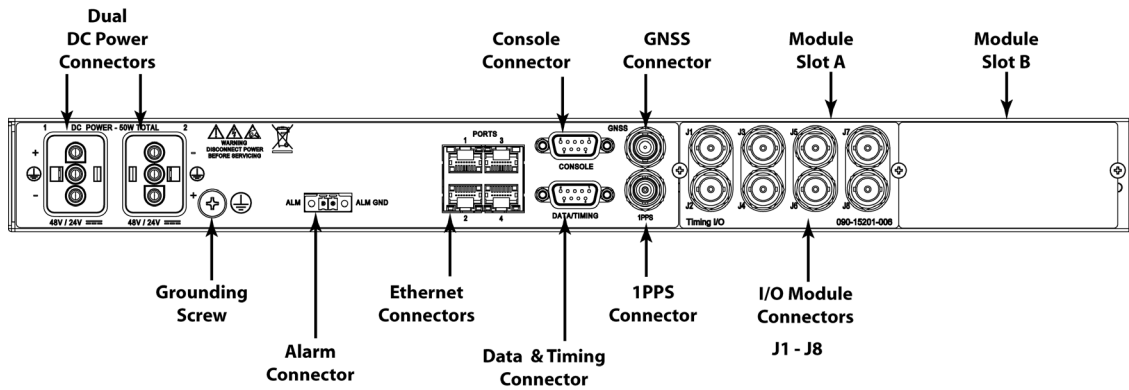


Figure 1-14. SyncServer S650 Rear Panel - Dual DC Version with 10 GbE

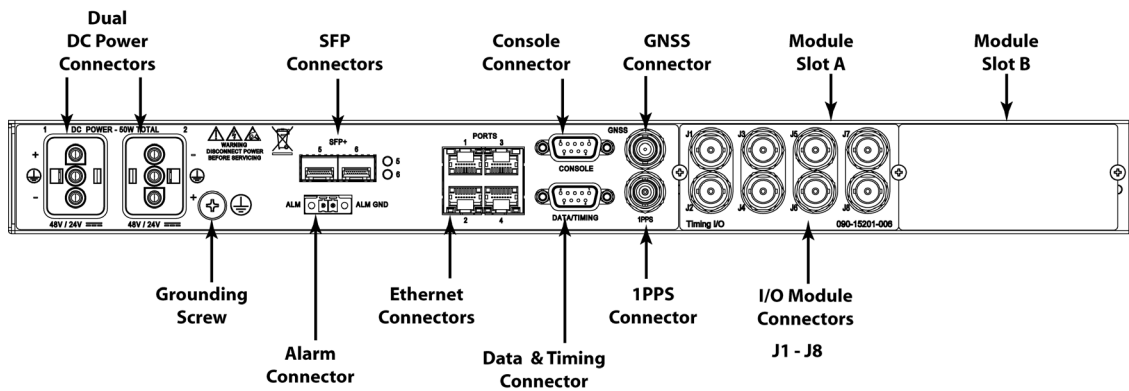


Figure 1-15. SyncServer S650i Front Panel

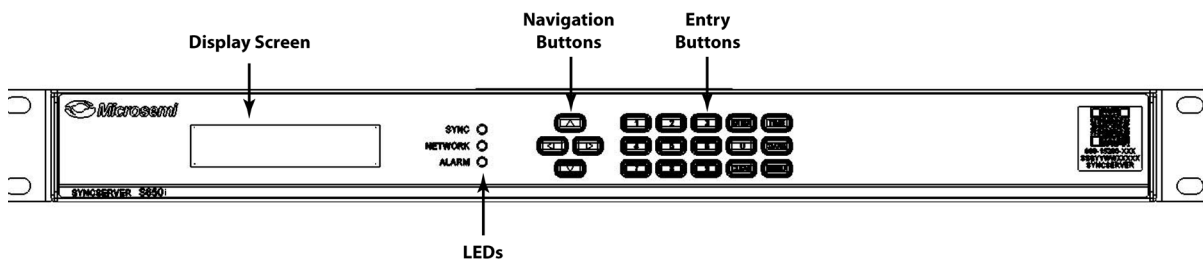


Figure 1-16. SyncServer S650i Rear Panel - Single AC Version

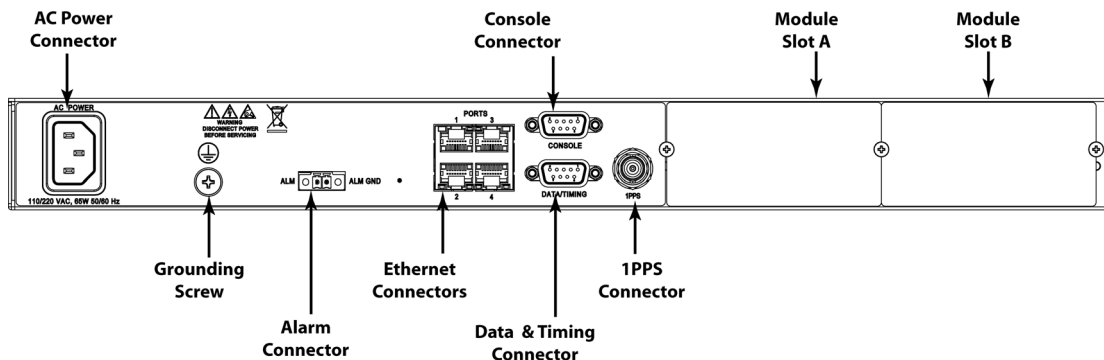
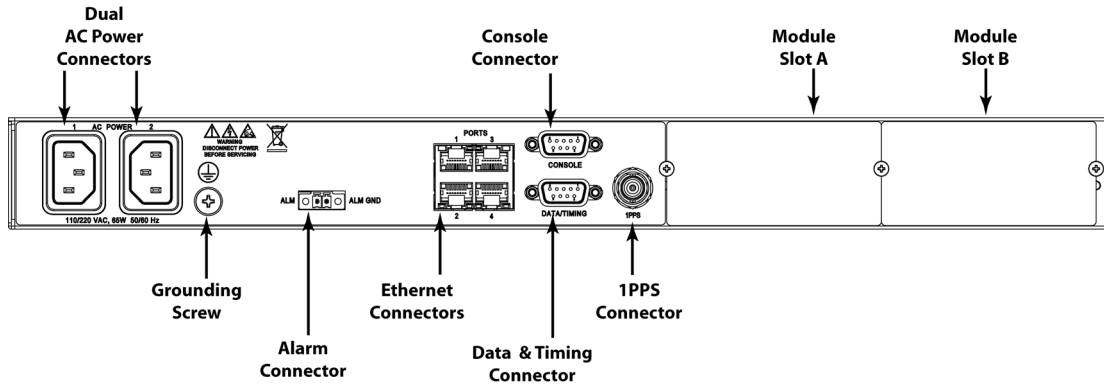


Figure 1-17. SyncServer S650i Rear Panel - Dual AC Version



Communications Connections

The SyncServer S6x0 is primarily controlled through the web interface available on LAN 1. Limited functionality is available via the console serial port.

Ethernet Management Port - LAN1

Ethernet port 1 is the management port that is used to access the web interface. This port is located on the rear panel of the SyncServer S6x0 and is a standard 100/1000 Base-T shielded RJ-45 receptacle. To connect the SyncServer S6x0 to an Ethernet network, use a standard twisted-pair Ethernet RJ-45 cable (CAT5 minimum). Configurable to 100_Full or 1000_Full or Auto :100_Full / 1000_Full.

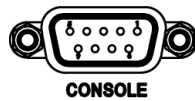
Serial Console Port

The serial port connection is made through a DB-9 female connector on the rear panel of the SyncServer S6x0. This port, which supports a baud rate of 115.2k (115200-8-N-1), allows you to connect to a terminal or computer using a terminal emulation software package. When connecting to this port, use a shielded serial direct connect cable.

This port is also used for serial data (NENA ASCII time code, Response mode).

Figure 1-18 shows the DB-9 female connector for the serial port.

Figure 1-18. Serial Port Connector



Input Connections

GNSS Connection

The SyncServer S6x0 features a BNC connector for input from GNSS navigation satellites to provide a frequency and time reference. This port also provides 9.7V to power a Microsemi GNSS antenna (see [Antenna Kits Overview](#) in [Appendix C, Installing GNSS Antennas](#)). See [Figure 1-19](#). This connector is not present on the SyncServer S650i.

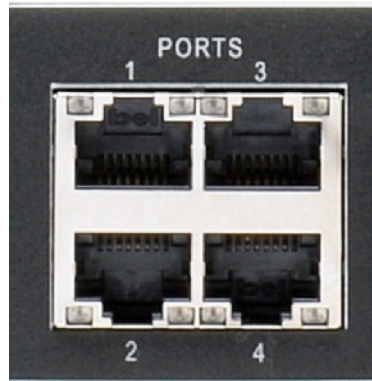
Figure 1-19. GNSS Input Connection



NTP Input/Output Connections

The S600 / S650 has four dedicated and software isolated GbE Ethernet ports, each equipped with NTP hardware time stamping. These are connected to a very high-speed microprocessor and an accurate clock to assure high bandwidth NTP performance. See [Figure 1-20](#). See [Appendix E, IP Port Details](#) for information on Ethernet port isolation and management port rules.

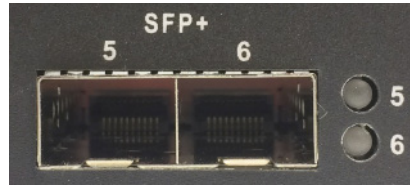
Figure 1-20. NTP Input/Output Connections



10 GbE Input/Output Connections

The S600 / S650 10 GbE option adds two SFP+ ports equipped with hardware timestamping that supports NTP, PTP, and NTP Reflector operations. The 10 GbE ports are in addition to the standard four 1 GbE ports for a total of 6 ports. These ports are ideal for interoperability with 10 GbE switches. SFP modules supported are limited to 10 GbE speeds only, and overall system time stamping capacity remains as specified.

Figure 1-21. 10 GbE Input/Output Connections



Output Connections

Serial Data/Timing Output Connection

The serial data/timing port connection is made through a DB-9 female connector on the rear panel of the SyncServer S6x0, as shown in [Figure 1-22](#). When connecting to this port, use a shielded serial direct connect cable.

The dedicated Data/Timing port is provided to output NMEA-0183 or NENA PSAP strings. If NENA is selected, the serial Console port also supports the two-way timing aspects of the standard. In addition, the F8 and F9 Microsemi legacy time strings are available.

With the optional time interval measurement option, this port can alternatively be used to send timestamps and measurements.

Figure 1-22. Serial Data/Timing Connection



1PPS Output Connection

The SyncServer S6x0 provides a BNC female connector ([Figure 1-23](#)):

Figure 1-23. 1PPS Output Connection



Alarm Relay

The SyncServer S6x0 features a Phoenix connector for an alarm relay output. See [Figure 1-24](#). The relay is open when the configured alarm classes ([Figure 1-25](#)) occur. If the SyncServer S6x0 is not powered, then the alarm relay will be open. The relay is energized (shorted), when the SyncServer S6x0 is powered and no configured alarms are active.

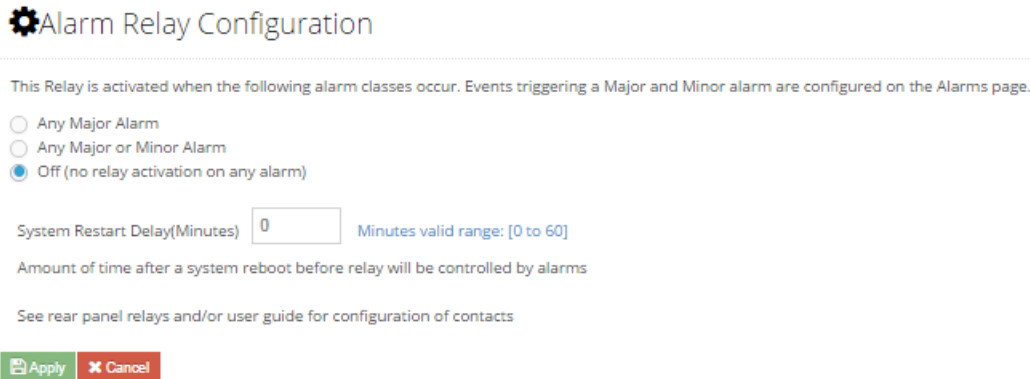


Note: The alarm relay is shorted when the alarm is active for firmware releases 1.0 and 1.1.

Figure 1-24. Alarm Relay Connector



Figure 1-25. Alarm Relay Configuration Web GUI



Timing I/O Card Connections

The Timing I/O Module is an exceedingly versatile time and frequency input and output option. In the standard configuration, it supports the most popular input and output time codes, sine waves, and rates.

The standard configuration offers a broad yet fixed selection of signal I/O on its eight BNC connectors (see [Figure 1-26](#)). J1 is dedicated to time code and rate inputs, J2 to sine wave inputs, and J3-J8 to mixed signal outputs. The standard Timing I/O Module configuration is 1PPS or IRIG B AM-In, 10 MHz- In, IRIG AM and IRIG DCLS-Out, 1PPS-Out and 10 MHz-Out.

The FlexPort™ Technology option enables the 6 output BNCs (J3-J8) to output any supported signal (time codes, sine waves, programmable rates, etc.), all configurable in real time via the secure web interface. Similarly, the 2 input BNCs (J1-J2) can support a wide variety of input signal types. This uniquely flexible BNC by BNC configuration makes very efficient and cost effective use of the 1U space available.

See [Figure 1-27](#) to view the signal types for the standard configuration and the configuration with the FlexPort™ option.

Figure 1-26. Timing I/O Module BNC Connectors

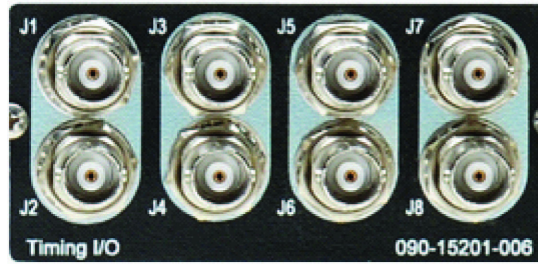


Figure 1-27. Signal Types for Timing I/O Module

		Slot A				Slot B			
→ BNC Connectors		Input		Output					
↓ Signals		J1	J2	J3	J4	J5	J6	J7	J8
Standard	1PPS	●					●	off	off
	IRIG B AM	●		●				off	off
	IRIG B DCLS					●		off	off
	10 MHz		●		●			off	off
FlexPort	IRIG A/B/C37/E/G NASA/2137/XR3 AM/DCLS	■		■	■	■	■	■	■
	Selectable/Programmable Rates	■		■	■	■	■	■	■
	1/5/10 MHz Sine Waves		■	■	■	■	■	■	■

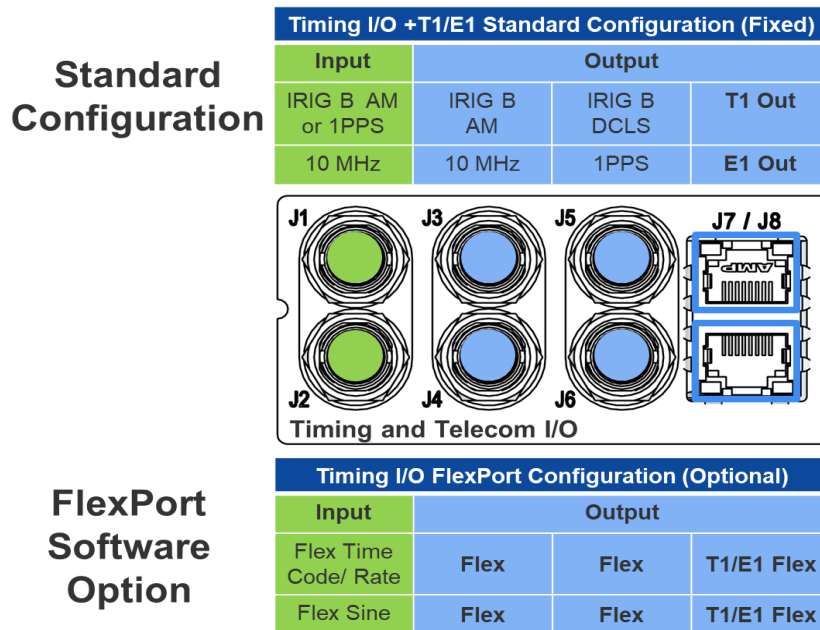
- = Fixed specific signal type
- = User configurable Time Codes, Selectable/Programmable Rates or Sine Waves

Timing I/O Module with Telecom I/O Connections

The Timing I/O Module with Telecom I/O (090-15201-011) features six BNC ports in positions J1-J6 and two RJ-48c ports in position J7 and J8, as shown in [Figure 1-28](#). The standard configuration for the RJ-48C ports is J7=T1 Output and J8=E1 Output.

Ports are individually configurable for the signal formats in [Figure 1-28](#) if FlexPorts are enabled with the FlexPort license. If the license is not installed, then J7 can only be configured for T1 output and J8 can only be configured for E1 output.

Figure 1-28. Timing I/O Module with Telecom I/O Connections



T1/E1 FlexPort

J7 Input or Output: T1 or E1

J7 / J8 Outputs: T1, E1, CC, JCC, JSW (sine),
2.048 MHz (square), 1.544 MHz (square)

Ports J1-J6 have identical functionality to the basic Timing I/O module. See [Figure 1-27](#) for details about configuration choices..

Table 1-1. J7 and J8 Connector Pin Assignments - Timing I/O Module with Telecom I/O Connections

Pin	Signal
1	Rx ring (not supported on J8)
2	Rx tip (not supported on J8)
3	N/C
4	Tx ring
5	Tx tip
6	N/C
7	N/C
8	N/C

Timing I/O Module with HaveQuick/PTTI Module Connections

The Timing I/O with HaveQuick/PTTI module (090-15201-012) adds support for a set of timing protocols and signals generally associated with the GPS User Equipment sector and timing interfaces intended for equipment interoperability. Within that sector definitions for a Precise Time and Time-Interval (PTTI) Interface cover an evolutionary range of signaling and protocols. A core set of revised documents (ICD-GPS-060) form a basis for the subject, including baseline HaveQuick and BCD interfaces and protocol definitions. This module supports many variations of this category of timing interfaces. References to STANAG (STANdard NATO AGreement) codes are variations of the core ICD-GPS-060A code.

Along with the unique HaveQuick/PTTI capabilities, this module supports all functionality that is available on J1 - J6 of the standard timing I/O module. Connections J7 and J8 uniquely provide balanced 2-wire PTTI BCD capabilities. The FlexPorts license comes pre-installed on a system containing a HaveQuick/PTTI module.

For details on HaveQuick input support on J1 and J2, see [Provisioning HaveQuick Input on Timing I/O HaveQuick/PTTI Module](#).

For details on HaveQuick output support on J3 through J8, see [Provisioning Outputs on Timing I/O HaveQuick/PTTI Module](#).

Figure 1-29. HaveQuick/PTTI Module Connections

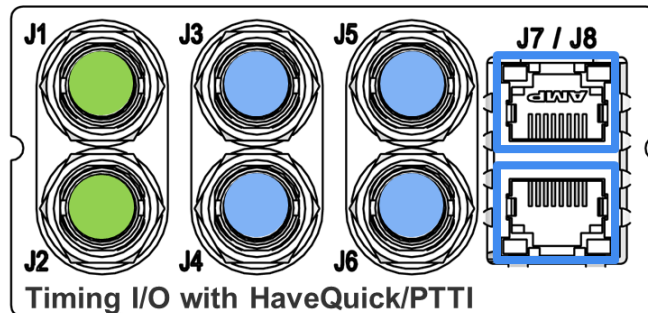


Table 1-2. HaveQuick/PTTI Module Port Descriptions

Port	Description
J1	Input same as Timing I/O module with FlexPort functionality always On, Supports TTL and 5V HaveQuick Input ¹
J2	Input same as Timing I/O module with FlexPort functionality always On, used for 1PPS input when HaveQuick is configured on J1

Table 1-2. HaveQuick/PTTI Module Port Descriptions

Port	Description
J3	Output same as Timing I/O module with FlexPort functionality always On, Includes HaveQuick TTL or HaveQuick 5V outputs. Includes 10V PPS or 10V PPM output.
J4	Output same as Timing I/O module with FlexPort functionality always On, Includes HaveQuick TTL or HaveQuick 5V outputs. Includes 10V PPS or 10V PPM output.
J5	Output same as Timing I/O module with FlexPort functionality always On, Includes HaveQuick TTL or HaveQuick 5V output Includes 10V PPS or 10V PPM output
J6	Output same as Timing I/O module with FlexPort functionality always On, Includes HaveQuick TTL or HaveQuick 5V output Includes 10V PPS or 10V PPM output
J7	RS422 PTTI Output on RJ-48
J8	RS422 PTTI Output on RJ-48

Note:

- ¹ HaveQuick Timecode input provides the major and minor time. An external 1PPS input, if available, is used for synchronizing the on-time mark.

Table 1-3. J7 & J8 Connector Pin Assignments - Timing I/O Module with HaveQuick/PTTI Connections

Pin	Signal
1	PTTI Tx+ (code out)
2	PTTI Tx- (code out)
3	1PPS/PPM out, TTL level (for test purposes only)
4	Ground
5	Reserved, do not connect
6	N/C
7	Reserved, do not connect
8	Reserved, do not connect

HaveQuickII (HQII) and Extended HaveQuick (XHQ) Timecodes

The following timecodes are supported with HaveQuick/PTTI module:

- STANAG 4246 HAVE QUICK I
- STANAG 4246 HAVE QUICK II
- STANAG 4430 Extended HAVE QUICK
- ICD-GPS-060A HAVE QUICK

PTTI Binary Coded Decimal (BCD)

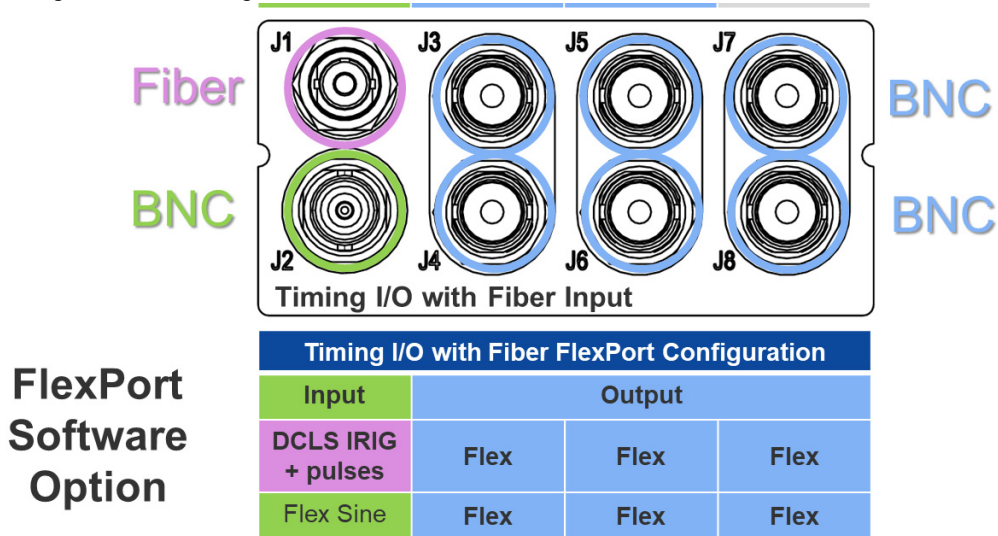
There are two different formats that are supported:

- Full - The PTTI BCD time code is a 50 bit message defining the UTC time of day, day of year, and TFOM transmitted at 50 bps.
- Abbreviated - The abbreviated PTTI BCD time code is a 24 bit message defining the UTC time of day. The day of year, and TFOM bits are set high (1) transmitted at 50 bps.

Timing I/O Modules with Fiber Connectors

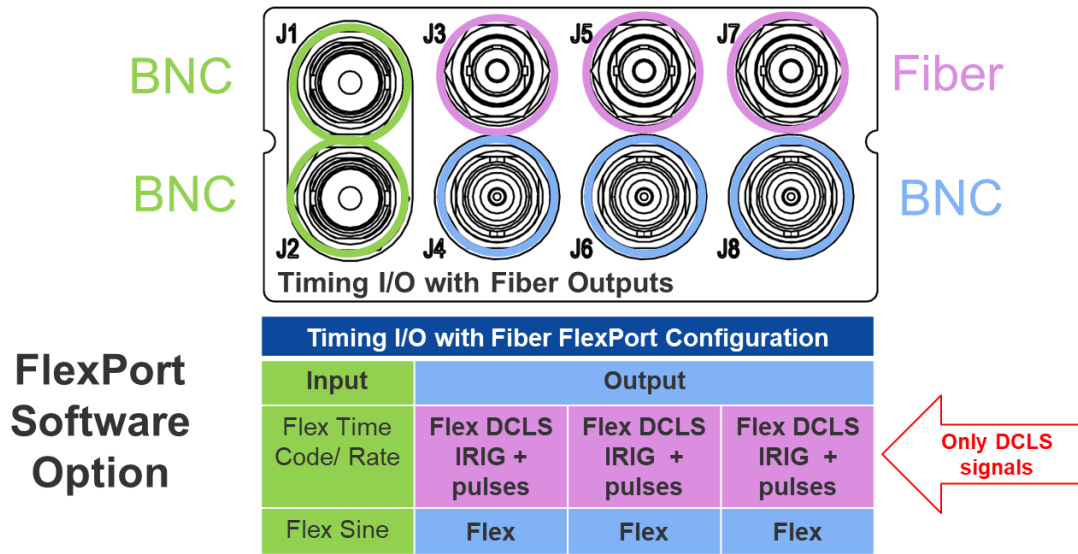
There are two variations on the Timing I/O Module with fiber connectors. The 090-15201-013 has three output BNC multimode fiber connectors: J3, J5, and J7. The 090-15201-014 has a single multimode fiber connector, the J1 Input. See [Figure 1-30](#).

Figure 1-30. Timing I/O Modules with Fiber Connections



Flex Timing License is Required

Figure 1-31. Timing I/O Modules with Fiber Outputs



Flex Timing License is Required

Low Phase Noise (LPN) Module Connections

The module has eight 10MHz LPN outputs (J1-J8). There are two different LPN modules available with different performance specifications.

There is no user configuration necessary with these modules.

Figure 1-32. LPN Module Connections

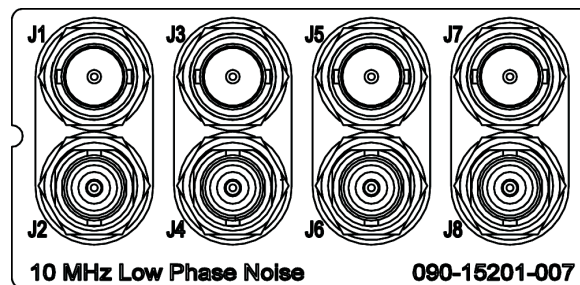
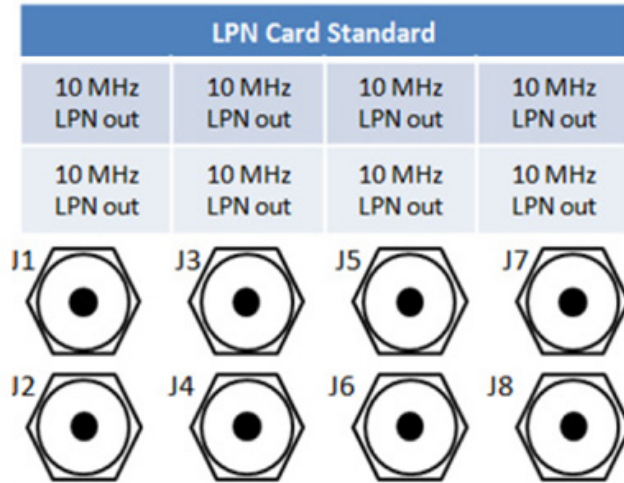


Figure 1-33. LPN Module Signal Types



Power and Ground Connections

The SyncServer S6x0 is available with either single or dual 120/240 VAC power, or dual DC power. The SyncServer S6x0 is not equipped with a Power switch. AC power is controlled by the unplugging the AC power cord. Frame ground connections on the SyncServer S6x0 are made on the grounding stud located on the left side of the rear panel, as identified with the international Ground marking, as shown in [Figure 1-34](#) and [Figure 1-35](#).



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 1-34. SyncServer S6x0 Single AC Version Power and Ground

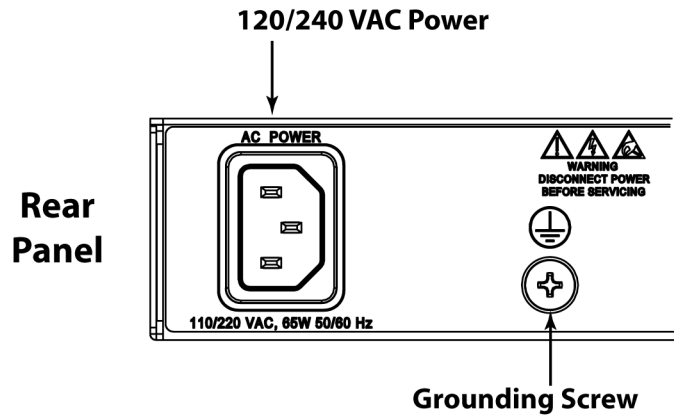


Figure 1-35. SyncServer S6x0 Dual AC Version Power and Ground

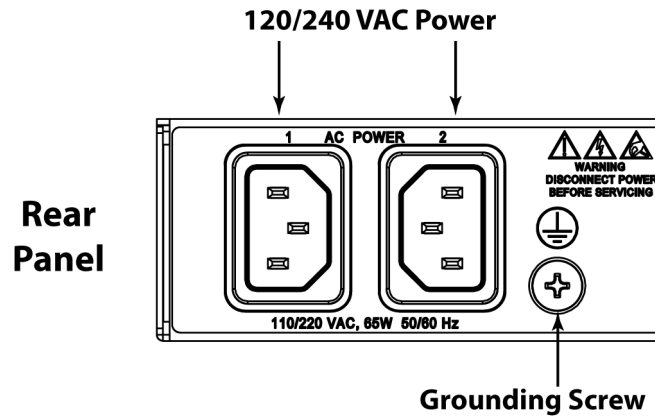
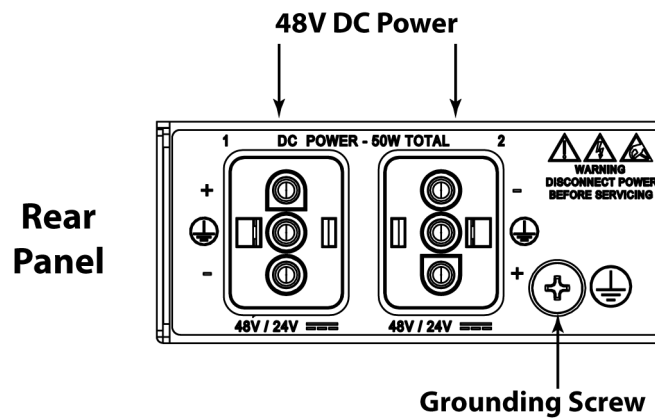


Figure 1-36. SyncServer S6x0 Dual DC Version Power and Ground



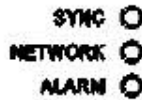
Functional Description

LEDs

The SyncServer S6x0 provides three LEDs on the front panel, as shown in [Figure 1-37](#), that indicate the following:

- Sync Status
- Network Status
- Alarm Status

Figure 1-37. LEDs for SyncServer S6x0



See [Figure 2-6](#) for details about the LEDs.

Communication Ports

Communication ports on the SyncServer S6x0 allow you to provision, monitor, and troubleshoot the chassis with CLI commands.

Management Ethernet Port

The system web interface for full control is located on Ethernet port 1 (LAN1) and is used as the Management Ethernet connector to provide connectivity to an Ethernet local area network. The front panel can be used to configure an IPv4 address (static or DHCP) or enable DHCP for IPv6. Once the IP address is set and a connection is made to a Local Area Network (LAN), you can access the SyncServer S6x0 web interface.

Local Console Serial Port

The serial port supports very limited local control; you can configure the SyncServer S6x0 with CLI commands using a terminal or computer with terminal emulation software. The connector is located on the front panel. The Local port is configured as a DCE interface and the default settings are as follows:

- Baud = 115.2K
- Data Bits = 8 bits
- Parity = None
- Stop bits = 1
- Flow Control = None

Time Inputs

The SyncServer S6x0 can use GNSS, NTP, and IRIG as external input references (depending on model and configuration). The NTP signals use the RJ45 (1 - 4) connectors on the rear panel. The GNSS reference uses a BNC connector on the rear panel. The IRIG signal uses a BNC connector (J1) on the optional Timing I/O module on the rear panel, as described in [Table 1-4](#).

Frequency Inputs

The SyncServer S6x0 can use either 1PPS, 10 MPPS, 10 MHz, 5 MHz, or 1 MHz as external frequency input references. The 1PPS/10 MPPS use the J1 BNC and the 10 / 5 / 1 MHz signals use a BNC connector (J2) on the Timing I/O module on the rear panel, as described in [Table 1-4](#).

Frequency and Timing Outputs

The SyncServer S6x0 can provide NTP, 10 / 5 / 1 MHz, 1PPS, IRIG, or TOD output signals. The NTP signals use the RJ45 (1 - 4) connectors on the rear panel. The serial TOD output connects to a DB9 connector (DATA/SERIAL) on the rear panel. The IRIG, PPS, 10 MPPS, and 10 / 5 / 1 MHz signals use BNC connectors (J3 - J8) on the Timing I/O module on the rear panel. A 1PPS output is also available using a BNC connector (1PPS) on the rear panel.

Table 1-4. Timing Input/Output Module

Config.	Input BNCs		Output BNCs					
	J1	J2	J3	J4	J5	J6	J7	J8
Standard	IRIG B AM 124 or 1PPS	10 MHz	IRIG B AM	10 MHz	IRIG B B004 DCLS	1PPS	off	off
Flex Port Option	A000 A004 A134 IRIG B000 IRIG B004 IRIG B120 IRIG B124 IRIG E115 IRIG E125 IEEE 1344 C37.118.1a -2014 1PPS 10 MPPS	1 MHz 5 MHz 10 MHz	FlexPort J3-J8 Software Selectable Outputs per BNC (Configured via the web interface): a) Pulse: i) Fixed Rate 10/5/1MPPS, 100/10/1/kPPS, 100/10/1/0.5PPS, 1PPM ii) Programmable Period: 100 ns to 2 sec, step size of 10 ns b) Timecode: IRIG B 000/004/1344 DCLS, 120/124/1344 AM • IRIG A 004/134 • IRIG B 000/001/002/003/004/005/006/007/ C37.118.1a-2014/ 1344 DCLS • IRIG B 120/122/123/124/125/126/127/1344 AM • IRIG E 115/125 • IRIG G 005/145 • NASA 36 AM/DCLS, 2137, XR3 c) Sine: 1/5/10 MHz BNC-by-BNC output phase adjustment for timecodes and pulses					



Note: The SyncServer S6x0 uses IRIG 1344 version C37.118.1a-2014.

- On the input side, the code performs a subtraction using control bits 14 - 19 from the supplied IRIG time with the expectation that this will produce UTC time. This aligns with the C37.118.1a-2014 definition.
 - On the output side, control bits 14 - 19 will always be zero, and the encoded IRIG time will be UTC (if using an input 1344 IRIG as the reference the 2014 rules are applied to get that value). Hence, any code receiving S6x0 IRIG 1344 output should work regardless of which version they are decoding (since there is nothing to add or subtract).
-

Configuration Management

The SyncServer S6x0 can be configured using the keypad interface, web interface or Command Line Interface.

Keypad/Display Interface

The keypad/display interface displays the time, system status, and provides the following functions:

- Configuring and enabling/disabling the LAN1 network port
- Setting the time and entering freerun mode
- Adjusting the brightness
- Locking the keypad
- Shutting down the SyncServer

Web Interface

The SyncServer S6x0 also allows the user to access information via the LAN1 Ethernet port using HTTPS protocol. To use the SyncServer S6x0 web interface, enter the IP address for Ethernet port 1 into a web browser. Enter your user name and password for the SyncServer S6x0 when prompted.

Dashboard View

See [Figure 1-38](#) for an example of the dashboard status screen that will appear.

Figure 1-38. Web Interface - Dashboard

The screenshot shows the SyncServer S650 Web Interface Dashboard. At the top, there is a header with the Microsemi logo, the device name 'SyncServer S650', and status indicators for Sync (locked), Net, Alarm, and a user welcome message 'Welcome admin'. Below the header, the dashboard is divided into a left navigation menu and a main content area. The navigation menu includes options like Dashboard, Network, Network Timing, Timing, References, Security, Admin, Logs, OPTION SLOT A, OPTION SLOT B, and Help. The main content area features a 'System' status table and a list of configuration options on the right.

System	Status
Sync	Locked
Stratum	1
Network	1 2 3 4
GNSS	10
Alarm	1
Power	1
Slot	A B

The right-hand side of the dashboard lists various configuration options, including Timing, GNSS, Network, NTP, Timing Services, Timing Services Status, Alarm(s), Slot Modules, and About.

Command Line Interface (CLI)

The Command Line Interface can be used to control specific function of the SyncServer S6x0 from a terminal connected to the EIA-232 serial port or the Ethernet LAN1 port. Refer to [Chapter 5, Command Line Interface \(CLI\)](#) for further details.



Note: Before you can communicate with the SyncServer S6x0 through an Ethernet connection, you must first configure the Ethernet port using the serial connection or front panel (see [Provisioning the Ethernet Ports](#), on page 203).

Alarms

The SyncServer S6x0 uses alarms to notify you when certain conditions are deteriorating below specified levels or when issues arise, such as loss of power, loss of connectivity, or excess traffic on a port. These alarms are indicated by LEDs, WebGUI status, CLI status, alarm connector (configurable), SNMP Trap (configurable), message log (configurable), and email (configurable). For more information, see [Provisioning Alarms](#), on page 273 and [Appendix A, System Messages](#).

Chapter 2 Installing

This chapter describes the procedures for installing the SyncServer S6x0.

In This Chapter

- [Getting Started](#)
- [Unpacking the Unit](#)
- [Rack Mounting the SyncServer S6x0](#)
- [Installation Check List](#)
- [Signal Connections](#)
 - [Communications Connections](#)
 - [SyncServer S6x0 Synchronization and Timing Connections](#)
- [Connecting the GNSS Antenna](#)
- [Installation Check List](#)
- [Applying Power to the SyncServer S6x0](#)

Getting Started

Before you begin to install the SyncServer S6x0, review the information in this section.

If you encounter any difficulties during the installation process, contact Microsemi Frequency and Time Division (FTD) Services and Support. See [Contacting Technical Support](#), on page 297 for telephone numbers. Contact Microsemi FTD Services and Support for technical information. Contact Customer Service for information about your order, RMAs, and other information.

Security Considerations for SyncServer S6x0 Installation

- The SyncServer S6x0 should be installed in a physically secure and restricted location.
- Whenever possible, the SyncServer S6x0's Ethernet ports should be installed behind the company's firewall to prevent public access.

Site Survey

The SyncServer S6x0 can be installed in a wide variety of locations.

Before you begin installation, determine the chassis location, ensure the appropriate power source is available (120/240 VAC), and ensure that the equipment rack is properly grounded.

The SyncServer S6x0 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 15" (38.1 cm).

The SyncServer S6x0 is to be installed into a rack. The AC power connection is to be made to a 120 or 240 VAC power receptacle following local codes and requirements. An external Surge Protective Device is required to be used with the AC version of the SyncServer S6x0.

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: -40° F to 149° F (-20° C to 65° C) for SyncServer S6x0 with quartz oscillator (standard or OCXO); 23° F to 131° F (-5° C to 55° C) for SyncServer S6x0 with Rubidium oscillator.
- Operating Humidity: 5% to 95% RH, maximum, w/condensation

- 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 SyncServer S6x0.

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 SyncServer S6x0:

- Standard tool kit
- Cable ties, waxed string, or acceptable cable clamps
- 1 mm² / 16 AWG wire to connect grounding lug to permanent earth ground
- One UL 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 GNSS)
- 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 ground connections to the chassis

Unpacking the Unit

The SyncServer S6x0 is packaged to protect them from normal shock, vibration and handling damage. (Each unit is packaged separately.)



Caution: To avoid ESD damage to parts that are packaged with the SyncServer S6x0, observe the following procedures.

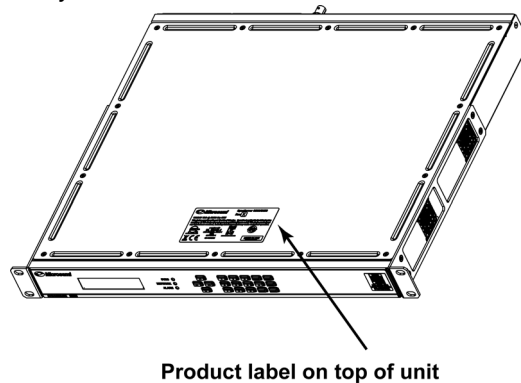
Unpack and inspect the unit as follows:

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 Microsemi 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 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. See [Figure 2-1](#) for the location of the label on the SyncServer S6x0. Contact your Microsemi distributor if the model or item number do not match.

For a complete listing of item numbers, see [Table 7-4](#), [Table 7-5](#) and [Table 7-6](#).

Figure 2-1. SyncServer S6x0 - Location of Product Label



Rack Mounting the SyncServer S6x0

The installation procedure described in this section provides general guidelines for installing the SyncServer S6x0. Always follow applicable local electrical standards.

SyncServer S6x0 is shipped with 19-inch rack mounting brackets attached.

Mount the chassis to the front of the equipment rack rails with four screws and associated hardware, as shown in [Table 2-3](#). Use the proper screws for the equipment rack.

Figure 2-2. Dimensions for SyncServer S6x0

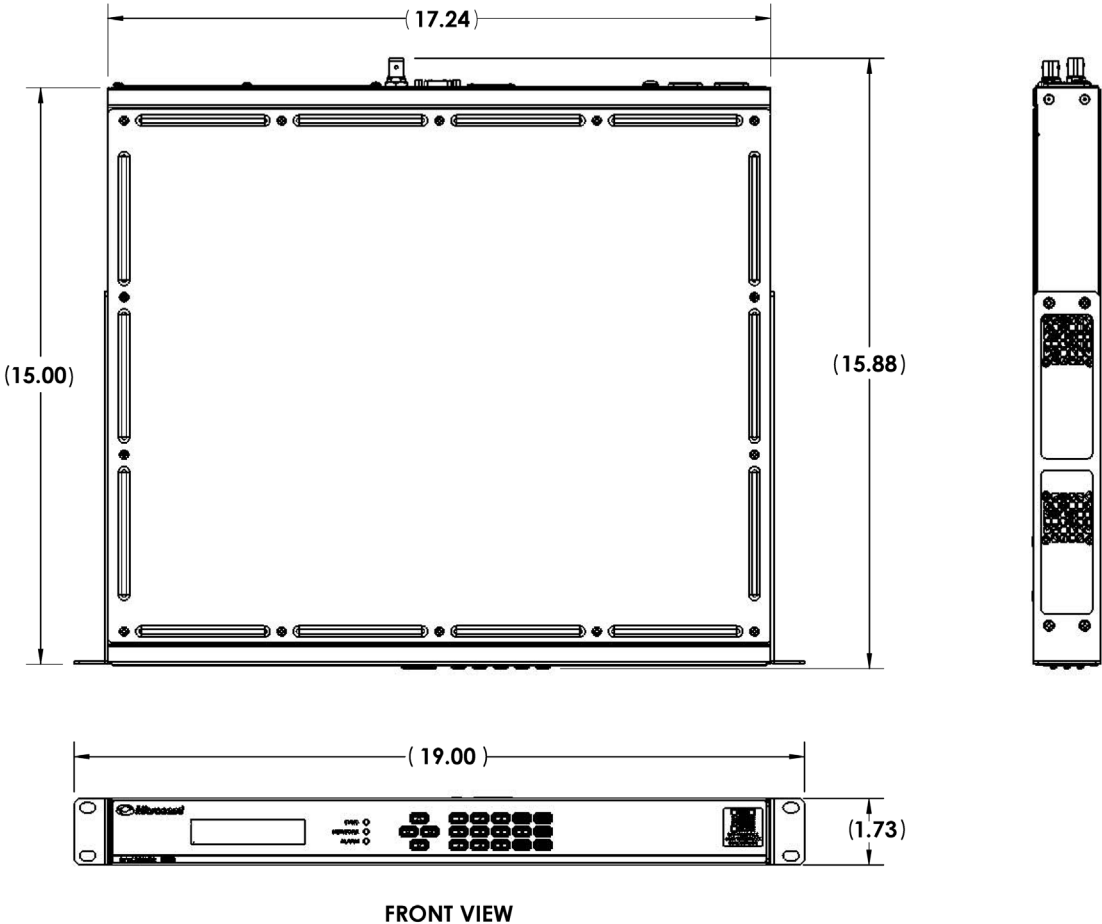
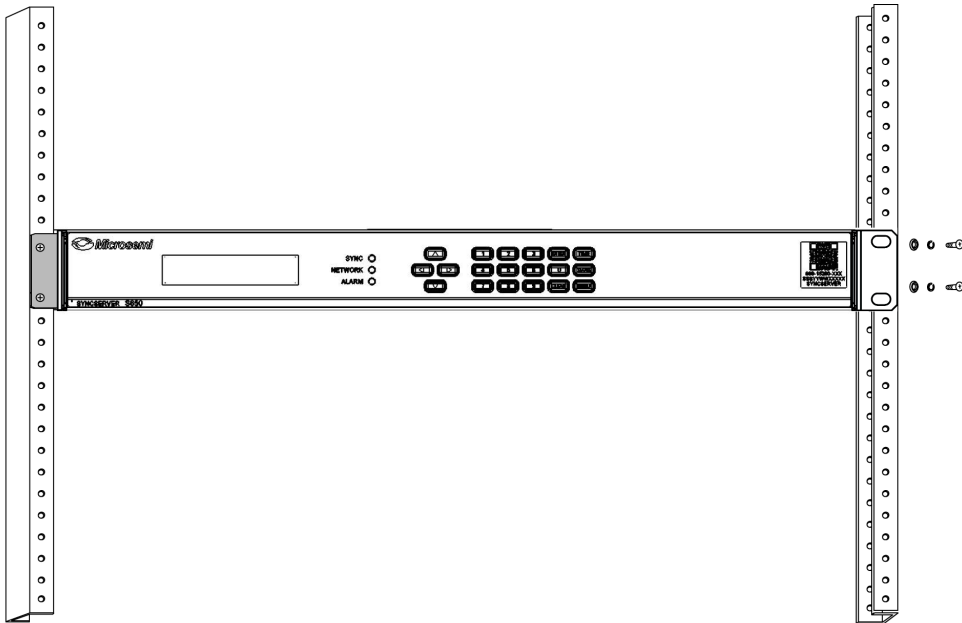


Figure 2-3. Rack Mounting the SyncServer S6x0



Making Ground and Power Connections

The SyncServer S6x0 has either one or two 120/240 VAC connectors, depending on the specific model, which are located on the left side of the rear panel. (see [Figure 2-4](#) and [Figure 2-5](#)).

Ground Connections

The frame ground connection is made using the grounding screw, which is marked with the universal ground symbol, as shown in [Figure 2-6](#). This screw is located on the left side of the rear panel for all models of the SyncServer S6x0, as shown in [Figure 2-4](#) and [Figure 2-5](#).

Figure 2-4. SyncServer S600/S650 Power & Ground Connections - Single AC Version

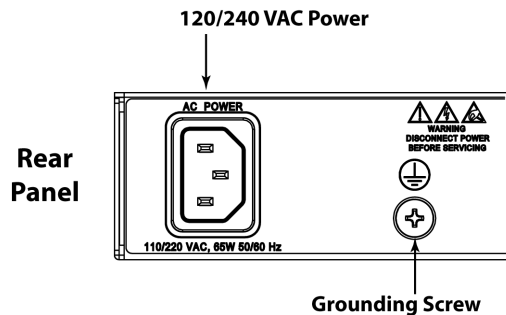


Figure 2-5. SyncServer S600/S650 Power & Ground Connections - Dual AC Version

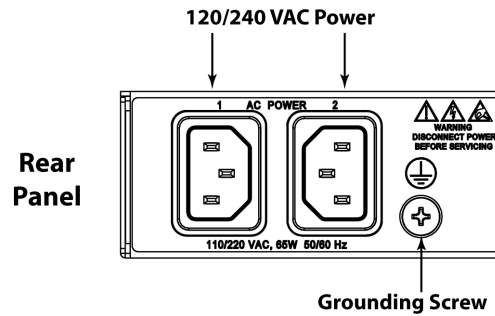


Figure 2-6. Universal Ground Symbol



After installing the SyncServer S6x0 into the rack, connect the chassis to the proper grounding zone or master ground bar per local building codes for grounding.

Run a 16 AWG green/yellow-striped insulated wire from the SyncServer S6x0 grounding lug 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, Microsemi recommends running a cable of the shortest possible length from the ground lug to earth ground.

1. Remove the grounding screw from the rear panel of the SyncServer S6x0.
2. Crimp the customer-supplied UL listed Ring Lug to one end of the 16 AWG wire. Coat the lug with an electrically conductive antioxidant compound such as Kopr-shield spray. Use the grounding screw to connect the ring lug to the left side of the rear panel. The surface of the SyncServer S6x0 rear panel and threads where the grounding screw attaches must be clean of contaminants and oxidation.
3. Connect the other end of the 1 mm² / 16 AWG green/yellow-striped wire to earth ground using local building electrical codes for grounding.

The suggested method is to crimp the appropriate customer-supplied UL listed Ring Lug to the other end of the 1 mm² / 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, tightening to a torque value of 53.45 in-lbs.

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

AC Power Connection

Use the following procedure to make the power connections for the AC version of the SyncServer S6x0. An Over-Current Protection Device must be placed in front of the shelf power.

Figure 2-7. SyncServer S6x0 Single AC Power Connector

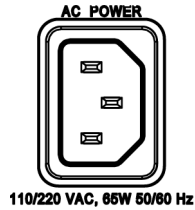
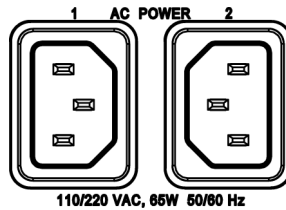


Figure 2-8. SyncServer S6x0 Dual AC Power Connector



Warning: To avoid possible damage to equipment, you must provide power source protective fusing as part of the installation. The SyncServer S6x0 is intended for installation in a restricted-access location.

1. Insert the female end of the AC power cord into the AC power connector on the SyncServer S6x0. The power receptacles support IEC cable with V-locks. The V-lock will latch the cable to prevent accidental removal of the power cord.
2. Plug the male end of the AC power cord into an active 120 VAC or 240 VAC power socket.
3. For dual AC versions, repeat steps 1-2 for the second AC power connector.

DC Power Connection

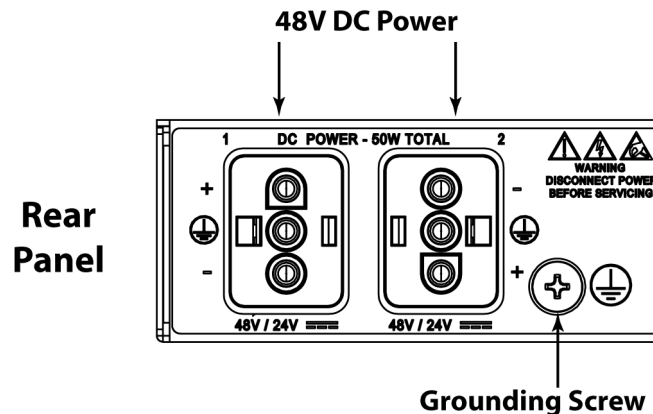
Use the following procedure to make the power connections for the DC version of the SyncServer S6x0. An Over-Current Protection Device must be placed in front of the shelf power. The SyncServer S6x0 uses a Molex HCS-125 series connector.



Warning: To avoid possible damage to equipment, you must provide power source protective fusing as part of the installation. The SyncServer S6x0 is intended for installation in a restricted-access location.

1. Create a custom cable using the supplied Molex connector housing (Molex 03-12-1036) and terminals (Molex 0018121222). The terminals need to be crimped to the wires.
2. Connect the other end of the DC cable to nominal 24VDC or 48 VDC.
3. Repeat steps 1-2 for the second DC power connector.
4. The positive wire must be connected to the positive terminal (+) and the negative wire to the negative terminal (-). The ground connection should only be connected to ground and not to a power supply.

Figure 2-9. SyncServer S6x0 Dual DC Power Connectors



Signal Connections

The connectors for the SyncServer S6x0 are located on the rear panel.

Communications Connections

The communication connections allow user control of the SyncServer S6x0. The EIA-232 serial port and Ethernet port 1 (LAN1) are located on the rear panel are shown in [Figure 1-9](#).

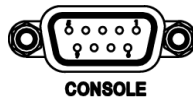
Ethernet Port 1

Ethernet port 1 is a standard 100/1000 Base-T shielded RJ-45 receptacle on the rear panel of the unit. It is used to provide connectivity to a web interface and to an Ethernet local area network (as well as for NTP input/output). To connect the SyncServer S6x0 to an Ethernet network, use an Ethernet RJ-45 cable. See [Table 2-2](#) for connector pinouts.

Serial (Console) Port

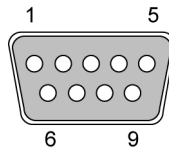
The serial port connection is made through a DB-9 female connector on the rear panel of the unit. This port, which supports a baud rate of 115.2k (115200-8-1-N-1), allows you to connect to a terminal or computer using a terminal emulation software package for remote monitoring and control. This port is also used for serial data (NENA ASCII time code, Response mode). When connecting to this port, use a shielded serial direct connect cable.

Figure 2-10. Serial Port Connector



[Figure 2-11](#) shows the DB-9 male connector that mates with the serial port on the SyncServer S6x0.

Figure 2-11. Serial Port Male Mating Connector Pins



[Table 2-1](#) describes the DB-9 connector pin assignments for the serial port

Table 2-1. Serial Port Connector Pin Assignments

Signal	Pin
TXD	2
RXD	3
Ground	5

SyncServer S6x0 Synchronization and Timing Connections

The SyncServer S6x0 has one GNSS input and four NTP input/output connections. The SyncServer S6x0 has one 1PPS output. The SyncServer S650 may also have an optional Timing I/O Module.

GNSS Connection

To connect a GNSS signal to the SyncServer S6x0, you must install a GPS antenna. See [Connecting the GNSS Antenna](#), on page 72.



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



Warning: To avoid possible damage to equipment, you must provide external lightning protection when installing the GNSS antenna to prevent transients.

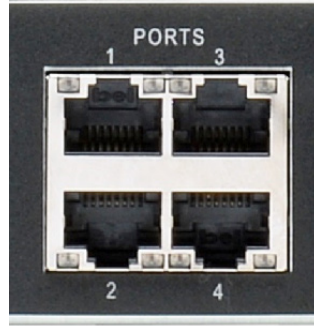
Ethernet Connections

The Ethernet ports are standard 100/1000 Base-T shielded RJ-45 receptacles, which are used for NTP inputs. To connect the SyncServer S6x0 to an Ethernet network, use an Ethernet RJ-45 cable. See [Table 2-2](#) for connector pinouts.

Table 2-2. System Management Ethernet Connector Pin Assignments

RJ-45 Pin	100Base-T Signal	1000Base-T Signal
1	TX+ (Transmit positive)	BI_DA+
2	TX- (Transmit negative)	BI_DA-
3	RX+ (Receive positive)	BI_DB+
4	Not Used	BI_DC+
5	Not Used	BI_DC-
6	RX- (Receive negative)	BI_DB-
7	Not Used	BI_DD+
8	Not Used	BI_DD-

Figure 2-12. Ethernet Connections



10 GbE Connections

The two SFP+ ports are only available with the 10 GbE option. These SFP+ ports are equipped with hardware timestamping that supports NTP, PTP, and NTP Reflector operations. These ports are ideal for interoperability with 10 GbE switches. SFP modules supported are limited to 10 GbE speeds only, See [Table 2-3](#) for a list of recommended and supported SFP+ transceivers.

Figure 2-13. 10 GbE Connections

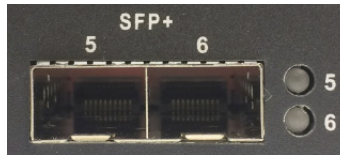


Table 2-3. Recommended and Supported SFP+ (10GbE) Transceivers

Vendor	Mode	Item Code or P/N
ALU	multi-mode	10GBASE-SR, PN: 3HE04824AA
ALU	single mode	10GBASE-LR, PN: 3HE04823AA
Finisar	multi-mode	PN: FTLX8573D3BTL
Finisar	multi-mode	PN: FTLX8574D3BCL
Finisar	single mode	PN: FTLX1471D3BCL
D-Link	multi-mode	10GBASE-SR, PN: DEM-431XT-DD
Cisco	multi-mode	SFP-10G-SR

Table 2-3. Recommended and Supported SFP+ (10GbE) Transceivers

Vendor	Mode	Item Code or P/N
Cisco	single mode	SFP-10G-LR
Juniper	multi-mode	SFPP-10G-SR
Juniper	single mode	SFPP-10G-LR
Juniper	multi-mode	EX-SFP-10G-SR
Juniper	single mode	EX-SFP-10G-LR

Timing I/O Module Connections

The standard configuration offers a broad yet fixed selection of signal I/O on its eight BNC connectors (see [Figure 1-26](#)). J1 is dedicated to time code and rate inputs, J2 to sine wave inputs, and J3-J8 to mixed signal outputs. The standard Timing I/O Module configuration is 1PPS or IRIG B AM-In, 10 MHz- In, IRIG AM and IRIG DCLS-Out, 1PPS-Out and 10 MHz-Out.

The FlexPort™ Technology option enables the 6 output BNCs (J3-J8) to output any supported signal (time codes, sine waves, programmable rates, and so on.) on all configurable in real time via the secure web interface. Similarly, the 2 input BNCs (J1-J2) can support a wide variety of input signal types. This uniquely flexible BNC by BNC configuration makes very efficient and cost effective use of the 1U space available.

See [Figure 1-27](#) to view the signal types for the standard configuration and the configuration with the FlexPort™ option. See [Figure 2-14](#).

See [Figure 1-28](#) for the signal types supported with the Telecom I/O module option. See [Figure 2-15](#).

See [Table 1-2](#) for the signal types supported with the HaveQuick/PTTI module option. See [Figure 2-16](#).

See [Figure 2-16](#) for the fiber optic transmitter module options.

Figure 2-14. Timing I/O BNC Connections (090-15201-006)

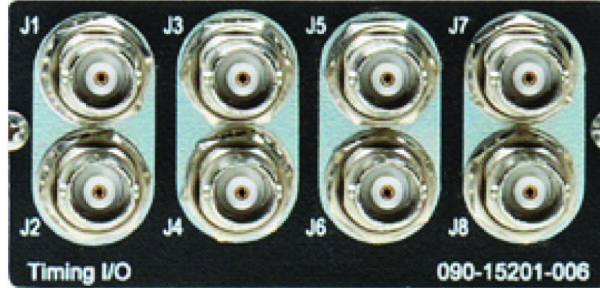


Figure 2-15. Timing I/O with Telecom I/O Connections (090-15201-011)



Figure 2-16. Timing I/O with HaveQuick/PTTI Connections (090-15201-012)



Figure 2-17. Timing I/O with Fiber Optic Transmitter Connections (090-15201-013 and -014)

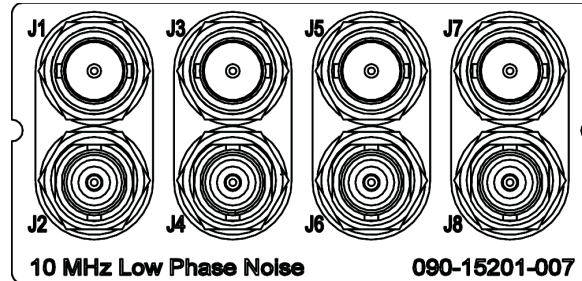
- Timing I/O with Fiber Tx ●
- Timing I/O with Fiber Rx ●
- Same basic functionality as timing I/O card



LPN Module Connections

This module provides low phase noise 10 MHz signals on all eight ports (J1-J8). See [Figure 2-18](#).

Figure 2-18. LPN BNC Connections



Serial Timing Connection

The SyncServer S6x0 features a DB-9 female connector on the rear panel of the unit. This port supports a baud rate of 4800 to 115.2k (115200-8-1-N-1). When connecting to this port, use a shielded serial direct connect cable. See [Figure 2-19](#). See [Table 2-4](#) for pin-outs for this RJ-45 connector.

Figure 2-19. Data/Timing Connection



Table 2-4. Serial Data/Timing Port Pin-Outs - DB9 Connector

Signal	Pin
TXD	2
RXD	3
Ground	5

See [Table B-25](#) in Appendix B for TOD format details.

1PPS Output Connection

The SyncServer S6x0 features a single BNC female connector for the 1PPS signal. See [Figure 2-20](#).

Figure 2-20. 1PPS Output Connection



Connecting the GNSS Antenna



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

The antenna connections for the SyncServer S6x0 are made at the BNC female connector labeled GNSS. Allow at least one hour for the unit to track and lock to GNSS satellites, though it typically takes far less time provided the antenna has an adequate view of the sky.



Note: The SyncServer S650i does not include a GNSS antenna connector.

Figure 2-21. GNSS Input Connection



Proper cable, grounding techniques, and lightning arrestors should be used. Mount the antenna outside, preferably on the roof with an unobstructed view of the sky. Avoid mounting the antenna near a wall or other obstruction blocking part of the sky. Mount the antenna well above roads or parking lots.



Note: For the best possible timing accuracy the cable delay must be determined and entered into SyncServer S6x0 with the web interface. See [Table C-1](#) for cable delay values of SyncServer S6x0 GNSS antenna kits.



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.

Connecting Alarm Relay

The alarm relay output is open when an alarm activation on this page is configured and the alarm is in alarm state:

ALARM=OPEN



Note: The SyncServer S650i does not include a GNSS antenna connector.

The external Alarm mating connector is not supplied. The mating connector is made by Phoenix Contact, and the manufacturer's part number is 1827703.

Figure 2-22. Alarm Connections



Installation Check List

To verify that the installation of the SyncServer S6x0 is complete, perform the checks and procedures in [Table 2-5](#).

Table 2-5. Installation Completeness Checklist

Operation	Complete
Ensure the SyncServer S6x0 chassis is securely attached to mounting rack	
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 SyncServer S6x0

The SyncServer S6x0 is not equipped with a Power switch. After installing the 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 SyncServer S6x0 powers up and begins normal operation, the LEDs all turn on. After the self-test is complete and the firmware is operational, the LED states may change to indicate the appropriate state or status.

[Table 2-6](#) provides a description of the SyncServer S6x0 LEDs.

Table 2-6. LED Descriptions

Label	LED	Description
SYNC	Clock Status	Green - Time or Frequency clock in Normal or Bridging state Amber - Time or Frequency clock in Freerun or Holdover state
NETWORK	Network Status	Red - Management port (LAN1) is not configured or is down Amber - Some configured ports are down (LAN2 to LAN4) Green - All configured ports are up
ALARM	Alarm System alarm/fault indicator	Off - Operating normally Amber - Minor Alarm(s) Red - Major/Critical Alarm(s)

The SyncServer 6x0 does not contain a battery-backed real time clock. Therefore, it will always boot up with a default value for the system time. This time will be updated when it obtains time from a time reference such as GNSS, IRIG, or NTP. The default value for the date is the software build date. This date will be used for the first log entries when booting up the unit. The time will change to local time during the boot-up process if a time zone has been configured.

Chapter 3 Keypad / Display Interface

This chapter describes the keypad / display interface.

Overview

The keypad / display interface displays the time, system status, and provides the following functions:

- Configuring and enabling/disabling the LAN1 network port.
- Setting the time and entering freerun mode.
- Adjusting the brightness.
- Locking the keypad.
- Shutting down the SyncServer.

When the SyncServer starts, the display shows "Booting SyncServer please wait...". Shortly thereafter, the SyncServer displays the default time screen.

The following buttons are user-input devices for the keypad/display interface.

- ENTER: Use with MENU - Applies a menu selection or function setting.
- CLR: Use with MENU - Returns to the previous screen without saving changes.
- Left/Right Arrow Buttons: In functions, will change where the next number will be entered left or right. In status, scrolls a screen horizontally when "<previous:next>" is displayed.
- Up/Down Arrow Buttons: In functions, will change where the next number will be entered. In status, scrolls a screen vertically, displays the previous/next screen.
- Number Buttons: Enters a number, or selects a numbered menu item.

The following three buttons change the function of the display.

- TIME: Changes the format and contents of the time display.
- STATUS: Displays status of basic SyncServer operational conditions.
- MENU: Displays a menu of functions.

The following sections cover these three buttons in more detail.

TIME Button

Cycling the TIME button changes the predefined format and contents of the time display:

Large numeric time display on full screen. Hours:Minutes:Seconds

Medium numeric time display on the left, current reference and NTP Stratum on the right

Small date and time, reference, and NTP stratum.

The time display also indicates a time scale:

If the time zone setting on the TIMING - Time Zone web page is set to UTC, the time display shows "UTC" as the time scale.

If the time zone setting on TIMING - Time Zone page is set to a non-UTC (local) time zone, the time display leaves the time scale blank, or adds AM/PM if the user selects the 12-hour time scale. (Press the MENU button and select 2) Display > 3) 12/24 > 1) 12 (AM/PM).

If the Ignore UTC Corrections from GPS Reference setting on the TIMING - HW Clock page is enabled (selected), the time display shows "GPS" as the time scale.

Note: The TIMING - Time Zone page configures the display for UTC or local time. The TIMING -

STATUS Button

Pressing the STATUS button repeatedly displays a series of status screens for:

- NTP
- Alarms
- Network Ports
- Clock
- GNSS Receiver
- SyncServer model, serial number, software version, and software upgrade availability. If installed, the configuration for each port of the timing/IO module.

Figure 3-1. NTP Status Screen

2015.11.12	04:33:44 UTC
Ref: ---	NTP Stratum: 16

Some screens have a "Next>" in the upper right. This means more information is available by pressing the right arrow button. This cycles through screens on that topic.

NTP Status Screen

Network Time Protocol (NTP) status.

Stratum: The Stratum number of the SyncServer. Stratum 1 means it is locked to a Hardware Clock.

Hardware Clock Input Reference that is a Stratum 0 source. Stratum 2-15 means the SyncServer is locked to another NTP time source. Stratum 16 means that the SyncServer is unsynchronized.

Reference: This field identifies the "system peer". While stratum is 16, this field shows the progression of the NTP clock PLL. The field starts with a value of "INIT". Once a peer has been selected, the clock may be stepped, in which case the reference ID field changes to "STEP".

Once the PLL is locked, the stratum is updated and the reference ID provides information about the selected peer. When the SyncServer is operating at stratum 1, the reference ID displays the name of the Hardware Clock reference input.

NTP Packet I/O: The number of NTP packets the SyncServer has replied to and initiated. The SyncServer replies to clients that send NTP requests. The SyncServer also sends NTP requests when the NTP daemon isn't synchronized (i.e., Sync LED is RED) and when it is configured to synchronize to an NTP association (e.g., a Server type association).

Alarm Status Screen

Current alarm status. Use the right or left arrow to show details about the alarms.

Major: List of up to three current major alarms

Minor: List of up to three current minor alarms

LAN Status Screens

Multiple screens, four for each network port. There are two screen for IPv4 and two for IPv6. Use Next> to see the entire IP address configuration.

State: Shows "Up" if the port is enabled and "Down" if the port is disabled.

IP: IP address for the port

SM: Subnet mask

GW: Gateway address

Clock Status Screen

Hardware Clock and Input Reference status.

GNSS Receiver Status Screen

GNSS receiver status.

Antenna: OK

GNSS: Operational

GNSS SATELLITES

- GPS: number of GPS satellites currently being tracked.
- GLONASS: number of GLONASS satellites currently being tracked
- SBAS: number of SBAS satellites currently being tracked
- Max CNo: The highest CNo (Carrier-to-Noise ratio) of all satellites (value given for each satellite type)

GNSS SOLUTION

Status: OK Service 3D

Mode: Auto or Manual

SyncServer Status Screen

Hardware and software identification. Software upgrade availability.

Model: The model number.

S.N.: The serial number.

Version: The software "Release Version" number.

Option Slot A/B Status Screens

Shows the configuration of each of the slot A/B input and output connections.

Option: Description of installed module (if any)

Flex I/O Option: Enabled | Disabled

J1 Input: Configuration of input

J2: Input: Configuration of input

J3 Output: Configuration of output

J4 Output: Configuration of output

J5 Output: Configuration of output

J6 Output: Configuration of output

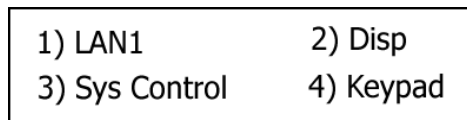
J7 Output: Configuration of output

J8 Output: Configuration of output

MENU Button

Pressing the MENU button presents a numbered menu of functions, as shown in [Figure 3-2](#).

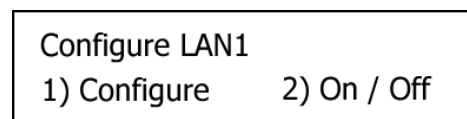
Figure 3-2. Menu of Functions



LAN1

Selecting LAN1 brings up the Display menu screen on the display, as shown in [Figure 3-3](#).

Figure 3-3. Configure LAN1 Screen

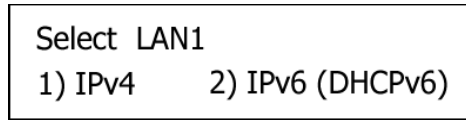


1. **Configure:** Use to select IPv4 or IPv6 address mode for LAN1 port. IPv6 automatically configures LAN1 with a dynamic IPv6 address.

If Configure is selected, the Select LAN1 screen will appear, as shown in [Figure 3-4](#).

2. **On/Off:** Use On to enable the LAN1 network port. Off disables the LAN1 network port for all traffic types.

Figure 3-4. Select LAN1 IP Mode Screen



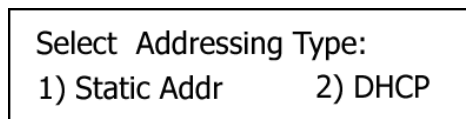
1. **IPv4:** Select IPv4 address mode for LAN1 port.

If IPv4 is selected, the Select Addressing Type screen will appear, as shown in [Figure 3-5](#).

2. **IPv6:** Select IPv6 address mode for LAN1 port.

If IPv6 (DHCPv6) is selected, the SyncServer automatically configures LAN1 with a dynamic IPv6 address.

Figure 3-5. Select IPv4 Addressing Type Screen

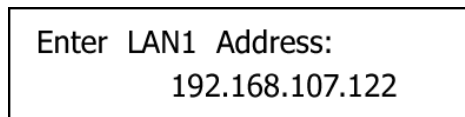


1. **Static Addr:** Select IPv4 address mode for LAN1 port.

If Static Address is selected, the Enter LAN1 Address screen will appear, as shown in [Figure 3-6](#). After the address is entered press the ENTER button and you will be prompted to enter the Subnet mask (then ENTER) followed by the Gateway address. Once the gateway address has been entered the LAN 1 port will be reconfigured.

2. **DHCP:** Select DHCP addressing type for LAN1 port. DHCP automatically configures LAN1 with a dynamic IPv4 address.

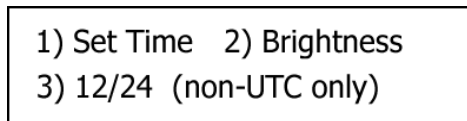
Figure 3-6. Enter LAN1 Static IPv4 Address Screen



Display

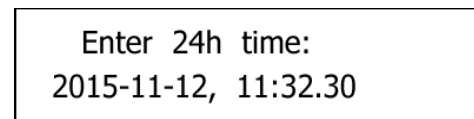
Selecting Display brings up the Display menu screen on the display, as shown in [Figure 3-7](#).

Figure 3-7. Display Menu Screen



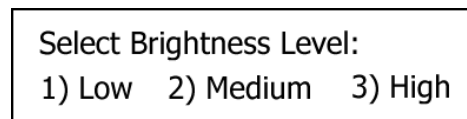
1. **Set Time:** Enter the UTC date and time using 24-hour format. Select ENTER to apply the entered time to the system clock. The system must have previously been set to the "Forced Manual Time Entry " mode on the Timing->Input Control web page. See [Figure 3-8](#).

Figure 3-8. Set Time Screen



2. **Brightness:** Adjust the brightness of the front panel display. See [Figure 3-9](#).

Figure 3-9. Set Brightness Screen

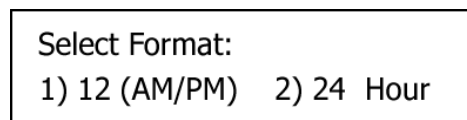


3. **12/24 (non-UTC Only):** Select a 12 (AM/PM) or 24-hour clock format. See [Figure 3-10](#).



Note: The 12/24 and 24 Hour only appear if a local time zone has been specified via the web interface.

Figure 3-10. Select Time Format Screen

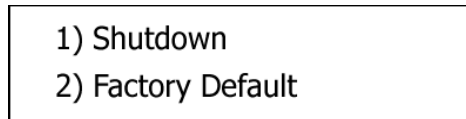


Many keypad functions timeout after approximately 10 seconds of inactivity (no user inputs).

Sys Control

Selecting Sys Control brings up the Shutdown / Factory Default screen on the display, as shown in [Figure 3-11](#).

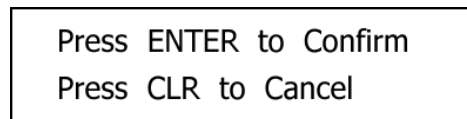
Figure 3-11. Shutdown / Factory Default Screen



See [Factory Defaults](#) in Appendix B for default settings.

1. **Shutdown:** Halts the SyncServer. The message Press the ENTER button to Confirm appears in the display, as shown in [Figure 3-12](#).
2. Factory Default

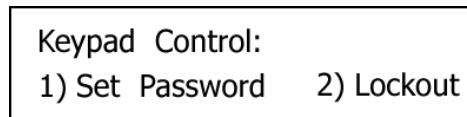
Figure 3-12. Confirmation Screen



Keypad

Selecting Keypad brings up the Keypad Control screen on the display, as shown in [Figure 3-13](#).

Figure 3-13. Keypad Control Display Screen



1. **Set Password:** Sets the password for the Lockout function. The *first time* the interface asks for the "Current Password", enter 95134. No password recover or reset feature is available for the keypad, except to reset factory defaults using the Sys Control - Factory Reset page.
2. **Lockout:** The Lockout function password protects the keypad from changes. Asks for confirmation. The factory default password for the keypad is "95134".

Chapter 4 Web Interface

This chapter describes the web interface for the SyncServer S6x0.

See [Communicating Through LAN1 Ethernet Port](#), on page 196 for details on how to access the web interface.

In This Chapter

- [Status / Information Windows](#)
- [Navigation Windows](#)





Note: For security reasons, the SyncServer S6x0 only supports https. However, the user will get warnings from most web browsers that a self-signed certificate is being used (not from a recognized certificate authority). Users should accept the warnings and proceed to the login page.


The internal self-signed certificate can be renewed and updated on the Security->https page. Users can also request and install a https certificate.


Figure 4-1. Login

Please Enter Your Information

Username 

Password 

 Login

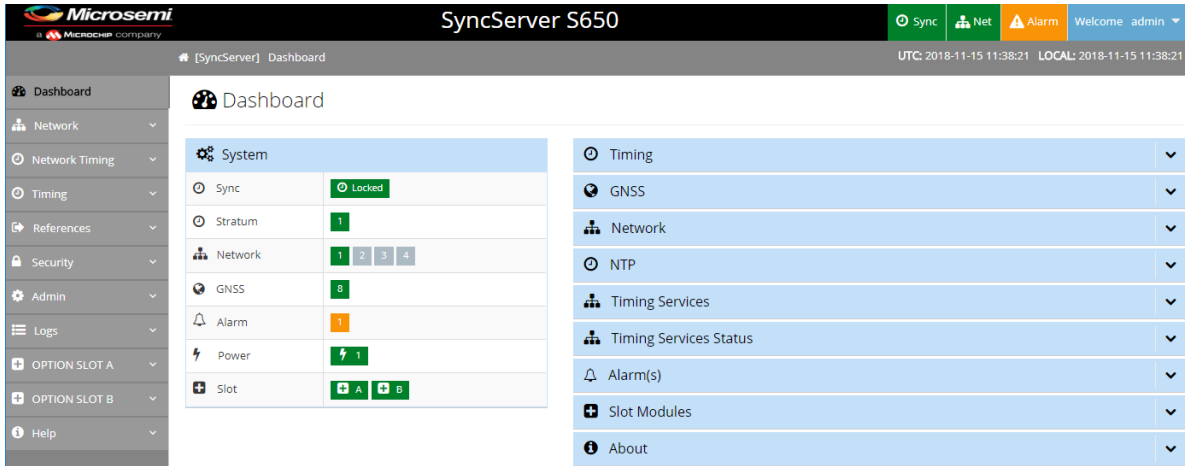
 ← Forgot Password

For security reasons, the SyncServer S6x0 will lock out a user if an invalid password is entered three times. The user is locked out for 1 hour. The lockout is also removed if the unit is rebooted.



Note: The default user name is “admin” and the default password is: Microsemi . To avoid unauthorized access, you should change the default password.

Figure 4-2. Dashboard Screen



Note: UTC and local time are displayed in the upper right portion of the page. Local time is based on the timezone setting in the SyncServer unit. Daylight saving time is also applied to the local time if applicable. Local time is not determined by the location of the web browser.



Note: If the browser is displaying a busy indicator, then please wait until the previous action is complete before starting another action. Depending on the browser used, the web page responsiveness will vary due to the use of the encryption cipher suite used in the S6x0. Microsemi recommends using the Google Chrome browser. Under heavy network traffic load, the web responsiveness will degrade.

Status / Information Windows

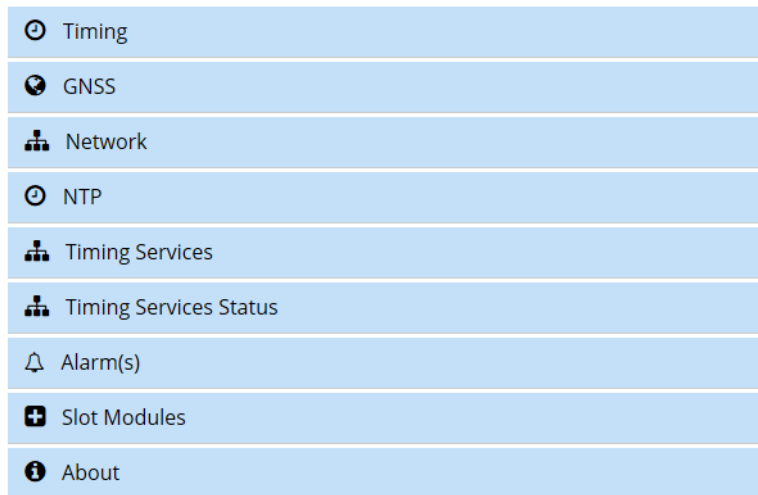
The Status/Information windows in the dashboard, as shown in [Figure 4-3](#), displays status details and information regarding the following:

- Timing
- GNSS
- Network
- NTP
- Timing Services

- Timing Services Status
- Alarms
- Slot Modules
- About

Clicking on the down arrow on a window expands the information under that topic.

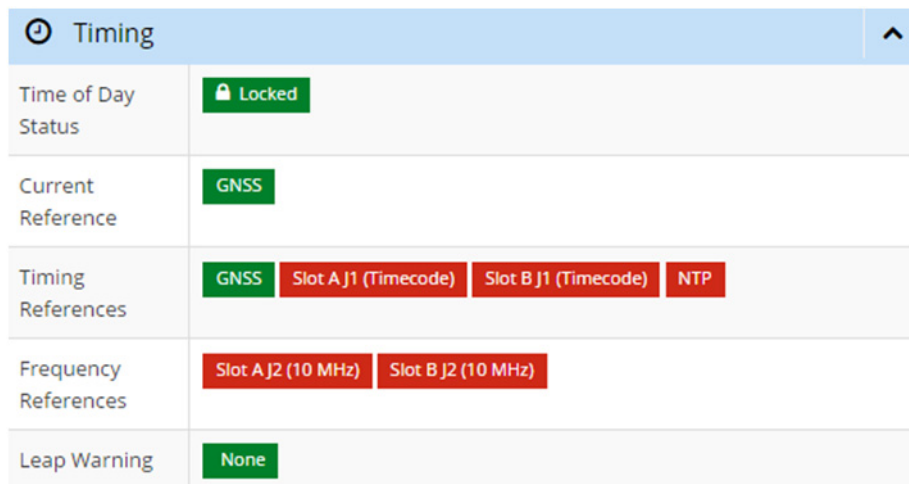
Figure 4-3. Status/Information Windows



Timing Status & Information

The Timing window in the dashboard, as shown in [Figure 4-4](#), displays status details and information about system timing, including current reference, lock status, and status of input references. See [Table 4-1](#).

Figure 4-4. Timing Window





Note: The SyncServer 6x0 does not contain a battery-backed real time clock. Therefore, it will always boot up with a default value for the system time. This time will be updated when it obtains time from a time reference such as GNSS, IRIG, or NTP. The default value for the date is the software build date. This date will be used for the first log entries when booting up the unit. The time will change to local time during the boot-up process if a time zone has been configured.

Table 4-1. Timing Window Descriptions

Item	Details	Color Scheme
Time of Day Status	<p>This row is essentially showing the time clock state.</p> <p>See Table 4-2 for descriptions of clock states.</p>	<p>Warmup Freerun Handset Locking Locked Bridging Holdover Holdover Recovering</p>
Current Reference	<p>This row shows the input reference that is currently “driving” the SyncServer. It could be a timing source (best case), an external holdover source, or the SyncServer internal reference (worst case). See Table 4-3 for details of current sources.</p>	<p>Green if any externally selected reference, Amber color only if internal oscillator.</p>
Timing References	<p>This row shows all enabled time references.</p>	<p>If a time reference is ready to be used it will be green. If it is not ready it will be red.</p>

Table 4-1. Timing Window Descriptions

Item	Details	Color Scheme
Frequency References	<p>This row shows all enabled frequency-only references.</p> <p>The use of a frequency reference is thought of as a method for holding-over time when there either was never an active time source or it was lost.</p>	<p>If a holdover source is ready to be used it will be green.</p> <p>If it is not ready it will be red.</p>
Leap Pending	<p>This row indicates if a Leap second is pending.</p>	<p>If there is no warning of a Leap second pending it will be green.</p> <p>If there is a warning of a Leap second pending it will be red.</p>

The SyncServer S600/S650 has separate timing and frequency clock controls. The time and frequency clocks are usually in the same clock state. If they are different, then the “Current Reference” row will include text after the icon which displays the frequency clock state. The “Time of Day Status” always shows the time clock state.

While locking to a new reference, the two states may be different for a brief time.

If there are no valid timing references, but there is a valid frequency reference, then there should be text shown since the frequency and time clock states are different.

The system time locks, but does not frequency lock to an NTP reference. Therefore, the frequency status will display free-run while the system is locked to an NTP reference and there are no frequency references connected.

Table 4-2. Status - Clock State Descriptions

Status Indication	Meaning	Details
Warmup	SyncServer not ready for any type of synchronization functionality. This is a one-time status following power-up	Directly equal to the common warmup clock state (to both freq and time)
Freerun	SyncServer does not have a time reference and never has had one since powerup.	
Handset	For future use.	
Locking	SyncServer has selected a qualified active time input for use and is now in process of aligning all outputs to it.	In this status, the Current Source row will, by definition, have a “green” item that has a match to it in the Timing Sources row. An “active” time source just means one that is continuously providing time (where continuous is a relative term – in general it is an update per second).
Locked	SyncServer outputs are now aligned to a selected active time source.	
Bridging	SyncServer no longer has a selected active time source, but it hasn't been that way for very long.	This is really just the beginning of holdover, but is a period where the output performance should be as good as when in Locked. It provides a hysteresis buffer to prevent nuisance Locked-Holdover-Locked transitions. In this state the Current Source row will NOT have a green item from the Timing Sources row.
Holdover	SyncServer no longer has a selected active time source, and it has been that way for longer than the Bridging duration. Also the condition for “red holdover” (next row) is not met.	Either we are holdover using an external frequency reference OR we are in holdover using the SyncServer internal reference AND the duration is less than a user-specified time duration. ¹

Table 4-2. Status - Clock State Descriptions (Continued)

Status Indication	Meaning	Details
Holdover	Same as prior row but specific additional conditions are met. This condition occurs if the current source is the internal oscillator and the duration in time holdover has exceeded the time defined by user in the Timing > Holdover window.	The unit has been in holdover for more than a user-specified duration and the holdover is based on the SyncServer internal reference. In this case the Holdover Sources row will not contain any green items.
Relocking	SyncServer has selected a qualified active time input for use and is now in process of aligning all outputs to it.	

Note:

¹ The main purpose of holdover is to allow the S6xx time server to continue to operate as "normal" using the internal oscillator or external frequency reference even though the connection the GNSS is lost. The user defines how long this holdover period will last. During this time the NTP Reference Time Stamp is updated regularly indicating the S6xx is still connected to a time reference. Once the user defined holdover period is exceeded the reference time stamp is no longer updated. This is important information to provide to NTP clients as they can then determine whether or not to continue to synchronize to the S6xx. Once the S6xx reacquires GNSS and relocks, the NTP Reference Time Stamp will again be updated regularly.

By NTP protocol definition, once an NTP server locks to a time reference and sets the Leap Indicator to 00 from 11 it never returns to 11. In other words, once the unit has left stratum 16 it should never return to stratum 16. Instead it uses the reference time stamp behavior mentioned above.

Table 4-3. Status - Current Source Details

Item	Status Where it Will Happen	Details
No current source	Warmup	Directly equal to the common warmup clock state (to both freq and time)
Current Source taken from Timing References	Locking Locked Relocking	When the status is any of these there MUST be a selected time source, which takes precedence in the Current Reference row (more important than if there is also a qualified frequency reference). There must be at least one green item in the Timing References row. The leftmost green one will be identically indicated in the Current Reference row. This is because the leftmost green item in Timing References is the highest priority time source and therefore must be selected. For example, if it is GNSS it will appear identically as Current Reference and in Timing References row.
Current Source taken from Frequency References	Freerun Bridging Holdover Holdover	For any Status in this category there cannot be a qualified Timing Reference (nothing green in that row), so it is certain that SyncServer is using frequency-only reference. If there is a qualified Frequency Reference (meaning something green in this row), then the leftmost green one will be the current source. If there is no qualified Frequency Reference (nothing green in that row) then all that remains is the SyncServer internal reference, which is what appears in the Current Reference row. In this case the entry will be one of the following, depending on the specific SyncServer product oscillator type: <ul style="list-style-type: none"> ■ Internal Rb, ■ Internal OCXO ■ Standard

GNSS Status & Information

The GNSS window in the dashboard, as shown in [Figure 4-5](#), displays status details and information about GNSS. C/No is the carrier-to-noise density which is defined as the carrier power divided by the noise power spectral density. Higher C/No results in better tracking and performance.

The GNSS signal strength (C/No) can vary from 1 to 63. Typical values for a good GNSS installation will be between 35 and 55.

Figure 4-5. GNSS Window

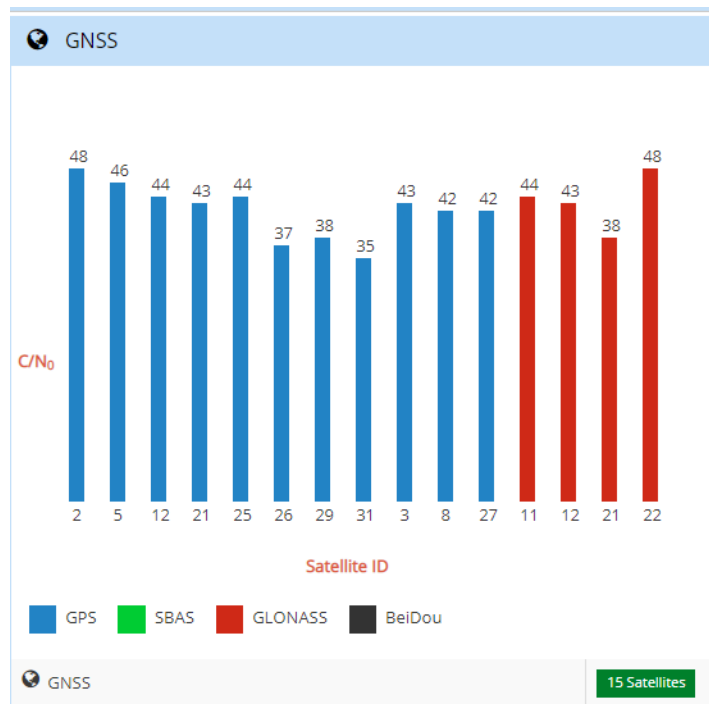


Table 4-4. GNSS Window - Descriptions

Field	Potential Values	Notes
GNSS	Lists number of satellites being tracked	
Antenna Status	<ul style="list-style-type: none"> ■ OK - operating normally ■ Open - open circuit in antenna cable or no DC load in splitter ■ Short - short circuit in antenna cable ■ Initializing - temporary condition 	

Table 4-4. GNSS Window - Descriptions

Field	Potential Values	Notes
Receiver Status	<ul style="list-style-type: none"> ■ Invalid - not tracking ■ Tracking NO UTC - tracking, but UTC offset not known ■ Tracking - tracking 	
Position Status	<ul style="list-style-type: none"> ■ No Data - no position data ■ Survey 2D - calculated 2D position, lat/lon but no elevation ■ Survey - calculating position and surveying to average position ■ Position Fix - position fixed, either manual or to surveyed position 	
Position	Position - latitude, longitude, and height/elevation	
GNSS Receiver Firmware Upgrade	<ul style="list-style-type: none"> ■ Never run - upgrade process has not run ■ In progress - GNSS receiver being upgraded ■ Not required - GNSS receiver firmware is at correct revision ■ Successful - GNSS receiver firmware upgraded ■ Failed - GNSS receiver firmware upgrade failed ■ Interrupted - GNSS receiver firmware upgrade failed 	If failed or interrupted conditions persist, the unit should be rebooted.

Network Status & Information

The Network window in the dashboard, as shown in [Figure 4-6](#), displays status details and information about the network ports in use.

Figure 4-6. Network Window

LAN	IP	Subnet Mask/Prefix Length
LAN1	192.168.107.122	255.255.255.0
LAN3	192.168.107.124	255.255.255.0
LAN4	2001:4888:2050:81c5:526:401:1:2	64

NTP Status & Information

The NTP window in the dashboard, as shown in [Figure 4-7](#), displays status details and information about the NTP configuration.

Figure 4-7. NTP Window

NTP		
NTPd	System Peer	127.127.47.0
	System Peer Mode	client
	Leap Indicator	0
	Stratum	1
	Reference ID	FREE



Note: The dashboard will provide Leap indicator information as soon as it is available. For GPS, this is usually many months ahead.

The Leap indicator information in the NTP messages sent out the Ethernet port(s) will only be sent out the last 24 hours before the event for the "01" or "10" values of this parameter. See [Table 4-5](#) for more details about the Leap indicator.

Timing Services Information

The Timing Services window in the dashboard, as shown in [Figure 4-8](#), displays status details and information about the NTP reflector and PTP configuration.

Figure 4-8. Timing Services Window

Timing Services			
LAN	Name	Timing Service	IP
3	(2) PTP 1	PTP master	192.168.107.124

Timing Services Status

The Timing Services Status window in the dashboard, as shown in [Figure 4-9](#), displays status details and information for the NTP reflector and PTP.



Note: The row labeled with "Service" is a configuration of the port. The Timing Services Status window shows this configuration. For PTP, the actual PTP Grandmaster operational state as either Passive or Master is found in the window Network Timing > NTPr/PTP Status, in the row "Port State". See [Figure 4-27](#).

Figure 4-9. Timing Services Status Window

Property	Value
Attached to	LAN4
Service	PTP master, Enterprise
Port identity	00:b0:ae:ff:fe:03:7a:9e, Port:1
Clock class	6
Clock accuracy	within 100 ns
Rx Packets/second	0
Clients	0

Alarm Information

The Alarms window in the dashboard, as shown in [Figure 4-10](#), displays active alarms.

Figure 4-10. Alarms Window

#	Time	Severity	Name
1	2016-05-02 21:38:009	MINOR	J2B input loss of signal
2	2016-05-02 21:36:041	MAJOR	Ethernet port 2 link down

Slot Modules Status & Information

The Slot Modules window in the dashboard, as shown in [Figure 4-11](#), displays status details about the modules installed in the Options Slots.

Figure 4-11. Slot Modules Window

Slot Modules		
Modules	Type	Status
Slot A	Timing I/O + HaveQuick/PTTI Card	Installed
Slot B	Timing I/O + Fiber Input Card	Installed
10G	10G Ethernet Card	Installed

“About” Device Information

The “About” window in the dashboard, as shown in [Figure 4-12](#), displays system information about the unit.

Figure 4-12. About Window

About	
Hostname	SyncServer
Model	SyncServer S650
Serial Number	RKT-15309034
Release Version	3.0.6
Up Time	11 day(s) 8 hour(s) 32 minute(s) 59 second(s)
Memory Free	81.36 %
Oscillator	Rubidium
Update Availability Status	Unavailable: last check unsuccessful



Note: The update available feature will only function if LAN1 has been configured with an IPv4 address and a DNS server is configured. The DNS server can be either automatically configured via DHCP or manually when using a static IP address. The update available feature can be disabled on the Admin->General page.



Note: You can check for the latest version number of SyncServer S600 and S650 software at these URLs:

http://update.microsemi.com/SyncServer_S600

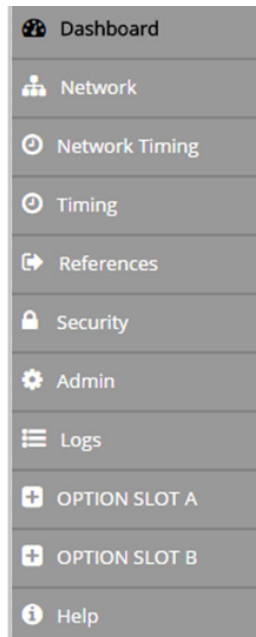
http://update.microsemi.com/SyncServer_S650

The number of the most current version of the software will appear. You can compare this to the version number installed in the SyncServer by proceeding to the web GUI Dashboard and finding the version number in the About drop down on the right side. If you do not have the latest version installed consider contacting Technical Support.

Navigation Windows

The navigation portion of the web interface is used to access the various pages to configure different aspects of the SyncServer S6x0 and to view status information. See [Figure 4-13](#). The navigation menu will expand and contract depending on the current selection.

Figure 4-13. Navigation Portion of Dashboard



Network Configuration Windows

The Network tab on the dashboard provides access to windows for Ethernet, SNMP, SNMP Trap configuration, and Ping.

Network - Ethernet Configuration

Use this window to configure or modify the Ethernet setting for LAN1 - LAN6, and to manually set the DNS server address for LAN1. There is a separate "Apply" button for each Ethernet port and the DNS server address configuration.

The following Ethernet parameters can be configured:

- Speed
 - Auto | Full 100 | Full 1000
- IP format
 - IPv4 | IPv6
- Config
 - Static | Dynamic
 - IPv6 Auto Config
- IP address
- Subnet mask for IPv4, prefix length for IPv6
- Gateway address

DNS server addresses can be added for LAN1. This will usually be necessary if LAN1 is configured with a static IP address.

See [Figure 4-14](#). See [Appendix E, IP Port Details](#) for information on Ethernet port isolation, management port rules, and timing port rules.



Note: Each Ethernet port should be configured on a different subnet.

Figure 4-14. Network - Ethernet Configuration Window

LAN	Link	Speed	IP	Config	Address	Subnet Mask / Prefix Length	Gateway	Apply
LAN1	↑	Auto	<input checked="" type="checkbox"/> IPv4 <input type="checkbox"/> IPv6	DHCP Static	10.241.57.56	255.255.255.0	10.241.57.1	▶
LAN2	↓	Auto	<input type="checkbox"/> IPv4 <input type="checkbox"/> IPv6	Static Static				▶
LAN3	↓	Auto	<input type="checkbox"/> IPv4 <input type="checkbox"/> IPv6	Static Static				▶
LAN4	↓	Auto	<input type="checkbox"/> IPv4 <input type="checkbox"/> IPv6	DHCP Static				▶
LAN5	↓	Full_10Gb	<input checked="" type="checkbox"/> IPv4 <input type="checkbox"/> IPv6	Static Static	10.0.5.11	255.255.255.0	10.0.5.1	▶
LAN6	↓	Full_10Gb	<input checked="" type="checkbox"/> IPv4 <input type="checkbox"/> IPv6	Static Static	10.0.5.11	255.255.255.0	10.0.5.1	▶

DNS Address(s)

Network - SNMP Configuration

Use this window to add, edit or delete v2 communities, and to add or delete SNMP users. See [Figure 4-15](#).

The following SNMP parameters can be configured:

- Basic Configuration
 - sysLocation, 1-49 characters
 - sysName, 1-49 characters
 - sysContact, 1-49 characters
 - Read Community, 1-49 characters
 - Write Community, 1-49 characters
- Add v3 User - up to 10 users can be added
 - Name, 1-32 characters
 - Authentication Phrase, 1-49 characters
 - Authentication Encryption: MD5 or SHA
 - Privacy Phrase, 8-99 characters
 - Privacy Selection: "Authentication" or "Authentication & Privacy".
Privacy uses AES128



Note: SNMP user names, community names, and privacy/authentication phrases can contain all ASCII characters except (<), (&), (>), ("), (').

The SNMP engine ID is displayed for the user's convenience. The SNMP MIB files for use with the SyncServer can be downloaded on this page.

Figure 4-15. Network - SNMP Window

SNMP

Notice: No v3 users configured

Basic Configuration

sysLocation	Microsemi	Read Community	microcommr
sysName	SyncServer	Write Community	microcommw
sysContact	admin@localhost		

Save

v3 Users

User Name	Mode	Level

Add v3 User

Name		Priv Phrase	
Auth Phrase		Min Priv	Authentication
Auth Crypt	<input type="radio"/> MD5 <input type="radio"/> SHA		

Save

SNMP Engine ID

Engine ID	0x8000236e0300b0ae00360b
-----------	--------------------------

Download

Download SNMP mib	Save as...
-------------------	------------

Cancel

Network - SNMP Trap Configuration

Use this window add or edit SNMP trap recipients. Up to 10 trap managers can be added.

The following parameters can be configured:

- IP Address - IPv4 or IPv6 address of trap manager
- Trap Version: v2c or v3
- User / Community, 1-32 characters
- Authentication Phrase (v3 only), 1-99 characters
- Privacy Phrase (v3 only, privacy uses AES128), 1-99 characters
- Authentication Encryption: MD5 or SHA (v3 only)

See [Figure 4-16](#).



Note: Some SNMP browsers and trap managers require that an SNMPv3 user be created with the same username and authentication as used for the trap configuration in order for the SNMPv3 discovery process to complete properly.



Note: SNMP is designed to be used with LAN1. Do not configure a SNMP manager address in a subnet used by the other LAN ports (LAN2 - LAN6).

Figure 4-16. Network - SNMP Traps

Dashboard > Network > SNMP Traps

SNMP Traps

Trap Recipients		
Destination	Ver	User/Community
Add / Edit Trap Recipients		
IP Address	<input type="text"/>	<input type="radio"/> v2c <input type="radio"/> v3
User / Community	<input type="text"/>	<input type="checkbox"/> Send as Inform
Auth Phrase	<input type="text"/>	<input type="radio"/> MD5 <input type="radio"/> SHA
Priv Phrase	<input type="text"/>	
<input type="button" value="Save"/>		
<input type="button" value="Cancel"/>		

Network - Ping

Use this window to perform network ping tests. Use ping to test network connectivity out the LAN ports as needed. The result of the ping will be displayed in the window when completed. An IPv4 or IPv6 address should be entered in the IP address field. See [Figure 4-17](#).

Ping may not operate as expected when IPv6 auto-config is enabled. An IPv6 source address may be used that doesn't route correctly to the destination address.

Figure 4-17. Network - Ping Window

The screenshot shows a web interface for performing a network ping test. At the top, there is a breadcrumb trail: "Dashboard > Network > Ping". Below this is a header area with a network icon and the word "Ping". The main content area is titled "Network Ping Test" and contains the following elements:

- An "IP Address" label followed by an empty text input field.
- A dropdown menu currently set to "LAN1".
- Two radio button options: "Ping4" (which is selected) and "Ping6".
- A large, empty rectangular area labeled "Ping Output" for displaying the results of the test.
- At the bottom, there are two buttons: a green "Apply" button and a red "Cancel" button.

Network Timing Windows

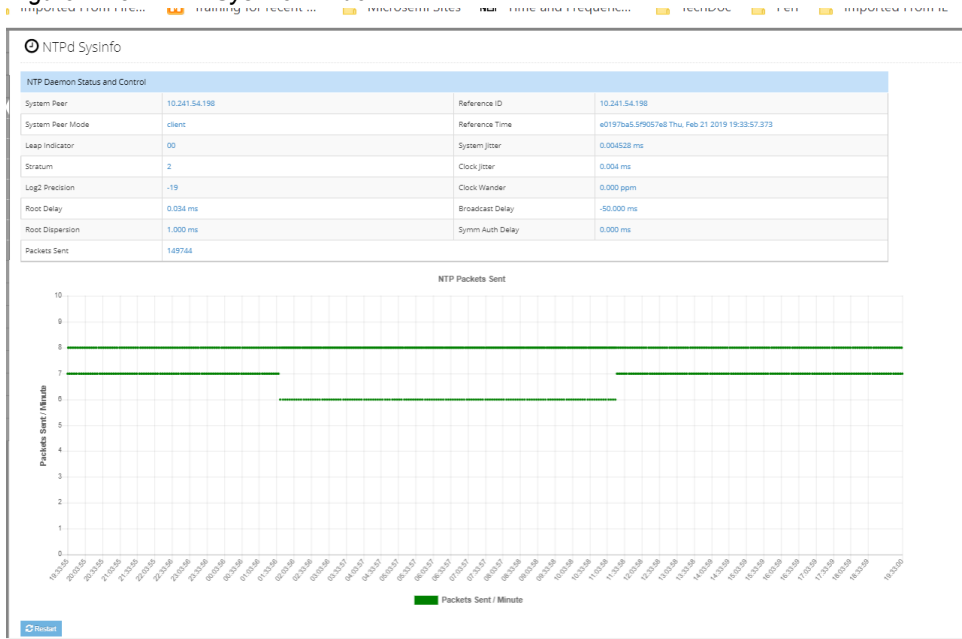
The Network Timing tab on the dashboard provides access to windows to configure NTP, view NTP Daemon Status and Control, and to view NTP Associations.

NTP SysInfo Window

Use this window to view NTP Daemon Status and Control.

See [Figure 4-18](#). See [Table 4-5](#) for descriptions of NTP Daemon Status and Control parameters.

Figure 4-18. NTP SysInfo Window



At the bottom of the Sysinfo page, a graph is included that shows the NTP packet load. It displays the number of packets per minute sent each minute over the last 24 hours.

The restart button at the bottom of the page will restart NTPd. This will also clear the statistics and the graph.

Table 4-5. NTPd SysInfo Parameter Descriptions

Parameter	Description
System Peer	<p>The IP address of the clock source. The source is selected by the NTP daemon that is most likely to provide the best timing information based on: stratum, distance, dispersion and confidence interval. The address of the local SyncServer Hardware Clock can be viewed in the hardware reference clock section of the NTP associations page.</p>
System Peer Mode	<p>The relationship of the SyncServer to a system peer, usually a "client". Depending the configuration, the mode can be:</p> <ul style="list-style-type: none"> ■ Client: A host operating in this mode sends periodic messages regardless of the reachability state or stratum of its peer. By operating in this mode the host, usually a LAN workstation, announces its willingness to be synchronized by, but not to synchronize the peer. ■ Symmetric Active: A host operating in this mode sends periodic messages regardless of the reachability state or stratum of its peer. By operating in this mode the host announces its willingness to synchronize and be synchronized by the peer. ■ Symmetric Passive: This type of association is ordinarily created upon arrival of a message from a peer operating in the symmetric active mode and persists only as long as the peer is reachable and operating at a stratum level less than or equal to the host; otherwise, the association is dissolved. However, the association will always persist until at least one message has been sent in reply. By operating in this mode the host announces its willingness to synchronize and be synchronized by the peer. <p>A host operating in client mode (a workstation, for example) occasionally sends an NTP message to a host operating in server mode (the SyncServer), perhaps right after rebooting and at periodic intervals thereafter. The server responds by simply interchanging addresses and ports, filling in the required time information and returning the message to the client. Servers need retain no state information between client requests, while clients are free to manage the intervals between sending NTP messages to suit local conditions.</p> <p>In the symmetric modes, the client/server distinction (almost) disappears. Symmetric passive mode is intended for use by time servers operating near the root nodes (lowest stratum) of the synchronization subnet and with a relatively large number of peers on an intermittent basis. In this mode the identity of the peer need not be known in advance, since the association with its state variables is created only when an NTP message arrives. Furthermore, the state storage can be reused when the peer becomes unreachable or is operating at a higher stratum level and thus ineligible as a synchronization source.</p> <p>Symmetric active mode is intended for use by time servers operating near the end nodes (highest stratum) of the synchronization subnet. Reliable time service can usually be maintained with two peers at the next lower stratum level and one peer at the same stratum level, so the rate of ongoing polls is usually not significant, even when connectivity is lost and error messages are being returned for every poll.</p>

Table 4-5. NTPd SysInfo Parameter Descriptions (Continued)

Parameter	Description										
Leap Indicator	<p>The Leap Indicator (LI) is a two-bit binary number in the NTP packet header that provides the following information:</p> <ul style="list-style-type: none"> ■ Advance warning that a leap second adjustment will be made to the UTC timescale at the end of the current day. Leap seconds are events mandated by the world time authority (BIPM) in order to synchronize the UTC time scale with the earth's rotation. ■ Whether the NTP daemon is synchronized to a timing reference. <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;"><u>LI</u></th> <th style="text-align: left;"><u>Meaning</u></th> </tr> </thead> <tbody> <tr> <td>00</td> <td>No Warning</td> </tr> <tr> <td>01</td> <td>Leap second insertion: Last minute of the day has 61 seconds.</td> </tr> <tr> <td>10</td> <td>Leap second deletion: Last minute of the day has 59 seconds.</td> </tr> <tr> <td>11</td> <td>Alarm condition (Not synchronized)</td> </tr> </tbody> </table> <p>When the SyncServer or NTP daemon is started or restarted, the leap indicator is set to "11", the alarm condition. This alarm condition makes it possible for NTP clients to recognize that an NTP server (the SyncServer) is present, but that it has yet to validate its time from its time sources. Once the SyncServer finds a valid source of time and sets its clock, it sets the leap indicator to an appropriate value. The NTP Leap Change Alarm on the ADMIN - Alarms page can be configured to generate an alarm and send notifications each time the leap indicator changes state.</p>	<u>LI</u>	<u>Meaning</u>	00	No Warning	01	Leap second insertion: Last minute of the day has 61 seconds.	10	Leap second deletion: Last minute of the day has 59 seconds.	11	Alarm condition (Not synchronized)
<u>LI</u>	<u>Meaning</u>										
00	No Warning										
01	Leap second insertion: Last minute of the day has 61 seconds.										
10	Leap second deletion: Last minute of the day has 59 seconds.										
11	Alarm condition (Not synchronized)										
Stratum	<p>This is an eight-bit integer that indicates the position of an NTP node within an NTP timing hierarchy. It is calculated by adding 1 to the stratum of the NTP system peer. For the SyncServer, the stratum values are defined as follows:</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;"><u>Stratum</u></th> <th style="text-align: left;"><u>Meaning</u></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Hardware Clock when locked</td> </tr> <tr> <td>1</td> <td>Primary server</td> </tr> <tr> <td>2-15</td> <td>Secondary server</td> </tr> <tr> <td>16-255</td> <td>Unsynchronized, unreachable</td> </tr> </tbody> </table> <p>For example, the SyncServer is:</p> <ul style="list-style-type: none"> ■ stratum 1 when the Hardware Clock (stratum 0) is synchronized to an input reference, in holdover mode, or in freerun mode. ■ stratum 2 through 15 when it is synchronized to a remote NTP server. ■ stratum 16 when it is unsynchronized, indicating that it is searching for a valid source of timing information. 	<u>Stratum</u>	<u>Meaning</u>	0	Hardware Clock when locked	1	Primary server	2-15	Secondary server	16-255	Unsynchronized, unreachable
<u>Stratum</u>	<u>Meaning</u>										
0	Hardware Clock when locked										
1	Primary server										
2-15	Secondary server										
16-255	Unsynchronized, unreachable										
Log2 Precision	<p>This is a signed integer indicating the precision of the selected peer clock, in seconds to the nearest power of two. A typical value is -18 for a Hardware Clock where the uppermost 18 bits of the time stamp fractional component have value, indicating a precision in the microsecond range.</p>										

Table 4-5. NTPd SysInfo Parameter Descriptions (Continued)

Parameter	Description
Root Delay	This is a measure of the total round trip delay to the root of the synchronization tree. A typical value for a SyncServer operating at stratum 1 would be 0 since the SyncServer is a root of the synchronization tree. For other stratum levels, an appropriate value is displayed. Depending on clock skew and dispersion, this value could be positive or negative.
Root Dispersion	This is a signed fixed-point number indicating the maximum error relative to the primary reference source at the root of the synchronization subnet, in seconds. Only positive values greater than zero are possible.
Packets Sent	Count of the number of NTP packets sent since NTPd was last restarted.
Reference ID	This is a four-byte field used to identify the reference clock source. At initialization, while the stratum is 16, this field shows the progression of the NTP clock PLL. The field will start with a value of INIT (may be displayed as 73.78.73.84, the ASCII decimal values). Once a peer has been selected, the clock may be stepped, in which case the reference ID field will change to STEP (or 83.84.69.80). Once the PLL is locked, the stratum will be updated and the reference ID will identify the selected peer. In the case of a SyncServer operating at stratum 1, the reference ID will display the source for the local timing reference (such as GNSS). In the case where the selected peer is another NTP server, the reference ID will display the IP address of the server or a hash unique to the association between the SyncServer and the remote server.
Reference Time	The time when the SyncServer last received an update from the selected peer. Represented using time stamp format in local time. If the local clock has never been synchronized, the value is zero. A time stamp of zero corresponds to a local time of Thu, Feb 7 2036 6:28:16.000. This value is typically updated every 16 seconds for a locally attached hardware reference (e.g., GNSS, IRIG) and in an interval of 64- 1024 seconds for a readily accessible remote NTP server.
System Jitter	Jitter (also called timing jitter) refers to short-term variations in frequency with components greater than 10 Hz.
Clock Jitter	Jitter (also called timing jitter) refers to short-term variations in frequency with components greater than 10 Hz.
Clock Wander	Wander refers to variations in frequency with components less than 10 Hz.
Broadcast Delay	The broadcast and multicast modes require a special calibration to determine the network delay between the local and remote servers. Typically, this is done automatically by the initial protocol exchanges between the client and server. This is the broadcast or multicast delay reported by the NTP daemon.
Symm Auth Delay	When NTP authentication is enabled and performed on outgoing NTP packets, this adds a trivial amount of fixed delay that can be removed based on the authdelay value. This value is always set to zero on the SyncServer.



Note: If the system is using NTP as the reference and the NTP server is performing a leap smear, then all non-NTP outputs of the system will be degraded, especially outputs on the optional I/O modules.

NTP Associations

Use this window to view NTP Associations.

See [Figure 4-19](#). See [Table 4-6](#) for descriptions of NTPd Associations parameters.

Figure 4-19. NTPd Associations Window

The screenshot shows the 'NTPd Assoc' window in the SyncServer S650 interface. The window title is 'NTPd Assoc'. It contains two tables: 'Hardware Reference Clock' and 'NTP Associations'.

Hardware Reference Clock								
Remote	Mode	Refid	Stratum	Reach	Offset (ms)	Delay (ms)	Disp (ms)	Poll (s)
*127.127.47.0	sys.peer; being polled	.GNSS.	0	377	0.000	0.000	0.002	32

NTP Associations								
Remote	Mode	Refid	Stratum	Reach	Offset (ms)	Delay (ms)	Disp (ms)	Poll (s)
+10.241.54.198	candidate; being polled	.GNSS.	1	377	0.004	0.042	0.015	16
+10.241.54.124	candidate; being polled	.GNSS.	1	377	-0.012	0.016	0.006	16
224.0.1.1	reject; broadcasting to	.MCST.	16	0	0.000	0.000	0.002	64
ff0e::101	reject; broadcasting to	.MCST.	16	0	0.000	0.000	0.002	64

Table 4-6. NTPd Associations Parameters

Parameter	Description
Remote	<p>The domain name or IP address of the remote end of the NTP association. "Hardware Clock" is the SyncServer's Hardware Clock. In the case of a remote NTP connection, this will be the IP address of the remote end.</p> <p>The character in the left margin indicates the mode in which this peer entry is operating:</p> <ul style="list-style-type: none"> ■ (space) reject The peer is discarded as unreachable, synchronized to this server (synch loop) or outrageous synchronization distance. ■ x = falsetick The peer is discarded by the intersection algorithm as a falseticker. ■ ,(period) = excess The peer is discarded as not among the first ten peers sorted by synchronization distance and so is probably a poor candidate for further consideration. ■ - (minus) = outlier The peer is discarded by the clustering algorithm as an outlier. ■ + (plus) = candidate The peer is a survivor and a candidate for the combining algorithm. ■ # (pound sign) = selected The peer is a survivor, but not among the first six peers sorted by synchronization distance. If the association is ephemeral, it may be demobilized to conserve resources. ■ * (asterisk) = sys.peer The peer has been declared the system peer and lends its variables to the system variables. ■ o = pps.peer The peer has been declared the system peer and lends its variables to the system variables. However, the actual system synchronization is derived from a pulse-per-second (PPS) signal, either indirectly via the PPS reference clock driver or directly via kernel interface.
Mode	

Table 4-6. NTPd Associations Parameters (Continued)

Parameter	Description
Ref Id	<p>This is a four-byte field used to identify the reference clock source. At initialization, while the stratum is 16, this field shows the progression of the NTP clock PLL. The field will start with a value of INIT (may be displayed as 73.78.73.84, the ASCII decimal values).</p> <p>Once a peer has been selected, the clock may be stepped, in which case the reference ID field will change to STEP (or 83.84.69.80). Once the PLL is locked, the stratum will be updated and the reference ID will identify the selected peer. In the case of a SyncServer operating at stratum 1, the reference ID will display the source for the local timing reference (e.g., GNSS, IRIG, FREE). In the case where the selected peer is another NTP server, the reference ID will display the IP address of the server or a hash unique to the association between the SyncServer and the remote server.</p>
Stratum	<p>The stratum level of the remote clock in the NTP hierarchy. Lower values are given more emphasis. For the local Hardware Clock, stratum 0 is a special value that indicates the Hardware Clock it is synchronized by a "timing root" reference such as GNSS. Values in the range of 1 through 15 indicate the number of steps the remote NTP connection is from its timing root. Stratum 16 is a special value that indicates that the remote connection is not synchronized. The stratum reported by the SyncServer is incremented by one from its synchronizing peer. For example, while synchronized to the Hardware Clock (Stratum 0), the stratum of the SyncServer is one (Stratum 1).</p>
Reach	<p>This is an 8-bit shift register that keeps track of the last 8 attempts to reach the remote end of the association. New bits are added to the rightmost end of the register (1 for reached or 0 for unreached) and old bits "fall off" the left hand side. The shift register is represented in octal. For example, by converting "377" from octal to binary, one gets "11111111", indicating 8 successful polls. For a sequence of eight successful polling attempts on a new association, the octal value of Reach increases as follows: 1, 3, 7, 17, 37, 77, 177, 377. If the value isn't one of those just shown, there may be a problem polling the remote end of the association. If the value remains at 0, or decreases to 0, the association is becoming unreachable. The reach value stays 0 if the SyncServer is a broadcast or multicast server.</p>
Offset (ms)	<p>The time offset between the SyncServer and the remote server, in seconds, of the last poll. The NTP daemon's clock selection algorithm gives preference to lower Offset values.</p> <p>The Offset for the Hardware Clock is usually in the microsecond range. For external NTP associations, the offset is affected by the time base of the remote node and the characteristics of the network path, with values typically in the 1 - 10 millisecond range.</p>
Delay (ms)	<p>The total delay, in seconds, of the round trip to the remote end of the NTP association. For example, a value of "0.07817" equals approximately 78 milliseconds. The Delay for the Hardware Clock is "0". For most NTP associations, typical values range from tens to hundreds of milliseconds. The NTP daemon's clock selection algorithm gives preference to lower Delay values.</p>

Table 4-6. NTPd Associations Parameters (Continued)

Parameter	Description
Disp (ms)	Dispersion represents the maximum error of the SyncServer relative to the NTP association. There are two components in dispersion, those determined by the peer relative to the primary reference source of standard time and those measured by the SyncServer relative to the peer. They provide not only precision measurements of offset and delay, but also definitive maximum error bounds, so that the SyncServer can determine not only the time, but the quality of the time as well.
Poll (s)	The length of the interval (in seconds) with which the SyncServer polls the remote server, usually starting at 64 seconds and gradually increasing to 1024 seconds. Valid values range from 16 to 65535, increasing by powers of 2. The polling interval for the Hardware Clock is fixed at 16 seconds. The user-configured Minimum and Maximum Poll Interval settings on the NTP - Config page limit this interval.

NTP Configuration Window

Use this window to configure NTP parameters, including the Role (Server, Peer, or Broadcast), Address, and Port.

See [Figure 4-20](#). See [Table 4-5](#) for descriptions of NTP Configuration parameters.

Figure 4-20. NTP Configuration Window

The screenshot shows the 'NTPd Config' window. At the top, there is a warning: 'To apply changes, NTPd must be restarted'. Below this is the 'General' section with three checkboxes: 'Hardware Reference Clock' (checked, value: Server 127.127.47.0), 'Enable NTP Query' (checked, value: NTP Query), and 'Enable NTP Leap Smear' (unchecked, value: NTP Leap Smear). Below the general settings is a table with columns: Role, Address, Port, Prefer, Burst, MinPoll, MaxPoll, Symmetric, TTL, and a delete icon. The table contains five rows of configuration. At the bottom of the window are three buttons: 'Save', 'Restart', and 'Cancel'.

Role	Address	Port	Prefer	Burst	MinPoll	MaxPoll	Symmetric	TTL	
Server	10.241.54.198	LAN1	<input type="checkbox"/>	Both	Default	0:00:16	10	0	
Broadcast	224.0.1.1	DEFAULT	<input type="checkbox"/>	N/A	Default	Default	None	7	
Broadcast	:::101	DEFAULT	<input type="checkbox"/>	N/A	Default	Default	1	7	
Server	10.241.54.124	LAN1	<input type="checkbox"/>	N/A	Default	0:00:16	None	0	
Server		DEFAULT	<input type="checkbox"/>	Both	Default	Default	None		

Click the Save button after making changes to save the changes. Click the Restart button to apply the changes.

NTP Query Parameter: If the NTP Query checkbox is enabled, then the SyncServer will respond to queries sent to it from ntpq. Ntpq is used to query the state of an NTP server.

NTP UTC Leap Second Smear: If the NTP Leap Smear checkbox is checked, then the SyncServer will implement a UTC leap second smear function at any forthcoming UTC leap second event. The unit will smear the NTP time stamps for the 24-hour interval before the leap second event. The operation is as defined in the NTPd reference implementation. This functionality is supported as a master NTP clock and will only affect the NTP responses for NTPd and NTP Reflector operations. It will not affect any other time-of-day functions such as IRIG outputs, etc. Behavior of the system is not defined if the system is an NTP client to an NTP server that is smearing.

Table 4-7. NTPd Association Configuration Parameters

Parameter	Description
Role	<p>Server Creates a persistent association between the SyncServer (client) and an NTP node (server). The client synchronizes with the server if the client's clock selection algorithm selects this server as the best clock. Typical server associations include: the hardware clock, the factory default NTP servers, and servers added by the user. The user creates a Server association to designate an NTP node that has an NTP Stratum better or equal to that of the SyncServer (client). Often, the NTP server is another Stratum 1 server with a GPS reference that is outside the user's administrative jurisdiction.</p> <hr/> <p>Peer Creates a persistent symmetric-active association between the SyncServer (peer1) with an NTP node (peer2). For the NTP node running in symmetric-passive mode, there is nothing needs to be done on the NTP node. However, the NTP node can be configured in symmetric active mode too. When configured, the two nodes can synchronize with each other in a variety of failure scenarios, such as loss of GPS and Internet connectivity. The user configures NTP associations on two NTP nodes that point to the each other. The two nodes are usually of equal stratum and have independent references, such as two separate GPS installations or two separate network paths to NTP servers on the Internet. In the event of a reference failure, the peerscan synchronize to the node that has the best remaining reference.</p> <hr/> <p>Broadcast Creates a broadcast server association. When configured with a broadcast address (e.g., 192.168.61.255), the association broadcasts NTP messages from the network interface with the matching IP address (e.g., 192.168.61.58). Broadcast messages go out to all nodes on the subnet, and are usually blocked by routers from reaching adjacent subnets. Consult with the network administrator to select a correctly-scoped address and Time-to-Live (TTL) value. Typical Usage: Broadcast associations to reduce network traffic with a large number of NTP clients.</p>
Address	The IP address or DNS name of the NTP association.
Port	With the default setting, the NTP daemon automatically detects and uses a valid network port to communicate with configured NTP server(s). Depending on the IP routing infrastructure, this is typically LAN1. The user can override this by selecting a specific network port. If so, the address must be specified using an IP address instead of a DNS name. The Port setting is only available for Server, Peer, Broadcast, and Multicast associations. (Factory Default = "Default")

Table 4-7. NTPd Association Configuration Parameters (Continued)

Parameter	Description
Prefer	<p>The NTP daemon will synchronize with an association marked prefer over an equivalent association that is not. The internal hardware reference clock prefer setting can be cleared in order to allow an external NTP server to be preferred over the internal hardware reference clock.</p> <p>By default the SyncServer S600 Series has the NTP Prefer selected for the local hardware reference clock. In most operating scenarios the local hardware reference clock (which more often than not will be tracking GNSS) will be the only reference being used. With the Prefer being selected, and no statistically better reference available, the time server will achieve Stratum 1 status on startup or restart as rapidly as possible. If the Prefer is not selected for the hardware reference clock then the NTP daemon will go through a standard validation procedure for a reference clock. This procedure will take several minutes and should happen by the time the reach indicates 377 on the reference clock association. For optimal operation, Microsemi recommends the local hardware reference remain selected as a Prefer in the configuration.</p>
Burst	<p>Burst When the server is reachable, send a burst of eight packets instead of the usual one. The packet spacing is about two seconds. This is designed to improve timekeeping quality for server associations. This setting should only be used in agreement with the administrator of the remote NTP device as the traffic load may be onerous.</p> <p>iBurst When the server is unreachable, send a burst of eight packets instead of the usual one. As long as the server is unreachable, the packet spacing is about 16s to allow a modem call to complete. Once the server is reachable, the packet spacing is about two seconds. This is designed to speed the initial synchronization acquisition with the server command.</p>
MinPoll	<p>This option specifies the minimum poll interval for NTP messages, in seconds to the power of two. The minimum poll interval defaults to 6 (64 s), but can be decreased to a lower limit of 4 (16 s).</p>
MaxPoll	<p>This option specifies the maximum poll interval for NTP messages, in seconds to the power of two. The maximum poll interval defaults to 10 (1,024 s), but can be increased to an upper limit of 17 (36.4 h).</p>
Symmetric	<p>This option specifies an optional MD5 symmetric key ID, which must be 20 characters.</p>
TTL	<p>This field is used to specify the TTL in the IP header for broadcast packets. This will control the number of hops that the packet can be sent.</p>

After changing the NTP configuration, click the save button and then the RESTART button to put the new configuration into effect. While the NTP daemon restarts, its services are temporarily unavailable, and it generates the following alarm events: NTP Stratum Change, NTP System Peer Change, NTP Leap Change.

The SyncServer S6x0 supports both broadcast and multicast.

- For broadcast, the IP address is the local subnet broadcast address.
- For multicast, the IP address is an IPv4 or IPv6 multicast address. This can be either the IANA designated NTP multicast address (224.0.1.1 IPv4 or FF0X:0:0:0:0:0:101 IPv6) or any unassigned multicast address (typically in the range 224.0.1.0 to 238.255.255.255 for IPv4 or FF0X:x:x:x:x:x:x for IPv6).
- You can configure multiple multicast addresses but only one broadcast address on a SyncServer S6x0.
- SyncServer S6x0 does NOT support broadcast and multicast with Autokey.

The TTL used for multicast is in the range: [1, 7].

NTPd Most Recently Used (MRU) List Window

Use this window to display a list of the most recently used clients. See [Figure 4-21](#).

The data displayed includes the following:

- Client IP
- First Request Time
- Last Request Time
- Total Requests
- Version of NTP
- Mode of NTP

This window also displays a graph of Client Requests / 30 minutes. There is a separate bar for each 30-minute interval, and the graph will display data for up to the last 24 hours.

Figure 4-21. NTP MRU List Window

The screenshot displays the 'NTPd Most Recent Used (MRU) List' window. The left sidebar contains a navigation menu with categories like Dashboard, Network, Network Timing, Timing, References, Security, Admin, Logs, and OPTION SLOTS. The main content area features a table with the following data:

Client IP	First Req Time	Last Req Time	Total Requests	Version	Mode
192.168.1.121	11/06 18:32:48	11/11 17:12:35	6519	4	4

Below the table, it indicates 'Showing 1 to 1 of 1 entries'. A chart titled 'Client Requests' is present, with a y-axis labeled 'Requests / 30 Minute' ranging from 0 to 10. A legend below the chart shows a grey box for 'NTP Requests / 30 Minute'. A green 'Save As' button is located at the bottom left of the chart area.

NTP / PTP Services Configuration Window

Use this window to configure NTP reflector and PTP services. See [Figure 4-22](#).

This page can be used to configure multiple NTPr and PTP configurations. However, only one timing service can be mapped to each port.

Figure 4-22. NTP / PTP Service Configuration Window

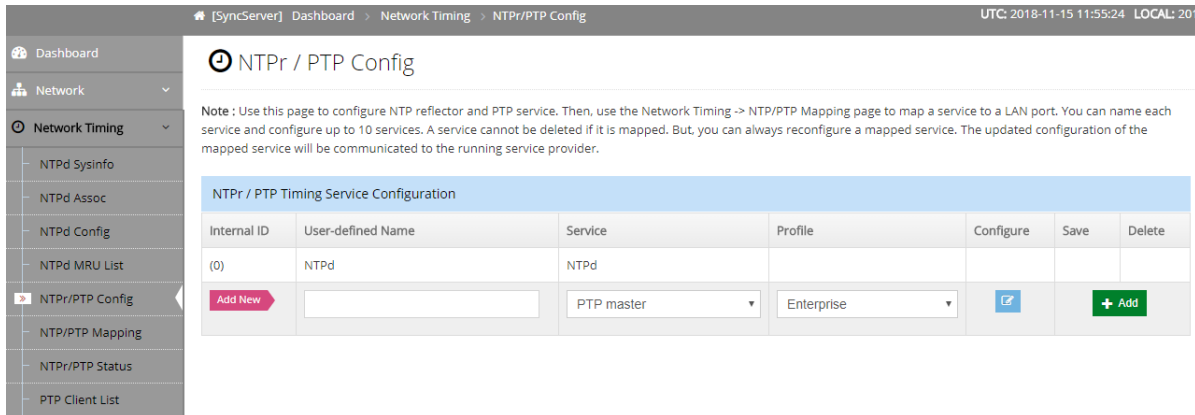


Table 4-8. NTP / PTP Services Configuration Parameters

Parameter / Column	Description
Internal ID	<p>The S6x0 automatically assigns this number as a unique identifier to reference this specific timing service when it appears on other forms.</p> <p>The assigned values will not necessarily be consecutive.</p>
User-defined Name	<p>Use this entry to provide a helpful name to describe the specific service.</p> <p>Maximum number of characters in the name is 47. Although probably not a good idea, multiple rows can have the same entry. The internal ID assures that they are always unique.</p>
Service	<p>This selection provides a top-level control for the type of network timing service being defined. The drop-down list provides all candidates.</p> <p>In release 2.1 the selections are NTPr (NTP reflector), PTP client and PTP master. See note below about NTPd</p> <p>Note: These columns are context-aware based on the current Service column selection. Configure column may be additionally context-aware based on the selected Profile. Hence the best way to work with these 3 columns (Service, Profile, Configure) is left-to-right.</p>

Table 4-8. NTP / PTP Services Configuration Parameters (Continued)

Parameter / Column	Description
Profile	When appropriate, this column is used to further refine the categorization of the timing service. A good example is a PTP master (top-level service), which always operates with a specific PTP profile.
Configure	<p>For a timing service that has additional configuration parameters, this selection brings up a form where all remaining parameters can set as desired.</p> <p>Selecting OK on the configure form maintains this configuration as long as the associated timing service row is being worked on. When (if) the Save selection in that row is executed, then the configuration becomes part of that service.</p>
Save	<p>Use this to save the timing service configured on this row.</p> <p>This also saves the settings (if any) that are associated with Configure for this same row.</p>
Delete	<p>Remove the specific timing service configuration associated with this row.</p> <p>If the row being deleted is currently mapped for use on a physical port, this action will not be allowed. If you really want to do it, first unmap it on the Network Timing'NTP/PTP Mapping form.</p>

Reflector capability is only available when the existing Security License option is installed. PTP is only available with the appropriate PTP license option.

The reflector does not support symmetric security keys or Autokey.

The timing service will only support one IP address. When using IPv6, there could be multiple IPv6 addresses associated with the Ethernet port. The IPv6 address can be selected by the user or automatically selected by the system in the following order.

1. Configured static IPv6
2. First available global address - DHCP or autoconfig
3. Link-local

The unit will not respond to IPv4 NTP packets if the reflector is enabled for IPv6. The unit will not respond to IPv6 NTP packets if the reflector is enabled for IPv4.

The SyncServer S6x0 Series implements real-time, hardware-based network packet processing in tandem with accurate hardware based NTP/PTP time stamping, general packet limiting and alarming. The reflector protects the SyncServer CPU from excessive network traffic Denial of Service (DoS) attacks, while concurrently providing high-bandwidth, high-accuracy NTP/PTP operations.

The system uses a real-time, hardware-based NTP/PTP packet identification and time-stamping engine. The high capacity hardware uses the extremely accurate S6x0 Series clock to deliver the best possible NTP/PTP timestamps. At line speed, NTP/PTP client packets are identified, the precise and accurate time stamps are added and the packets returned to the requesting NTP/PTP client, while also bandwidth-limiting all other packets to the CPU. Since all operations are in hardware operating at 1GbE or 10 GbE line speed the packet capacity is in excess of 360,000 packets per second.

The NTP Reflector supports the most common NTP Mode 3 NTP client requests for time. The NTP daemon running on the embedded CPU on the other hand is capable of more NTP features and functions. The advantage of the SyncServer S6x0 Series is that it can simultaneously perform NTP reflector operations on one user-selectable port while conducting traditional NTP Daemon operations on the other ports. This provides the best of both NTP operational models including common NTP daemon functions, such as peering, clustering, selection, MD5 and Autokey authentication. The primary trade-offs are shown in [Table 4-9](#).

Figure 4-23. NTP Packet Reflector

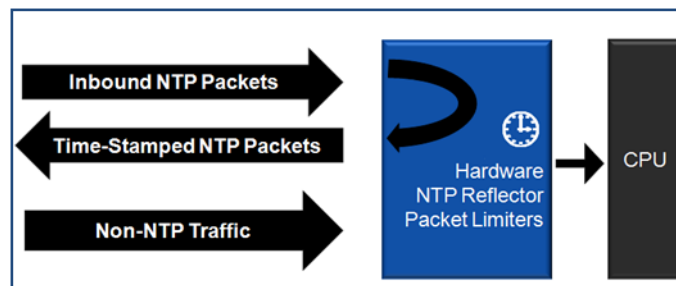


Table 4-9. NTP Reflector vs. NTP Daemon Performance Trade-Offs

Feature	NTP Reflector	NTP Daemon
Enhanced Security	X	
360,000 NTP requests/second	X	
Enhanced Time Stamp Accuracy	X	
DoS Detection/Alarming	X	
CPU Protection	X	
NTP Peering, Clustering, Selection		X
MD5 and Autokey Functions		X

It is important to note that NTP is UDP/IP and is by nature susceptible to DoS attacks as no TCP/IP connection is required. The Security-Hardening of the line speed NTP Reflector is such that in the event of an NTP DoS attack the NTP packets will not reach the CPU and compromise the server operation. Instead, all NTP packets can be responded to (or limited) and if the NTP load is in excess of what is expected an alarm is sent notifying the user. The alarm threshold can be set on the packet monitoring page, which is part of the Security section tab..

When changing the configuration between IPv4 and IPv6, the reflector will be disabled for up to 15 seconds. During this time, the traffic will be forwarded to the CPU. If the traffic rate exceeds the all-packets threshold, then the traffic will be dropped and an alarm generated.

Figure 4-24. PTP Configuration Parameters

Configurable Parameters	
Domain	<input type="text" value="0"/> Valid range: [0 to 127]
Two-step	<input type="text" value="0"/> Valid range: [0 to 1]
Priority 1	<input type="text" value="128"/> Valid range: [0 to 255]
Priority 2	<input type="text" value="128"/> Valid range: [0 to 255]
Announce Interval	<input type="text" value="0"/> Valid range: [0 to 0]
Sync Interval	<input type="text" value="0"/> Valid range: [0 to 0]

Ok Cancel

For a list of PTP parameters, including default value and range, see [Table B-43](#) through [Table B-48](#) in Appendix B.

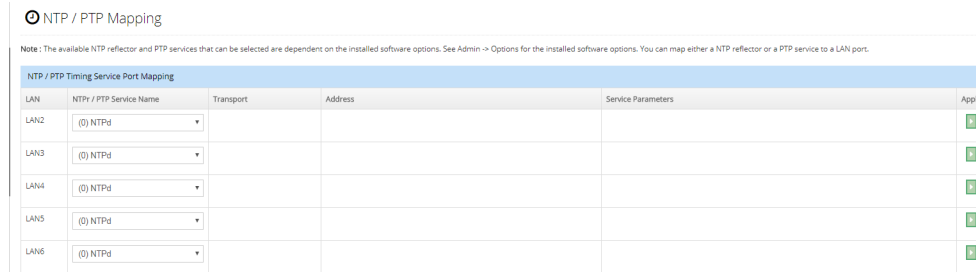
NTP / PTP Mapping Window

Use this window to map either a NTP reflector or a PTP service to a LAN port. See [Figure 4-25](#). A license is required for all timing services, other than NTPd. NTP reflector requires security license. PTP input requires PTP input license. PTP master requires PTP master license.

The NTP Reflector and PTP capability is supported on the LAN2, LAN3, LAN4, LAN5, and LAN6 ports, but it is not supported on LAN1.

GNSS must be configured, enabled, and connected if the "Auto-Asymmetry Correction" is enabled for the PTP client. The asymmetry correction feature allows the system to learn and correct for asymmetry in the network between the PTP master and the PTP client in the SyncServer. If asymmetry correction is enabled without GPS, then the PTP client will only be used to adjust the system frequency and won't adjust the system time.

Figure 4-25. NTP / PTP Mapping Window



NTPr / PTP Status Window

Use this window to view status of ports with NTP reflector or PTP service. See [Figure 4-26](#). See [Figure 4-27](#) for an expanded view of the NTPr/PTP Status for a port.

Figure 4-26. NTPr / PTP Status Window



Figure 4-27. NTPr/PTP Status Window - Port Details

🕒 NTPr/PTP Status

NTPr / PTP Status

LAN2

LAN3

Service Name	(3) PTPdefault
Service Config	PTP master, Default
Port State	Master
Service Packets per second	0
Number of Clients	N/A

Announce Content

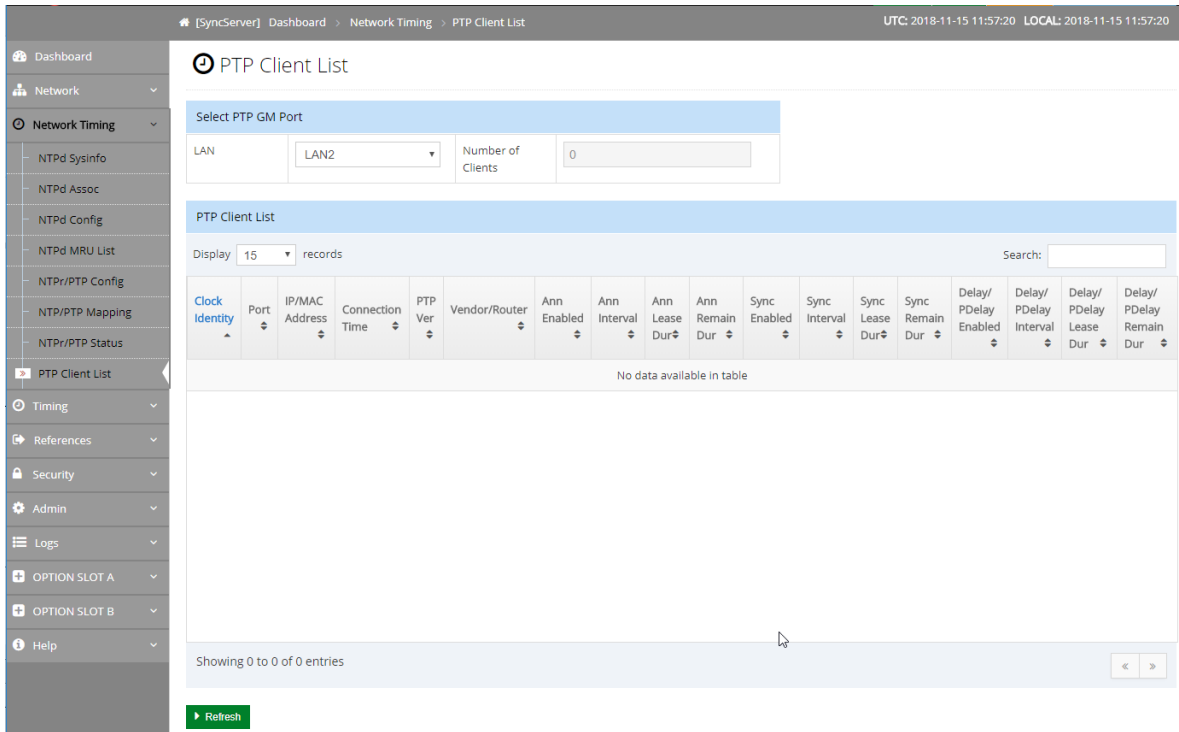
Port Identity	00:b0:ae:ff:fe:00:36:0b, Port:3
Clock Class	6
Clock Accuracy	within 100 ns
Offset Scaled Log Variance	0x3871
Timescale	PTP
Time Source	GPS
Time Traceable	True
Frequency Traceable	True
Current UTC Offset Valid	True
Current UTC Offset	37
Leap 61	False
Leap 59	False
Steps Removed	0

LAN4

PTP Client List Window

Use this window to display a list of PTP clients and client details. See [Figure 4-28](#). The PTP client list is useful for initial PTP network setup, to assure expected PTP clients are connected to expected SyncServer LAN port(s). and to check PTP client settings from one location.

Figure 4-28. PTP Client List Window



Client details displayed include the following:

- Clock Identity
- Port
- IP/MAC Address
- Connection Time
- PTP Version
- Vendor/Router
- Announce Enabled
- Announce Interval
- Announce Lease Duration
- Announce Duration Remaining
- Sync Enabled
- Sync Interval
- Sync Lease Duration
- Sync Duration Remaining
- Delay/PDelay Enabled
- Delay/PDelay Interval

- Delay/PDelay Lease Duration
- Delay/PDelay Duration Remaining

Timing Configuration Windows

The Timing tab on the dashboard provides access to windows to enable time and holdover sources, manually set time, set the time zone, and to configure format of the serial output.



Note: The SyncServer 6x0 does not contain a battery-backed real time clock. Therefore, it will always boot up with a default value for the system time. This time will be updated when it obtains time from a time reference such as GNSS, IRIG, or NTP. The default value for the date is the software build date. This date will be used for the first log entries when booting up the unit. The time will change to local time during the boot-up process if a time zone has been configured.

The system will monitor all inputs and determine if there is a valid signal on each input. The system only uses one reference at a time. The highest priority valid input will be used. This is specified on the Timing->Input Control page. Each reference has a different priority - the slot A and slot B references will have different priorities. With release 2.1, the priorities can be changed. All releases allow individual input references to be enabled/disabled. A frequency reference is only used if there are no valid timing references.

Timing - Input Control Window

Use this window to enable external time and frequency references, and manually set the time when no external time reference will be supplied. There are special limitations associated with this mode of operation, as described on the form itself. If "Ignore UTC corrections" is enabled, then local time is not available on the front panel or the web page.

Use this window to manually set the IRIG input year, UTC offset from TAI, and Leap Second Notification. See [Provisioning Inputs with Manual Entry Controls](#), on page 216 for details.

When using the forced manual time entry mode, the unit should not have NTP configured as an input reference. Therefore, no NTP devices should be configured on the NTP config page if using this mode.



Note: If "Forced Manual Time Entry" is selected on the Input Control form (while Time of Day status = Freerun), or if time is set from front-panel, the unit may not lock to GNSS upon return to the "External Time Sources" setting on the Input Control form.

The workaround for this is to disable GNSS (and apply) after setting the unit to "External Time Sources". Then enable GNSS again (and apply).

It is recommended that the SyncServer S6x0 be rebooted when leaving manual time mode.

See [Figure 4-29](#) and [Figure 4-30](#).

Figure 4-29. Timing - Input Control Window - Upper Portion

⌚ Input Control

The screenshot shows the 'Input Control' window with two main sections:

- External Input Sources:**
 - Note:** Drag and drop a row in the Time or Frequency Reference Priority table to adjust its priority. Use the Reset button to restore the default priority order.
 - Time Reference Priority Table:**

Enable	Reference	Priority
<input checked="" type="checkbox"/>	GNSS	1
<input checked="" type="checkbox"/>	Slot AJ1 Timecode	2
<input checked="" type="checkbox"/>	Slot BJ1 Timecode	3
<input checked="" type="checkbox"/>	PTP	4
 - Ignore UTC corrections from GPS reference and serve GPS timescale. Not applicable to any other time reference (i.e. Timecode, NTP, etc.)
 - Frequency Reference Priority Table:**

Enable	Reference	Priority
<input checked="" type="checkbox"/>	Slot AJ2 (Frequency)	1
<input checked="" type="checkbox"/>	Slot BJ2 (Frequency)	2
<input type="checkbox"/>	Slot AJ1 (10MPPS, 1PPS)	3
- Forced Manual Time Entry:**
 - Time selection: Jan / 18 / 2018 08 : 13 : 10
 - Note:** In Forced Manual Time Entry mode:
 - Local oscillator is always used as reference.
 - External references are not used.
 - Outputs are forced to indicate an artificially induced "locked" operating status typically associated with tracking high accuracy external time references.
 - It is NOT recommended to use this mode if time of day status row on Dashboard -> Timing is anything other than "Freerun" prior to selection.

Buttons at the bottom: Apply, Cancel, Reset.

Figure 4-30. Timing - Input Control Window - Lower Portion


Manual IRIG Year Input		Manual UTC Offset from TAI	
Year	<input type="text" value="2017"/>	Offset (s)	<input type="text" value="0"/>
<input type="button" value="Apply"/>		<input type="button" value="Apply"/>	
Manual Leap Second Notification			
Adjustment	<input type="radio"/> +1 Second <input type="radio"/> -1 Second <input checked="" type="radio"/> None	Note : Leap second notification is used with IRIG time code input to manually provide advance notification of a pending leap event to NTP clients. The NTP leap second flag will be raised the day of the pending event. If GPS or NTP is the current time source at the time of the leap event, the NTP leap notification follows the leap notification data provided by GPS or NTP and this manual leap second notification feature is not used.	
Date (at midnight)	<input checked="" type="radio"/> June 30 <input type="radio"/> December 31		
<input type="button" value="Apply"/>			

Timing - Holdover Configuration Window

Use this window to configure a duration in holdover (loss of stratum 0 reference) until the server either unlocks or attempts to get time from other NTP servers (if configured to do so). After this holdover period is exceeded, then the unit will attempt to lock to external NTP servers.

See [Figure 4-31](#).

Figure 4-31. Timing - Holdover Window

 **Holdover**

Installed Oscillator : OCXO Oscillator

Holdover Configuration	
Time Error Limit	<input type="text" value="0.024123"/> ms <small>Valid range: [0.000100 ms to 100 ms]</small>
Holdover Duration	<input type="text" value="1.000000"/> days <small>Valid range: [0.001 days to 200.00 days]</small>

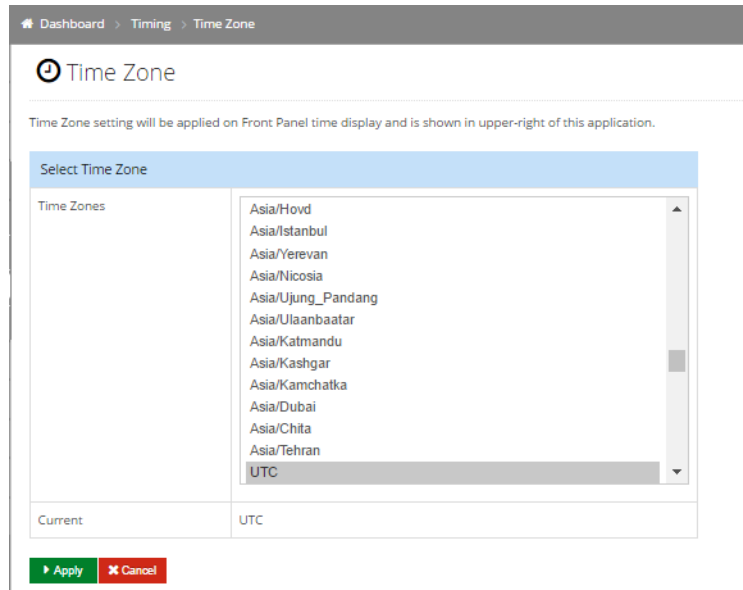
Holdover occurs when the input references (GNSS, etc.) are not available and microprocessor is steering the internal oscillator (standard, OCXO, Rubidium). During holdover the clock accumulates error (drifts away from perfect). By adjusting the values you can explore the relationship of holdover in days and clock error for the installed oscillator. When the clock error is reached the server will either unlock or revert to getting time from other NTP servers.

Holdover occurs when the input references (GNSS, etc.) are not available and microprocessor is steering the internal oscillator (standard, OCXO, Rubidium). During holdover the clock accumulates error (drifts away from perfect). By adjusting the values you can explore the relationship of holdover in days and clock error for the installed oscillator. When the clock error is reached the server will stop updating the NTP reference time. If other NTP servers are configured, it will then start getting time from other NTP servers. The value obtained with this estimator is a conservative estimate of the performance of the unit. Actual performance may vary and will typically be better than this estimate.

Timing - Time Zone Configuration Window

Use this window to select the desired time zone for the SyncServer S6x0. See [Figure 4-32](#) below. The time zone is only for the front panel display. NTP time will continue to be served in UTC.

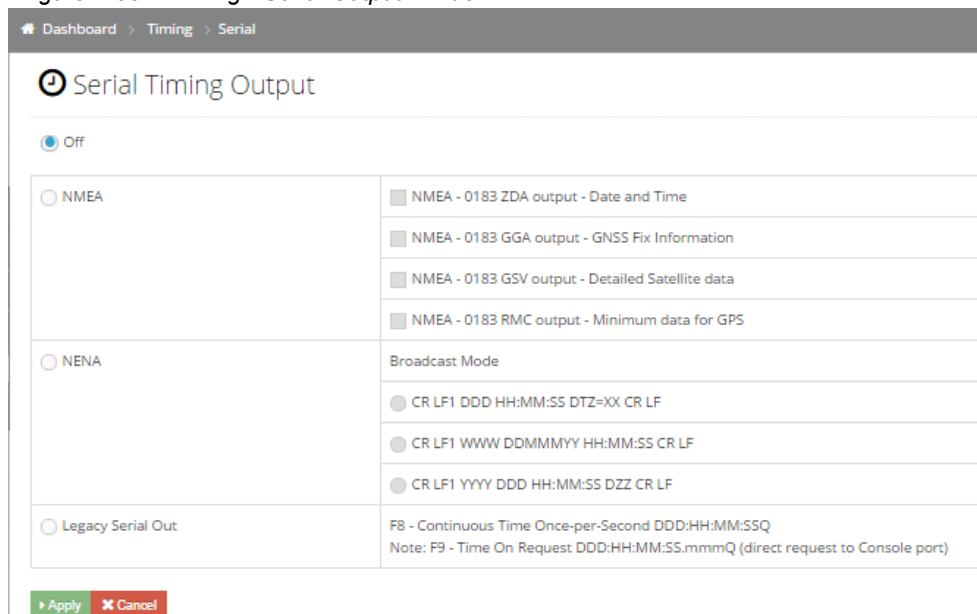
Figure 4-32. Timing - Time Zone Window



Timing - Serial Output Configuration Window

This window is used to select the format for the serial timing output for the SyncServer S6x0. See [Figure 4-33](#) below.

Figure 4-33. Timing - Serial Output Window



Timing - 1 PPS Time Interval Measurement / Event Time Window

Use this window to set up 1PPS time interval measurements and event time. See [Figure 4-34](#) below. See [Making Time-Interval or Event Timestamp Measurements](#) for details on using this feature.

Figure 4-34. 1 PPS Time Interval Measurement / Event Time Window

The screenshot shows a web interface for configuring 1 PPS time interval measurements. On the left is a sidebar with a menu including Dashboard, Network, Network Timing, Timing, Input Control, Holdover, Time Zone, Serial, TI Meas./Event Time, References, Security, Admin, Logs, OPTION SLOT A, OPTION SLOT B, and Help. The main content area is titled "1 PPS Time Interval Measurement / Event Time". It features a "Select Input" section with a "Slot" dropdown set to "Slot B". Below is the "Configure Measurement" section, which is a table with columns for "Output", "Duration", and "Apply". The "Output" column contains fields for "Destination" (LOCAL), "IPversion" (IPv4), "IP Address" (10.10.10.10), and "UDP Port" (9999). The "Duration" column has a dropdown set to "10 Minute". The "Apply" column contains a green "Start" button. Below this is the "Measurement Data" section, which has two radio buttons: "Time Interval Measurement" (selected) and "Event Time". Under "Time Interval Measurement", there are eight input fields for statistics: Current Interval (ns), Maximum Interval (ns), Mean of Intervals (ns), Standard Deviation (ns) (with a value of 0), Number of samples, Minimum Interval (ns), Median Interval (ns), and RMS of Intervals (ns) (with a value of 0). At the bottom is the "Download Measurement" section, which includes an "Output Format" field with the value "(1492453600,1.48610406e-01)", a dropdown set to "TAI", and a green "Save as..." button.

Requirements

- Software license
- SyncServer S650 with optional timing I/O module

Capabilities

- Make measurements on a 1PPS signal connected to J1 port of either module A or module B. Measures the rising edge of the signal compared to the SyncServer system time.
- Calculate statistics and display results - current measurement, number of measurements, maximum, minimum, mean, median, standard deviation, and RMS
- Take measurements and calculate statistics over a user-selected duration from 10 minutes to 24 hours, or continuous. Web interface button to start and stop measurement. Statistics are only available if measurements are stored locally, rather than streamed on an Ethernet port or serial port.

- Store results locally or either send results to IP address with selected UDP port number, or to the timing/event serial port. Time interval results are sent once a second with the UTC time and measurement result. Event timing results are sent as they are obtained. Note that the serial port may limit the rate of measurement results. For example, a baud rate of 9600 may limit results to 25 per second. A program will need to run on the remote computer to collect the data. For example, SocketTest could be used. It is available from <https://sourceforge.net/projects/sockettest/>
 - Example: 2017-10-30,17:57:35,-1.30000000e-07
- Download locally stored data to a file in either UTC or GMT format. Results can only be downloaded if the measurement was stored locally instead of streaming to serial or Ethernet port.
 - UTC: Each measurement is on a separate line containing the time and the measurement with units of seconds. This download output format lists the time using the TAI timescale and in the UNIX time format, which is the integer number of seconds since January 1, 1970, 00:00:00.

Example: 1509386292,-1.30000000e-07
 - GMT: Each measurement is on a separate line containing the date/time and the measurement with units of seconds. This download output format lists the time using the UTC timescale in a format of year-month-day, hours:minutes:seconds..

Example: 2017-10-30,17:57:35,-1.30000000e-07
- Microsemi's TimeMonitor Analyzer application can be used to analyze the results. Either download the results, or capture results to a file from the serial port or IP port streams.
 - TimeMonitor Analyzer can load the UTC-format file with "Load Other Data->Load Single/Dual Column File ..."
 - TimeMonitor Analyzer can load the GMT-format file with "Load Other Data->Load Date Phase/Freq File ..."



Note: The 1PPS input should be disabled on the Timing->Input control page. The measurement is not useful if the SyncServer is using the 1PPS as the reference.

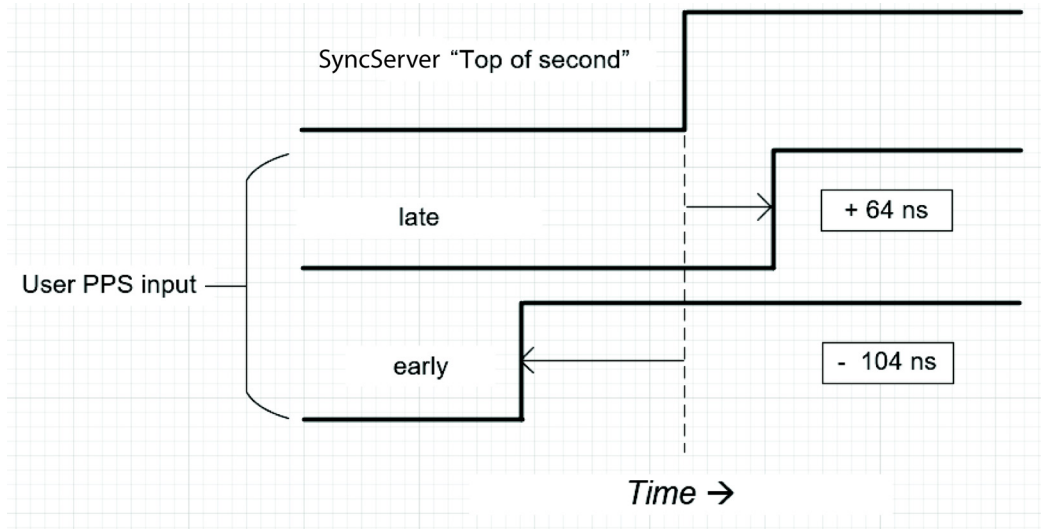


Note: Measurements are not useful if the SyncServer system clock has not been set or is changing. Therefore, it is not recommended to use the measurement feature when the SyncServer is in warmup, free-run, or locking clock states.



Note: If the user 1PPS input is later than the internal 1PPS, then the measurement will be positive. If the user 1PPS is early, then the measurement result will be negative. See [Figure 4-35](#).

Figure 4-35. Time-Interval Measurement (conceptual)



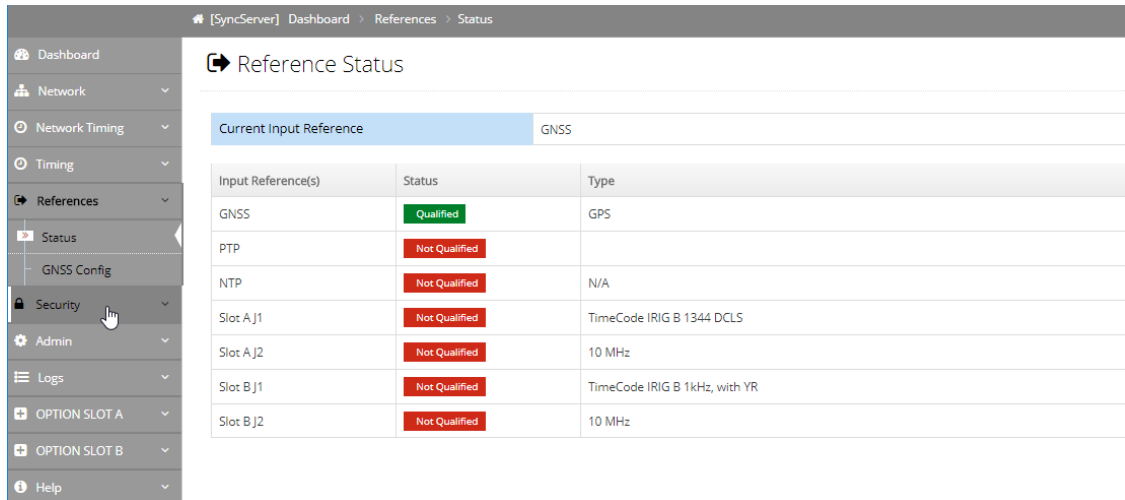
References Configuration Window

The References tab on the dashboard provides access to configure GNSS position and operating mode, as well as view Reference Status.

References - Reference Status Window

Use this window to view status information for system References. See [Figure 4-36](#).

Figure 4-36. References - Status Window



References - Reference GNSS Window

Use this window to configure GNSS position and operating mode. See [Figure 4-37](#).



Note: For accurate timing, it is important to accurately enter the delay of the antenna and cable. If the system has already locked to a reference, then it is recommended that the user restart the SyncServer after changing the cable delay. Otherwise, it may take an extended period of time before the change is fully incorporated.

If the GNSS multi-constellation license is installed, then GPS, GLONASS, Galileo, QZSS, and BeiDou can be selected. Only one or two of the constellations groups can be selected. GPS, Galileo, and QZSS are considered part of one constellation group, and can all be selected together as one of the two available constellation groups. It is not possible to select all five constellations.

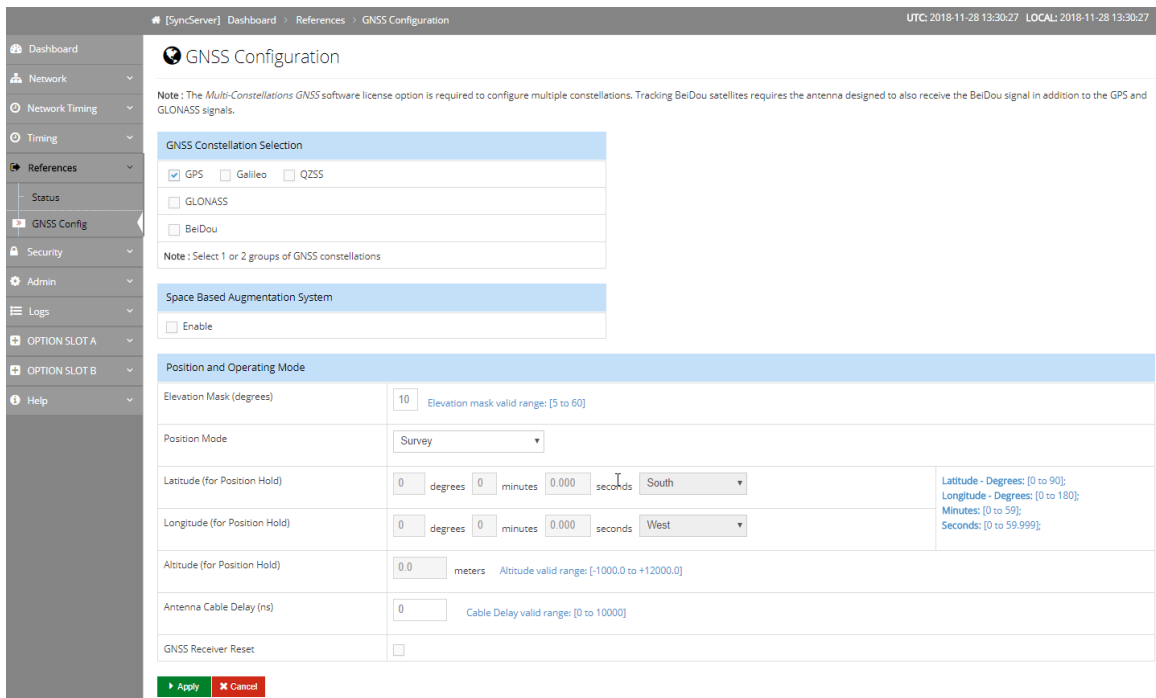
The Space Based Augmentation System (SBAS) can be enabled.

The Position Mode allows the user to set the position mode to Survey (stationary), Position Hold (stationary), or Dynamic. The default configuration for the SyncServer S6x0 is Survey mode. For stationary applications, Microsemi recommends using the Survey mode to avoid timing errors introduced by manually entering an inaccurate position.

- Survey means the SyncServer S6x0 will automatically survey the position and then transition to using this position value. This is meant for stationary applications.

- Position Hold allows the user to manually enter the position for a stationary application. The user enters the Latitude, Longitude and Altitude values for the SyncServer S6x0. The position needs to be accurately determined to avoid creating timing errors.
- Dynamic means the SyncServer S6x0 will continuously determine the position for applications where the system is moving. The user can select the dynamic platform model for Automotive, Seaborne, or Airborne. For Automotive, the maximum horizontal velocity is 100 m/sec. For Seaborne, vertical velocity is assumed to be zero, and maximum horizontal velocity is 25 m/sec. For Airborne, maximum horizontal velocity is 500 m/sec and maximum vertical velocity is 100 m/sec. For unpressurized airborne applications, the maximum operational altitude for the product is 25,000 ft (7620 m).

Figure 4-37. References - GNSS Window



Note: The updated GNSS receiver included in hardware released for v3.1 and later, allows for Galileo as a choice for GNSS Constellation Selection. If v3.1 or newer software is installed in an older unit, the Web GUI screen will not display Galileo as a choice.

Check the Help > About window for the System Inventory. The GNSS Receiver line indicates if the GNSS receiver is Galileo capable.

Security Configuration Windows

The Security tab on the dashboard provides access to configure security for Users, Access Control, Services & System Control, HTTPS, SSH, NTPd Symmetric Key, NTPd Autokey Server, NTPd Autokey Client, RADIUS, TACACS+, and LDAP.

Security - Users Window

Use this window to add or delete users, and for Password Maintenance. See [Figure 4-38](#). All Users and Admin have the same privileges



Note: Only alphanumeric characters and underline are allowed for the User name. Alphabetic characters in User names must be lower case.

- abcdefghijklmnopqrstuvwxyz
 - 0123456789
 - _
-



Note: The following characters are not allowed for the password: (, ", <, >, &,), \$



Note

Number of allowed characters:

- Username: 1-32 characters, must be lowercase. Mixed-case is not supported.
 - Password: 8-64 characters, must contain uppercase, lowercase, numbers, and special characters
 - Recovery question: 1-34 characters
 - Recovery answer: 1-34 characters
 - Email address: 1-34 characters, "-" is not allowed in email address
 - SMTP gateway: 1-34 characters
-

Figure 4-38. Security - Users Configuration Window

Security - Access Control Configuration Window

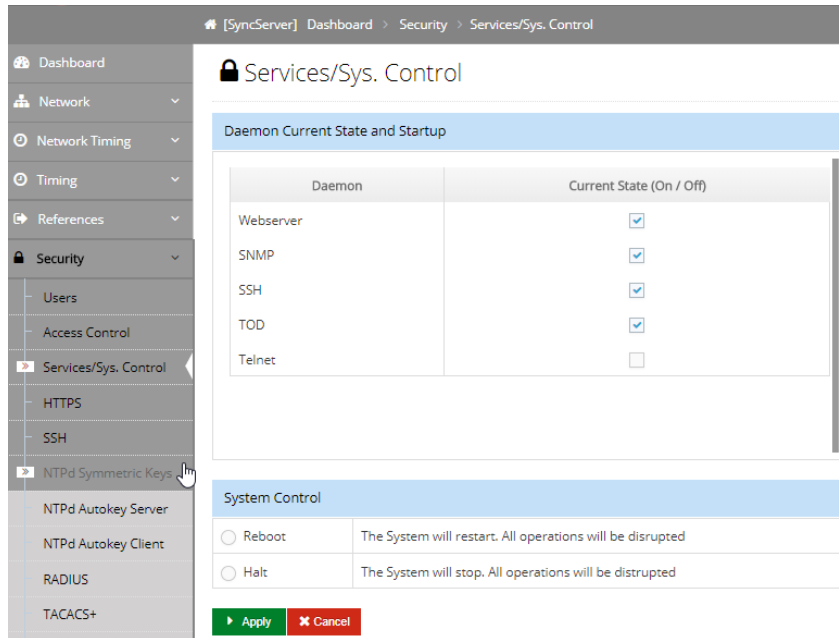
Use this window to configure access control for LAN1-LAN6 (whitelist). If nothing is configured, then the unit will accept data from all devices. If any addresses are configured, only packets from those devices will be accepted. Each field will support a maximum of 1000 characters. Enter IP addresses separated by a comma. See [Figure 4-39](#).

Figure 4-39. Security - Access Control Configuration Window

Security - Services & System Control Window

Use this window to configure the state for the Webserver, SNMP, SSH, TOD, and Telnet, and to reboot or halt the system. See [Figure 4-40](#).

Figure 4-40. Security - Services & System Control Configuration Window



Security - HTTPS Configuration Window

Use this window to configure the web server and self-signed certificate info. See [Figure 4-41](#).

See [Table 4-10](#) for details about supported HTTPS protocols.



Note

Number of allowed characters:

- Common name: 1-63 characters
- State: 1-63 characters
- Locality: 1-63 characters
- Organization: 1-63 characters

Figure 4-41. Security - HTTPS Configuration Window



Note: The https certificate will revert to self-signed certificate after importing configuration.

Table 4-10. Supported HTTPS Protocols

Model	TLS 1.0	TLS 1.1	TLS 1.2
SyncServer S600		x	x
SyncServer S650		x	x

Table 4-11. HTTPS Configuration Parameters

Parameter / Column	Description
Protocols	TLS 1.1 or TLS 1.2
Cipher Suites	SSL high or SSH high and medium
Web Session Timeout	Timeout range from 5 to 1440 minutes

Table 4-12. HTTPS Self-Signed Certificate Parameters

Parameter / Column	Description
Bits	Number of bits for RSA key
Common Name	Fully qualified domain name (FQDN) of the SyncServer
Days to Expiration	Number of days before certificate expires
ISO Country Code	Two-character code for country where you are located
State	State where you are located (for example, California)
Locality	City where you are located
Organization	Name of Organization
Organizational Unit	Unit or division of organization (for example, IT Department)
Email Address	Email address associated with company

Security - SSH Configuration Window

Use this window to configure SSH security. See [Figure 4-42](#). Including the same username in both the allowed and denied lists is not supported.

Figure 4-42. Security - SSH Configuration Window

Dashboard > Security > SSH

SSH

Security Configuration

Allowed Users	<input type="text"/>
Denied Users	<input type="text"/>
Users are a space delimited list and support ? and * wild cards	
Log Level	Info
SSH Session Timeout	600 seconds
Regenerate Keys	<input type="checkbox"/>

Security - NTPd Symmetric Keys Configuration Window

Use this window to generate, upload and download NTP Symmetric Security Keys. See [Figure 4-43](#). MD5 keys should be 20 characters long.

Figure 4-43. Security - NTPd Symmetric Keys Window

Dashboard > Security > NTPd Symmetric Keys

NTPd Symmetric Keys

NTP Symmetric Security Keys

Current Keys

Key Does Not Exist

Upload Keys

No Keys ...

Download Keys

Security - NTPd Autokey Server Configuration Window

Use this window to configure the NTP Autokey Server and download the IFF Group Key file. See [Figure 4-44](#).



Note: Autokey, LDAP, RADIUS, and TACACS+ require the optional security license.

Figure 4-44. Security - NTPd Autokey Server Configuration Window

NTPd Autokey Server

Configure NTP Autokey Server

Identity Scheme IFF

Server Password

Generate

Download IFF Group Key File

Group Key File

Save as...

Cancel Restart

Security - NTPd Autokey Client Configuration Window

Use this window to configure the NTP Autokey Client and install the IFF Group Key file. See [Figure 4-45](#).

Figure 4-45. Security - NTPd Autokey Client Configuration Window

NTPd Autokey Client

Install IFF Group Key File

Group Key File No File ... Browse

Install

Configure Autokey Client

Identity Scheme IFF

Client Password

Generate

Cancel Restart

Security - RADIUS Configuration Window

Use this window to enable and configure RADIUS authentication. Up to 5 RADIUS servers can be configured. See [Figure 4-46](#). After entering the RADIUS information, click the green "+" icon to add the row. Then click the "save" icon to save the information.

The SyncServer S6xx software supports remote authentication using RADIUS, TACACS+ and LDAP servers. The authentication process with multiple remote authentication servers is different among the RADIUS, TACACS+ and LDAP servers.

For RADIUS and LDAP, the additional servers are used for "fail over" purpose. They are used only when the prior server in the list is not reachable. The first reachable server is going to authenticate the username and password. The result of the authentication is the result for the entire remote authentication, meaning that it is not going to use the additional servers to authenticate further. If the authentication succeeds, the user is allowed to login to the SyncServer. If the authentication fails, the SyncServer continues its local authentication using the local users list.



Note:

- RADIUS key: 1-16 characters



Note: The SyncServer S600/S650 has only one level of management access of Authentication/Authorization and that is full control. There is no read-only management access. Therefore Authentication = Authorization when there is only one level of management access.

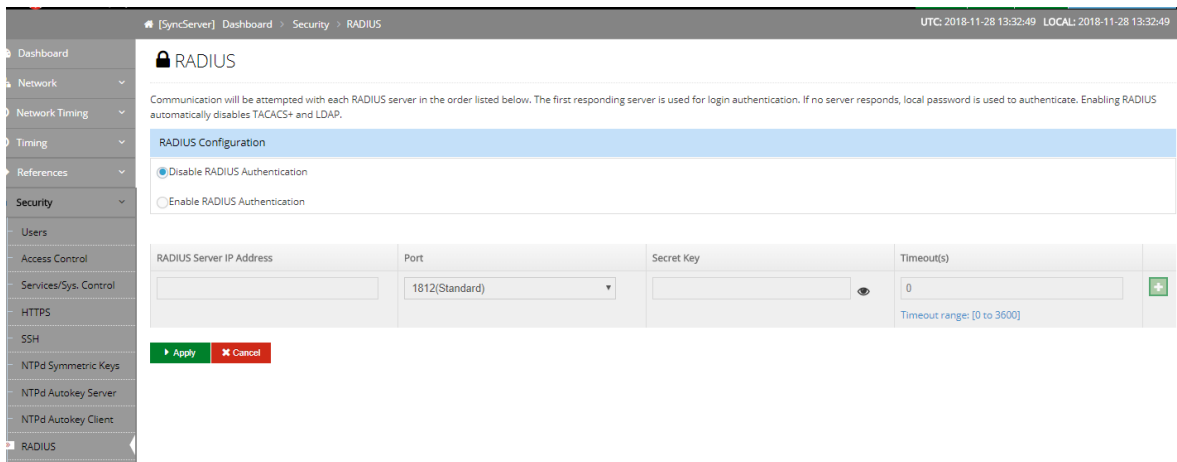


Note: In order to use RADIUS authentication with the SSH login, a local user must be created with the same username as used with RADIUS. This is not necessary for the web login.



Note: RADIUS is designed to be used with LAN1. Do not configure a RADIUS server address in a subnet used by the other LAN ports (LAN2 - LAN6).

Figure 4-46. Security - RADIUS Configuration Window



Security - TACACS+ Configuration Window

Use this window to enable and configure TACACS+ authentication. Up to 5 TACACS+ servers can be configured. See [Figure 4-47](#). After entering the TACACS+ information, click the green "+" icon to add the row. Then click the "save" icon to save the information.

The SyncServer S6xx software supports remote authentication using RADIUS, TACACS+ and LDAP servers. The authentication process with multiple remote authentication servers is different among the RADIUS, TACACS+ and LADP servers.

For TACACS+, the additional servers are used for "iterative" purpose. Whenever a server successful authenticates the username and password, it completes the entire remote authentication. Otherwise, the authentication continues with the next configured server. This process goes on until it uses all the authentication servers. The SyncServer local authentication happens last.



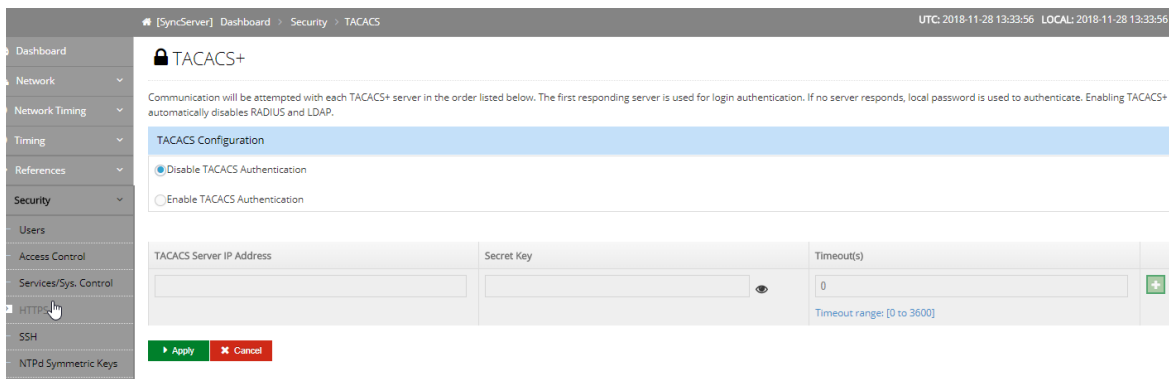
Note:

- TACACS+ key: 1-16 characters



Note: TACACS+ is designed to be used with LAN1. Do not configure a TACACS+ server address in a subnet used by the other LAN ports (LAN2 - LAN6).

Figure 4-47. Security - TACACS+ Configuration Window



Note: The SyncServer S600/S650 has only one level of management access of Authentication/Authorization and that is full control. There is no read-only management access. Therefore Authentication = Authorization when there is only one level of management access.



Note: In order to use TACACS+ authentication with the SSH login, a local user must be created with the same username as used with TACACS+. This is not necessary for the web login.

Security - LDAP Configuration Window

Use this window to enable LDAP, and configure LDAP settings and servers. Up to 5 LDAP servers can be configured. See [Figure 4-48](#).

The SyncServer S6xx software supports remote authentication using RADIUS, TACACS+ and LDAP servers. The authentication process with multiple remote authentication servers is different among the RADIUS, TACACS+ and LDAP servers.

For RADIUS and LDAP, the additional servers are used for "fail over" purpose. They are used only when the prior server in the list is not reachable. The first reachable server is going to authenticate the username and password. The result of the authentication is the result for the entire remote authentication, meaning that it is not going to use the additional servers to authenticate further. If the authentication succeeds, the user is allowed to login to the SyncServer. If the authentication fails, the SyncServer continues its local authentication using the local users list.



Note:

- Search base name: 1-199 characters
- binddn: 1-63 characters
- bindpw: 1-63 characters
- Search filter: 1-199 characters
- Login attribute: 1-63 characters



Note: LDAP is designed to be used with LAN1. Do not configure a LDAP server address in a subnet used by the other LAN ports (LAN2 - LAN6).

Figure 4-48. Security - LDAP Configuration Window

The screenshot shows the LDAP configuration window with the following sections:

- LDAP Settings:**
 - Disable LDAP Authentication:
 - Enable LDAP Authentication:
- Settings:**
 - Port - Server Binding: 389 (Port number range: [1 to 65535])
 - Time Limit for Searching(sec): 300 (Time Limit range: [120 to 65535])
 - Time Limit for binding(sec): 300 (Time Limit range: [120 to 65535])
 - LDAP Protocol Version: LDAPv3
 - Scope to search server with: sub
- Servers:**
 - Server 1: [Input field]
 - Server 2: [Input field]
 - Server 3: [Input field]
 - Server 4: [Input field]
 - Server 5: [Input field]
 - Search Base Name: [Input field]
 - binddn: [Input field]
 - bindpw: [Input field with eye icon]
 - Search Filter: [Input field] (No outermost (and) . They are added automatically.)
 - Login Attribute: [Input field]

Buttons: Apply, Cancel



Note: The SyncServer S600/S650 has only one level of management access of Authentication/Authorization and that is full control. There is no read-only management access. Therefore Authentication = Authorization when there is only one level of management access.



Note: In order to use LDAP authentication with the SSH login, a local user must be created with the same username as used with LDAP. This is not necessary for the web login.

Table 4-13. LDAP Configuration Parameters

Parameter / Column	Description
Port - Server Binding	IP port for server
Time Limit for Searching	Timeout for searches

Table 4-13. LDAP Configuration Parameters (Continued)


Parameter / Column	Description
Time Limit for binding (sec)	Timeout for binding
LDAP Protocol Version	LDAPv2 or LDAPv3
Scope to search with	<ul style="list-style-type: none"> ■ base - limits search to base object ■ one - limits search to immediate children of base object, but not base object ■ sub - search base objects and all child objects
Server 1 - 5	Enter up to 5 servers
Search Base Name	Search base
binddn	bind dn
bindpw	bind password
Search Filter	Search filter
Login Attribute	Login attribute
Apply	<p>Use this to apply the LDAP settings configured on this page</p> <p>This also saves the settings that are associated with Configure for this page.</p>
Cancel	Cancel and clear the settings on this page.




Security - Packet Monitoring (security license required)

Use this window to configure packet load monitoring thresholds. The All Packets threshold is used to limit the number of packets from each port that are sent to the processor. It will also generate the “Excessive traffic on port” alarm if the threshold is exceeded, and identify the impacted port. Packets that are handled by the NTP reflector or PTP master are not counted toward this limit. The Service Packets limit sets a threshold to create an alarm when the packet rate exceeds the limit when using the NTP reflector or PTP master. The service packets threshold does not limit the number of packets handled. When the service packet threshold is exceeded the "service load limit exceeded" alarm will set. If a timing service (NTP reflector or PTP) is mapped to an Ethernet port, then the all packets threshold is set to a fixed value of 3000 packets/second.

See [Figure 4-48](#). If a timing service is enabled on a port it is identified by the green indicator on this form.

Figure 4-49. Security - Packet Monitoring Window

 Packet Monitoring

Packet Load Monitoring Thresholds (pkts/s)			
LAN	All Packets	Service Packets	
LAN1	<input type="text" value="13000"/>		
LAN2	<input type="text" value="3000"/>	<input type="text" value="360000"/>	
LAN3	<input type="text" value="3000"/>	<input type="text" value="360000"/>	
LAN4	<input type="text" value="3000"/>	<input type="text" value="360000"/>	

Note: The All Packets threshold maximum limit of 13,000 relates to packets allowed to reach the CPU. These would be regular NTPd, HTTPS, SSH, etc. class packets as supported for each port. The Service Packets threshold is used only when the NTP Reflector (NTPr) or PTP is enabled for that LAN port (green circle). The maximum allowable threshold is 360,000 Service Packets per second. When NTP Reflector or PTP is enabled on the port, the All Packets threshold is automatically set to 3000 packets per second to constrain the other allowable packets. See Network Timing -> NTP/PTP Mapping for the mapped NTPr/PTP port.

Security - X.509 Certificate Signing Request (CSR)

Use this window to generate and download a Certificate Signing Request (CSR). See [Figure 4-50](#). CSRs are created in the Base-64 encoded PEM format. This format includes the "-----BEGIN CERTIFICATE REQUEST-----" and "-----END CERTIFICATE REQUEST-----" lines at the beginning and end of the CSR.



Note: Some certificate authorities require the user to change the public/private keys before requesting a new certificate. To change the keys, go to the Security->HTTPS web page, fill out the self-signed certificate with the "Regenerate keys" box checked. Then click "Apply".

Then you will be ready to create a CSR with new keys.

However, changing the keys will invalidate any existing X.509 certificate, and the system will use a new self-signed certificate until a new certificate is installed.

The SyncServer is typically deployed within an enterprise that manages its own root and/or intermediate Certification Authorities. The Certificate Signing Requests generated by the SyncServer will be signed by these internal Certification Authorities to generate X.509 Certificates that will be installed on the SyncServer.

The CSR page accepts the following information from the user:

Figure 4-50. Security - X.509 CSR Window

Dashboard > Security > X.509 CSR

X.509 Certificate Signing Request

Note: To configure self-signed certificate, use Security -> HTTPS

Certificate Signing Request Info

Common Name	Microsemi
ISO Country Code	US <small>Two character international Country Code</small>
State	CA
Locality	Aliso Viejo
Organization	Microsemi Corporation
Organizational Unit	FTD
Email Address	support@microsemi.com

Generate

Download Certificate Signing Request

Certificate Signing Request	
-----------------------------	--

Save as...

Table 4-14. X.509 Configuration Parameters

Parameter / Column	Description
Common Name	Fully qualified domain name (FQDN) of the SyncServer
ISO Country Code	Two-character code for country where you are located
State	State where you are located (for example, California)
Locality	City where you are located
Organization	Name of organization
Organizational Unit (optional)	Unit or division of organization (for example, IT Department)
Generate	The CSR is generated when the "Generate" button is pressed.
Download Certificate Signing Request	The "Download Certificate Signing Request" section on the page allows the user to download the CSR as a file.
Save As	This button allows the user to save the CSR on the user's machine

To learn more, perform an internet search on the terms "SSL Certificate Formats", "PEM Files" and/or "Converting SSL certificate formats"

Security - X.509 Install

Use this window to install on the SyncServer the Certificate or Certificate/Chain that was generated using the CSR. See [Figure 4-51](#) Installation can be done with certificate/chain files in PEM or PKCS7 format. The PEM format is the most common format that Certification Authorities issue certificates in. PEM certificates usually have extensions such as .pem, .crt, .cer, and .key. They are Base64 encoded ASCII files and contain "-----BEGIN CERTIFICATE-----" and "-----END CERTIFICATE-----" statements. Server certificates, intermediate certificates, and private keys can all be put into the PEM format. Apache and other similar servers use PEM format certificates. Several PEM certificates, and even the private key, can be included in one file, one below the other, but most platforms, such as Apache, expect the certificates and private key to be in separate files. The PKCS#7 or P7B format is usually stored in Base64 ASCII format and has a file extension of .p7b or .p7c. P7B certificates contain "-----BEGIN PKCS7-----" and "-----END PKCS7-----" statements. A P7B file only contains certificates and chain certificates, not the private key. Several platforms support P7B files including Microsoft Windows and Java Tomcat.

Depending on the CA signing setup, installation can be done in either one of the following two ways:

1. A single certificate file, which includes the signed end user (SyncServer) certificate and the certificate chain (intermediate CAs if any and root CA).
2. Two files, with the first one being the signed end user (SyncServer) certificate and the second being the certificate chain.

The user can upload the signed certificate/chain files and then click the "Install" button to install the certificate on the SyncServer.

The "View Certificate" section allows the user to view the certificate currently being used in the system. The root/intermediate CA's certificate(s) are also installed in client web browsers that will access the SyncServer. The browser being used needs to be able to identify the Certification Authority as a known or trusted CA. This will allow the browser to show the connection to the SyncServer as being secure (https).



Note: If an HTTPS certificate was installed, the system will return to using the self-signed HTTPS certificate after a configuration default.

Figure 4-51. Security - X.509 Install Window

X.509 Certificate Install

If your CA provides you with both the signed certificate and the certificate chain file describing the chain to the CA's trusted root CA, you need to select the option Certificate and Chain to upload both files.

Certificate
 Certificate and Chain

Certificate	No File ... <input type="button" value="Browse"/>
Encoding	<input checked="" type="radio"/> PEM <input type="radio"/> PKCS7
Certificate Chain	No File ... <input type="button" value="Browse"/>
Encoding	<input type="radio"/> PEM <input type="radio"/> PKCS7
Install	<input type="button" value="Install"/>

View Certificate

Certificate
 Certificate Chain

View Certificate

Certificate

```
-----BEGIN CERTIFICATE-----
MIIFTCGA-WgAwfBAglCIScwDQYJKoZIhvcNAQELBQAwSzENMAsGA1UEAwVEVGZz
dDELMAkGA1UECAwCO0ExCzAJBgNVBAYTAiVTMREwDwYDVQKDARUZXN0IE9yZzEN
MAAsGA1UECwwVEGVzdDQeFw0xNjA5MTcyMTQ2NDIaFw0xNzA5MjcyMTQ2NDIaMFUx
FjAUBgNVBAMMDTEwLj0MS41Ny4xMDIyCzAJBgNVBAGMAkRBMQswCQYDVQGEwJUVz
EPMAOGA1UECgwGQm9laW5nMRAwDgYDVQQLADZkZjZkZjZkZjZkZjZkZjZkZjZkZjZk
9w0BAQEFAAOCAQ8AMIIBBgKCAQEAIQyovwWPrmJjEM6WGeoruPTU-4AjiiCUT-R1
qf7Wjs7sHrqaM8d1e39xwM/A9RjMSKFBz8DGvz2ddX2Yw33nuK2HZW46TgkXoU
LNuCSNCgkSuuRyo39G4xEY2oLp48Eaowxetm8dJppgZAJ8sLlanPSyEKjC98pzQ
NA5am0FW2PmmirC9WgBEUPPYngzaB1ZiH8r88EoLF512dVuykWAjDaNEGeFXAx
-----END CERTIFICATE-----
```

Admin Configuration Windows

Admin - General Configuration Window

Use this window to configure system identification and to check for software updates. See [Figure 4-52](#). Enables the SyncServer to check the Microsemi upgrade notification site at <http://update.microsemi.com> every day at noon local time for new software updates. Displays a notice on the Status page and can send an SNMP trap when an upgrade is available. Requires that the SyncServer management port have firewall access to the internet.



Note: Only alphanumeric characters, hyphen, and underline are allowed for the hostname. The hostname can be from 1 to 63 characters long.

- abcdefghijklmnopqrstuvwxyz
- ABCDEFGHIJKLMNOPQRSTUVWXYZ
- 0123456789
- - _

Figure 4-52. Admin - General Configuration Window

⚙️
General

Please logout and re-login after changing Web Session Timeout interval

System Identification

Hostname	<input type="text" value="SyncServer"/>
----------	---

Changing the SyncServer hostname may affect NTP Autokey operation. If NTP Autokey server or client is enabled on the SyncServer you must reconfigure it with the new hostname. You can review Autokey settings on the Security -> NTPd Autokey Server or Security -> NTPd Autokey Client web pages.

Web Session Timeout

5 Min
 10 Min
 15 Min
 30 Min
 60 Min

Software Update availability Check ↔

Check for software upgrades

Enables the SyncServer to check the Microchip update notification site daily for new software updates. A notice of the current update status is available on the Dashboard About menu. With this setting enabled, an event notification named "Software upgrade available" can be used to trigger outbound notification (SNMP trap, email, etc.) whenever the availability of an update is detected. The desired behavior of this notification can be configured on the Admin Alarms form.

▶ Apply
✖ Cancel



Note: The software update availability feature uses IPv4. An IPv4 address and DNS server must be configured on the Network->Ethernet page in order to use this feature.

Admin - Alarm Relay Configuration Window

Use this window to configure system alarm relay details. See [Figure 4-53](#).

Figure 4-53. Admin - Alarm Relay Configuration Window

Alarm Relay Configuration

This Relay is activated when the following alarm classes occur. Events triggering a Major and Minor alarm are configured on the Alarms page.

Any Major Alarm
 Any Major or Minor Alarm
 Off (no relay activation on any alarm)

System Restart Delay(Minutes) Minutes valid range: [0 to 60]

Amount of time after a system reboot before relay will be controlled by alarms

See rear panel relays and/or user guide for configuration of contacts

Admin - Alarm Configuration Window

Use this window to configure system alarms. Users can also see the current status of each alarm and clear individual alarms. Use the scroll control on this form to access additional alarms. See [Figure 4-54](#). See [Table 4-15](#) for descriptions of Alarm Configuration parameters.

Figure 4-54. Admin - Alarm Configuration Window

Alarms

Alarm Configuration

Name	State	Clear Now	Auto ACK (s)	Severity	Reporting Delay (s)	Send Trap	Write Log	Send Email
Warm-up state	●	<input type="checkbox"/>	<input type="text" value="0"/>	Minor ▼	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Free-run state	●	<input type="checkbox"/>	<input type="text" value="0"/>	Minor ▼	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Fast-track state	●	<input type="checkbox"/>	<input type="text" value="0"/>	Notify ▼	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Normal-track state	●	<input type="checkbox"/>	<input type="text" value="0"/>	Notify ▼	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Bridging state	●	<input type="checkbox"/>	<input type="text" value="0"/>	Notify ▼	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Holdover state	●	<input type="checkbox"/>	<input type="text" value="0"/>	Minor ▼	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Holdover recovery state	●	<input type="checkbox"/>	<input type="text" value="0"/>	Minor ▼	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Holdover time error threshold exceeded	●	<input type="checkbox"/>	<input type="text" value="0"/>	Minor ▼	<input type="text" value="0"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Table 4-15. Alarm Configuration Parameter Descriptions

Parameter	Description
Name	<p>Name of the alarm.</p> <p>If there is an asterisk as first character it means it is a transient alarm. For alarms that have multiple secondary info (e.g. Excessive Traffic on Ethernet port has a secondary field that identifies which port), these settings are global to all of the secondary cases.</p>
State	<p>Indicates the current status of the alarm based on color</p> <ul style="list-style-type: none"> ■ Always grey (unlit) if the event is transient. ■ Green if severity is Minor, Major, or Notify and the condition is not SET or if the user has cleared (acknowledged it) even if it is SET. ■ Blue if severity is Notify and the condition is SET and not user-cleared ■ Amber if severity is Minor and the condition is SET and not user-cleared ■ Red if severity is Major and the condition is SET and not user-cleared
Clear Now	<p>This is a user-control to cause some of the alarm report mechanisms to extinguish that particular alarm indication. These include Dashboard > Alarms, Alarm summary at top of Web GUI, Physical alarm connector, front panel Alarm LED, and Alarm information on front-panel display. This is really just an acknowledgement of the alarm, but of course has no ability to impact the underlying condition.</p>
Auto ACK	<p>This is the same as Clear Now except it provides an automatic clearing action after a user-defined time period following SET of the alarm. Zero (default) means to never auto-clear it.</p>
Severity	<p>Controls the reported severity level of the alarm. Notify Minor Major</p> <p>The severity level "Notify" is not reported on Dashboard > Alarms, Alarm summary at top of Web GUI, Physical alarm connector, front panel Alarm LED, Alarm information on front-panel display. This also applies to transient alarms.</p>
Reporting Delay	<p>This value can be used to defer the time from when the condition becomes SET until it is actually reported. If the condition has cleared by the time the delay has elapsed then the alarm is never reported. Main purpose would be to avoid "chatter".</p>
Send Trap	<p>Provides "per alarm" user control of reporting the alarm via SNMP Trap. All severities are reported with Traps.</p>


Table 4-15. Alarm Configuration Parameter Descriptions (Continued)

Parameter	Description
Write Log	Provides "per alarm" user control of reporting the alarm by writing an event entry in the Log. All severities and transients are reported into the message log.
Send Email	Provides "per alarm" user control of reporting the alarm by sending an Email. All severities and transients are reported with email.

Admin - Email Configuration Window

Use this window to set, modify or delete email addresses for alarm email recipients. See [Figure 4-55](#).

Figure 4-55. Admin - Email Configuration Window

 Alarm Email Recipients

SMTP gateway not configured : Email recipients not configured

SMTP Gateway Address

Alarm Sender Email Address

Alarm Recipients Email Address

<input type="text"/>	
<input type="text"/>	
<input type="text"/>	
<input type="text"/>	
<input type="text"/>	
<input type="text"/>	
<input type="text"/>	
<input type="text"/>	
<input type="text"/>	
<input type="text"/>	
<input type="text"/>	

Admin - Banner Configuration Window

Use this window to enable whether the login banner is displayed before the login interface. Users can create a custom banner or use a standard U.S. government banner. See [Figure 4-56](#).

Figure 4-56. Admin - Banner Configuration Window

Dashboard > Admin > Banner Config

Banner Configuration

If enabled, the Login Banner will be presented before the login interface.

Disable Login Banner

Standard U.S. Government (USG) Information System (IS) Banner

Customer Banner (Maximum 2000 characters including spaces)

Admin - Serial Port Configuration Window

Use this window to configure the parameters for the Time of Day port and for the console Serial port. See [Figure 4-57](#).

Figure 4-57. Admin - Serial Port Configuration Window

Serial Port Configuration

Time of Day Port		Console Port	
Baud Rate	<input type="radio"/> 4800 bps <input checked="" type="radio"/> 9600 bps <input type="radio"/> 19.2 kbps <input type="radio"/> 38.4 kbps <input type="radio"/> 57.6 kbps <input type="radio"/> 115.2 kbps	Baud Rate	<input type="radio"/> 4800 bps <input type="radio"/> 9600 bps <input type="radio"/> 19.2 kbps <input type="radio"/> 38.4 kbps <input type="radio"/> 57.6 kbps <input checked="" type="radio"/> 115.2 kbps
Data Bits	<input type="radio"/> 7 <input checked="" type="radio"/> 8	Data Bits	8
Parity	<input type="radio"/> Even <input type="radio"/> Odd <input checked="" type="radio"/> None	Parity	None
Stop Bits	<input checked="" type="radio"/> 1 <input type="radio"/> 2	Stop Bits	1

[Apply](#) [Cancel](#)

Admin - Upgrade System Software Window

Use this window to upgrade system software. Note that the system will reboot after the software is upgraded. See [Figure 4-58](#).

Figure 4-58. Admin - Upgrade System Software Window

Upgrade System Software

Note : If the *Security Protocols* option is installed, upload speed may be significantly slowed if LAN1 port "All Packets" limit has been set to a small value. To ensure the fastest upload, temporarily set this threshold to the maximum value prior to initiating the upgrade. The setting is on Security -> Performance Monitoring

1	Authorization File	<input type="button" value="No File ..."/> Browse
2	Upgrade File	<input type="button" value="No File ..."/> Browse
3	Install	Install

[→ Upgrade history](#)

[Cancel](#)

The authentication file is provided with the upgrade file and verifies that this SyncServer unit is authorized to upgrade with the specified upgrade file.



Note: You can check for the latest version number of SyncServer S600 and S650 software at these URLs:

http://update.microsemi.com/SyncServer_S600

http://update.microsemi.com/SyncServer_S650

The number of the most current version of the software will appear. You can compare this to the version number installed in the SyncServer by proceeding to the web GUI Dashboard and finding the version number in the About drop down on the right side. If you do not have the latest version installed consider contacting Technical Support.



Note: For releases after 1.1, if the upgrade process is used to load a previous (older) version of the software, then the unit will reset the configuration to factory default values.

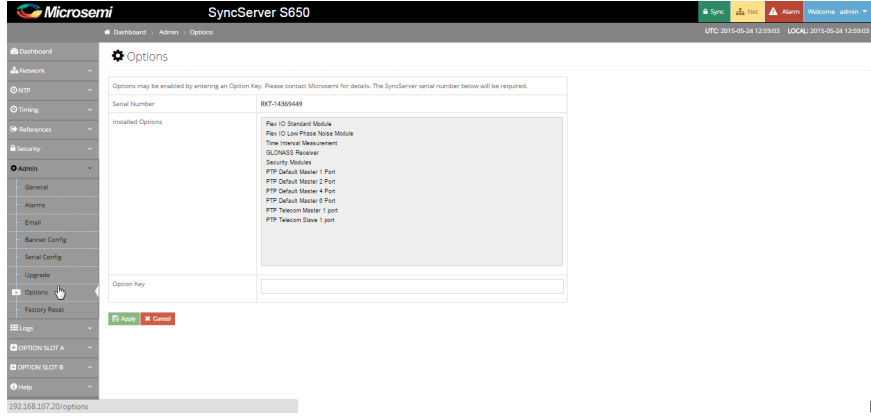


Note: If the all-packets limit on LAN1 has been reduced on the Security->Packet Monitoring page, then it is recommended that the limit be temporarily increased back to the default value of 13000 packets/second. Otherwise, the file upload will be very slow and may timeout.

Admin - Options Configuration Window

Use this window to enter option keys to enable SyncServer options. See [Figure 4-59](#).

Figure 4-59. Admin - Options Configuration Window



Admin - Configuration Backup / Restore / Reset

Use this window to back up, restore, or reset the SyncServer S6x0 to factory configuration. See [Figure 4-60](#).



Note: For a configuration restore, the system will reject a configuration file that was generated from a unit running system software that is newer than the software currently running in the unit.



Note: If an HTTPS certificate was installed, the system will return to using the self-signed HTTPS certificate after a configuration restore.

Figure 4-60. Admin - Factory Reset Window

Configuration Backup/Restore/Reset

Password	<input type="password"/> Note: password should be same for backup & restore
<input type="radio"/> Backup	<input type="button" value="Save as..."/>
<input type="radio"/> Restore	<input type="text" value="No File ..."/> <input type="button" value="Browse"/>
<input type="radio"/> Reset to factory default configuration	This feature resets *ALL* configuration settings of the SyncServer, and restores the original factory configuration. The SyncServer reboots upon completing this operation. The browser will remain open, but will not be able to reconnect to the SyncServer at the previous IP address. To reconnect to the SyncServer's web interface, reconfigure the LAN1 port IP address using the keypad display. Connect to the SyncServer's new IP address using a browser. Log in to the web interface using the factory default username, "admin", and password, "Microsemi".

Logs Configuration Windows

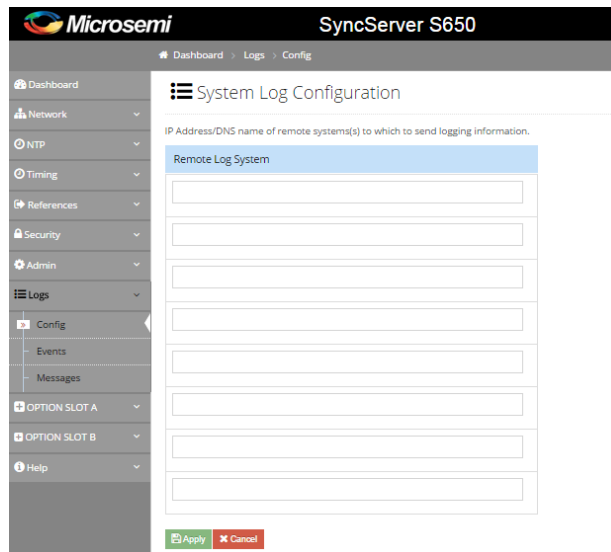
Logs - System Log Configuration Window

Use this window to set, modify, or delete IP addresses / DNS names of remote systems to which to send log information. See [Figure 4-61](#).



Note: Syslog is designed to be used with LAN1. Do not configure a system log server address in a subnet used by the other LAN ports (LAN2 - LAN6).

Figure 4-61. Logs - System Log Configuration Window



The logs rotate, and up to 7 logs are kept. In release 2.0 or later, individual rotated log files can be selected. When 7 have been created, the oldest will be overwritten. The log rotate depends on size of 100k, but this is subject to change without notice.

A remote syslog server can be configured with this window and all logs can then be stored on the remote server.

Logs - Events Log Configuration Window

Use this window to view and save the events log. See [Figure 4-62](#).

Figure 4-62. Logs - Events Window

The screenshot shows the 'Events' window in the SyncServer interface. At the top, there is a breadcrumb trail: [SyncServer] Dashboard > Logs > Events. The current time is displayed as UTC: 2018-11-15 12:08:50 and LOCAL: 2018-11-15 12:08:50. On the left is a navigation sidebar with categories like Dashboard, Network, Timing, References, Security, Admin, and Logs. The 'Events' window title is 'Events'. Below the title is a 'Select Log File' section with a dropdown menu set to 'events_log', a 'Go' button, and a 'Clear ALL events_log files' button with an 'Apply' button. The main area contains an 'Events Log' table with columns for Time, Source, and Description. A 'Save as...' button is located at the bottom left of the table area.

Time	Source	Description
Nov 15 11:35:53	SyncServer lstatd:	User admin login from IP Address 10.241.101.127 on 2018-11-15 11:35:53am
Nov 13 01:42:36	SyncServer systemd:	pam_unix(systemd-user:session): session closed for user admin
Nov 13 01:42:36	SyncServer sshd[6361]:	pam_unix(sshd:session): session closed for user admin
Nov 13 01:42:36	SyncServer sshd[6424]:	Disconnected from 10.241.128.45 port 38866
Nov 13 01:42:36	SyncServer sshd[6424]:	Received disconnect from 10.241.128.45 port 38866:11: disconnected by user
Nov 13 01:42:36	SyncServer KCLI:	[user: admin]: logout
Nov 13 01:40:26	SyncServer KCLI:	[user: admin]: show system
Nov 13 01:40:12	SyncServer KCLI:	[user: admin]: show ip status
Nov 13 01:40:03	SyncServer sshd[6361]:	lastlog_openseek: Couldn't stat /var/log/lastlog: No such file or directory
Nov 13 01:40:03	SyncServer sshd[6361]:	lastlog_openseek: Couldn't stat /var/log/lastlog: No such file or directory
Nov 13 01:40:03	SyncServer systemd:	pam_unix(systemd-user:session): session opened for user admin by (uid=0)
Nov 13 01:40:03	SyncServer sshd[6361]:	pam_unix(sshd:session): session opened for user admin by (uid=0)
Nov 13 01:40:03	SyncServer sshd[6361]:	Accepted password for admin from 10.241.128.45 port 38866 ssh2

Logs - Messages Window

Use this window to view and save the message log. Most recent entries appear at the end of the display (scroll to the end). See [Figure 4-63](#).

Figure 4-63. Logs - Messages Window

The screenshot shows the 'Messages' window in the SyncServer interface. The breadcrumb path is '[SyncServer] Dashboard > Logs > Messages'. The current time is UTC: 2018-11-28 13:08:26 and LOCAL: 2018-11-28 13:08:26. The window title is 'Messages'. Below the title is a 'Select Log File' section with a dropdown menu set to 'messages_log', a 'Go' button, a 'Clear ALL messages_log files' button, and an 'Apply' button. The main area is a 'Messages Log' table with columns for Time, Source, and Description. The table contains 13 rows of log entries. At the bottom left of the table area is a 'Save as...' button.

Time	Source	Description
Nov 12 18:07:00	SyncServer alarmd:	Id: 177, Index: 000, Severity: notify, Alarm: set, Msg: Configuration changed
Nov 12 18:07:00	SyncServer istated:	system configuration changed
Nov 12 17:33:46	SyncServer alarmd:	Id: 004, Index: 000, Severity: notify, Alarm: set, Msg: Entered time normal-track state
Nov 12 17:33:46	SyncServer alarmd:	Id: 003, Index: 000, Severity: notify, Alarm: clear, Msg: Transitioned out of time fast-track state
Nov 12 17:29:37	SyncServer alarmd:	Id: 004, Index: 001, Severity: notify, Alarm: set, Msg: Entered freq normal-track state
Nov 12 17:29:37	SyncServer alarmd:	Id: 003, Index: 001, Severity: notify, Alarm: clear, Msg: Transitioned out of freq fast-track state
Nov 12 17:24:50	SyncServer alarmd:	Id: 162, Index: 000, Severity: notify, Alarm: set, Msg: NTP stratum changed to 1
Nov 12 17:24:50	SyncServer alarmd:	Id: 163, Index: 000, Severity: notify, Alarm: set, Msg: NTP leap indicator changed to 0
Nov 12 17:24:50	SyncServer alarmd:	Id: 161, Index: 000, Severity: notify, Alarm: set, Msg: NTP system peer changed
Nov 12 17:24:04	SyncServer alarmd:	Id: 153, Index: 000, Severity: notify, Alarm: set, Msg: Phase has been aligned
Nov 12 17:23:52	SyncServer alarmd:	Id: 003, Index: 000, Severity: notify, Alarm: set, Msg: Entered time fast-track state
Nov 3 20:53:11	SyncServer alarmd:	Id: 002, Index: 000, Severity: minor, Alarm: clear, Msg: Transitioned out of time free-run state
Nov 3 20:53:09	SyncServer alarmd:	Id: 152, Index: 000, Severity: notify, Alarm: set, Msg: Timeline has been changed

Option Slot A/ Slot B Configuration Windows

Options Slot A and B Configuration Window - Timing I/O Module

Use this window to configure the module in Options Slot A and B. The example shown in [Figure 4-64](#) is for the Timing I/O module. See [Figure 4-65](#), [Figure 4-66](#), and [Figure 4-71](#). See [Provisioning IRIG Inputs on Timing I/O Module](#), on page 208. See [Provisioning Sine Wave Inputs on Timing I/O Module](#), on page 209. See [Provisioning Outputs on Timing I/O Module](#), on page 252.



Note: Option Slot A and B are only available with the SyncServer S650.

The configurations on the Timing I/O Module configuration page are fixed unless the optional flex timing license is installed.

Figure 4-64. Options Slot A Configuration Window Showing Timing I/O Module

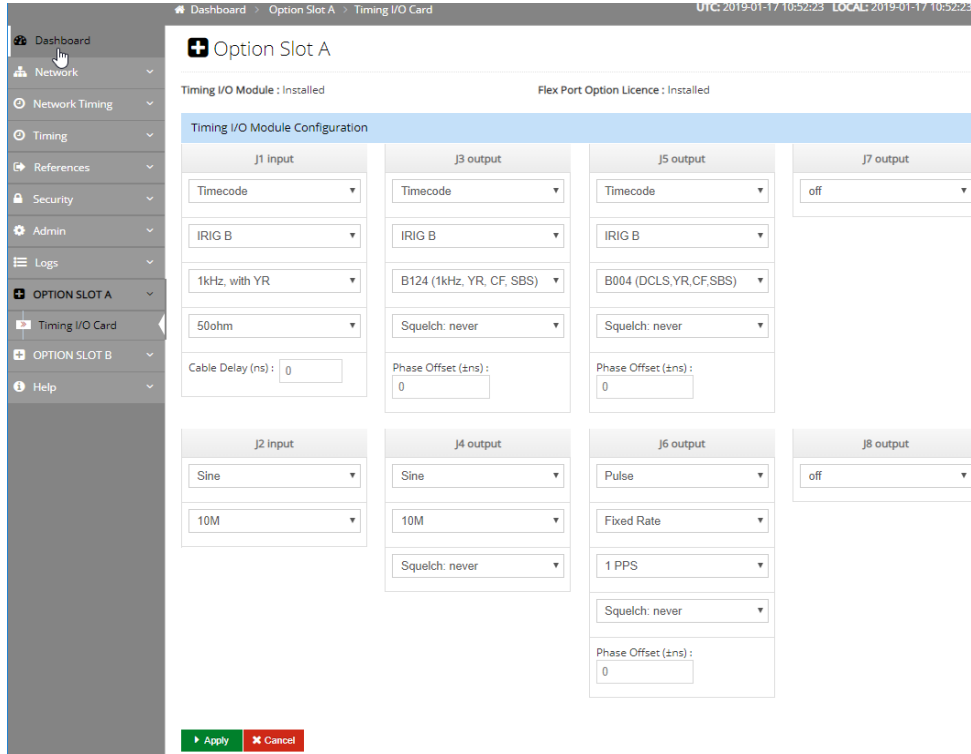


Figure 4-65. Options Slot A Configuration Window - Telecom Module Installed

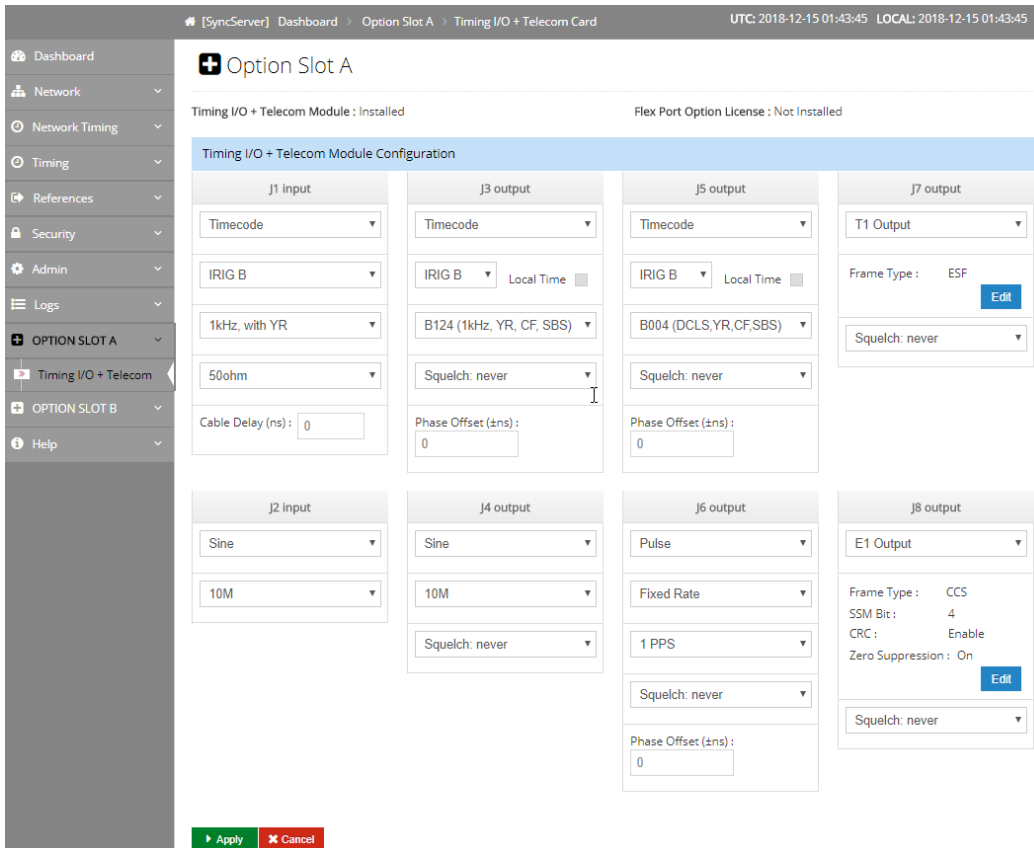


Figure 4-66. Options Slot A Configuration Window - Telecom Module - T1 Input Choices

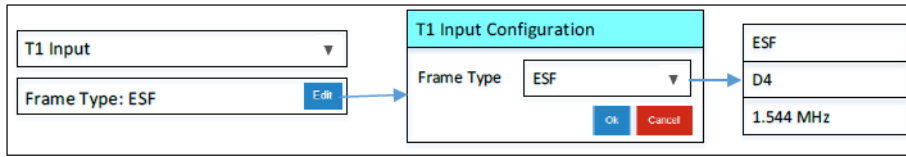


Figure 4-67. Options Slot A Configuration Window - Telecom Module - E1 Input Choices

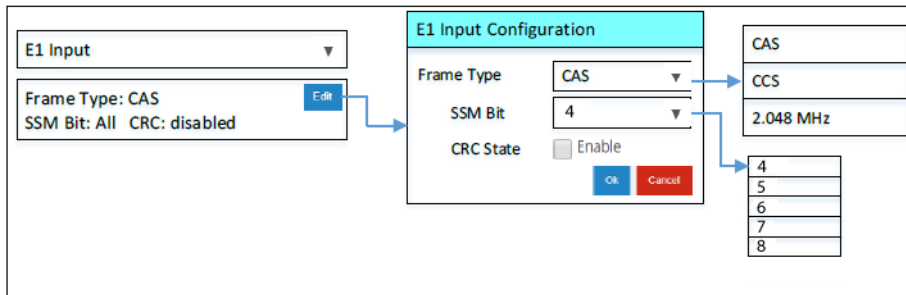


Figure 4-68. Options Slot A Configuration Window - Telecom Module T1 Output Choices

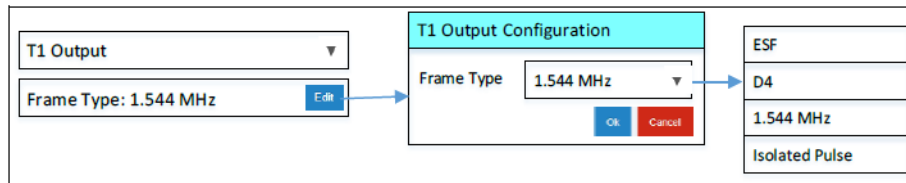


Figure 4-69. Options Slot A Configuration Window - Telecom Module E1 Output Choices

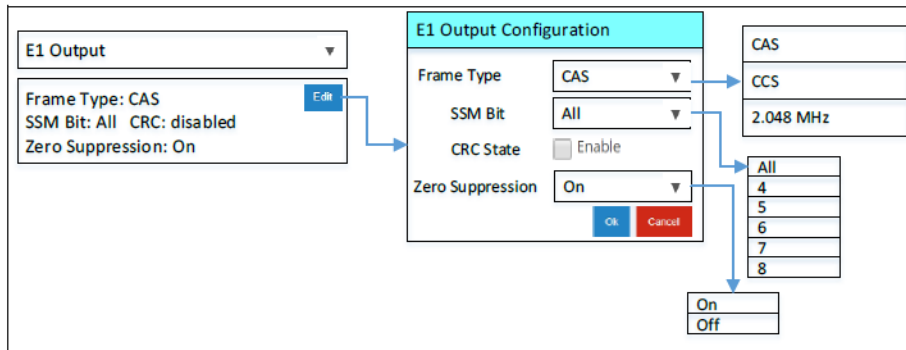


Figure 4-70. Telecom Module - J7 and J8 Examples - Flex Port License

Examples of J7 and J8

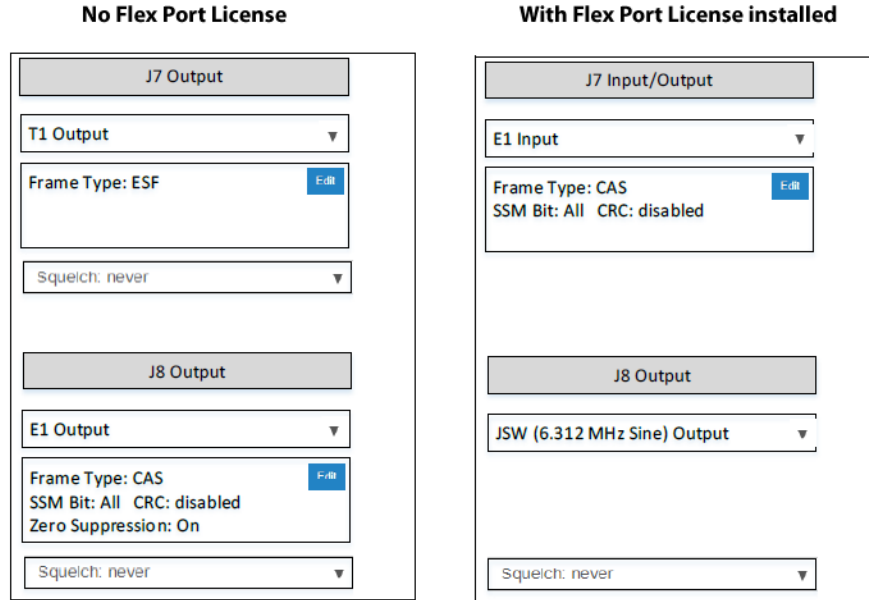
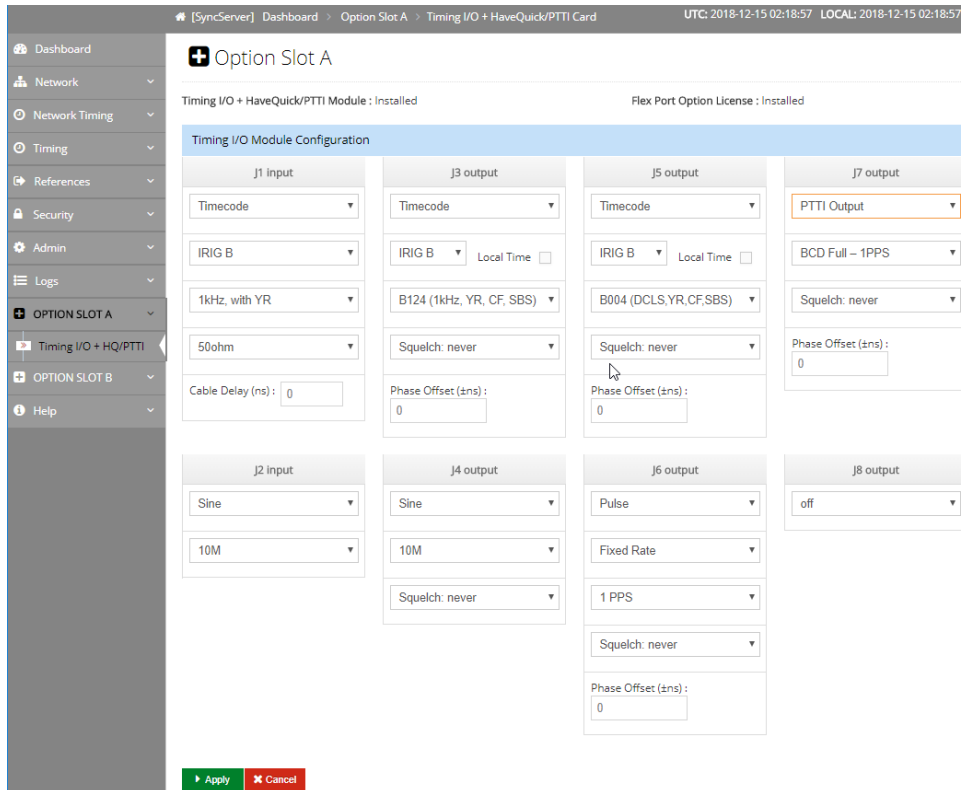


Figure 4-71. Options Slot A Configuration Window - HaveQuick/PTTI Module Installed



The SyncServer S600/S650 has separate timing and frequency clock controls.

The squelch feature uses the time clock state for timecode and fixed-rate pulse modes. The squelch feature uses the frequency clock state for programmable-period pulse and sine modes.

The time clock state can be viewed on the "Time of Day Status" line on the Dashboard >Timing display. Normally frequency and clock states are the same. If they are different, then the frequency clock state is displayed next to the icon on the "Current Reference" line.

Table 4-16. Squelch Settings

Squelch Setting	Function	Notes
Never	Clock state will not cause squelch.	
If not locked	Output will only occur when appropriate clock state is "Locked" or "Bridging" (internal state = Normal or Bridging)	
In warmup / freerun / locking / holdover exceeded	Output will only occur when appropriate clock state is "Locked", "Bridging", or "Holdover"	
In warmup	Squelch output from powerup until unit comes out of warmup. It will not be squelched after that.	Output will first turn on when "freerun" is entered.
In warmup / freerun	Prevent output from powerup until the unit comes out of freerun. Once (if) it does it will stay on since these states can never be re-entered.	Output will be turned on when "Locking" is entered.
In warmup / freerun/ locking	Prevent output from powerup until unit comes out of "Locking" (internal state = "fast"). Another way of saying this is don't output until first lock from powerup, but thereafter always output.	These 3 states are only encountered following powerup or reboot. Once Locked state is attained none of these states will ever occur again.

Table 4-17. Clock Status

SyncServer Clock Status	Description	Possible Next State	Conditions Required for Next Transition State
Warmup	<p>The unit is warming up. This is the first clock state following power-up or reboot.</p> <p>Typical Warm-up time is:</p> <p>Quartz: 6 minutes Rubidium: 9 minutes</p> <p>Note: Warm-up times may vary based on environmental conditions and other factors.</p>	Freerun	Warm-up complete
Freerun	<p>The unit is operating without an input reference, but is ready to use one. This state will persist if no qualifiable input reference is provided. While in this state, the stability of the clock output is tied to the internal reference oscillator.</p>	Fast-track	Input becomes qualified
Fast-track	<p>The selected input has been qualified and the firmware clock servo begins to actively converge the output to the selected input. This is the transitional phase that leads to the Locked clock state.</p> <p>Typical duration for Quartz and Rubidium: 20 minutes</p>	Freerun	The unit no longer has a qualified input.
		Normal	Clock stabilized
Locked	<p>The unit has a qualified input and is locked to the reference.</p>	Recovery	Clock not stabilized adequately
		Bridging	The unit no longer has a qualified input.
Bridging	<p>The unit no longer has a qualified reference, but remains operating within performance associated with Locked operation.</p>	Holdover	Bridging time exceeded
		Normal	Input reference re-qualified in less than bridging time.

Table 4-17. Clock Status (Continued)

SyncServer Clock Status	Description	Possible Next State	Conditions Required for Next Transition State
Holdover	The unit no longer has a qualified reference.	Recovery	Input becomes qualified
Recovery	The selected input has been qualified and the firmware clock servo begins to actively converge the output to the selected input.	Holdover	The unit no longer has a qualified input.
		Locked	Clock stabilized

Options Slot B Configuration Window

Use this window to configure the module in Options Slot B. The first example, shown in [Figure 4-72](#), is for the Fiber Input Module with Flex Port License and Pulse Output options installed. The second example, shown in [Figure 4-74](#), is for the Low Phase Noise (LPN) module.



Note: Option Slot B is only available with the SyncServer S650.

The configurations on the LPN are fixed.

Figure 4-72. Slot B - Fiber Input Module, Flex Port and Pulse Output Options Installed

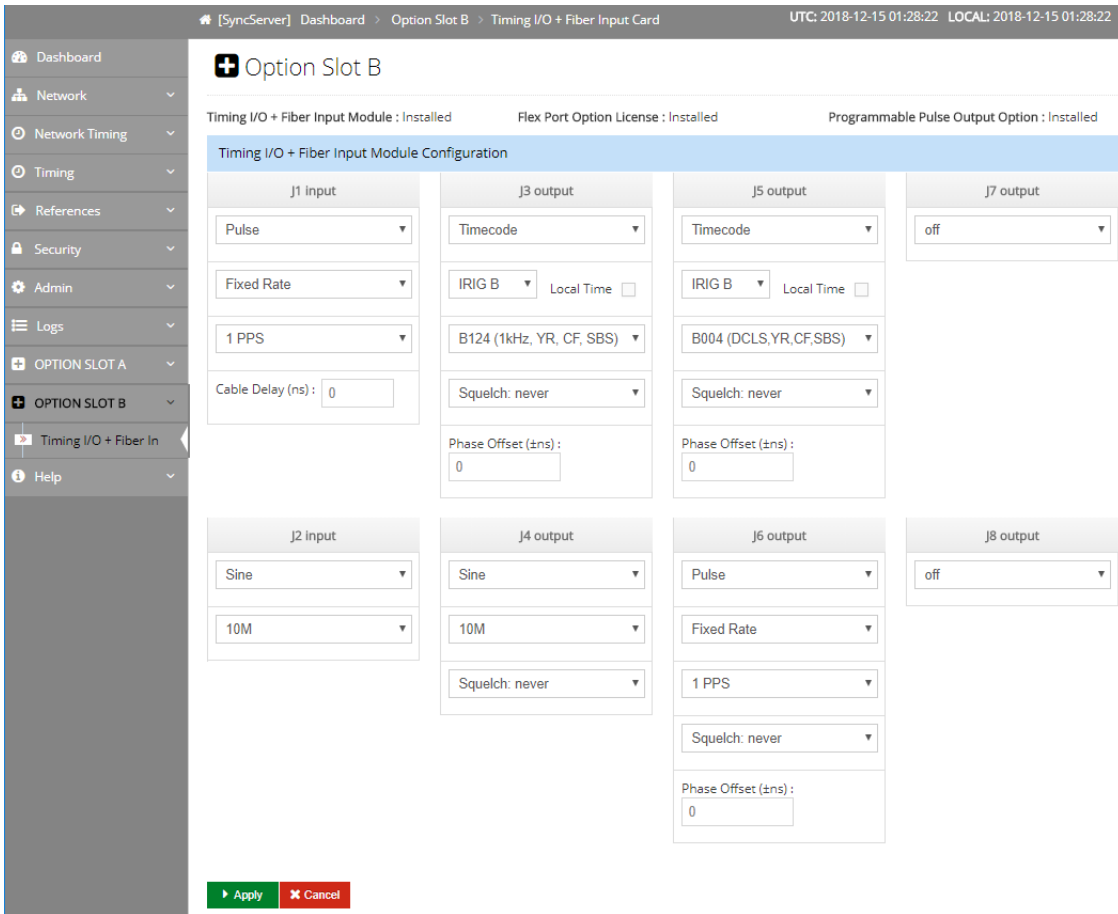


Figure 4-73. Slot B - Fiber Output Module, Flex Port and Pulse Output Options Installed

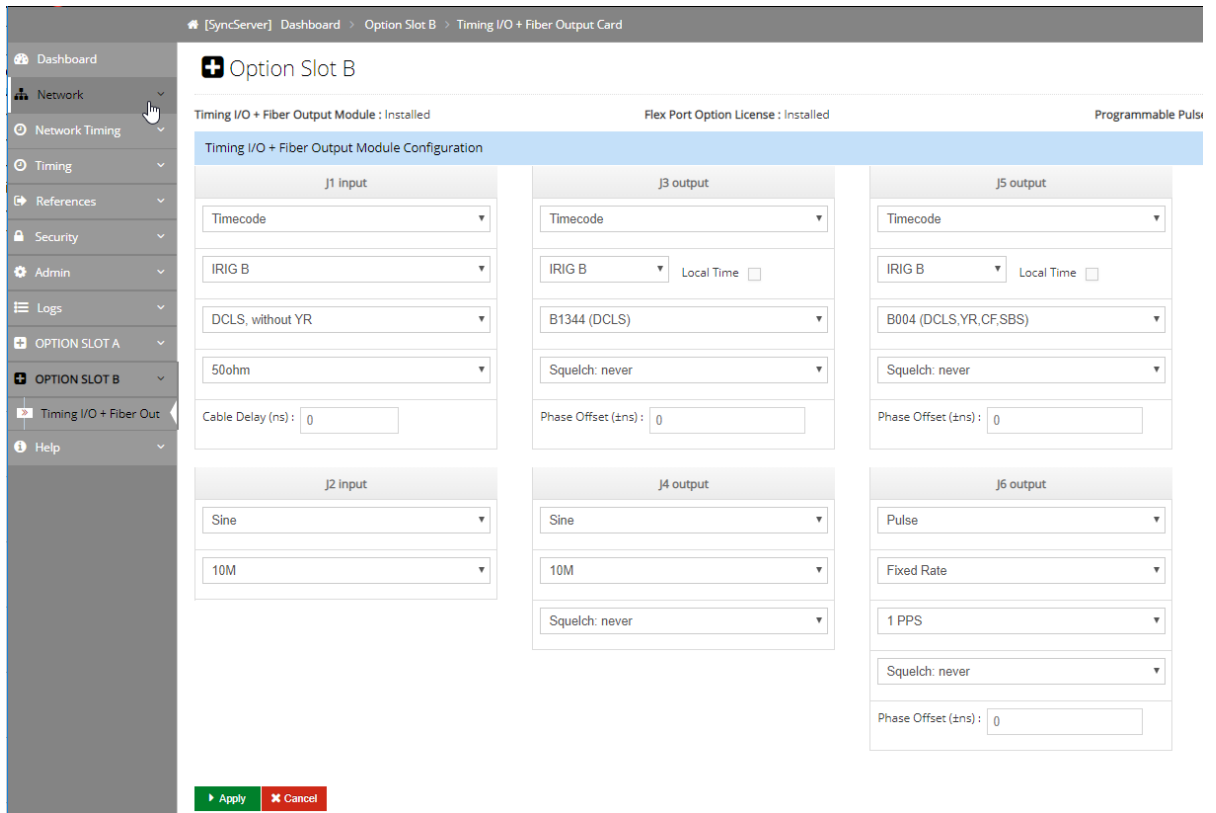
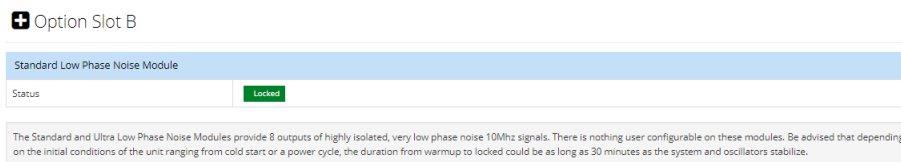


Figure 4-74. Slot B - LPN

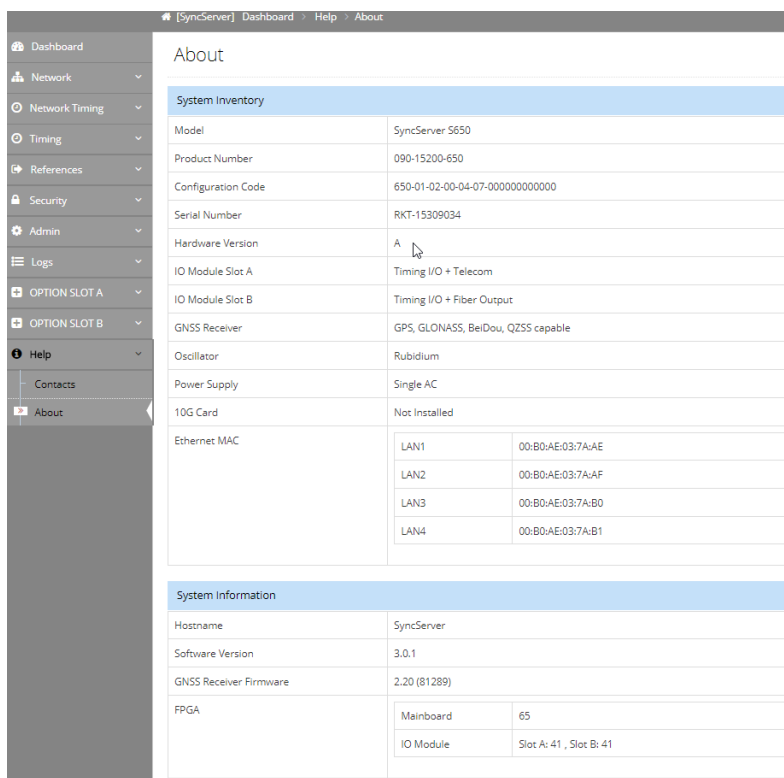


Help Windows

About Window

Use this window to view information about the unit. See [Figure 4-75](#).

Figure 4-75. Help - About Window



Contact Window

Use this window to view information about how to contact Customer Assistance Centers. See [Figure 4-76](#).

Figure 4-76. Help - Contacts Window

Contacts

Download

Download SNMP mib [Save as...](#)

Customer Assistance Centers

Worldwide (Main Number)	+1-408-428-7907 (Available 24/7)
USA toll-free	+1-888-367-7966
Europe, Middle East & Africa	+49 700 32886425 (Available 0800-1700 Monday-Friday Central European time)

Customers who have purchased technical support contracts may email questions to:

Americas & APAC	FTD.Support@microsemi.com
EMEA	FTD.EMESupport@microsemi.com

Chapter 5 Command Line Interface (CLI)

This chapter describes the CLI command conventions, the prompts, line editing functions, and command syntax. The CLI command functions and features are listed alphabetically.

In This Chapter

- [SyncServer S6x0 CLI Command Set](#)



Note: Under heavy network traffic load, the CLI may respond slower.

SyncServer S6x0 CLI Command Set

This section provides an alphabetical listing and details of all CLI commands. Both the serial CONSOLE CLI commands and SSH CLI commands should be identical.

Table 5-1. CLI Commands for SyncServer S6x0

Command	Similar Web Interface Location
set clock	Timing > Input Control
set configuration	Admin > Configuration Backup / Restore / Reset
Dashboard > Admin > Upgrade	See upper right corner of Dashboard screen
F9 - Time on Request	Report Time on Request
F50 - GPS Receiver LLA/XYZ Position	References > GNSS Config
F73 - Alarm Status	Click on the Arrow for the Alarm(s) tab to display Alarms status
show gnss status	Click on the Arrow for the GNSS tab to display GNSS status
halt system	Security > Services / Sys. Control
history	Logs > Events
show image	Dashboard > About > Release Version

Table 5-1. CLI Commands for SyncServer S6x0

Command	Similar Web Interface Location
set image	Admin > Configuration Backup / Restore / Reset
show ip	Network > Ethernet
set ip	Network > Ethernet
set nena active	Timing > Serial
set nena-format	Timing > Serial
show nena-format	Timing > Serial
reboot system	Security > Services / Sys. Control
set service	Security > Services / Sys. Control
show-session-timeout	Admin > General
set-session-timeout	Admin > General
show system	Click on the Arrow for the About tab on the dashboard to display system info

set clock

This command provides an ability to set the time.

Command Syntax:

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

where

<date-time> = YYYY-MM-DD,HH:MM:SS

The time is presumed to be UTC.

set configuration

Use this command to replaces the current configuration with the factory default configuration. On SyncServer, user is prompted with “Y” to confirm that they really want to do it.

```
set configuration factory
```

Returning the configuration to factory defaults also includes:

- Loss of configured user logins
- Loss of configured network settings (addresses, firewall, etc.)

Installed licenses remain installed.

The SyncServer S6x0 reboots as part of this process.

The behavior with this command is identical to using the WebGUI to reset to factory default (Dashboard > Admin> Configuration Backup/Restore/Reset).

F9 - Time on Request

The F9 command is used to record the time the SyncServer S6x0 receives a request from the user. The general behavior is covered in [Table 5-2](#). This function is configurable through the command line interface only. It is not configurable from the keypad.

Table 5-2. F9 Syntax Basic Behavior

Syntax	Behavior
F9<CR>	Enables the connection for “time on request” operation. When enabled, the only inputs the connection will respond to are <code>ctrl-C</code> and <code>SHIFT-T</code> (see next 2 rows).
<code>ctrl - C</code>	Disables the connection for “time on request” operation
<code>SHIFT-T</code>	If “time on request” enabled, this triggers a time response on the connection. Note: The “T” does not appear (it is not echoed back by SyncServer S6x0).

Enter the command `F9<CR>` to prepare the SyncServer S6x0 for the user's request. At the desired moment, send the request to the SyncServer S6x0 by entering an upper case "T". The SyncServer S6x0 saves the current time-of-day, accurate to within 1 microsecond, to a buffer, and then outputs it to the command line interface. The SyncServer S6x0 continues to provide the time-of-day each time it receives a "T" until `F9` is cancelled. To cancel `F9`, enter `ctrl-C` on your keyboard. The command line disregards all input other than `SHIFT-T` and `ctrl-C` (hex 03).

The time-of-day output is only available on the network or serial port used to give the `F9` command.

The format of the default string returned with `SHIFT-T` is entered (assuming time on request is enabled) is as follows:

```
<SOH>DDD:HH:MM:SS.mmmQ<CR><LF>
```

where:

- <SOH>=ASCII Start-of-Heading character
- <CR>=ASCII Carriage Return character
- <LF>=ASCII Line Feed character
- YYYY=Year
- DDD=day-of-year.

- HH=hours.
- MM=minutes.
- SS=seconds.
- mmm=milliseconds.
- :=colon separator.
- Q=time quality character, as shown below
 - SPACE** = Time error is less than time quality flag 1's threshold
 - . = Time error has exceeded time quality flag 1's threshold
 - * = Time error has exceeded time quality flag 2's threshold
 - # = Time error has exceeded time quality flag 3's threshold
 - ? = Time error has exceeded time quality flag 4's threshold, or a reference source is unavailable

Example:

To prepare Time on Request, enter:

```
SyncServer> F9
```

Then, to request the current time, enter `SHIFT-T` on your keyboard. ("T" does not appear).

Response:

```
<SOH>128:20:30:04.357*<CR><LF>
```

To exit F9, press `Ctrl-C` on your keyboard.

F50 - GPS Receiver LLA/XYZ Position

GPS Receiver LLA/XYZ Position

Use function F50 to display the current GPS position, as well as the following:

- Select the positional coordinate system, Latitude Longitude Altitude (LLA) or XYZ (Earth-Centered, Earth-Fixed XYZ coordinates).
- If LLA is selected, Altitude Mode shows the elevation in given meters.

Use the following format to display the current position of the GPS receiver in LLA coordinates:

```
F50<S>B<N><SEP>LLA<CR>
```

SyncServer S6x0 responds with the coordinate information in the following format:

```
F50<S>B<N><SIGN><S><DEG>d<MIN>'<SEC>"<S><SIGN><S><DEG>d<MIN>'<SEC>"<S><ALT><UNITS><CR><LF>
```

where:

- F50 = Function 50
- <S> = ASCII space character one or more.
- B = ASCII letter to denote Option Bay number follows
- <N> = Option Bay Number, 1.
- <SEP> = Separator
- LLA = LLA mode
- <CR> = carriage return character.
- <SIGN> = N or S for latitude; E or W for longitude;
- - for negative altitude and <S> or + for positive altitude.
- <DEG> = two-digit degrees for latitude or three-digit degrees for longitude.
- d = ASCII character d
- <MIN> = two-digit minutes.
- ' = ASCII character '
- <SEC> = two-digit seconds + 1 digit 10ths of seconds.
- " = ASCII character "
- <ALT> = altitude in meter
- <UNITS> = unit of altitude, 'm' for meters
- <LF> = line feed character.

For example, to display the LLA coordinates of the antenna, enter:

```
F50 B1 LLA<CR>
```

SyncServer S6x0 responds:

```
F50 B1 N 38d23'51.3" W 122d42'53.2" 58m<CR><LF>
```

To display the present antenna position using ECEF XYZ coordinates in meters, use the following format:

```
F50<S>B<N><<SEP>>XYZ<CR>
```

SyncServer S6x0 responds using the following format:

```
F50B<N><S><<SIGN>><S><<MX>>m<S><<SIGN>><S><<MY>>m<S><<SIGN>><MZ>>m<CR><<LF>
```

where:

- F = ASCII character F
- 50 = function number
- <S> = ASCII space character
- B = ASCII letter to denote Option Bay number follows
- <N> = Option Bay Number, SyncServer S6x0 only has 1
- <SIGN> = Either + or - for the position of the ECEF XYZ coordinates
- <MX> = Antenna X-position in meters to tenths of a meter
- <MY> = Antenna Y-position in meters to tenths of a meter
- <MZ> = Antenna Z-position in meters to tenths of a meter
- M = ASCII character m for Meters
- <ALT> = altitude in meters
- <CR> = carriage return character
- <LF> = line feed character

Example:

```
SynsServer> F50 B1 XYZ
```

Response:

```
: F50 B1 X 1334872.770000m Y 6073285.070000m Z 1418334.470000m
```


F73 - Alarm Status

Use function F73 to view alarm status. The SyncServer S6x0 will return a response in the follow format:

```
F73<SP>S<STATUS><SOURCE><SP><123456789ABCDEFGHIJ><CR><LF>
```

The alphanumeric characters 1-9 and A-J represent specific positions in the response string shown above. [Table 5-3](#) describes F73's alarm indicators based on their position in the response string.

Table 5-3. F73 Alarm Indicators

Syntax	Alarm	Indicators	Description
F	n/a	n/a	ASCII character F
7	n/a	n/a	ASCII character 7
3	n/a	n/a	ASCII character 3
<SP>	n/a	n/a	ASCII space character, one or more
S	n/a	n/a	ASCII character S, Status delimiter
<STATUS>	Clock Status	"L" = Locked "U" = Unlocked	The Clock Status indicator reports "Locked" when the SyncServer S6x0 clock is locked to a reference source (e.g., GPS, IRIG, etc.). This is the normal operational state of the clock. While locked, the clock steers its internal oscillator to the reference source. The Clock Status indicator reports "Unlocked" when the SyncServer S6x0 clock is not locked to a reference source. This may be because the reference source is unlocked or unstable. While unlocked from a reference source, the SyncServer S6x0 uses its internal oscillator to keep time until a reference becomes available again.

Table 5-3. F73 Alarm Indicators

Syntax	Alarm	Indicators	Description
<SOURCE>	Clock Source	<p>“A” = Clock to Timing I/O Slot A (J1A)</p> <p>“B” = Clock to Timing I/O Slot B (J1B)</p> <p>“P” = Clock to GNSS</p> <p>“R” = Clock to External Input Reference (J2A/B)</p> <p>“T” = Clock to NTP</p> <p>“F” = None</p>	<p>Same as WebGUI “Current Reference” row in Dashboard > Timing.</p> <p>This is also equivalent to the “Time input selected” notification.</p> <p>“A” and “B” encoding can also occur if the BNC is configured for 1PPS.</p>
<SP>			ASCII space character, one or more
1	PLL Synthesizer	<p>“_” = Locked</p> <p>“C” = Unlocked</p>	<p>The PLL Synthesizer indicator reports “Locked” during normal operation while the system clock’s PLL is locked to the internal oscillator.</p> <p>The PLL indicator reports “Unlocked” if the SyncServer S6x0 clock’s hardware PLL has failed. While the PLL indicator is “Unlocked”, all SyncServer S6x0 clock timing parameters are unreliable and should not be used. Contact Microsemi FTD Services and Support.</p>
2		“_” = Locked	Always “_” for initial release.
3	Primary	<p>“_” = OK</p> <p>“P” = Fault</p>	Indicates OK when GNSS input qualified for time, which is equivalent to Green indication for GNSS on Dashboard > Timing> Timing Reference row. Note that disabling of GNSS will also generate “P”.
4	(For future use)	“_” = OK	Always “_” for initial release.

Table 5-3. F73 Alarm Indicators

Syntax	Alarm	Indicators	Description
5	IRIG - Slot A	<p>“-” = OK “I” = Fault</p>	<p>Indicates OK when the Slot A-J1 input is qualified for time. This connector supports all IRIG inputs.</p> <ul style="list-style-type: none"> ■ This is equivalent to Green indication for Slot A - J1 on Dashboard>Timing >Timing Reference row. ■ Note that disabling of AJ1 will also generate “I”. ■ If this input is configured for PPS/10MPPS this alarm will react based on the condition of the input ■ This only applies to slot A.
6	External Input Reference - Slot B	<p>“-” = OK “A” = Fault</p>	<p>Indicates OK when the Slot A - J2 input is qualified for frequency. This connector supports only frequency inputs (1/5/10MHz). This is equivalent to Green indication for Slot A - J2 in WebGUI Dashboard > Timing > Holdover References row.</p> <p>Note that:</p> <ul style="list-style-type: none"> ■ Disabling of Slot A - J2 will also generate “A”. ■ This only applies to slot A.
7	Primary Power	<p>“-” = OK “W” = Fault</p>	<p>The Primary Power indicator reports “OK” when the power supply voltages are normal. It reports “Fault” when the power supply voltages exceed +/-10% of nominal supply regulation.</p> <p>While the Primary Power indicator reports a fault, all outputs from the SyncServer S6x0 are unreliable and should not be used unless a Secondary Power supply is available and operating normally.</p> <p>When seen from the rear of the SyncServer S6x0, the Primary Power indicator corresponds to the power supply module in the lowest, left-most bay.</p>

Table 5-3. F73 Alarm Indicators

Syntax	Alarm	Indicators	Description
8	Secondary Power	<u>Dual AC version</u> “_” = OK “w” = Fault <u>Single AC version</u> “_” = OK	This alarm can only be set for the version that has Dual AC.
9	Rb Oscillator	<u>Unit with Rb</u> “_” = OK “R” = Fault <u>Unit without Rb</u> “_” = OK	<p>The Rubidium Oscillator indicator reports “OK” when the Rubidium Oscillator is operating normally. It reports “Fault” when the Rubidium Oscillator is warming up or has a PLL fault.</p> <p>Faults that occur during the warm up period after the unit is started up are not significant. This is normal behavior as the oscillator must perform an initial transition from unlocked to locked.</p> <p>This alarm can only set on a unit that contains an Rb oscillator.</p>
A	Excessive Frequency Adjustment	“_” = OK “X” = Fault	“X” is indicated when the “Excessive Frequency Adjustment” alarm is set.
B	Clock Status - First time lock	“_” = First time lock OK “A” = Clock Status has not locked since power on	“A” is indicated until the “First normal-track since power up” transient alarm has occurred. Thereafter it remains “_”.
C	Time Error	“_” = OK “U” = Fault	“U” is indicated when the “Holdover time error threshold exceeded” condition is set. The severity setting has no impact. The condition for what will set this alarm is defined on the WebGUI Dashboard > Timing > Holdover form.
D	Timeout		Always “_”
E	NTP		Always “_”
F	IRIG - Slot B	“_” = OK	Always “_”
G	External Input Reference - Slot B	“_” = OK	Always “_”
H	(For future use)	“_” = OK	Always “_”
I	(For future use)	“_” = OK	Always “_”

Table 5-3. F73 Alarm Indicators

Syntax	Alarm	Indicators	Description
J	(For future use)	"-" = OK	Always "-"
<CR>	n/a		Carriage return
<LF>	n/a		Line feed

Example:

```
SyncServer> F73
```

Response:

```
F73 : SLP X---IA-w-----
```

show gnss status

This command provides GPS satellite tracking information:

```
show gnss status
```

Example:

```
SyncServer> show gnss status
```

Response:

```
Gnss Status

Latitude : 12 21 06.39 N
Longitude : 76 35 05.17 E
HGT Val Ellipsoid : 712.4 m
HDOP : 0.970000
PDOP : 1.980000
Fix Quality : 1
Used Satellites : 8
Receiver Status : Tracking
Operation Mode : Survey
Antenna Status : OK
SBAS Constellation : Not Tracking
```

Current GNSS Satellite View:

```
+-----+
|Index |GnssID |SatID |SNR  |Azimuth |Elev  |PrRes  |
|-----|-----|-----|-----|-----|-----|-----|
|1      |GPS    |14    |25   |349     |50    |-10    |
|.....|.....|.....|.....|.....|.....|.....|
|2      |GPS    |18    |23   |65      |35    |63     |
|.....|.....|.....|.....|.....|.....|.....|
|3      |GPS    |21    |32   |146     |43    |-68    |
|.....|.....|.....|.....|.....|.....|.....|
|4      |GPS    |22    |22   |13      |44    |69     |
|.....|.....|.....|.....|.....|.....|.....|
|5      |GPS    |25    |34   |108     |12    |9      |
|.....|.....|.....|.....|.....|.....|.....|
|6      |GPS    |26    |26   |191     |7     |-42    |
|.....|.....|.....|.....|.....|.....|.....|
|7      |GPS    |27    |27   |255     |25    |35     |
|.....|.....|.....|.....|.....|.....|.....|
|8      |GPS    |31    |31   |185     |52    |13     |
+-----+
```

halt system

Use this command to shut down the operating system as a preparatory step before power-off. This command does not reboot the system.

```
halt system
```

The behavior of this command is the same as using the Web GUI to perform a Halt (Dashboard>Security>Services).

Example 1:

If using via serial connection to console port:

```
SyncServer> halt system  
  
The system is being HALTED NOW  
  
.....
```

<now numerous messages will be received as processes are stopped>

```
reboot: System halted
```

Example 2:

If using SSH session:

```
S650> halt system  
  
The system is being shutdown now  
  
The system can be powered off in 60 seconds  
  
.....  
  
SyncServer>
```

The connection is lost and on the front panel the following message appears:

```
System shutting down...  
The system can be powered  
off after 60 seconds.
```

At this point SyncServer S6x0 must be re-powered for further operation.

history

The command provides a listing of user entries during this session, regardless of their validity. If a configuration command provides the configuration value(s) on the same entry line as the command, then the configuration value(s) will be shown in the history.

Responses are not shown in the history list.

Command Syntax:

```
history
```

Example:

```
SyncServer> history
```

Response:

```
0 2015-11-19 18:49:28 set ip address-mode LAN3 ipv4 dhcp
1 2015-11-19 18:49:37 F73
2 2015-11-19 18:49:46 this is not a legal command
3 2015-11-19 18:50:08 show gnss status
4 2015-11-19 18:50:38 set-session-timeout
5 2015-11-19 18:50:47 show-session-timeout
6 2015-11-19 18:50:58 history
```

- The DHCP configuration (item 0) is shown in history because it is accomplished on the same line as the command.
- The configured session timeout value does not appear (item 4) because the CLI prompts for that value on a response line.
- Responses to `F73` (item 1) and `show...` requests (items 3,5) do not appear in history
- Anything entered, even if not valid syntax (item 2) will be maintained in the history.

show image

Use this command to display current version in active and backup locations, as well as which image will be used on boot.

Command Syntax:

```
show image
```

Example

```
SyncServer> show image
```

Response

```
SYSTEM IMAGE DETAILS

Active Image : 1
Backup Image : 2
Active Image Ver : 1.0.4
Backup Image Ver : 1.0.3.7
Next Boot Image : 1
```

This example tells us that:

- The active image (what is currently running in SyncServer S6x0) is 1.0.4. Note that this version is also displayed with the `show system` command.
- There is a backup image (2) and it contains software version 1.0.3.7.
- Next Boot Image identifies that if a reboot occurs it will load image 1, which we can deduce is the image we are currently running.

set image

This command provides the ability to control which software version will be loaded on next power-up (or reboot).

Command Syntax:

```
set image {1 | 2}
```

Example

To set the next reboot to use the image 2:

```
SyncServer> set image 2
```

show ip

Use this command to display the current IP settings for all LAN ports.

Command Syntax:

```
show ip config
```

The information displayed is consistent with the content shown in the Web Interface (Dashboard>Network>Ethernet).

Example:

```
SyncServer> show ip config
```

Response:

```
Eth port config
```

```
-----  
|Port|Speed |IPVersion |IPv4Mode|IPv6Mode|AutoConfig|  
|----|-----|-----|-----|-----|-----|  
|LAN1|AUTO |ipv4 |DHCP |STATIC |enable |  
|...|.....|.....|.....|.....|.....|  
|LAN2|AUTO |ipv4 |STATIC |STATIC |enable |  
|...|.....|.....|.....|.....|.....|  
|LAN3|AUTO |ipv4_ipv6 |STATIC |STATIC |enable |  
|...|.....|.....|.....|.....|.....|  
|LAN4|AUTO |ipv4_ipv6 |DHCP |DHCP |disable |  
-----
```

```
IPv4 config
```

```
-----  
|Port|Address |Subnet Mask |Gateway |  
|----|-----|-----|-----|  
|LAN1|192.168.1.100 |255.255.255.0 |192.168.1.1 |  
|...|.....|.....|.....|  
|LAN2|192.168.99.7 |255.255.255.0 |192.168.99.1 |  
|...|.....|.....|.....|  
|LAN3|192.168.1.99 |255.255.255.0 |192.168.1.1 |  
|...|.....|.....|.....|  
|LAN4|192.168.4.100 |255.255.255.0 |192.168.4.1 |  
-----
```

```
IPv6 config
```

```
-----  
|Port|Address |Pref|Gateway |  
|----|-----|----|-----|  
|LAN1| |0 | |  
|...|.....|...|.....|  
|LAN2| |0 | |  
-----
```

```

|...|.....|...|.....|
|LAN3|2001:db9:ac10:fe10::2 |64 |2002:0DB9:AC10:FE10::1 |
|...|.....|...|.....|
|LAN4| |0 | |
-----

```

Example 2:

```
SyncServer> show ip status
```

Response 2:

Ethernet MAC

```

-----
|Port|MAC          |
|----|-----|
|LAN1|00:B0:AE:00:36:0B |
|...|.....|
|LAN2|00:B0:AE:00:36:0C |
|...|.....|
|LAN3|00:B0:AE:00:36:0D |
|...|.....|
|LAN4|00:B0:AE:00:36:0E |
-----

```

Eth Status-IPv4

```

-----
|Port|Address          |Subnet Mask       |Gateway           |
|----|-----|-----|-----|
|LAN1|192.168.107.122 |255.255.255.0    |192.168.107.1    |
-----

```

Eth Status-IPv6

```

-----
|Port|Address          |Pref|Gateway |
|----|-----|-----|-----|
|LAN4|2001::120         |64 | |
-----

```

set ip

Use this command to set the address mode to DHCP (IPv4 or IPv6) for the LAN1-LAN6 ports. Use this command to provision the Host, Mask, and Gateway for IPv4 static addresses.

Command Syntax:

- To provision the IPv4 or IPv6 address mode on the specified LAN port as DHCP:

```
set ip address-mode lan{1|2|3|4|5|6} {ipv4|ipv6} dhcp
```

- For changes to take effect, the specified LAN port must be restarted.

- To set the IPv4 address, mask and gateway of the Ethernet interfaces for the specified port:

```
set ip ip-address lan{1|2|3|4|5|6} ipv4 address  
<addrv4_value> netmask <maskv4_value> gateway  
<gatewayv4_value>
```



Note: Setting the IPv4 static address for a LAN port with this command automatically disables the DHCP address mode for that port.

Example 1:

To set the address-mode of the Port 1 Ethernet interface to DHCP:

```
SyncServer> set ip address-mode lan1 ipv4 dhcp
```

Example 2:

To set the static IPv4 address for LAN1 to 192.168.2.11, the mask to 255.255.255.0, and the gateway 0.0.0.0:

```
SyncServer> set ip ip-address lan1 ipv4 address 192.168.2.11  
netmask 255.255.255.0 gateway 0.0.0.0
```

set nena active

Use this command to enable the NENA response mode on this connection.

Command Syntax:

```
set nena active
```

Example:

```
SyncServer>set nena active
```

Response:

```
NENA response active: CR to trigger, ctrl-c to deactivate
```

```
2016 349 07:40:19 S+00
```

```
2016 349 07:40:21 S+00
```

```
2016 349 07:40:22 S+00
```

```
2016 349 07:40:22 S+00
```

```
2016 349 07:40:23 S+00
```

```
SyncServer >
```

show nena-format

Use this command to display the current NENA format for the CLI connection.

Command Syntax:

```
show nena-format
```

Example:

```
s650>show nena-format
```

Response

```
NENA format : 8
```

set nena-format

Use this command to set the NENA format for the CLI connection.

Command Syntax:

```
set nena-format [0|1|8]
```

Example:

To set the NENA format to 8 for the serial timing output:

```
SyncServer>set nena-format 8
```

reboot system

This command halts current operation, then reboots the SyncServer S6x0. Except for no loss of power, this is functionally equivalent to power-up of the SyncServer S6x0.

```
reboot system
```

The behavior of this command is the same as using the Web GUI to perform a Reboot (Dashboard>Security>Services).

Example 1:

If using console port serial connection:

```
S650> reboot system
```

Response:

```
The system is going down for REBOOT NOW!
```

```
.....
```

```
SyncServer login:
```

Example 2:

If using SSH session:

```
S650> reboot system
```

Response 2:

```
The system is going down for REBOOT NOW!
```

```
.....
```

The connection will be lost after the REBOOT NOW! message.

set service

Use this command to enable or disable HTTP on the SyncServer S6x0. When disabled the Web interface will not be accessible. The only way to re-enable HTTP is using this CLI command.

Disabling HTTP provides a method to effectively eliminate the ability to remotely configure SyncServer S6x0.

Command Syntax:

```
set service http {enable | disable}
```

Example:

To enable HTTP:

```
set service http enable
```


set-session-timeout

Use this command to define a timeout for a CLI session. The session will auto-terminate if there is no session activity (i.e. user entries) for the configured duration. If the connection is remote SSH, the connection will terminate upon timeout. If the session is direct to the CONSOLE serial port, auto-logout will occur upon timeout.

Command Syntax:

```
set-session-timeout
```

- The system will prompt for the timeout value.

Example:

To set the session timeout to one hour (3600 seconds):

```
SyncServer> set-session-timeout
```

The system will prompt for the timeout value.

```
Timeout ( 0 - 86400 sec):
```

Enter the following, then press Enter.

```
3600
```

Response:

```
3600 sec timeout set successfully
```

show-session-timeout

Use this command to display the session timeout value.

Command Syntax:

```
show-session-timeout
```

Example:

```
SyncServer> show-session-timeout
```

Response:

```
The current session timeout - 3600 sec
```

show system

Use this command to display basic facts about the SyncServer S6x0.

Command Syntax:

```
show system
```

Example

```
SyncServer> show system
```

Response

```
Host Name : SyncServer  
Serial Num : MSK102  
Model Num : S650  
Build : 1.0.4  
Uname : Linux SyncServer 3.13.0 #1 SMP Tue Nov 17 13:19:51  
PST 2015 armv7l  
Uptime : 0 day(s) 0 hour(s) 24 minute(s) 48 second(s)  
Load Avg : 0.69 0.42 0.38  
Free Mem : 87.83 %  
CPU Model : ARMv7 Processor rev 0 (v7l)  
CPU Identifier : Altera SOCFPGA  
Total Mem : 1007 MB  
Oscillator Type : Rubidium  
Update Available : Up to date
```

Chapter 6 Provisioning

This chapter describes the procedures for provisioning the SyncServer S6x0. Use these procedures after you have installed and powered up the SyncServer S6x0 (see [Chapter 2, Installing](#)).

In This Chapter

- [Establishing a Connection to the SyncServer S6x0](#)
- [Managing the User Access List](#)
- [Provisioning Ethernet Port](#)
- [Provisioning Input References](#)
 - [Setting GNSS Parameters](#)
 - [Provisioning IRIG Inputs on Timing I/O Module](#)
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- [Provisioning Outputs](#)
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 - [Provisioning Outputs on Timing I/O Module](#)
 - [Provisioning Outputs on Timing I/O with Telecom Module](#)
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 - [Provisioning Programmable Pulse Output](#)
- [Making Time-Interval or Event Timestamp Measurements](#)
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Establishing a Connection to the SyncServer S6x0

There are four ways to bring the SyncServer S6x0 on line:

1. The SyncServer S6x0 default IPv4 address for port LAN1 is 192.168.1.100, the subnet mask is 255.255.255.0, and the gateway address is 0.0.0.0 (no gateway). These may be suitable.
2. Use the front panel to input the IP address, subnet mask and gateway.
3. Use the front panel to turn on DHCP and review the assigned address.
4. Use the serial port

Communicating Through LAN1 Ethernet Port

The LAN1 Ethernet port must be set to an IP address that is compatible with your network to allow communication. If the default IPv4 address (indicated above) is not acceptable, you must first configure Ethernet LAN1 port through the EIA-232 serial port with CLI commands or with the front panel.

Once the LAN1 port has been configured, it can be used to access the SyncServer S6x0 web interface. Connect the LAN1 port to your network with a CAT5 Ethernet cable. Enter the LAN1 port IP address into a web browser. Enter your user name and password for the SyncServer S6x0 when prompted.



Note: The default user name is “admin”. The default password is: Microsemi.

To avoid unauthorized access, you should change the default password.

HTTPS

A certificate is required with HTTPS. The SyncServer S6xx uses a self-signed certificate rather than a certificate generated by a known certificate authority. Browsers will therefore give warnings when attempting to connect to the SyncServer S6x0. Users will need to allow the browser to continue. The actual messages and screens will be different for different browsers. Certificates have an expiration date. After the built-in certificate expires, a new certificate can be generated on the Security->https page.

[Figure 6-1](#) shows an example HTTPS message from the Google Chrome browser. Clicking the Advanced button brings up the message shown in [Figure 6-2](#).

[Figure 6-3](#) shows an example HTTPS message from the Mozilla Firefox browser. Clicking the Advanced button brings up the message shown in [Figure 6-4](#).

Figure 6-1. Example - Chrome Browser HTTPS Warning

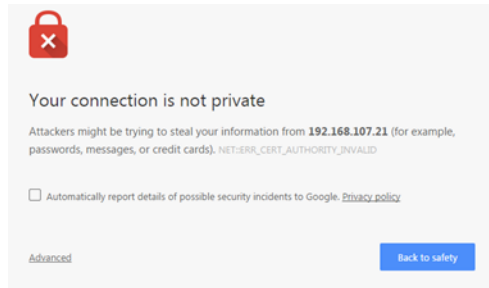


Figure 6-2. Example - Chrome Browser HTTPS Warning, Advanced

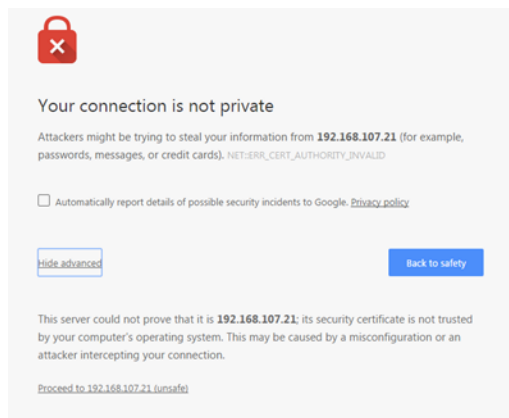


Figure 6-3. Example - Firefox Browser HTTPS Warning

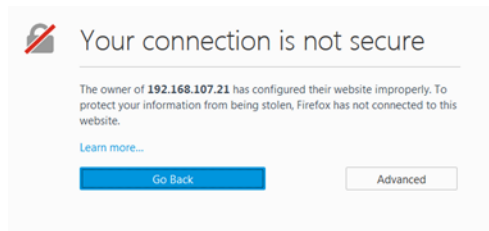


Figure 6-4. Example - Firefox Browser HTTPS Warning, Advanced

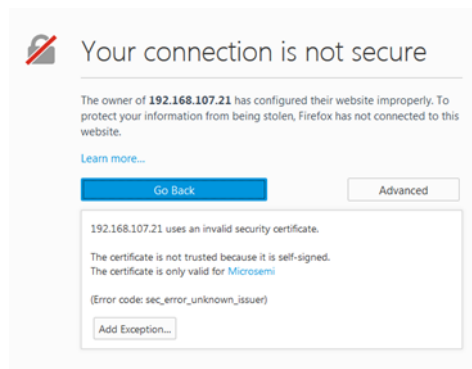


Table 6-1. Configuring the LAN1 Port

Method	Steps	Notes
Web Interface Path	Network > Ethernet	
CLI Command	<pre>set ip ip-address lan1 ipv4 address <addrv4_value> netmask <maskv4_value> gateway <gatewayv4_value> set ip address-mode lan1 {ipv4 ipv6} dhcp</pre>	
Front Panel	<p>Menu button</p> <p>Select “1) LAN1”</p> <p>Select “1. Configure”</p> <p>Select “1) IPv4” or “2) IPv6 (DHCPv6)”</p> <p>If IPv4, select Addressing Type “1) Static Addr” or “2) DHCP”</p> <p>If IPv4 Static Addr,</p> <ul style="list-style-type: none"> ■ enter IPv4 address and press Enter button ■ enter netmask and press Enter button ■ enter gateway and press Enter button 	This method can only be used to configure LAN1.

Communicating Through the Serial Port

An EIA-232 serial port is available on the rear panel for a direct serial connection to a terminal or a computer with terminal emulation. Use the following procedure to connect the SyncServer S6x0 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 200.

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 labeled “Console” on the rear panel of the SyncServer S6x0.
2. Configure the emulation software for 8 data bits, 1 stop bit, no parity, 115.2 kbps 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 default user name is “admin”. The default password is: Microsemi.

*To avoid unauthorized access, you should change the default password.

Managing the User Access List

When you are logged in with the Web GUI, you can add, edit, or delete user names in the user access list. The user list can contain up to 15 names (in addition to “admin”). Users are required to enter a user name and password to log in to the system. All Users and Admin have the same privileges.

Use the procedures in this section to manage user access to the SyncServer S6x0.

Logging In

Use the following procedure to log in to the system at the admin level.



Note: The default user name is “admin” and the default password is: Microsemi .

To avoid unauthorized access, you should change the default password.

Adding a User

Use the following methods to add a user to the system access list.

Table 6-2. Adding a New User

Method	Steps	Notes
Web Interface	Security > Users 1. Enter New Username 2. Enter New Password 3. Retype New Password 4. Use radio buttons to select the desired type of password recovery question 5. Enter Answer to password recovery question 6. Enter email address of user for password recovery communication 7. Enter SMTP gateway IPv4 address for SyncServer 8. Send Test Email. 9. Click the Apply button	
CLI	n/a	
Front Panel	n/a	



Note: The User name can only have alphanumeric characters, hyphen, and underline, with a maximum of 32 characters. Alphabetic characters in User names must be lowercase.

- abcdefghijklmnopqrstuvwxyz
- 0123456789
- -_

There is a maximum of 16 users, including admin user.



Note:

- Passwords must be at least 8 characters (maximum of 64 characters), and need to include at least 1 upper-case, 1 lower-case, 1 number, and 1 special character.
- The following characters are not allowed: (, ", <, >, &,), \$

Deleting A User

Use the following methods to delete a user from the system access list. Do not delete the default username and password.



Note: The “admin” account cannot be deleted or renamed.

Table 6-3. *Deleting a User*

Method	Steps	Notes
Web Interface	Security > Users 1. Select the user to be deleted with User dropdown box 2. Click the Delete Selected User box. 3. Click the Apply button.	
CLI	n/a	
Front Panel	n/a	

Changing a User’s Password

Use the following procedure to change a user's password.



Note:

- Passwords must be at least 8 characters (maximum of 64 characters), and need to include at least 1 upper-case, 1 lower-case, 1 number, and 1 special character.
 - The following characters are not allowed: & < > ' "
-

Table 6-4. Changing a User's Password

Method	Steps	Notes
Web Interface	Security > Users 1. Select the user with User dropdown box 2. Enter the new password in the New Password box 3. Enter the new password in the Retype New Password box 4. Click the Apply button.	
CLI	n/a	
Front Panel	n/a	

Provisioning the Ethernet Ports

Provisioning Ethernet Port

Ethernet Auto-Negotiation

The Ethernet ports LAN1-LAN6 ports can be configured to allow automatic negotiation of their connection speeds. When the Speed setting for a port is set to "Auto" (default), auto-negotiation is enabled and the SyncServer S6x0 will advertise connection speeds of 100/1000M. The user can also select a connection speed for a port of 100M or 1000M to configure the speed used by auto-negotiation.

IP Version

The Ethernet ports LAN1-LAN6 ports can be individually configured for either an IPv4 or IPv6 address. Use the dot-decimal notation format xxx.xxx.xxx.xxx to enter the IPv4 address parameter.

Configuration - DHCP or Static

The SyncServer S6x0 supports static as well as dynamically allocated IP addresses on the Ethernet ports LAN1 - LAN6. For a dynamically allocated address with the DHCP setting, a connection to a DHCP server is required. In Static mode, the user must configure the IP parameters (Host Address, Subnet Mask, and Gateway Address) for the Ethernet port.



Note: The LAN1 interface should not be configured with the same address as any of the other Ethernet ports. If this is done, then network access could be lost to the LAN1 management interface.

All Ethernet Interfaces (LAN1, LAN2, LAN3, LAN4, LAN5, LAN6) must be configured to be in different subnets/networks. If any two or more IP interfaces have the same subnet, those interfaces will not function properly.



Note: If using a gateway, then all IP interfaces should be configured with the proper gateway IP address and subnet mask. If not using a gateway, then configure the SyncServer S6x0 to not use a gateway by setting the gateway address to 0.0.0.0. If a gateway address is programmed on LAN1, then the gateway/router must be present and reachable for the port to operate normally.

Table 6-5. Setting Ethernet Port Parameters

Method	Steps	Notes
Web Interface	<p>Network > Ethernet</p> <ol style="list-style-type: none"> 1. Select the speed with Speed dropdown box for the desired port 2. Select the IP address type by clicking on the IPv4 check box 3. Enter the IP address using the dot-decimal notation format xxx.xxx.xxx.xxx 4. Enter the Subnet mask using the dot-decimal notation format xxx.xxx.xxx.xxx. For IPv6, enter the prefix length. 5. Enter the Gateway address using the dot-decimal notation format xxx.xxx.xxx.xxx. 6. Click the Apply button. 	
CLI	<pre>set ip ip-address lan {1 2 3 4 5 6} ipv4 address <addrv4_value> netmask <maskv4_value> gateway <gatewayv4_value></pre> <pre>set ip address-mode lan{1 2 3 4} {ipv4 ipv6} dhcp</pre>	
Front Panel	<p>Menu button Select "1) LAN1" Select "1. Configure" Select "1) IPv4" or "2) IPv6 (DHCPv6)" If IPv4, select Addressing Type "1) Static Addr" or "2) DHCP" If IPv4 Static Addr,</p> <ul style="list-style-type: none"> ■ enter IPv4 address and press Enter button ■ enter netmask and press Enter button <p>enter gateway and press Enter button</p>	<p>Can only be used to set parameters for LAN1.</p>

Provisioning Input References

When operating in normal (locked) mode, the SyncServer S6x0 uses an external reference, such as GNSS, to acquire the frequency and/or TOD alignment. Selection among multiple references inputs is based on priority.

The SyncServer 6x0 does not contain a battery-backed real time clock. Therefore, it will always boot up with a default value for the system time. This time will be updated when it obtains time from a time reference such as GNSS, IRIG, or NTP. The default value for the date is the software build date. This date will be used for the first log entries when booting up the unit. The time will change to local time during the boot-up process if a time zone has been configured.

The system will monitor all inputs and determine if there is a valid signal on each input. The system only uses one reference at a time. The highest priority valid input will be used. This is specified in the [Timing - Input Control Window](#). Each reference has a different priority - the slot A and slot B references will have different priorities. With release 2.1, the priorities can be changed. All releases allow individual input references to be enabled/disabled. A frequency reference is only used if there are no valid timing references.

Setting GNSS Parameters

When the GNSS reference is enabled, you can set the satellite position parameters either automatically with Survey mode, or manually with Position Hold mode. The GNSS reference input is enabled by default.

In Position Hold mode, you must specify the latitude, longitude, and height. Position Hold mode should not be used unless antenna location has been accurately surveyed.

You can specify the elevation mask which provides a method to filter out satellites used in the timing solution based on elevation (0 = horizon, 90 = direct overhead). The mask selection eliminates satellites smaller than the selected mask value.

You can also specify the cable delay. The effect of the entered value is to move the positioning of the rollover of the second (e.g. PPS) earlier by the value entered, thereby accounting for the delay associated with antenna and cable. See [Table C-1](#) for cable-delay values for Microsemi GNSS antenna kits and accessories.



Note: It is important the cable delay be configured with the proper value. This can be determined from the cable length and the delay of the antenna.

Use the following methods to provision the GNSS port state and GNSS parameters for the SyncServer S6x0.

Table 6-6. Enable GNSS Port and Set GNSS Parameters

Method	Steps	Notes
Web Interface	Timing >Input Control 1. Select radio button for External Input Sources. 2. Click the GNSS check box. 3. Click the Apply button.	Enable GNSS Port.
	References > GNSS Configuration 1. In the GNSS Constellation Selection section, click the check box for GPS, GALILEO, QZSS, GLONASS, or BEIDOU. 2. In the Space Based Augmentation System section, click the Enable check box to enable SBAS. 3. Click the Apply button.	Select GNSS Constellation GPS GALILEO GLONASS BEIDOU QZSS Multi-constellation license is required for BEIDOU, QZSS, GALILEO, or GLONASS access
	References > GNSS 1. Enter Elevation Mask value. 2. Use drop-down box to select Mode of "Survey" or "Position Hold". 3. Enter Latitude value if "Position Hold" mode. Use drop-down box to select North or South. 4. Enter Longitude value if "Position Hold" mode. Use drop-down box to select East or West. 5. Enter Altitude value if "Position Hold" mode. Use drop-down box to select dimensions. 6. Enter Cable Delay value. 7. Click the Apply button.	Set GNSS parameters.
CLI	n/a	
Front Panel	n/a	



Note: If v3.1 or newer software is installed in an older unit, the Web GUI screen will not display Galileo as a choice. Check the Help > About window for the System Inventory. The GNSS Receiver line indicates if the GNSS receiver is Galileo capable.

Provisioning IRIG Inputs on Timing I/O Module

IRIG inputs are supported on Port J1 of the Timing I/O module with the SyncServer S650.



Note: A Flex Port Option license is required for full configurability of all BNC connectors on the Timing I/O module.



Note: The system will automatically detect and decode the modulation frequency of AM-modulated IRIG inputs, regardless of the configured AM modulation frequency. The clockAccuracy value will be based on the configured AM modulation frequency and not the actual input signal modulation frequency.



Note: If an IRIG input is not consistently qualified using the 50-ohm impedance, then try using the high-impedance setting.

Table 6-7. Configure IRIG or Pulse Inputs on Timing I/O Module

Method	Steps	Notes
Web Interface	<p>Option Slot A/B > Timing I/O Card</p> <ol style="list-style-type: none"> In the section of the form labeled “J1 Input”, use dropdown box to select the input signal category of interest: Timecode, “Pulse”, or Off. For TimeCode, use the dropdown box to select the type of IRIG input: <ul style="list-style-type: none"> - DCLS, without YR - DCLS, with YR - 1kHz, without YR - 10kHz, with YR - 10kHz, without YR - 1kHz, with YR - B1344, DCLS - B1344, 1kHz - 100Hz, with YR - C37.118.1 (DCLS) For Pulse, use the dropdown box to select 1PPS or 10MPPS. Click the Apply button. 	<p>Configure IRIG Input on J1</p> <p>For IRIG 1344, the code performs a subtraction using control bits 14 - 19 from the supplied IRIG time with the expectation that this will produce UTC time. This aligns with the C37.118.1-2011 definition.</p>
Web Interface	<p>Timing > Input Control</p> <ol style="list-style-type: none"> In the Manual IRIG Year Input section near the bottom of the window, enter the Year. Click the Apply button. 	<p>Manually Configure Year for IRIG Input on J1</p>
CLI	n/a	n/a
Front Panel	n/a	n/a

Provisioning Sine Wave Inputs on Timing I/O Module

Sine wave inputs are available for Port J2 of the Timing I/O module with the SyncServer S650.



Note: A Flex Port Option license is required for full configurability of all BNC connectors on the Timing I/O module.

Table 6-8. Configure Sine Wave Inputs on Timing I/O Module

Method	Steps	Notes
Web Interface	<p>Option Slot A > Timing I/O Card</p> <ol style="list-style-type: none">For input J2, use dropdown box to select “Sine” or Off.If sine is selected, use the dropdown box to select the frequency of the sine wave input:<ul style="list-style-type: none">- 10 MHz- 5 MHz- 1 MHzClick the Apply button.	
CLI	n/a	n/a
Front Panel	n/a	n/a

Provisioning T1/E1 Input on Timing I/O Telecom Module

T1 or E1 input is available for Port J7 of the Timing I/O Telecom module with the SyncServer S650.



Note: On E1 or T1 signals that support SSM, the SyncServer will decode the SSM. If the SSM corresponds to a value worse than the internal oscillator, then the signal will be disqualified. If the input signal doesn't support SSM, then the highest quality level is assumed for the input. See [Appendix F, PQL Mapping](#) for details.

The following signals support SSM: T1 with ESF framing and E1 CAS or CCS with CRC enabled.



Note: A Flex Port Option license is required for full configurability of all BNC and RJ48c connectors on the Timing I/O Telecom module.

Table 6-9. Configure T1 or E1 Input on Timing I/O Telecom Module

Method	Steps	Notes
Web Interface	<p>Option Slot A/B > Timing I/O Card</p> <ol style="list-style-type: none"> For J7 Input/Output, use dropdown box to select T1 input. In the Frame Type area, click the Edit button, Use the Frame Type dropdown box to select the T1 frame type: <ul style="list-style-type: none"> - ESF - D4 - 1.544 MHz Use the SSM dropdown box to select the SSM bit. Click the Apply button. 	A Flex Port Option license is required for T1 Input on J7 connector of the Timing I/O Telecom module.
Web Interface	<p>Option Slot A/B > Timing I/O Card</p> <ol style="list-style-type: none"> For J7 Input/Output, use dropdown box to select E1 input. In the Frame Type area, click the Edit button, Use the Frame Type dropdown box to select the E1 frame type: <ul style="list-style-type: none"> - CAS - CSS - 2.048 MHz Use the SSM dropdown box to select the desired SSM bit. To enable CRC, click the Enable box for CRC State. Click the Apply button. 	A Flex Port Option license is required for E1 Input on J7 connector of the Timing I/O Telecom module
CLI	n/a	n/a
Front Panel	n/a	n/a

Provisioning HaveQuick Input on Timing I/O HaveQuick/PTTI Module

Along with support for all time and frequency input capabilities (including time-interval measurement and event timestamping if Time Interval Measurement license is installed) that are associated with the standard timing I/O module (090-15201-006), additional input reference support is provided for HaveQuick timecode inputs along with an associated precise PPS input. The specifically supported HaveQuick codes are:

- ICD-GPS-060A. This is the originating Havequick code defined in document of same name. See figure 8 and associated descriptions in that document.
- HaveQuick Extended (STANAG 4430). This code adds leap second content (compared to ICD-GPS-060A).
- HaveQuick II (STANAG 4246). This code is the same as ICD-GPS-060A but removes the 8 TFOM bits at the end of the code.

Whichever code is selected it is connected to BNC at J1. The function is to provide time-of-day information into the S6xx.

Precise alignment is provided with a PPS input on the J2 connection. The J1 and J2 inputs are used cooperatively to establish "wall clock" time (J1) with high-precision (J2).

Using the Web Interface, the following steps are used to synchronize time from any of these codes:

1. As with any synchronization input to S6xx, the input must be enabled. This is always accomplished on the Timing > Input Control form. The figure below shows the relevant portion of the form. In this case since the HaveQuick/PTTI module is in slot A, only the Slot A J1 Timecode needs to be enabled.

Select Apply to complete the configuration.



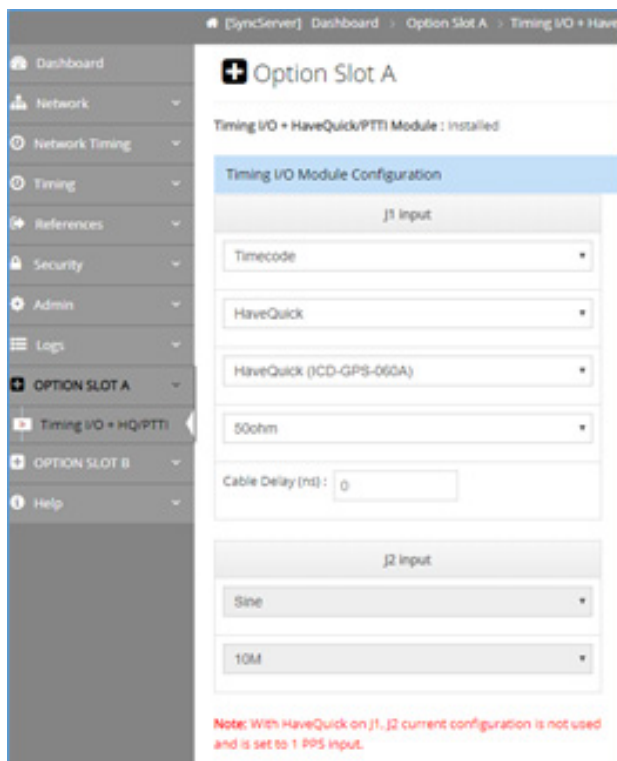
Note: As will be seen, when J1 is configured for a HaveQuick input, J2 is automatically configured to expect an associated PPS input. There is no need to enable J2 on this form.

Time Reference Priority		
Enable	Reference	Priority
<input type="checkbox"/>	GNSS	1
<input checked="" type="checkbox"/>	Slot A J1 Timecode	2
<input type="checkbox"/>	Slot B J1 Timecode	3
<input type="checkbox"/>	PTP	4

2. The specific input configuration is completed on the module configuration form. Since the HaveQuick/PTTI module is in slot A on this S6xx, the navigation is OPTION SLOT A > Timing I/O + HQ/PTTI. Only the relevant portion of the form is shown below.

- The top selection for J1 is shown as Timecode. If something else is in this list box, change it to Timecode.
- The 2nd J1 box shows HaveQuick. If something else is in this list box, change it to HaveQuick.
- Given that the 1st and 2nd list boxes are set as shown, the 3rd box can be set to any of the supported HaveQuick codes.
- Notice that J2 input is grayed out. No selections are possible whenever HaveQuick is selected for J1. This is because with HaveQuick on J1 a PPS input is the only allowed (and required) input for J2. Rather than force an explicit configuration, the note in red below the J2 input controls explains this situation. This approach also has the benefit that any other configured use of J2 (when relevant) remains configured when needed.
- Since the precise alignment comes from the PPS on J2, the cable delay control on J1 (bottom control for J1) is used to compensate cable delay on the PPS connection at J2. For example, if 100 ns is entered, this will cause the synchronization of the J2 PPS to be moved earlier by 100 ns compared with the PPS rising edge arriving at J2.

Select Apply to complete the configuration.



Assuming that appropriate inputs are being provided to J1 and J2, the S6xx will lock to this source of time. The status can be seen on the References > Status form and most comprehensively on the Dashboard > Timing form, shown below. Note that only J1 is indicated here (which is where the HaveQuick code is connected), but the J2 PPS input is also part of this combined reference and is required to obtain lock. Note: If there is no J2 PPS an LOS alarm will set.

Timing	
Time of Day Status	Locked
Current Reference	Slot A J1 (Timecode)
Timing References	Slot A J1 (Timecode)
Frequency References	
Leap Pending	None

Note that this module supports outputs that are compatible with these inputs, so it is possible to use another S6xx that has a HaveQuick/PTTI module as a source to evaluate the capability.

Provisioning PTP Client Input

The LAN2 - LAN6 ports can be configured as PTP Client inputs with the SyncServer S650.



Note: A PTP Input Option license is required for this feature.

Table 6-10. Configure PTP Client Inputs

Method	Steps	Notes
Web Interface	<p>Network Timing > NTPr/PTP Config</p> <ol style="list-style-type: none"> 1. In the “ADD NEW” row, enter the User-Defined Name for the service. 2. In the “ADD NEW” row, use the Service dropdown box to select “PTP Client”. 3. In the “ADD NEW” row, use the Profile dropdown box to select desired profile. 4. To configure the PTP client, click the blue Configure icon in the “ADD NEW” row, The Configurable Parameters window will open. 5. Make desired changes to the configurable parameters. Click the OK button when done. 6. Click the green ADD button. <p>Network Timing > NTP /PTP Mapping</p> <ol style="list-style-type: none"> 1. For the desired LAN port, use the Service Name dropdown box to select the desired PTP client service. 2. Click the Apply button for the port being mapped. 	
CLI	n/a	n/a
Front Panel	n/a	n/a

GNSS must be configured, enabled, and connected if the "Auto-Asymmetry Correction" is enabled. The asymmetry correction feature allows the system to learn and correct for asymmetry in the network between the PTP master and the PTP client in the SyncServer. If asymmetry correction is enabled without GPS, then the PTP client will only be used to adjust the system frequency and won't adjust the system time.

Provisioning Inputs with Manual Entry Controls

The common purpose for the manual entry controls at the bottom of the Timing > Input Control window, see [Figure 6-5](#), is to provide a method to enable the S6xx to become aware of time-related status information in scenarios where they currently are no timing input capable of providing that status. The value of this may be best understood by considering that the S6xx can simultaneously support a variety of time inputs and outputs. If a particular time input does not, on its own, provide information that is needed to fully support a different type of time output then, without the method described in this section, such an output would have to report degraded status. Each of these controls exists to "fill in a gap" that otherwise would exist and lead to degraded time output capability. [Table 6-12](#) describes the manual entry controls. [Table 6-11](#) summarizes all available timing inputs and any gaps they might have, identifies the manual controls that can remove any gaps, and finally outputs that utilize the specific information.



Note: This section is not about the use of the "Forced Manual Time Entry" control, which has a narrow use-mode that is described in that area of the web form..

Figure 6-5. Timing - Input Control Window - Lower Portion

Manual IRIG Year Input		Manual UTC Offset from TAI	
Year	<input type="text" value="2017"/>	Offset (s)	<input type="text" value="0"/>
		<input type="button" value="Apply"/>	

Manual Leap Second Notification		
Adjustment	<input type="radio"/> +1 Second <input type="radio"/> -1 Second <input checked="" type="radio"/> None	<input type="button" value="Apply"/>
Date (at midnight)	<input checked="" type="radio"/> June 30 <input type="radio"/> December 31	
Note: Leap second notification is used with IRIG time code input to manually provide advance notification of a pending leap event to NTP clients. The NTP leap second flag will be raised the day of the pending event. If GPS or NTP is the current time source at the time of the leap event, the NTP leap notification follows the leap notification data provided by GPS or NTP and this manual leap second notification feature is not used.		

Table 6-11. Situations where use of manual time-information can allow for full capability on outputs

Input Time Reference	Information not provided by this timing reference category	Impact to outputs if not manually supplied (or provided by other qualified input)	Remedy	Notes
Any IRIG that includes current year, other than 1344 or C37.118	<ul style="list-style-type: none"> ■ No UTC offset from TAI ■ No pending leap 	<p>PTP:</p> <ul style="list-style-type: none"> ■ can't set TAI timescale ■ can't set UTCoffsetValid flag ■ can't indicate pending leap <p>NTP:</p> <ul style="list-style-type: none"> ■ can't indicate pending leap <p>IRIG1344/C37.118:</p> <ul style="list-style-type: none"> ■ can't indicate pending leap 	<p>Manually set:</p> <ul style="list-style-type: none"> ■ utc offset ■ pending leap 	IRIG is presumed to always supply UTC timescale.
IRIG "no year"	<ul style="list-style-type: none"> ■ No UTC offset from TAI ■ No Current year ■ No pending leap 	<p>PTP:</p> <ul style="list-style-type: none"> ■ can't set TAI timescale ■ can't set UTCoffsetValid flag ■ can't indicate pending leap <p>NTP:</p> <ul style="list-style-type: none"> ■ can't provide UTC time ■ can't indicate pending leap <p>IRIG1344/C37.118:</p> <ul style="list-style-type: none"> ■ can't provide UTC time ■ can't indicate pending leap 	<p>Manually set:</p> <ul style="list-style-type: none"> ■ utc offset ■ pending leap ■ current year 	These IRIG codes are a subset that do not provide the current year. For standard coding of IRIGs, the codes that lack year have last digit in the range 0 - 3. If range is 4 - 7 the year is provided. For example, B000 - B003 do not provide year, B004 - B007 provide year.

Table 6-11. Situations where use of manual time-information can allow for full capability on outputs (Continued)

Input Time Reference	Information not provided by this timing reference category	Impact to outputs if not manually supplied (or provided by other qualified input)	Remedy	Notes
IRIG 1344 or C37.118	No UTC offset from TAI	PTP: <ul style="list-style-type: none"> ■ can't set TAI timescale ■ can't set UTCOffsetValid flag 	Manually set: <ul style="list-style-type: none"> ■ utc offset 	As a practical matter, the pending leap is only for one minute, so this may not be useful for some applications - in which case manual use of pending leap can help.
NTP	<ul style="list-style-type: none"> ■ No UTC offset from TAI 	PTP: <ul style="list-style-type: none"> ■ can't set TAI timescale ■ can't set UTCOffsetValid flag 	Manually set: <ul style="list-style-type: none"> ■ utc offset 	
GNSS without GPS in the constellation configuration	<ul style="list-style-type: none"> ■ No UTC offset from TAI ■ No Pending leap 	PTP: <ul style="list-style-type: none"> ■ can't set TAI timescale ■ can't set UTCOffsetValid flag ■ can't indicated pending leap NTP: <ul style="list-style-type: none"> ■ can't indicate pending leap ■ IRIG1344/C37.118: <ul style="list-style-type: none"> ■ can't indicate pending leap 	Manually set: <ul style="list-style-type: none"> ■ utc offset 	

A simple example of this would be if the only available time input is an IRIG1344 and the S6xx is supporting a PTP (IEEE-1588) Master function. Since the IRIG input provides UTC timescale and PTP uses TAI timescale, the S6xx must convert from UTC time to get to TAI time. However, this conversion requires awareness of the current accumulated leapseconds, information the IRIG input does not supply. Without an auxiliary method for learning this value, the PTP output will encode the Announce message with the `ptpTimescale` flag set to false, which means that PTP clients using this S6xx PTP Master are unable to derive usable time. The remedy for this scenario is for the user to provide the current conversion value, which is easily known. By entering this in the “Manual Offset from TAI” field, the S6xx will now trust this to be the correct conversion and will apply it when it is needed to support an output. In the specific example, the time conversions are now performed (incorporating the user-supplied value), the PTP timestamps will encode TAI time, and the `ptpTimescale` flag is set to true.

Figure 6-12 provides a summary of the function supported by each of the manual entries on this form:

Table 6-12. Manual Time Control Functions

Control	Functionality	Notes
Manual IRIG Year Input	For IRIG inputs that do not supply year, this entry supplies the missing year information. This allows time outputs that include the year to provide a user-supplied correct year.	Once supplied and accepted, the year will progress forward based on this foundation. A quick way to check if the manually entered year is being used is to look on the time in upper right of web interface or front panel of S6xx.
Manual UTC Offset from TAI	Use this control to identify the current accumulated leapsecond difference between TAI and UTC time.	TAI time is the timescale used for PTP (IEEE-1588). Unlike UTC, TAI is not affected by leapseconds, so to convert between these timescales the accumulated difference due to leapseconds must be known.
Manual Leap Second Notification	Use this control to identify that a leapsecond is pending, the direction of the leapsecond, and the date of its occurrence.	<ul style="list-style-type: none"> ■ Once supplied and accepted (and not set to "none") indication that a leap is pending (due to manual entry) will appear on the Dashboard Timing form. ■ Leap pending notifications will be provided (in the timeframe appropriate for the specific output) for any output that is capable of reporting pending leap. ■ Historically, all leapseconds have occurred at either midnight June 30 or midnight December 31 ■ After the time of the leap has passed, the leap will no longer show as pending.

General Behavior Associated with Manual Entry

The following behaviors apply to all of the manual entries:

- If there is currently a qualified time reference that is capable of providing that particular information, then a manual entry supplying that information will NOT be used. In other words, the information from a qualified time reference is given preference over the manual information. A list of currently qualified time references can be seen on the Dashboard > Timing > Timing References row. Any references in this row that are green are qualified. These represent the pool from which that information may be provided.
- Similarly to the prior point, if a manual entry is being used (this happens when there is no qualified input that can provide that information) and an input becomes qualified that can provide it, then the manual value will be discarded in favor of what the input is supplying. This point may help orient the foundational purpose for these controls: they are not provided to correct errors from inputs (rare), they are provided to enable a method for these values to become known when there is no current input that can supply them.
- All manual entries are acted upon immediately or not at all. In other words, at the time the value is entered, if the situation at that moment is one that will actually allow use of the value (i.e. there is no qualified time input that is already providing it), then the value will be used (be applied on time outputs as needed).
- The S6xx features the capability to remember the last status that was in use for each of these manual controls. This way, there is a good chance the values will still be correct if power is cycled in a situation where some of these values are not being actively updated by a qualified time reference. This would be the case if only an IRIG (or NTP) was providing time input. On this point, it is important to realize that:
 - Even if using a manually entered year, the year will increment correctly at the end of the year. This means that on power-cycle the year that will be used won't necessarily be the value that was entered but will also incorporate any year increments that had taken place while operational.
 - If using a manually entered pending leap, if the time when the leap is scheduled to occur has not yet occurred when power is cycled, upon power-up the S6xx will remember that a leap had been pending. However, upon discovery of the current time if it turns out that the time for the leap has passed, then the pending leap will be turned off. Of course, if on subsequent power-up a time reference is provided that can supply leap pending status, then the condition will entirely be based upon that status.
 - If using a manually entered UTC offset, this value will be updated in the appropriate direction if a leap event occurs (i.e. the time of a pending leap happens). In this way, the UTC offset can increment even when it was originally entered manually and is not being directly updated by any external time reference.

Manual Entry Example

The example below illustrates the “pooling” behavior that ALL qualified time inputs (not just the selected time reference) are used to learn current status for any of these manual entries. In this case, two IRIG inputs are initially enabled; the specific configurations shown in [Figure 6-6](#) (access this form via References, ³Status). Note that the IRIG input configured for slot A does NOT provide the year whereas the IRIG input configured for slot B does provide the year. Initially, only the no-year IRIG is actually supplied (this is why it is green and the slot B J1 input is red). [Figure 6-7](#) shows the status from the Dashboard, ³Timing form. Since the only qualified (and selected) reference does not provide the year (or pending leap or UTC offset) information, the user can provide this information. On the manual inputs portion of the Timing > Input Control form ([Figure 6-8](#)) an action is taken to provide all of these values. For this example, they are intentionally provided with wrong values in order to illustrate the behavior when inputs are added later that provide the correct information. Of course, in actual usage (where only the input shown is available) the correct information should be provided.

With only the IRIG no-year input qualified ([Figure 6-7](#)) the values shown in [Figure 3](#) were entered. The effectiveness of each of these entries can be seen by the following methods:

- The manually entered year was accepted as can be seen in the upper right of the web application (see [Figure 6-9](#)). All time outputs that provide year information will now be providing this year.
- The manually entered pending leap was accepted as can be seen on the Leap Pending row in [Figure 6-7](#). Outputs that supply pending leap information indicate pending (and direction of the leap) at the time appropriate for those outputs (see section titled Reporting of Leapsecond Pending).
- In release 2.0, the only output that is not based on UTC timescale is the PTP (IEEE-1588) master capability. If a PTP master is configured on one of the LAN ports (2-4), the current value of UTC to TAI conversion can be seen on the Network Timing, ³NTP/PTP Status form. For this example, LAN2 had been configured for PTP master function. [Figure 6-10](#) shows a portion of the status. Note that the Current UTC offset value is shown to be 14 seconds, which is due to the manual entry ([Figure 6-8](#)). Note also that a pending leap is NOT shown even though it is indicated on [Figure 6-7](#). This behavior is illustrated in [Figure 6-14](#).

Now connect the year-capable IRIG that is configured on the slot B J1 input(see [Figure 6-6](#)). [Figure 6-11](#) shows that after this input becomes qualified, the correct year is extracted from this input, shown in the upper right of the web interface (and will be encoded onto any time outputs that provide year). Note that the time input that is currently driving the S6xx outputs is still the IRIG without year connected to slot A J1. This is because that input has higher priority. The example illustrates that ALL qualified inputs are used for extraction of the items shown on [Figure 6-8](#). Even

though the IRIG with year is not actually driving the precise synchronization output in this S6xx, it is now being used to extract the current year. Note that the year may not be immediately adjusted upon qualification of the IRIG that supplies the year, but it will happen within a few minutes. The message log will provide an entry when the timeline shift occurs. Here is an example:

```
Jan 30 18:46:28 SyncServer alarmd: id 152, index 000,  
severity Notify ALARM SET: Timeline has been changed
```

Continuing with this example, the year is now derived from an external input but the pending leap and UTC offset values continue to be taken from the user-entry since the IRIG input on BJ1 does not provide these items either. Since GPS provides all the information, if we provide GPS as an input these remaining items will be driven by the status provided via GPS. Since the manual values were intentionally set incorrectly for this example, they should change to the correct values as GPS comes up. [Figure 6-12](#) Shows that with GNSS now qualified (and it is also selected in this case) the leap pending status has been updated because there is actually no pending leap, which is what the S6xx learned from the addition of the GPS input. Similarly, [Figure 6-13](#) shows that the UTC offset is now showing 37 seconds, which is the correct value. Keep in mind in the situation that is the purpose for these manual controls, such as one where only an IRIG is available as input, then of course the manual entry for leap would have been “none” and UTC offset set to “37”, thus allowing for correct information to be encoded on time outputs even though no active input is providing it.

When GPS was connected, we can see the actions in the message log: the leap pending event is cleared, GPS becomes selected as the S6xx reference for time and frequency, the timeline is changed (due to the change in offset).

```
Jan 30 23:29:40 SyncServer alarmd: id 173, index 000,  
severity Notify, ALARM CLEAR: Leap event pending cleared
```

```
Jan 30 23:29:40 SyncServer alarmd: id 022, index 000,  
severity Notify ALARM SET: GNSS input time qualified
```

```
Jan 30 23:29:42 SyncServer alarmd: id 025, index 000,  
severity Notify ALARM SET: GNSS input selected as frequency  
reference
```

```
Jan 30 23:29:44 SyncServer alarmd: id 024, index 000,  
severity Notify ALARM SET: GNSS input selected as time  
reference
```

```
Jan 30 23:33:32 SyncServer alarmd: id 152, index 000,  
severity Notify ALARM SET: Timeline has been changed
```

Figure 6-6. Time-Related Information is extracted from all qualified inputs

Reference Status

Current Input Reference		SLOT A J1
Input Reference(s)	State	Type
GNSS	Disabled	N/A
NTP	Not Qualified	N/A
Slot A J1	Qualified	TimeCode IRIG B 1kHz, without YR
Slot A J2	Disabled	N/A
Slot B J1	Not Qualified	TimeCode IRIG B 1kHz, with YR
Slot B J2	Disabled	N/A

Figure 6-7. The qualified (and selected) input does not provide year (or leap) information.

Timing

Time of Day Status	Locked
Current Reference	Slot A J1 (Timecode)
Timing References	Slot A J1 (Timecode) Slot B J1 (Timecode)
Frequency References	
Leap Pending	Deletion (Manual)

Figure 6-8. Example showing user-entry of all manual inputs

Manual IRIG Year Input

Year: Apply

Manual UTC Offset from TAI

Offset (s): Apply

Manual Leap Second Notification

Adjustment: +1 Second -1 Second None Apply

Date (at midnight): June 30 December 31

Note : Leap second notification is used with IRIG time code input to manually provide advance notification of a pending leap event to NTP clients. The NTP leap second flag will be raised the day of the pending event. If GPS or NTP is the current time source at the time of the leap event, the NTP leap notification follows the leap notification data provided by GPS or NTP and this manual leap second notification feature is not used.

Figure 6-9. Manually entered year is being used

UTC: 2020-01-30 17:41:28 LOCAL: 2020-01-30 17:41:28

Figure 6-10. Portion of PTP Status

Announce Content

Port identity	00:b0:ae:ff:fe:03:7a:8d, Port:1
Clock class	6
Clock accuracy	within 10 us
Offset scaled log variance	0x3bea
Timescale	PTP
Timesource	Other
Time tracable	True
Frequency tracable	True
Current UTC offset valid	True
Current UTC offset	14 s
Leap 61	False
Leap 59	False
Steps removed	0

Figure 6-11. Qualified (non-selected) input provides year information

⌚ Timing

Time of Day Status	🔒 Locked
Current Reference	Slot A J1 (Timecode)
Timing References	Slot A J1 (Timecode) Slot B J1 (Timecode)
Frequency References	
Leap Pending	Deletion (Manual)

UTC: 2017-01-30 18:49:58 LOCAL: 2017-01-30 18:49:58

Figure 6-12. Adding GPS cleared the pending leap

⌚ Timing

Time of Day Status	🔒 Locked
Current Reference	GNSS
Timing References	GNSS Slot A J1 (Timecode) Slot B J1 (Timecode)
Frequency References	
Leap Pending	None

Figure 6-13. Adding GPS provided the correct UTC offset value

Announce Content

Port identity	00:b0:ae:ff:fe:03:7a:8d, Port:1
Clock class	6
Clock accuracy	within 100 ns
Offset scaled log variance	0x3bea
Timescale	PTP
Timesource	GPS
Time tracable	True
Frequency tracable	True
Current UTC offset valid	True
Current UTC offset	37 s
Leap 61	False
Leap 59	False
Steps removed	0

Reporting of Leapsecond Pending

The ability to provide manual entry of pending leapseconds (see Figure 3) provides benefits beyond the basic capability to inform S6xx of an upcoming leap in a circumstance where it has no way to learn of it from supplied timing inputs. The further benefit has to do with the varying rules (based on signal type) about when a pending leap should be declared in relation to the planned moment of the actual leap event. The concept is shown in [Figure 6-14](#).

- The figure shows a timeline that terminates with the application of a leapsecond.
- The figure shows all time inputs/outputs supported in release 2.0 that are capable of providing indication of a pending leapsecond. Specifically:
 - GPS is always one of the first sources to encode the news that a leapsecond is forthcoming. Because this input is unique in the list in that it is not also an output, there is no need to report (via GPS) to downstream devices from the S6xx that there is a pending leapsecond. For this reason, there is no limitation on how early a leapsecond may be encoded in GPS or on how early the S6xx will indicate it. This gets at a basic point that whenever the S6xx is aware of a pending leapsecond (from any source, including manual entry) this condition will be shown on the Dashboard, Timing form. For example, in [Figure 6-11](#) a pending leap is indicated because it was entered manually (and accepted).

There is a side-note here: release 2.0 supports multiple satellite constellation configuration. Any GNSS input whose configuration does

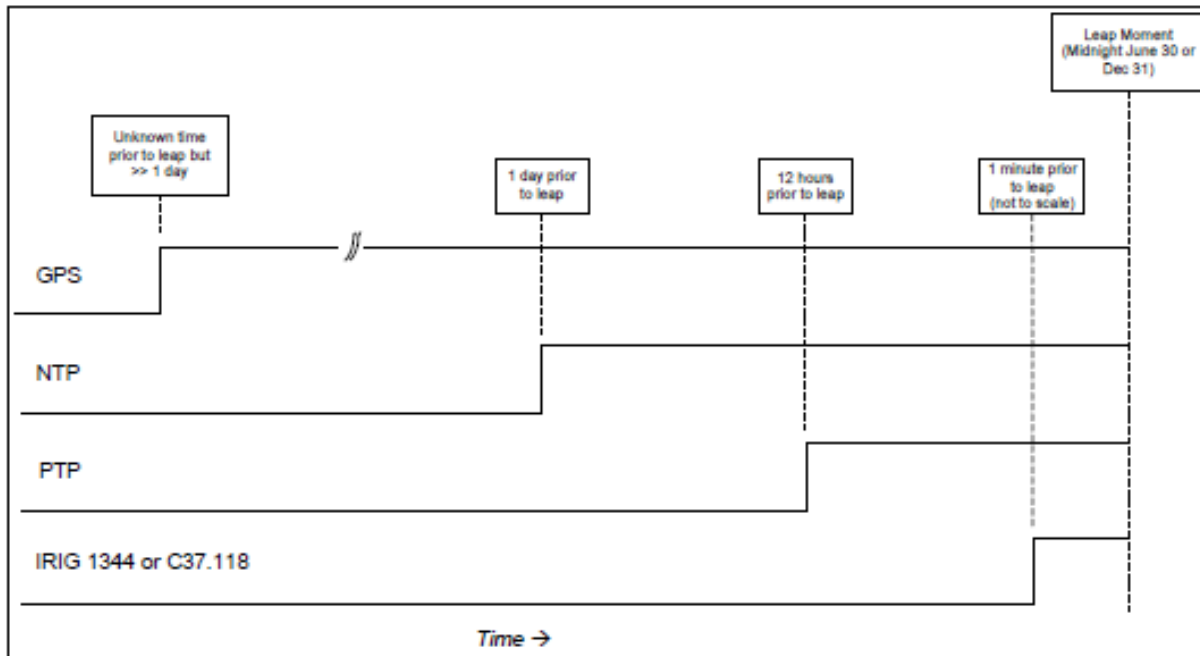
NOT include GPS will not be capable of learning about pending leapseconds or the current UTC offset, so the discussion above is applicable only to combinations that included the GPS constellation. When GPS is not included, the manual methods for indicating pending leapseconds or setting the correct UTC offset are available.

- The other inputs (NTP, PTP (not available as an input in release 2.0), and the IRIG codes shown) have expected notification timeframes (with respect to the leap moment) as shown. What these mean is that, even if there is knowledge of a leap pending in advance of these timeframes (such as would certainly occur with a GPS time reference), the indication on an output of each type should be “held off” until within that timeframe. As shown, with an NTP output the pending leap should not be indicated any sooner than 1 day prior to the event. With PTP, the leap is held off until ½ day prior to the leap event, and finally these special IRIG codes do not announce the pending leap until the final minute before the leap event.

You can think about how these timeframes impact each of these signal types both as an input and as an output, there are some interesting consequences:

- When the leap pending is taken from any of these signals, it will not be detected at the S6xx (at best) until within the appropriate timeframe.
- The S6xx will always do its best on its outputs to fulfill the complete timeframe for that output. However, what happens when the input providing the pending leap has a shorter pre-notification period than an output that is configured? For example, if the incoming signal that provides the leap notification is an IRIG 1344 and the S6xx is configured to function as an NTP Primary Server, the prenotification of the pending leap on NTP will be (at best) one minute because the IRIG 1344 won’t inform the S6xx earlier than one minute before and therefore this status cannot be conveyed on any output sooner than that.

Figure 6-14. Expected Pre-notification Times for Pending Leap Events



With the prior discussion as background the added utility of the manual leapsecond setting can be understood. First, a nuance is added to the basic behavior described for all manual entries in the section titled General Behavior Associated with Manual Entry which stated:

- If there is currently a qualified time reference that is capable of providing that particular information, then a manual entry supplying that information will NOT be used.

In the case of a manual pending leap entry, we amend this to:

- If there is currently a qualified time reference that is capable of providing leap pending information AND the time until the pending leap is within the expected timeframe for that particular input, then a manual leap pending entry will not be used.
- On the other hand, if a manual leap entry is applied before the expected timeframe for all qualified inputs in the pool, then the manual entry will be accepted. In such a case, once the time until the leap moment falls within the timeframe of any qualified input, the information supplied by that input will overrule (if needed) the manual setting.

Examples:

- If GPS is a qualified reference, manual leap pending input will never be accepted since GPS is expected to provide leap pending status (typically) many months prior to the leap moment. There is no formal definition for the timeframe but for sure there will be plenty of notice and hence there is no reason to accept a manual entry.

- If GPS is not a qualified reference, then manual control of leap will be allowed at any time except when the remaining time until leap is within the timeframe of the qualified time input shown in Figure 9 that has the longest timeframe. In this region, the inputs are expected to provide the leap pending status.
- An example where the manual input can help to provide maximum notification to all outputs occurs if IRIG 1344 is the only time input and the S6xx is operating as a PTP GrandMaster. Since the manual input is allowed all the way up to the minute prior to the leap moment, the user can manually enter the pending leap days (even weeks) prior to the leap event. Since the S6xx knows that the IRIG input won't provide any information until the last minute, the manual input is accepted. There is no problem providing the manual notification early because the S6xx knows to hold off based on the appropriate timeframe for the signal type. In this case with PTP output, the notification will appear in the PTP Announce messages . day prior to the event, just as it would have done if the input had been GPS (or even NTP).

Provisioning NTP Associations

The SyncServer can have multiple associations, each with a different Role. NTP associations with non-valid IP addresses and domain names are not shown in the Associations list. (If a known good domain name does not appear on this list, there may be a problem with the DNS server configuration or with the DNS service itself.)

[Table 6-13](#) describes the method to add a new NTP association.

[Table 6-14](#) describes the method to modify an existing NTP association.

[Table 4-7](#) provides descriptions of NTP Association configuration parameters.

The list of Current NTP Associations always includes the local Hardware Clock, which:

- Cannot be deleted or edited.
- Is configured as a preferred server
("server 127.127.45.0 prefer # pseudoaddress for the hardware clock" according to ntp.conf).
- Is displayed at the top of the list.



Note: The NTP hardware reference clock is by default marked with the NTP "prefer" setting. If the user wants to mark a different association as preferred, then the hardware clock should have the "prefer" unselected. The system will not prevent the user from setting multiple associations as "prefer", although this is usually not useful.

The user should consider adding NTP servers available on the local network to the list of Current NTP Associations.



Note: If the system is using NTP as the reference and the NTP server is performing a leap smear, then all non-NTP outputs of the system will be degraded, especially outputs on the optional I/O modules.

NTP Prefer Selection

By default the SyncServer S6x0 Series has the NTP Prefer selected for the local hardware reference clock. In most operating scenarios the local hardware reference clock (which more often than not will be tracking GNSS) will be the only reference being used. With the Prefer being selected, and no statistically better reference available, the time server will achieve Stratum 1 status on startup or restart as rapidly as possible. If the Prefer is not selected for the hardware reference clock

then the NTP daemon will go through a standard validation procedure for a reference clock. This procedure will take several minutes and should happen by the time the reach indicates 377 on the reference clock association. For optimal operation, Microsemi recommends the local hardware reference remain selected as a Prefer in the configuration.

Table 6-13. Add a New NTP Association

Method	Steps
Web Interface	<p>NTP > NTPd Config</p> <ol style="list-style-type: none"> 1. Select the Role with dropdown box as either Server, Peer, or Broadcast. 2. Enter the IP address or DNS name of the NTP association. 3. Select the Port with dropdown box, LAN1, LAN2, LAN3, LAN4, LAN5 or LAN6. 4. Click the “Prefer” checkbox to set this as a prefer association. 5. Select the Burst setting with the dropdown box as N/A, Burst, iBurst, or Both. 6. Select the MinPoll value with the dropdown box. 7. Select the MaxPoll value with the dropdown box. 8. Select the Symmetric key with the dropdown box 9. Click the + button in the right side column to add the association. 10. Click the Save button to save changes. 11. Click the Restart button to make any changes take effect.
CLI	n/a
Front Panel	n/a

Table 6-14. Modify Existing NTP Association

Method	Steps
Web Interface	<p>NTP > NTPd Config</p> <ol style="list-style-type: none"> 1. Select the NTP Association that is to be modified from the list. 2. Change the Role, if desired, with dropdown box as either Server, Peer, or Broadcast. 3. Change the IP address or DNS name, if desired, of the NTP association. 4. Change the Port with dropdown box, if desired, LAN1, LAN2, LAN3, LAN4, LAN5 or LAN6. 5. Click the “Prefer” checkbox, if desired, to select or deselect this as a prefer association. 6. Change the Burst setting, if desired, with the dropdown box as N/A, Burst, iBurst, or Both. 7. Change the MinPoll value, if desired, with the dropdown box. 8. Change the Symmetric value, if desired, with the dropdown box. 9. Change the MaxPoll value, if desired, with the dropdown box. 10. Click the Save button to save changes. 11. Click the Restart button to make any changes take effect.
CLI	n/a
Front Panel	n/a

Provisioning NTP Security

NTPd Symmetric Keys

- Generate the current keys.
- Upload a file containing keys from a local PC drive to the SyncServer.
- Download the SyncServer's current key file to a local PC drive.

Use the GENERATE button to clear previous keys and generate new ones.

NTPd Autokey Server

Use the Security > NTP - Autokey Server page to manage (add or remove) Autokey keys for NTP associations where the SyncServer is an NTP server.



Note: Hostname of Autokey Server and Autokey client must be different. Use the [Admin - General Configuration Window](#) to set hostname..

Configure NTP Autokey Server

Method	Steps	Notes
Web Interface	<p>Security > NTPd Autokey Server</p> <ol style="list-style-type: none">1. In the Identity Scheme IFF section, enter the Server Password. This is equivalent to the "crypto pw <server-password>" line in ntp.conf on a generic NTP device.2. Click the Generate button to create the key file.3. Click the Save as button to download IFF Group key file4. Click the Restart button to make any changes take effect.	<p>Configure NTP Autokey Server</p> <p>While the NTP daemon restarts, its services are temporarily unavailable, and it generates the following alarm events: NTP Stratum Change, NTP System Peer Change, NTP Leap Change.</p>
CLI	n/a	n/a
Front Panel	n/a	n/a

NTP Autokey Client

Use the Security > NTP - Autokey Client page to manage (add or remove) Autokey keys for NTP associations where the SyncServer is an NTP client..



Note: Hostname of Autokey Server and Autokey client must be different. Use the [Admin - General Configuration Window](#) to set hostname..

Table 6-15. Configure NTP Autokey Client

Method	Steps	Notes
Web Interface	Security > NTPd Autokey Client 1. Browse to locate the Group Key File from a secure location. 2. Click the Install button to save the AutoKey Client File to the SyncServer. 3. Enter a password and click the Generate button. 4. Click the Restart button to make any changes take effect. 5. Go to Network Timing > NTPd Config web page. 6. Add role of server, and select "Auto" from Symmetric pull-down. 7. Click the Save button. 8. Click Restart button.	Install IFF Group Key File While the NTP daemon restarts, its services are temporarily unavailable, and it generates the following alarm events: NTP Stratum Change, NTP System Peer Change, NTP Leap Change.
CLI	n/a	n/a
Front Panel	n/a	n/a

Add NTP Server Association using Autokey Authentication

Use the Network Timing > NTPd Config page to add NTP server associations where the SyncServer is Autokey Client..

Table 6-16. Configure NTP Autokey Client

Method	Steps	Notes
Web Interface	Network Timing -> NTPd Config <ol style="list-style-type: none">1. Add a Role of Server.2. Select 'Auto' from Symmetric pull-down menu3. Optional step: Check 'Prefer' for newly added NTPd server association and Uncheck 'Prefer' for Hardware Reference Clock, so that newly added NTPd will be selected as input reference over GNSS.4. Click the Save button.5. Click the Restart button to make any changes take effect.	
CLI	n/a	n/a
Front Panel	n/a	n/a

Provisioning Outputs

Configuring Network Timing Services

The form Network Timing,,> NTPr/PTP Config) supports generalized configuration of network timing services. The concept is that the ability to create and retain definitions for specific services, independently of the connection method, provides a useful way to aggregate within the S6x0 all network timing services that are of interest for that particular unit. As added services are provided in future releases, this form will evolve to support extended service capabilities. Up to 10 services (rows) can be created.

To use any of the services defined on this form, map that service to the specific physical network port where it should run. This is accomplished on the Network Timing „> NTP/PTP Mapping form.

Example - Creating a Network Timing Service

Figure 6-15 shows the timing services configuration form. Five services have previously been configured for this example. See Table 4-8 for descriptions of the parameters (columns) in this form.

Figure 6-15. Configuration of Network Timing Services

⌚ NTPr / PTP Config

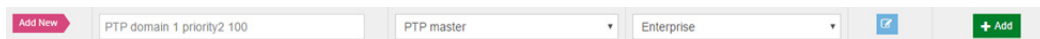
Note : Use this page to configure NTP reflector and PTP service. Then, use the Network Timing -> NTP/PTP Mapping page to map a service to a LAN port. You can name each service and configure up to 10 service: service cannot be deleted if it is mapped. But, you can always reconfigure a mapped service. The updated configuration of the mapped service will be communicated to the running service provider.

Internal ID	User-defined Name	Service	Profile	Configure	Save	Delete
(0)	NTPd	NTPd				
(2)	PTP using domain 3 and 2-step	PTP master	Enterprise			
(3)	PTP using domain 2 and 1-step	PTP master	Enterprise			
(4)	PTP slow packet rate	PTP master	Enterprise			
(5)	PTP high packet rate	PTP master	Enterprise			
(6)	NTPr operation	NTP reflector				
Add New	<input type="text"/>	PTP master	Enterprise			+ Add

To illustrate the process we walk through creating one more row, starting with Figure 6-15.

Suppose we want to use the S6x0 as a 1588 (PTP) GrandMaster. As part of an overall network plan, we want this one at a higher priority than another S6x0 that is providing PTP Grandmaster services in this same network. Our intent for doing this is so that if the clock quality being reported by both grandmasters is the same, then the BMCA (Best Master Clock Algorithm) executing at the downstream PTP clients will choose this S6x0 because of its better priority. Here are the steps:

- Using the Add New row, type in a helpful name for this service. This name reminds us that this service has the priority2 setting set to 100 and the PTP domain set to 1. Both of these will be accomplished later in this example.



- At this point there are 2 ways to proceed, both essentially equivalent:
 - Select the +Add control, which will create a new row in the table. From there we can further edit to the desired specific settings. This illustrates a general feature that any row in the table can be edited, so it is not always necessary to create a new one if it is preferred to alter an existing one.

- Alternatively, continue editing to the final configuration prior to selection of +Add. Doing it this way will result in the new row being saved to the desired settings when it is created (this will be evident since the Save control will be grayed out).

Both of these methods get to the same outcome, there is no clear advantage for either one.

For this example, the +Add control is selected now, resulting in [Figure 6-16](#).

Figure 6-16. Example - New Timing Service Configuration

⊙ NTPr / PTP Config

Note : Use this page to configure NTP reflector and PTP service. Then, use the Network Timing -> NTP/PTP Mapping page to map a service to a LAN port. You can name each service and configure up to 10 service service cannot be deleted if it is mapped. But, you can always reconfigure a mapped service. The updated configuration of the mapped service will be communicated to the running service provider.

Internal ID	User-defined Name	Service	Profile	Configure	Save	Delete
(0)	NTPd	NTPd				
(2)	PTP using domain 3 and 2-step	PTP master	Enterprise			
(3)	PTP using domain 2 and 1-step	PTP master	Enterprise			
(4)	PTP slow packet rate	PTP master	Enterprise			
(5)	PTP high packet rate	PTP master	Enterprise			
(6)	NTPr operation	NTP reflector				
(10)	PTP domain 1 priority2 100	PTP master	Enterprise			
	<input type="text"/>	PTP master	Enterprise			

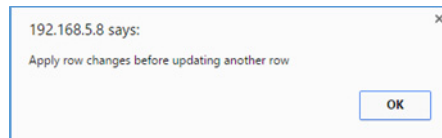
The new timing service is shown on the bottom row. Note that it was auto-assigned ID = 10, the actual value is not important. S6x0 assures that it is unique. Note also that the Save control is grayed out, indicating that there is nothing to save. However, since we haven't yet completed all of the desired configuration there is still work to do.

- Since the default values for Service and Profile columns happen to be what we want for this service, there is no need to change them. In general, if these did need to be changed they should be done in left-to-right (Service, then Profile, then Configure) order since the columns to the right will adapt based on selections to the left.
- Select the Configure control, which brings up [Figure 6-17](#), which always begins with default values the first time a new service is created. For this example we need to change the Domain and the Priority2 values. Set Domain = 1 and Priority2 = 100, then OK. [Figure 6-17](#) shows the configuration with these changes, just before selecting OK. This action returns back to [Figure 6-16](#) but now the detailed configuration matches the desired setup, as described in the User-Defined Name.

- To complete the configuration, select the Save button for this row. The appearance of the form just before this save action is shown in [Figure 6-18](#). Compare this with [Figure 6-16](#) for the following notes:
- [Figure 6-18](#) shows the Save button is ready to be used (it is not grayed out) and the entire row associated with the new service is highlighted. These are clues that the full configuration has not been completed. Why is that? It's because we made a change on the configuration form (and saved it with the OK) but we have not saved it at the top level (the entire timing service).

Contrast this with [Figure 6-16](#). Here the Save is grayed out because there are no pending changes (this was before the changes were made on the configuration form).

- If pending (unsaved) changes have been made to any row and an action is taken to make changes on a different row, a box will appear indicating that there are unsaved changes.



Similarly, if there are pending changes and a new form is selected, this form will appear to make sure the action is intended.

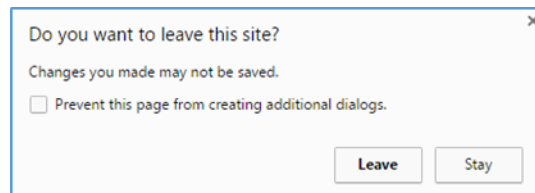


Figure 6-17. Modified configuration for "PTP domain 1 priority2 100" just before OK selected

PTP Profile Parameters			
Domain	<input type="text" value="1"/> <small>Valid range: [0,127]</small>	Log Announce Interval	<input type="text" value="0 (1 pkt/sec)"/>
Two-step	<input type="text" value="True"/>	Log Sync Interval	<input type="text" value="-7 (128 pkt/sec)"/>
Priority 1	<input type="text" value="128"/> <small>Valid range: [0,255]</small>	Log Delay Interval	<input type="text" value="-7 (128 pkt/sec)"/>
Priority 2	<input type="text" value="100"/> <small>Valid range: [0,255]</small>	Announce Timeout	<input type="text" value="3"/> <small>Valid range: [3,3]</small>
Diffserv Code	<input type="text" value="0"/> <small>Valid range: [0,64]</small>	TTL	<input type="text" value="16"/> <small>Valid range: [1,255]</small>
Delay Transport	<input type="text" value="Multicast"/>		

Figure 6-18. New timing service just before final save

NTPr / PTP Config

Note : Use this page to configure NTP reflector and PTP service. Then, use the Network Timing -> NTP/PTP Mapping page to map a service to a LAN port. You can name each service and configure up to 10 service service cannot be deleted if it is mapped. But, you can always reconfigure a mapped service. The updated configuration of the mapped service will be communicated to the running service provider.

Internal ID	User-defined Name	Service	Profile	Configure	Save	Delete
(0)	NTPd	NTPd				
(2)	PTP using domain 3 and 2-step	PTP master	Enterprise			
(3)	PTP using domain 2 and 1-step	PTP master	Enterprise			
(4)	PTP slow packet rate	PTP master	Enterprise			
(5)	PTP high packet rate	PTP master	Enterprise			
(6)	NTPr operation	NTP reflector				
(10)	PTP domain 1 priority2 100	PTP master	Enterprise			
	<input type="text"/>	PTP master	Enterprise			

Once a timing service has been created its configuration can be changed as desired, including the name. In other words, an existing service can be re-purposed or modified as needed.

Notice that there is a predefined row with internal ID = (0) at the top of the row portion of Figure 6-15, named NTPd. The NTPd service has always been available on S6x0 and is supported on all physical network ports. NTPd configuration is accomplished on the Network Timing'NTPd Config form. Rather than create a new method for its configuration, the existing method remains. However, as is seen in Mapping a Network Timing Service to a LAN Port, the method for mapping use of NTPd to physical network ports is consistent with all network timing services, which is why this row (non-deletable and non-configurable) appears on this form.

Mapping a Network Timing Service to a LAN Port

Creation of network timing services Figure 6-15 provides a customizable method for configuring specific services for use on a given S6x0. Selecting Network Timing > NTP/PTP Mapping provides the method to associate a service with the physical network port where it should operate. Figure 14 shows this form as it will appear on first power-up (factory preset).

The form lists all physical ports that support multiple timing services. This is currently LAN 2, 3, 4, 5 6). LAN1 currently supports only NTPd and is always mapped to that service, so it does not appear here. As the S6x0 capability evolves, the set of choices and assignment rules will evolve on this form. The service choices and allowed mapping rules are as described in Table 6-17. The behavior described in Table 6-17 is enforced by the form controls.

Figure 6-19. Factory Preset Mapping Form

LAN	NTPr / PTP Service Name	Transport	Multicast Dest Address	Address	Apply
LAN2	(0) NTPd				<input type="button" value="Apply"/>
LAN3	(0) NTPd				<input type="button" value="Apply"/>
LAN4	(0) NTPd				<input type="button" value="Apply"/>

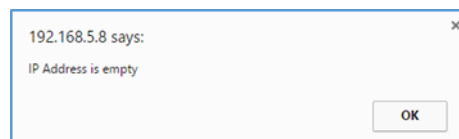
Table 6-17. Network Timing Service Mapping

Network Timing Service	Individual Mapping Rules	Combined Mapping Rules
NTPd	Supported on LAN1, LAN2, LAN3, LAN4, LAN5, LAN6	Always mapped to LAN1. Can be mapped to any combination of other ports as long as no other timing service is mapped to that port.
PTP Master	Can be mapped to any of these physical ports: LAN2, LAN3, LAN4, LAN5, LAN6	Can be mapped to any combination of ports as long as no other timing service is mapped to that port.
NTPr	Can be mapped to any of these physical ports: LAN2, LAN3, LAN4, LAN5, LAN6	Can be mapped to an allowed physical port if PTP Master is not mapped to a port.
PTP Client	Can be mapped to any of these physical ports: LAN2, LAN3, LAN4, LAN5, LAN6	Can be mapped to any combination of ports as long as no other timing service is mapped to that port.

Example - Mapping a Network Timing Service

Suppose that the goal is to provide the PTP Master service that was created (prior example [Figure 6-18](#)) on LAN4.

The first step (if not already done) is to configure LAN4 with a network configuration. This is accomplished on the Network > Ethernet form. [Figure 6-20](#) shows an example where LAN4 has been configured to IPv4 address 192.168.100.99. Attempting to complete a service mapping to a LAN that has not been configured will result in this message:



Next, the desired service is selected from the list box in the Service Name column. Since this example maps the service to LAN4, the list box from that row is used. Figure 16 shows the selection set. This list will always show the first two columns of whatever has been configured on Figure 6-18. As will be seen, the list does not filter out selections that may not actually be allowed per the combined mapping rules column of Table 6-17; the list always shows all services that could possibly be assigned to that port.

Selection of the service associated with internal ID (10), results in Figure 6-22. Note that this row is highlighted as indication that this assignment is not actually complete. The apply button on the right of this row is now available as indication that something needs to be saved.

Selection of apply will attempt to complete the mapping. This action causes any specific mapping rules (see Table 6-17) to be enforced, which could lead to non-acceptance of the candidate entry (more about this later). In this case the mapping meets all requirements and is accepted, the form after acceptance is shown in Figure 6-23. This service is now active on LAN4.

The current mapping of network timing services to LAN ports can also be observed on the Dashboard >Timing Services form. Figure 6-24 shows how this looks with the example just shown. As can be seen this form also shows LAN1 which in 2.0 release is always mapped to NTPd.

Figure 6-20. Example configuration on Network > Ethernet form

LAN	Link	Speed	IP	Config	Address	Subnet Mask / Prefix Length	Gateway	Apply
LAN1	↑	Auto	<input checked="" type="checkbox"/> IPv4 <input type="checkbox"/> IPv6 Autoconfig	DHCP	192.168.5.8	255.255.255.0	192.168.5.1	▶
LAN2	↑	Auto	<input checked="" type="checkbox"/> IPv4 <input type="checkbox"/> IPv6 Autoconfig	Static	192.168.99.99	255.255.255.0	192.168.99.1	▶
LAN3	↓	Auto	<input type="checkbox"/> IPv4 <input type="checkbox"/> IPv6 Autoconfig	Static				▶
LAN4	↑	Auto	<input checked="" type="checkbox"/> IPv4 <input type="checkbox"/> IPv6 Autoconfig	Static	192.168.100.99	255.255.255.0	192.168.100.1	▶

Figure 6-21. Timing Services choices appear in list box

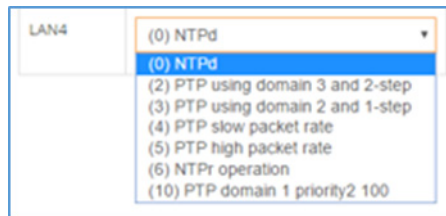


Figure 6-22. PTP Master timing service is in process of being mapped to LAN4

NTP / PTP Mapping

Note: The available NTP reflector and PTP services that can be selected are dependent on the installed software options. See Admin -> Options for the installed software options. You can map either a NTP reflector or a PTP service to a LAN port.

LAN	NTPr / PTP Service Name	Transport	Multicast Dest Address	Address	Apply
LAN2	(0) NTPd				<input type="checkbox"/>
LAN3	(0) NTPd				<input type="checkbox"/>
LAN4	(10) PTP domain 1 priority2 100	IPv4		192.168.100.99	<input type="checkbox"/>

Figure 6-23. Successful completion of mapping new timing service to LAN4

NTP / PTP Mapping

Note: The available NTP reflector and PTP services that can be selected are dependent on the installed software options. See Admin -> Options for the installed software options. You can map either a NTP reflector or a PTP service to a LAN port.

LAN	NTPr / PTP Service Name	Transport	Multicast Dest Address	Address	Apply
LAN2	(0) NTPd				<input type="checkbox"/>
LAN3	(0) NTPd				<input type="checkbox"/>
LAN4	(10) PTP domain 1 priority2 100	IPv4		192.168.100.99	<input type="checkbox"/>

Figure 6-24. Dashboard Timing Services shows current mapping

Timing Services

LAN	Name	Timing Service	IP
LAN1	(0) NTPd	NTPd	192.168.5.8
LAN2	(0) NTPd	NTPd	192.168.99.99
LAN3	(0) NTPd	NTPd	192.168.101.99
LAN4	(10) PTP domain 1 priority2 100	PTP master	192.168.100.99

Observing Status of Network Timing Services

Previous sections have covered Creating a Network Timing Service and Using a Network Timing Service. This section discusses how to observe the status of a timing service. To start with, keep in mind that a network timing service (defined on [Figure 6-15](#)) is only actually in use when it is mapped to a physical network port, accomplished on [Figure 6-19](#). Hence the set of services that will have status are those that have been mapped to a LAN port.

There are two areas on the web interface where timing service status can be observed. For NTPd:

1. Network Timing > Sysinfo provides complete status, showing standard NTP parameter values. The example below shows a typical status when the hardware

clock is GNSS. This status is applicable to all LAN ports that are mapped to NTPd.

Figure 6-25. NTPd status example

NTPd Sysinfo

NTP Daemon Status and Control	
System Peer	127.127.47.0
System Peer Mode	client
Leap Indicator	00
Stratum	1
Log2 Precision	-18
Root Delay	0.000 ms
Root Dispersion	0.008 ms
Reference ID	GNSS
Reference Time	dc439842.0dd27eda Tue, Feb 7 2017 0:50:10.053
System Jitter	0.003815 ms
Clock Jitter	0.004 ms
Clock Wander	0.000 ppm
Broadcast Delay	-50.000 ms
Symm Auth Delay	0.000 ms

[Restart](#)

2. A summarized status is also available on Dashboard > NTP.

NTP

NTPd	System Peer	127.127.47.0
	System Peer Mode	client
	Leap Indicator	00
	Stratum	1
	Reference ID	GNSS

All other timing services status appears at Network Timing'NTPr/PTP Status, which provides the ability to first select the LAN to which a given service is mapped (mapping accomplished on [Figure 6-23](#)). In release 2.0 due to the rules described in [Table 6-17](#), only one of the LANs will contain status. This form prepares for expanded capability.

NTPr/PTP Status

LAN2	▼
LAN3	▼
LAN4	▼

Using the setup from [Figure 6-23](#) where we have mapped a PTP Master onto LAN4, select LAN4 to observe its status. As can be seen in [Figure 6-26](#) the specific service in use is identified (fully configured on [Figure 6-18](#)) along with general status, including details about content being transmitted in the PTP Announce messages.

A reduced set of status can be seen at Dashboard > Timing Services Status as shown in [Figure 6-27](#).

When the mapped service is NTPr, the status provided is similar to what is seen for NTPd (see [Figure 6-25](#)). Using the example from [Figure 6-26](#), where an NTPr service is mapped to LAN2, the status examples are shown in [Figure 6-28](#) and [Figure 6-29](#).

Figure 6-26. Example status on Network Timing > NTPr/PTP Status form (PTP Master)

The screenshot shows the 'NTPr/PTP Status' interface. At the top, there are three tabs for LAN2, LAN3, and LAN4. The LAN4 tab is selected and expanded. Below the tabs is a table with the following data:

Service name	(10) PTP domain 1 priority2 100
Service config	PTP master, Enterprise
Port state	Master
Service Packets per second	0

Below this table is a section titled 'Announce Content' with another table:

Port identity	00:b0:ae:ff:fe:03:7a:8f, Port:1
Clock class	6
Clock accuracy	within 100 ns
Offset scaled log variance	0x3bea
Timescale	PTP
Timesource	GPS
Time tracable	True
Frequency tracable	True
Current UTC offset valid	True
Current UTC offset	37 s
Leap 61	False
Leap 59	False
Steps removed	0

Figure 6-27. Timing Service Status on Dashboard > Timing Services Status (PTP Master)

Timing Services Status	
Attached to	LAN4
Service	PTP master, Enterprise
Port identity	00:b0:ae:ff:fe:03:7a:8f, Port:1
Clock class	6
Clock accuracy	within 100 ns
Rx Packets/second	0

Figure 6-28. Example status on Network Timing/NTP/PTP Status form (NTPr)

NTPr/PTP Status	
LAN2	
LAN3	
Service	NTP Reflector
Leap Indicator	00
Stratum	1
Log2 Precision	-23
Root Delay	0.000 ms
Root Dispersion	0.000 ms
Reference ID	GNSS
Reference Time	dc447c81.f00eb293 Tue, Feb 7 2017 17:04:01.937
System Jitter	0.003815 ms
Clock Jitter	0.004 ms
Clock Wander	0.000 ppm
Broadcast Delay	-50.000 ms
Symm Auth Delay	0.000 ms
Rx Packets/second	0
LAN4	

Figure 6-29. Timing Service Status on Dashboard'Timing Services Status (NTPr)

Timing Services Status	
Attached to	LAN3
Service	NTP Reflector
Leap Indicator	00
Stratum	1
Reference ID	GNSS
Rx Packets/second	0

Monitoring Network Packets

The S6x0 provides capability to monitor and limit incoming packets on each of its LAN ports. The capability is covered in [Security - Packet Monitoring \(security license required\)](#). The relationship between the packet thresholds configured there and the mapped network timing services is as follows:

- For any LAN that has NTPd mapped (LAN1, 2, and 3 in [Figure 6-24](#)) those incoming timing service packets are only included in the All Packets column thresholds (not Service Packets column).
- For any LAN that has PTP Master or NTPr mapped (LAN4 in [Figure 6-24](#)) those incoming timing service packets are only included in the Service Packets column threshold (not All Packets column). Additionally, if a LAN has one of these services mapped to it, that is only LAN where the Service Packets column threshold value will be used. If such a mapping exists, it is indicated with a green dot and the threshold value in that row is allowed to be modified. The form below shows the Packet Monitoring form when the mapping is from example in [Figure 6-24](#). The green dot is lit for LAN4 because NTPr is mapped to LAN4.

The screenshot shows a web interface titled "Packet Monitoring" with a sub-header "Packet Load Monitoring Thresholds (pkts/s)". It contains a table with columns for "LAN", "All Packets", and "Service Packets".

LAN	All Packets	Service Packets	
LAN1	<input type="text" value="13000"/>		
LAN2	<input type="text" value="13000"/>	<input type="text" value="360000"/>	●
LAN3	<input type="text" value="13000"/>	<input type="text" value="360000"/>	●
LAN4	<input type="text" value="13000"/>	<input type="text" value="360000"/>	●

Provisioning the PTP Server Output

Table 6-18. Configure New PTP Server Output

Method	Steps	Notes
Web Interface	<p>Network Timing > NTPr/PTP Config</p> <ol style="list-style-type: none"> 1. Use the Service dropdown box to select PTP master in the “Add New” row at the bottom of the window. 2. Use the Profile dropdown box to select the desired profile in the “Add New” row. 3. Click the blue Configure icon in the “Add New” row. The Configurable Parameters window will open. 4. Change the parameter settings to the desired values. Click OK. 5. Click the green +Add button 	
	<p>Network Timing > NTP/PTP Mapping</p> <ol style="list-style-type: none"> 1. Use the NTPr/PTP Service Name dropdown box to select the PTP service name for the desired port. 2. Click the Apply button. 	Map PTP master to the desired LAN port.
CLI	n/a	n/a
Front Panel	n/a	n/a

Table 6-19. Editing Existing PTP Server Output

Method	Steps	Notes
Web Interface	Network Timing > NTPr/PTP Config 1. Use the Service dropdown box to select PTP master in the desired row. 2. Click the blue Configure icon in the Configure column of that row. 3. Change the parameter settings to the desired values. Click OK. 4. Click the Apply button.	
	Network Timing > NTP/PTP Mapping 1. Use the NTPr/PTP Service Name dropdown box to select the PTP service name for the desired port. 2. Click the Apply button.	Map PTP master to the desired LAN port.
CLI	n/a	n/a
Front Panel	n/a	n/a

The SyncServer only support TAI timescale. The ARB timescale is not used.

Per the enterprise profile specification, the PTP output will not be enabled until the UTC offset is known. This must be manually entered on the [Timing - Input Control Window](#) page if the system has not obtained this information from the reference. For example, the UTC offset must be manually entered for IRIG references.

Provisioning the PTP Server - PTP Output Power Profiles

Three types of PTP power profiles for grandmaster operations are supported. As with all PTP Master functionality, the PTP Master option must be installed to activate any of these (installed options are shown on Admin > Options). The supported power profiles are:

- Power Utility Profile IEC/IEEE 61850-9-3:2016
- Power Profile IEEE. C37.238-2017
- Power Profile IEEE C37.238-2011

All of these profiles use Layer-2, Multicast as covered in IEEE Std 1588-2008, Annex F. Additionally, they all use the peer-to-peer delay mechanism. Further details can be found in the standards documents with same name as the profile.

As with all network-based timing services, the power profiles are configured on the Network Timing > NTPr/PTP Config form. The top level Service is PTP Master, which, when selected, will allow each of these power profiles to be selected from the Profile selection control in that row. See [Configuring Network Timing Services](#). Once a service has been configured, a separate form (Network Timing > NTP/PTP Mapping) is used to attach the service to the desired network port(s). See [Mapping a Network Timing Service to a LAN Port](#).

Here's a summary of basic similarities and differences between these profiles. It may be helpful to bring up the configuration form for a service created for each of these profiles. This is accomplished by creating a timing service of the desired profile, then selecting the blue box from the Configure column for that row. This shows everything that can be configured for that profile.

- They all share the same set of basic PTP data set configurations, which are grouped by the "PTP Data Set" title on the configuration form for each profile. These are standard 1588 attributes. The only differences are that some settings have different ranges and defaults. For example, C37.238-2017 specifies default Domain of 254. The configuration forms are aware of any specific default and range differences between these profiles.
- The C37.238-2011 profile calls for support for VLAN tag insertion, so controls for VLAN Id and VLAN priority are provided. While not specifically required for other profiles, all of the configurations support it. However, only the C37.238-2011 profile defaults the VLAN enable/disable control to Enable.
- The C37.238 profiles call out support for a couple of IEEE Std 1588-2008 management messages. ALTERNATE_TIME_OFFSET_INDICATOR and ORGANIZATION_EXTENSION. Tables 81 and 35 in IEEE Std 1588-2008 show the structure of these TLV (Type Length Value) messages. However, rather than supply them as separate messages (as called out in IEEE Std 1588-2008) with C37.238 profiles they are appended to the Announce messages that are routinely multicast. To support these requirements the configuration forms for both C37.238 profiles include configuration (where appropriate) for both of these messages. Further details:

On the configuration form the area marked C27.238 TLV is actually the ORGANIZATION_EXTENSION message, but specifically as required by the profile. This TLV is always appended to each Announce message. Working through the relevant elements in the message structure:

- The organizationID for both C37.238 profiles is 0x1C129D. This is not user configurable. This value is always automatically encoded for this field.
- The organizationSubType is 0x000001 for profile C37.238-2011, 0x000002 for profile C37.238-2017. These are not user configurable. The appropriate value is always encoded for this field.

- Per IEEE Std 1588-2008, the dataField portion of the ORGANIZATION_EXTENSION message is allowed to have unique structure definition. For these profiles, the following elements are defined:

The GrandmasterID is part of the dataField. For C37.238-2011 the GrandmasterID range is restricted to 3 - 254 and defaults to 3. For C37.238-2017 the GrandmasterID range is unrestricted. This value is user configurable for both C37.238 profiles.

grandmasterTimeInaccuracy is an element in the data field. It provides a time error estimate in nanoseconds (the range is uint32). This field generally follows the standard Announce message clockAccuracy value except grandmasterTimeInaccuracy is essentially a continuous value compared with the 18 discrete values defined for clockAccuracy.

On the configuration form the area marked Alternate Time Offset Indicator TLV provides control for the ALTERNATE_TIME_OFFSET_INDICATOR message. Unlike the ORGANIZATION_EXTENSION TLV which contains C37.238 custom fields, this TLV maps directly to all of the data fields in table 81 of IEEE Std 1588-2008. Each of these is user-configurable so whatever is configured for each field will be incorporated into the outbound TLV. Additionally an Enable/Disable control is provided to support withholding this TLV if desired.

The SyncServer does not support SNMP MIB for Power Profile.

Viewing PTP Clients for PTP GM Outputs

The SyncServer S6x0 can list up to approximately 800 PTP clients by LAN port, with sorting based on client PTP attributes/

This feature is useful for:

- Initial PTP network setup
- Assuring expected PTP clients are connected to expected SyncServer LAN port(s)

- Checking PTP client settings from one location.

Table 6-20. Viewing PTP Clients for PTP GM Output Ports

Method	Steps	Notes
Web Interface	Network Timing > PTP Client List 1. Select the desired PTP GM port using the LAN dropdown box . 2. Use the Display dropdown box to select the number of client records to display for the selected LAN. 3. Click the Refresh button.	
CLI	n/a	n/a
Front Panel	n/a	n/a

Provisioning the Serial Timing Output

The serial timing outputs (on port labeled "DATA/TIMING") can be configured for NMEA, NENA, or serial legacy output format.

Table 6-21. Configure Serial Timing Output

Method	Steps	Notes
Web Interface	Timing > Serial 1. Select the NMEA radio button. 2. Click the check box or combination of check boxes for the desired type(s) of NMEA output format: - NMEA - 0183 ZDA Output - NMEA - 0183 GGA output - NMEA - 0183 GSV output - NMEA - 0183 RMC output 3. Click the Apply button.	Select NMEA output format. See Table 6-23 below for details about NMEA output formats.
	Timing > Serial 1. Select the NENA radio button. 2. Click the check box for the desired type of NENA output format: - DDD HH:MM:SS DTZ=XX - WWW DDDMMYY HH:MM:SS - YYYY DDD HH:MM:SS DZZ 3. Click the Apply button.	Select NENA output format. NENA ASCII time code is sent in broadcast mode , in which the code is sent once per second at the beginning of the second (Data/timing serial port).
	Timing > Serial 1. Select the Legacy Serial Output radio button. 2. Click the Apply button.	F8 - Continuous Time Once-per-Second DDD:HH:MM:SSQ Note: F9 - Time On Request DDD:HH:MM:SS.mmmQ (direct request to Console port)
	Timing > Serial 1. Click the Off radio button at the top of the dialog box. 2. Click the Apply button.	Turn Serial Timing Output off.
CLI	n/a	n/a
Front Panel	n/a	n/a

Table 6-22. NMEA183 Output Format Details

Format	Description
ZDA	All fields are updated except for timezone fields, which are always 00. \$GP, \$GL, and \$GB are used to indicate GPS, Glonass and Beidou respectively. Example: *\$GPZDA,235626,29,11,2016,00,00*40
GGA	All fields are updated except for the 2 DGPS fields, which are NULLed. \$GP, \$GL, and \$GB are used to indicate GPS, Glonass and Beidou respectively. Example: \$GPGGA,235626,3724.7719,N,12156.8643,W,1,14,0.8,14.3,M,-29.8,M,,*41
GSV	All fields are updated. \$GP, \$GL, and \$GB are used to indicate GPS, Glonass and Beidou respectively. Example: \$GPGSV,4,1,23,1,46,231,45,3,58,319,46,4,165,0,0,9,2,265,0*74 \$GPGSV,4,2,23,11,21,219,38,14,35,58,43,16,9,151,39,22,77,321,47*77 \$GPGSV,4,3,23,23,35,277,47,25,7,39,33,26,24,125,50,31,52,54,43*41 \$GPGSV,4,4,23,32,10,72,36*78 \$GLGSV,3,1,23,2,20,99,23,3,58,46,49,4,35,322,44,12,21,31,0*55 \$GLGSV,3,2,23,13,63,78,46,14,38,174,41,15,2,192,35,18,5,228,43*5F \$GLGSV,3,3,23,19,19,277,48,20,10,330,32*68
RMC	All fields are updated except for speed and course, the 2 magnetic variation field, which are all NULLed. \$GP, \$GL, and \$GB are used to indicate GPS, Glonass and Beidou respectively. Example: \$GPRMC,235626,V,3724.7719,N,12156.8643,W,,291116,,A*7D

Provisioning Outputs on Timing I/O Module

The standard configuration offers a broad yet fixed selection of signal I/O. J1 is dedicated to time code and rate inputs, J2 to sine wave inputs, and J3-J8 to mixed signal outputs. See [Table 1-4](#) for the standard Timing I/O Module configuration.

The FlexPort™ Technology option enables the 6 output BNCs (J3-J8) to output any supported signal (time codes, sine waves, programmable rates, etc.) on all configurable ports via the secure web interface.



Note: The SyncServer S6x0 uses IRIG 1344 version C37.118.1-2011. Control bits 14 - 19 will always be zero, and the encoded IRIG time will be UTC (if using an input 1344 IRIG as the reference the 2011 rules are applied to get that value). Hence, any code receiving S6x0 IRIG 1344 output should work regardless of which version they are decoding (since there is nothing to add or subtract).

Table 6-23. Configure IRIG and Other Outputs on Timing I/O Module

Method	Steps	Notes
Web Interface	Option Slot A > Timing I/O Card 1. For desired output J3-J8, use dropdown box to select the general signal output type of "Pulse", "Timecode" "Sine" or Off. 2. For TimeCode, use the dropdown box to select the type of IRIG: 3. For Pulse, use the dropdown box to select Fixed Rate or Programmable Period. 4. For Fixed-rate Pulse, use the dropdown box to select the rate or period. 5. For Programmable Period Pulse, enter the period, with a resolution of 10ns, and a range of 100 ns to 86400 s. 6. For Sine, use the dropdown box to select the frequency, 1M, 5M or 10M. 7. Enter phase offset value (for fixed-rate pulses or timecode outputs) It has a range of -0.499999800 to 0.499999800 s. 8. Click the Apply button.	Timecode Choices: - A004 (DCLS, YR, CF, SBS) - A134 (10Khz, YR, CF, SBS) - B000 (DCLS, CF, SBS) - B001 (DCLS, CF) - B002 (DCLS) - B003 (DCLS, SBS) - B004 (DCLS, YR, CF, SBS) - B005 (DCLS, YR, CF) - B006 (DCLS, YR) - B007 (DCLS, YR, SBS) - B120 (1kHz, CF, SBS) - B121 (1kHz, CF) - B122 (1kHz) - B123 (1kHz, SBS) - B124 (1kHz, YR, CF, SBS) - B125 (1kHz, YR, CF) - B126 (1kHz, YR) - B127 (1kHz, YR, SBS) - B1344 (DCLS) - B1344 (1kHz) - E115 (100Hz, YR, CF) - E125 (1kHz, YR, CF) - G005 (DCLS, YR, CF) - G145 (100kHz, YR, CF) - C37.118.1 - NASA 36 (DCLS) - NASA 36 (1kHz) - XR3 (250Hz) - 2137 (1kHz) - 2137 (DCLS)
CLI	n/a	n/a
Front Panel	n/a	n/a



Note: The web page may allow a larger range for the phase offset value, but the supported range is from -0.499999800 to 0.499999800.

Please note that for the 1PPS falling edge pulse, the maximum supported negative offset is -499,970,000 ns.

Provisioning Outputs on Timing I/O with Telecom Module

Table 6-24. Configure T1, E1, and Other Outputs on Timing I/O with Telecom Module

Method	Steps	Notes
Web Interface	<p>Option Slot A > Timing I/O Card</p> <p><u>T1 Output</u></p> <ol style="list-style-type: none"> For T1 output on J7, use dropdown box to select signal type of T1 Output. Click the Edit button. Use the dropdown box to select the frame type of ESF, D4 or freq1544kHz. Click the Apply button. <p><u>E1 Output</u></p> <ol style="list-style-type: none"> For E1 output on J8, use dropdown box to select signal type of E1 Output. Click the Edit button. Use the dropdown box to select the frame type of CCS, CAS, or freq2048khz. Click the Apply button. <p><u>Timing I/O Outputs</u></p> <p>For other ports, see information in Table 6-23.</p>	<p><u>Telecom Signal Type Choices</u></p> <ul style="list-style-type: none"> ■ T1 ■ E1 ■ CC and JCC ■ JSW ■ CC (50/50 duty cycle) ■ CC (5/8 duty cycle) ■ JCC (with 400 Hz) ■ JCC (no 400 Hz)
CLI	n/a	n/a
Front Panel	n/a	n/a

Provisioning Outputs on Timing I/O HaveQuick/PTTI Module

For BNC connections J3 - J6, along with support for all time and frequency output capabilities that are associated with the standard timing I/O module (090-15201-006), additional outputs associated with HaveQuick/PTTI are supported. J7 and J8 connections have a unique connector and are dedicated to PTTI output BCD codes (covered later).

J3 - J6 identically support the following HaveQuick/PTTI capabilities:

- 1 PPS and 1 PPMinute, both of which are included in the set of GPS-UE (User Equipment) interface signals shown in figure 4 of ICD-GPS-060, have additional signal level options. Using J3 as an example, the unique (to this module) 1 PPMinute 10V selection is shown. This selection, as well as other unique ones, is found near the end of the selection list for this control. Other selections specific to this module include: 1 PPMinute 5V, 1PPS 10V, and 1PPS 5V.

The combined capability for these 2 specific outputs is thereby extended to 3 signal levels: TTL (the common setting for all modules) plus the 2 new ones unique to this module: 5V and 10V, as shown in the following image.

The image shows a configuration window titled "J3 output". It contains the following elements from top to bottom:

- A dropdown menu with "Pulse" selected.
- A dropdown menu with "Fixed Rate" selected.
- A dropdown menu with "1 PPMinute 10V" selected.
- A dropdown menu with "Squelch: never" selected.
- A text input field labeled "Phase Offset (ans):" with the value "0".

Select Apply to complete the configuration.

- A set of HaveQuick codes is supported. Each timecode is provided with 2 signal level options: TTL or 5V. The code structure is identical for either choice.
 - ICD-GPS-060A. This is the originating HaveQuick code defined in document of same name. See figure 8 and associated descriptions in that document. Note that J1 input also supports this timecode.
 - HaveQuick II (STANAG 4246). This code is the same as ICD-GPS-060A but removes the 8 TFOM bits at the end of the code. Note that J1 input also supports this timecode.
 - HaveQuick Extended (STANAG 4430). This code adds leap second content (compared to ICD-GPS-060A). Note that J1 input also supports this timecode.
 - HaveQuick I (STANAG 4246). This is an abbreviated version of HaveQuick II (STANAG 4246). This timecode additionally removes Year of century and day of year, so it is effectively only current time of day. Not supported as an input on J1.

Configuration of the HaveQuick output is an extension of the existing Timecode top-level selection, as shown in the following image. For example to configure HaveQuick II (STANAG 4246) 5V on J5 connection:

1. Select Timecode on top-level control for that connection. This enables selection of all supported timecode categories on the 2nd control.
2. Select HaveQuick from the available list on the 2nd control.
3. Select the desired HaveQuick output code on the 3rd control, in this case HaveQuick II.

4. Select Apply to complete the configuration.

J7 and J8 support BCD timecode outputs on RJ45 connections since these codes require a 2-wire balanced output (not possible with BNC connection). The base code is defined in ICD-GPS-060A/B (figure 6 in revision A, figure 3-3 in revision B). Along with the standard BCD code, an abbreviated version is also supported. This version transmits the full 50 bits, but only the first 24 bits (UTC time of day) are meaningful. The remaining bits are set high.

For test purposes a selectable 1PPS or 1 PPMminute output is also available on the connection. Pinouts are as shown in [Table 6-25](#) below.

Table 6-25. J7 & J8 Connector Pin Assignments - Timing I/O Module with HaveQuick/PTTI Connections

Pin	Signal
1	PTTI BCD Tx+ (code out)
2	PTTI BCD Tx- (code out)
3	1PPS/PPM out, TTL level (for test purposes only)

Table 6-25. J7 & J8 Connector Pin Assignments - Timing I/O Module with HaveQuick/PTTI Connections

Pin	Signal
4	Ground
5	Reserved, do not connect
6	N/C
7	Reserved, do not connect
8	Reserved, do not connect

Electrical characteristics for code outputs on pins 1 and 2 are as described in ICD-GPS-060 revision B, section 3.4.3.3.

To configure BCD codes for output on J7 or J8 is straightforward:

- Navigate to the form using the OPTION SLOT A (or B) > Timing I/O + HQ/PTTI selection on the left-side column of the web interface.
- The only top-level choices will be off (no output) or PTTI Output, as shown in the figure. Select PTTI Output.
- The 2nd control lists the 4 available options:
 - BCD Full - 1PPS. This will generate the full BCD code along with 1PPS test signal on pin 3.
 - BCD Full - 1PPM. This will generate the full BCD code along with 1PPM (1 pulse per minute) test signal on pin 3.
 - BCD Abbrev - 1PPS. This will generate the abbreviated BCD code (still 50 bits, but only first 24 contain content) along with 1PPS test signal on pin 3.
 - BCD Abbrev - 1PPM. This will generate the abbreviated BCD code (still 50 bits, but only first 24 contain content) along with 1PPM (1 pulse per minute) test signal on pin 3.

Select Apply to complete the configuration.

Provisioning Programmable Pulse Output

Table 6-26 shows the Timing I/O modules that can provide a programmable pulse output when installed in the SyncServer S650. The Programmable Pulse Output license must be installed to use this feature, Only the J7 connection on the applicable modules can be configured as Pulse > Programmable Pulse. If two of the applicable modules are installed in the S650, there can be 2 independent programmable pulse configurations operating simultaneously, one on each of the J7 connections.

Table 6-26. Modules that Support Programmable Pulse Output

Supports Programmable Pulse	Does Not Support Programmable Pulse
Timing I/O module Timing I/O module with Fiber Input Timing I/O module with Fiber Output	Timing I/O module with Telecom Timing I/O module with HaveQuick/PTTI 10 MHz Low Phase Noise (LPN) module

In Summary, the programmable pulse feature supports controls to generate on-time (UTC) events based on pattern-matching of any digits in the following common time description format:

DDD:HH:MM:SS.<fractional second>

Where

DDD = Day of the year

HH = Hour of the day

MM = minute of the hour

SS = seconds of the minute

<fractional seconds> = time of the second in decimal digits down to 10 ns

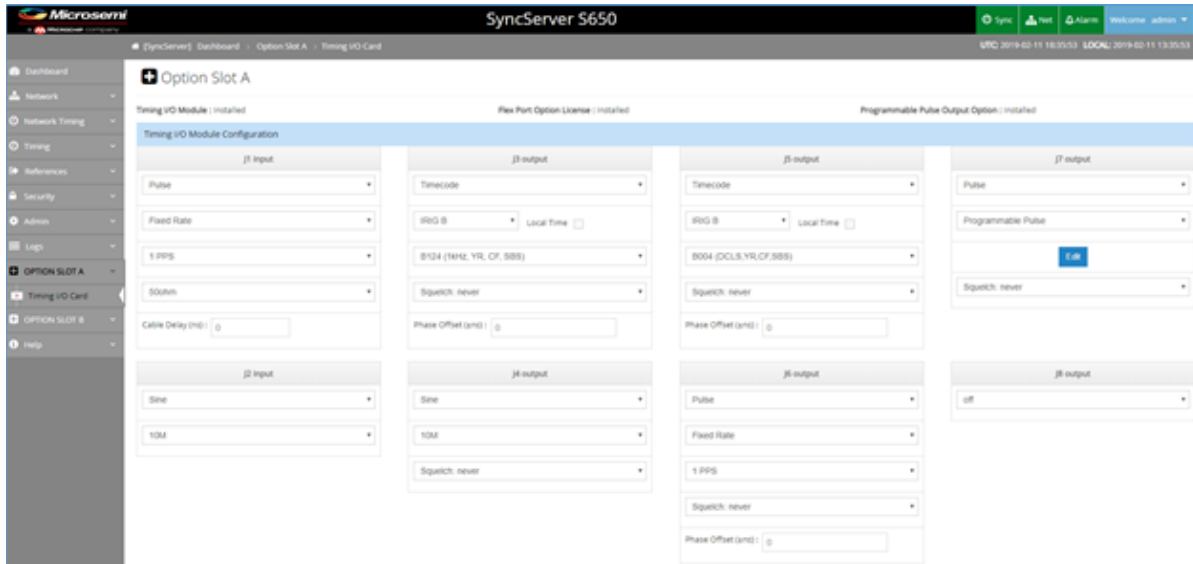
Additional capability is provided to define wildcard digits that will allow repeat pulse outputs whenever the first non-wildcard digit is matched in time (explained later).

The width (stop time) of the generated pulses can also be configured. Other than this control, the signal characteristics are the same as Pulse > Fixed Rate outputs on the J7 connector.

Configuration and Usage

Select the appropriate option slot from the left-side navigation pane, then configure at the J7 Output location on the form. For the example shown below in [Figure 6-30](#), the module in SLOT A is used and the J7 output is shown to already be set up for the Programmable Pulse capability. Note that in the region just above the J7 configuration it is shown that the Programmable Pulse Output Option is installed. If it were not installed, this setting would not be available. All currently installed options are listed at Admin > Options.

Figure 6-30. Option Slot Window - Timing I/O Module with Programmable Pulse License Installed



If the configuration is currently not set to Programmable Pulse, it is easy to get there. Using the J7 Output controls, first set the uppermost control to Pulse, then select Programmable Pulse on the 2nd control. Click the Edit button to display the Programmable Pulse Configuration window, as shown in [Figure 6-31](#).

The Squelch control provides the same function as for other outputs. Since this is a time output, the controls are related to the Time-of-Day Status (see Dashboard > Timing). For the squelch: never setting shown in the example form, the programmable pulse output will function under all time-of-day status conditions, even if the actual time is not known (for example, freerun). To allow this output to function only when time-of-day status is locked, then the squelch: if not locked selection could be used. This ensures that the output only happens when the S650 actually is time-aware and locked to a source of time. There are other refined choices supported.

Figure 6-31. Programmable Pulse Form

J7 output

Pulse

Programmable Pulse

Edit

Programmable Pulse Configuration

Start Time

Set End Time

End Time

Format is: YYYY:DD:MM:SS.{fractional seconds}

Ok Cancel

With the Programmable Pulse setting, an Edit button appears on the form. First-time selection brings up the configuration form which is used to create the specifically desired output behavior. The bottom of the form provides a reminder of time region covered by each of the configuration boxes.

The Start Time row is used to define a time (or times) when pulses should be generated. The "X" that is defaulted into each of the boxes is a wildcard which, as will be seen, is used to match all times for that particular time partition. Other than the wildcard character, numeric values are allowed within the appropriate range for each box. For example, the hour entries allow 0 - 2 for the tens of hours and 0 - 9 for single hours (e.g. 00 - 23 combined range).

Figure 6-32. Programmable Pulse Configuration

Programmable Pulse Configuration

Start Time

Set End Time

Format is: YYYY:DD:MM:SS.{fractional seconds}

Ok Cancel

The simplest usage is to provide numeric entry (no wildcards) for every box. This will have the effect of generating only 1 pulse per year, but it is a helpful way to understand the most basic operation. In words, The configuration below will produce a single pulse at the associated J7 connector with rising edge occurring on the 100th day of the year, 16th hour of that day, 12th minute of that hour, 44th second of that minute, 500 nanoseconds after the start of the 44th second (note that there are 8 fractional seconds digits, so the rightmost is tens of nanoseconds, hence the value shown is 500 ns).

Since the end time control is not used in this case, the pulse width is defaulted to the shortest possible, which is 10 ns.

Programmable Pulse Configuration	
Start Time	1 0 0 : 1 6 : 1 2 : 4 4 . 0 0 0 0 0 0 5 0
Set End Time	<input type="checkbox"/>

Since having capability to generate a precisely timed output only once a year is limiting, the wildcard can be used to greatly expand the utility. The behavior associated with the wildcard is as follows:

- The wildcard "X" means that all values are a match for the box that contains it.
- Working from the left (start at hundreds digit of day of year entry) the first non-wildcard value defines the rate at which pulses will be generated (example will demonstrate this).
- Again working from the left, as soon as a non-wildcard is encountered (i.e. a number is encountered), there can be no more wildcards. Tip: when entering wildcards if you first enter the rightmost one then all positions to the left will be auto-filled with wildcards.

Here's an example:

- Wildcards are entered for all entries from the left through the tens of seconds digit. The current time for all of these wildcard entries will never prevent generation of an output pulse. Another way of saying this is that a pulse will be generated whenever the time matches the remaining numerically-assigned entries.
- The first numeric digit is a 4 in the seconds location. Since everything to the left is a wildcard it means that outputs will occur sometime in every second that ends in 4. This would be 6 different times in every minute: seconds 04, 14, 24, 34, 44, and 54.
- Since there are further non-zero digits to the right of the 4, the actual time of the pulse outputs will be 70 milliseconds (the 070), 11 microseconds (the 011), and 560 nanoseconds (the 56) after every second in the minute that ends in "4".

This approach can be used to generate a variety of time-aligned repeating pulse patterns.

Programmable Pulse Configuration	
Start Time	X X X : X X : X X : X 4 . 0 7 0 0 1 1 5 6
Set End Time	<input type="checkbox"/>

For all above examples, the pulse width will be 10 ns (the default). For precise control of the pulse end time the set end time capability is used. Following the wild card example, the figure below shows a result after checking the set end time box. This brings up another set of entries that follow the same rules as the start time entries previously described. The difference is that these define when to end (go from high-to-low) the pulse. The example below shows that when wildcards are used, both start and stop must share the same wildcard positions, which is enforced by the interface behavior. The example shown will generate pulse widths of about 1 second, short of that amount by 70.01156 ms since only the start time has that additional delay (of course, that amount could also be added to the stop time to make it exactly one second width).

Because the end time setting is just as configurable and precise as the start time, this capability can be used as a method to generate a precise falling edge event (or series of events). Thought of in this way, the example below will generate a precise falling edge at 5, 15, 25, 35, 45, and 55 seconds of every minute. If there are situations where precise start (on rise) and stop (on fall) are needed, this scheme can support it.

Programmable Pulse Configuration	
Start Time	X X X : X X : X X : X 4 . 0 7 0 0 1 1 5 6
Set End Time	<input checked="" type="checkbox"/>
End Time	X X X : X X : X X : X 5 . 0 0 0 0 0 0 0 0

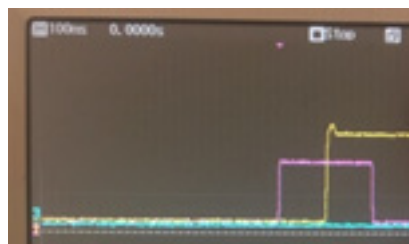
This capability can also be used as a precise method to bracket a signal of interest. As a simple example, suppose we want to frame an on-time PPS rising-edge with a pulse that begins 100 ns prior to the PPS and ends 100 ns after the PPS. The setup shown below will accomplish this:

- Since we are using the wildcard at the 1 seconds digit, the start time will initiate a pulse at 999.9999 milliseconds after the start of each second, which is the same thing as 100 ns prior to the start of the next second.
- The end time is set to occur 100 ns after the start of each second.

The image below shows the result on a scope. The yellow waveform is an on-time rising-edge PPS signal. The magenta waveform is the programmed pulse generated by this setup. Note that it straddles the PPS signal by 100 ns on either side.

This example also illustrates the behavior when the end time value is a smaller value than the start time, which might seem illogical (how can the pulse end before it starts?). The way to think of it is that there is always cause-and-effect between start and end time. If the programmed pulse hasn't started, then there is never anything to stop. Using the example, if you think of the startup of this configuration beginning at the top of a second, on that second the end time is encountered first (100 ns after start of second). However, since there hasn't yet been a start time match, nothing happens. Later in that same second, the start time match occurs (100 ns prior to the next second) and the programmed pulse actually starts. Then, 100 ns into the next second, the end time matches the wildcard and the programmed pulse ends. This process will continue on every second thereafter. This technique can be used to bracket any time of interest, even if it requires end time to be smaller than start time.

Programmable Pulse Configuration	
Start Time	X X X : X X : X X : X X . 9 9 9 9 9 9 9 0
Set End Time	<input checked="" type="checkbox"/>
End Time	X X X : X X : X X : X X . 0 0 0 0 0 0 1 0



To complete any setup, the OK control in lower right is chosen, which returns back to the slot module configuration form. The specific programmable pulse configuration is retained while on the module configuration form, but it is not actually configured until the Apply on the slot module configuration form is selected (same as is used for any module configuration). If you forget to Apply, a warning dialog will appear so you'll have the opportunity to save the programmable pulse configuration if that is what you wanted.

Table 6-27. Configure Programmable Pulse Outputs on Timing I/O Module

Method	Steps	Notes
Web Interface	Option Slot A/B > Timing I/O Card 1. On J7 configuration, use dropdown box to select the general signal output type of "Pulse". 2. Use the dropdown box to select Programmable Pulse output. 3. Click the Edit button. The Programmable Pulse Configuration window will appear. 4. Enter the desired Start Time. Format is: YYYY:DD:MM:SS.[fractional seconds] 5. For Set End Time, check the box. 6. Enter the desired End Time. Format is: YYYY:DD:MM:SS.[fractional seconds] 7. Click the OK button. This closes the Edit form but does not actually configure the changes (see next step). 8. Select Apply on the module configuration form to complete the configuration.	The Programmable Pulse license is required to use this feature.
CLI	n/a	n/a
Front Panel	n/a	n/a

Making Time-Interval or Event Timestamp Measurements

With the Time Interval Measurement license installed, if the unit has a module installed that allows the J1 connection to be configured as Pulse > Fixed Rate > 1 PPS then it is capable of making time-interval and event timestamp measurements.

Measurement Basics

The time-interval measurement function on S6xx is similar to measurement on a traditional time-interval stand-alone instrument: measurement of the time-difference between 2 inputs. A common use-case is to compare a reference PPS signal with a test PPS signal to assess its alignment with respect to that reference. This is the capability provided by S6xx. There are some differences:

- There is only one input needed: the PPS to be measured. This is connected to the J1 input on the desired module (if there are 2 modules, then either J1 can be used).
- The J1 input is internally measured against the reference PPS. A simple way to think of it is that this reference is the same as the 1PPS output generated by the S6xx. Other than accounting for cable delays, if you think of taking the S6xx PPS output to one input of a counter and the test PPS to the other input and making time-interval measurements, this is what is being done automatically in the S6xx.
- Unlike using a time-interval counter, which does not have time awareness, the S6xx records the actual time as part of each measurement which can very helpful when analyzing results.
- If the J1 input stops while the measurement is running (e.g. disconnected or squelched at the source) no measurements will be taken during that period, but if the signal later returns the measurements will automatically proceed. The gap in data collection will be reflected in the time of measurement for the results, so loss-of-signal anomalies during measurement are easily identified in post-processing.

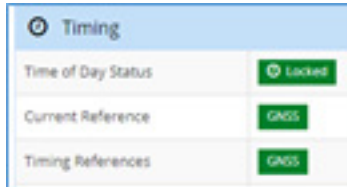
The polarity of each time-interval measurement is with respect to the reference PPS. If the J1 input PPS occurs after the reference, the result will be positive. If the J1 input PPS occurs before the reference, the result will be negative. In general, the "closest reference PPS" will be used for each measurement which effectively makes the measurement range -0.5 to +0.5 seconds.

The Event Timestamp function on S6xx is simple to explain: When a rising-edge input occurs on J1, that event is timestamped and recorded. The time-of-occurrence is saved with full time information, so the result ends up as a sequence of times when J1 input events occurred. There is no expected input rate for these events, they will be tagged whenever they occur. The sustained maximum rate where no events will be missed is 100 events/second (lower when serial/network connection used). An Event Overflow alarm can be used to provide a warning when this rate is exceeded. The alarm follows all standard alarm conventions and can be configured as desired at Admin > Alarms.(see [Admin - Alarm Configuration Window](#))

General notes applicable to either measurement function:

- The reference used for either measurement is the same as whatever is being used for normal synchronization. A typical example would be GNSS as the S6xx timing reference.

- The measurements will function even if there is no reference into the S6xx (for example, S6xx will measure even if it is freerunning with no awareness of the current time). While this allows for some special case measurements, users should ensure that the time-of-day status (see Dashboard > Timing) is in Locked state if the objective is to make accurate measurements against a good reference. This would be an optimal display for this use-case:



Measurement Setup

The first item is to connect the signal to be measured to whichever J1 input will be used. Simply connect it. The signal range expected is the same as for a PPS when used as an input sync reference. For either measurement type, set the first 3 choices as shown: Pulse, Fixed Rate, 1 PPS. The impedance and Cable Delay(ns) controls can be set as desired. The Cable Delay control reduces the measurement value by the amount entered, which you might do to eliminate transmission time due to cable.



Note: For event timestamp measurements there is no expectation that the input must occur at a 1 PPS rate, but this setting should be used. The events will be timestamped as they occur.



Next, since it generally makes no sense to also allow use of this input also as a sync input reference, the J1 connection should not be enabled on the Timing > Input Control form, as shown here. Disabling J1 as a timing input reference source does not restrict its usage for measurement.

The screenshot shows the 'Input Control' configuration page. It features a section for 'External Input Sources' with a note about adjusting priority. Below this are two tables: 'Time Reference Priority' and 'Frequency Reference Priority'. The 'Time Reference Priority' table has three rows: GNSS (checked, priority 1), Slot A (i) Timecode (unchecked, priority 2), and NTP (unchecked, priority 3). Below this table is a checkbox for 'Ignore UTC corrections from GPS reference and serve GPS timescale'. The 'Frequency Reference Priority' table has two rows: Slot A (j) (Frequency) (unchecked, priority 1) and Slot A (i) (10MPPS, 1PPS) (unchecked, priority 2).

Input Control

• External Input Sources

Note : Drag and drop a row in the Time or Frequency Reference Priority table to adjust its priority. Use the Reset button to restore the default priority order.

Time Reference Priority

Enable	Reference	Priority
<input checked="" type="checkbox"/>	GNSS	1
<input type="checkbox"/>	Slot A (i) Timecode	2
<input type="checkbox"/>	NTP	3

Ignore UTC corrections from GPS reference and serve GPS timescale. Not applicable to any other time reference (i.e. Timecode, NTP, etc.)

Frequency Reference Priority

Enable	Reference	Priority
<input type="checkbox"/>	Slot A (j) (Frequency)	1
<input type="checkbox"/>	Slot A (i) (10MPPS, 1PPS)	2

Making the Measurement

Either type of measurement is controlled on the Timing > Meas./Event Time form shown below.

Walking through the form top to bottom:

🕒 1 PPS Time Interval Measurement / Event Time

Select Input

Slot	Slot B
------	--------

Configure Measurement

Output		Duration	Apply
Destination	LOCAL	10 Minute	Start
IP Version	IPv4		
IP Address	10.10.10.10		
UDP Port	9999		

Measurement Data

Time Interval Measurement

Current Interval (ns)	<input type="text"/>	Number of samples	<input type="text"/>
Maximum Interval (ns)	<input type="text"/>	Minimum Interval (ns)	<input type="text"/>
Mean of Intervals (ns)	<input type="text"/>	Median Interval (ns)	<input type="text"/>
Standard Deviation (ns)	0	RMS of Intervals (ns)	0

Event Time

Download Measurement

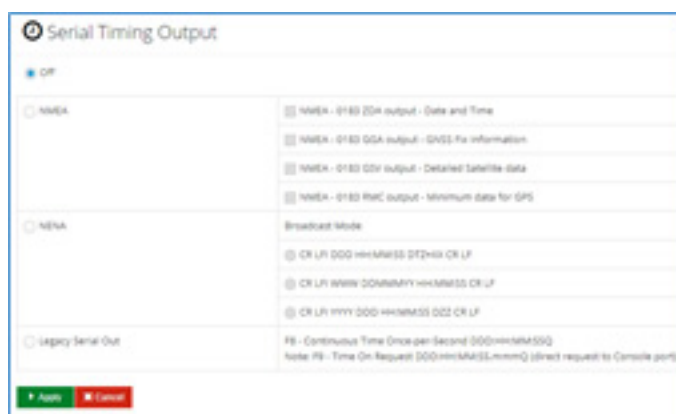
Output Format (1492453600,148610406e-01)	TAI	Save as...
--	-----	--

- The Select Input Slot control identifies which slot module J1 connection will be used for the measurement. Selection is only possible if the S6xx contains 2 slot modules and both are capable of supporting measurement. If there is only a single module no choice can be made and the control will show the correct slot. This control is common to time-interval and event timestamping measurements.
- The Configure Measurement section provides 3 areas of measurement control. These controls are all equally applicable to time-interval and event timestamping measurements.
- The Output section provides choice on the method to use for data transmission/storage:
 - Setting Destination to LOCAL directs the measurement results to local storage on the S6xx. Regardless of measurement type up to 86,400 measurements can be stored (the number of seconds in one day). The storage capacity is based on actual data, not measurement time. For example, if using Event Time mode and one event occurs each day, then the storage capacity is 86,400 days. If local storage becomes filled, new measurements will continue to be saved, pushing the oldest ones out as

needed so that the contents of the storage (when filled) will always be the most recent 86,400 measurements.

With this setting none of the other selections in the Output section are relevant (they are grayed out).

- Setting Destination to SERIAL directs the measurement results to the Data/Timing 9-pin serial connection on the S6xx. Any terminal program that supports serial connection can be used to collect (and log if desired) the results. Since there are other possible uses for this connection it may be necessary to de-activate other enabled functions currently assigned to it. The Timing > Serial form is where these other uses are controlled. To use this connection for output of measurements, this form must have setting to Off (as shown).



- Control of serial port settings is provided on the Admin > Serial Port Config form. This form provides independent serial port controls for the console port (not used for measurement output - upper 9-pin serial connector) and the Time of Day Port (on the left side of the form), which is the lower 9-pin connection labeled Data/Timing port on the S6xx. Configure these settings to agree with the terminal program settings on the device used to receive the measurements. Note that lower baud rates will lower the number of event time measurements that can be made each second. For example 9600 baud may limit event time measurements to 25 per second instead of 100 per second.

With SERIAL setting none of the other selections in the Output section are relevant (they are grayed out).

- Setting Destination to NETWORK directs the measurement results to the LAN1 ethernet connection (same physical connection as the WebGUI). With this setting, the other controls are used to specify the connection that will receive the LAN1 output: IPversion, IP Address, and UDP port.
- The Duration section provides control for how long the measurement should run. The control provides a range of bounded choices, all of which will open and close the measurement window for the indicated time, initiated by activation of the Start control. The measurement window will self-terminate regardless of whether or not any actual measurements occurred.

The continuous selection keeps the measurement window open endlessly upon Start selection.

- The Apply section provides the measurement start and stop control. The control is context-aware and always shows the action that will occur upon its application. Selecting Start begins the measurement and grays out other control settings since the measurement parameters are "locked in" as long as the measurement is running. Whenever the measurement is running the control will indicate Stop.

When the Destination setting is LOCAL the Start and Stop controls have additional significance:

- Following selection of Start any data collected so far can be downloaded (See Download Measurement section of form). Downloading while measurement is running will not cause any loss of data collection.
- Following selection of Stop and until the next Start is selected, any stored data from the prior measurement remains available for downloading. Upon next Start, this prior data is cleared in order to begin new data collection.

- The Measurement Data section provides control of which type of measurement to make:
 - If Time Interval Measurement is selected, the measurement performed is a time-interval measurement (every second) of the user-provided J1 input PPS compared with the S6xx system PPS. While the measurement runs, if the measurement Destination is set to LOCAL, the data shown below is periodically updated. Along with the current time-interval measurement, the other results are well-known statistical measures for data populations. Only the actual measurements are stored.

The screenshot displays a 'Measurement Data' section with a radio button selected for 'Time Interval Measurement'. Below this, there are two columns of input fields, each containing a numerical value. The left column includes 'Current Interval (ns)' (18), 'Maximum Interval (ns)' (26), 'Mean of Intervals (ns)' (22.6451612903226), and 'Standard Deviation (ns)' (3.9476280105234). The right column includes 'Number of samples' (31), 'Minimum Interval (ns)' (18), 'Median Interval (ns)' (26.0), and 'RMS of Intervals (ns)' (22.978250586152).

Field	Value
Current Interval (ns)	18
Maximum Interval (ns)	26
Mean of Intervals (ns)	22.6451612903226
Standard Deviation (ns)	3.9476280105234
Number of samples	31
Minimum Interval (ns)	18
Median Interval (ns)	26.0
RMS of Intervals (ns)	22.978250586152

- If Event Time is selected, the measurement performed is to timestamp the time of occurrence of every positive edge (the "event") at the J1 input. While the measurement runs, if the measurement Destination is set to LOCAL, the data shown below is periodically updated. This is a sampling of 3 recent timestamped events (this display may not always show consecutive events, but the stored data will not miss any events as long as the sustained input event rate is not greater than 100 events/second).

Number of Events shows the total events that have occurred since the start of this measurement

Most Recent Events shows recent timestamps in the format of <TAI seconds> <fractional seconds>. TAI time is the number of seconds since midnight Jan 1, 1970 and is the timescale used for IEEE-1588 (PTP). For the example shown below, the 3 events are seen to be precisely 10 seconds apart. The source for these events was an S6xx programmable pulse capability configured to generate an event whenever the UTC seconds contains a 6, resulting in events at 06, 16, 26, 36, 46, and 56 seconds every minute.

Event Time			
Number of Events	629		
Most Recent Events	1549671179	sec	10 ns
	1549671189	sec	10 ns
	1549671199	sec	10 ns

- The Download Measurement section provides the method to save measurement results wherever desired in the host environment. This option is available only when the Destination for the measurement is/was LOCAL. Results can be saved while the measurement is still running or any time after it has stopped. Details about downloads based on selection:

Time Interval Measurement:

– If format is UTC

Filename is of this form:

SyncServer_time_interval_measurement_UTC_1549673170.txt

Data format is of this form (last field is fractional seconds):

2019-02-11,16:45:02, -2.00000000e-09

2019-02-11,16:45:03, -2.00000000e-09

2019-02-11,16:45:04, 4.00000000e-09

File Header is of this form (directly compatible with Microsemi TimeAnalyzer):

```
#Title: SyncServer Time Interval Measurement: Timescale =
UTC
```

```
#Type: Phase
```

```
#Frequency: 1
```

- If format is TAI

Filename is of this form:

SyncServer_time_interval_measurement_TAI_1549673165.txt

Data format is of this form (last field is fractional seconds). These are the same measurements as UTC data above, the only difference is time of measurement (left column) is the TAI seconds:

```
1549903539, -2.00000000e-09
```

```
1549903540, -2.00000000e-09
```

```
1549903541, 4.00000000e-09
```

File Header is of this form (directly compatible with Microsemi TimeAnalyzer). Note that the #Start information provides the TAI time of the first measurement in traditional format (it won't appear if there are no measurements made).

```
#Title: SyncServer Time Interval Measurement: Timescale =  
TAI
```

```
#Type: Phase
```

```
#Frequency: 1
```

```
#Start: 2019-02-09 00:46:01
```

Event Time Measurement:

Example data is being sourced by an event every 10 seconds.

- If format is UTC

Filename is of this form: SyncServer_event_time_UTC_1549904290.txt

Data format is of this form (YYYY-MM-DD, HH:MM:SS, <fractional seconds>). Each row is the time of an event:

```
2019-02-11,16:56:53, 1.00000000e-08
```

```
2019-02-11,16:57:03, 1.00000000e-08
```

```
2019-02-11,16:57:13, 1.00000000e-08
```

File Header is of this form (directly compatible with Microsemi TimeAnalyzer)

```
#Title: SyncServer Event Time Capture: Timescale = UTC
```



```
#Type: Phase  
  
#Frequency: 1
```

– If format is TAI

Filename is of this form: SyncServer_event_time_TAI_1549904286.txt

Data format is of this form (<TAI seconds>.<fractional seconds>):

```
1549904260.000000010  
  
1549904270.000000010  
  
1549904280.000000010
```

File Header is of this form (directly compatible with Microsemi TimeAnalyzer). Note that the #Start information makes it easy to know in traditional format the TAI time of the first event (it won't appear if there are no events).

```
#Title: SyncServer Event Time Capture: Timescale = TAI  
  
#Type: Phase  
  
#Frequency: 1  
  
#Start: 2019-02-11 16:57:30
```

Provisioning Alarms

This section describes the controls used to provision and manage alarms in the SyncServer S6x0. For a list of all alarms, see [Appendix A, System Messages](#).

The Web GUI allows you to perform the following:

- Provision the severity level
- Show current alarm settings
- Show current alarms
- Display alarm status

Alarms are also indicated by an LED on the front panel.

Table 6-28. Configuring Alarm Settings

Method	Steps	Notes
Web Interface	<p>Admin > Alarms</p> <p>Configure Alarm</p> <ol style="list-style-type: none"> 1. Enter the “Auto ACK” value (Auto Acknowledgement) for the alarm. 2. Use the drop-down box for “Severity” to set the alarm to “Major”, “Minor”, or “Notify”. 3. Enter the “Reporting Delay” value (in seconds) for the alarm. 4. Use the check box for “Send Trap” to enable/disable an SNMP trap for the alarm. 5. Use the check box for “Write Log” to enable/disable recording in the log when the alarm is triggered. 6. Use the check box for “Send Email” to enable/disable email notification for the alarm. 7. Click the Apply button. <p>Clear Alarm</p> <ol style="list-style-type: none"> 1. Use the check box for “Clear Now” for the alarm to be cleared. 2. Click the Apply button. 	<p>Auto-Acknowledge has the same effect as a manual “Clear Now” (described below). It just does it automatically after the specified number of seconds. Setting this value to zero causes Auto-Acknowledge to be disabled.</p> <p>Information about Transient events is shown indicating that they are not configurable</p> <p>This causes some of the alarm report mechanisms to extinguish that particular alarm indication. These include Dashboard > Alarms, Alarm summary at top of Web GUI, Physical alarm connector, front panel Alarm LED, and Alarm information on front-panel display. This is just an acknowledgement of the alarm, but of course has no ability to impact the underlying condition.</p>
CLI	n/a	
Front Panel	n/a	

Saving and Restoring Provisioning Data

Backing up Provisioning Data

Table 6-29. Backing Up Provisioning Data

Method	Steps	Notes
Web Interface	Admin > Config Backup/Restore/Reset 1. Enter a password for Backup and Restore. 2. Use the radio button to select "Backup". 3. Click the "Save As" button. Enter the desired file name and navigate to the desired location to store the file. 4. Click the Apply button.	
CLI	n/a	
Front Panel	n/a	

Restoring Provisioning Data

Table 6-30. Backing Up Provisioning Data

Method	Steps	Notes
Web Interface	Admin > Config Backup/Restore/Reset 1. Enter a password for Backup and Restore. 1. Use the radio button to select "Restore". 2. Navigate to the location of the backup file and select it. 3. Click the Apply button.	Password for Backup and Restore should be the same.
CLI	n/a	
Front Panel	n/a	

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 SyncServer S6x0) is the server generating responses. The SyncServer S6x0 SNMP supports traps and the MIB-II system MIB.

SyncServer S6x0 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 the AES128 encryption standard.

Port 161 is the port of standard SNMP interactive communications and port 162 is the trap port.

SNMP functionality is provisioned on the SyncServer S6x0 using the web interface.

SNMP Status

The SyncServer S6x0 supports a proprietary MIB, S650.mib, which provides selected status information for the unit.

The SyncServer S6x0 also supports selected MIB-II functionality:

- SNMPv2-MIB::system
- IF-MIB::interfaces (ifTable)
- IF-MIB::ifXTable
- RFC1213-MIB::at
- IP-MIB::ipAddressTable
- IP-MIB::icmp
- RFC1213-MIB::tcp (partial support)
- RFC1213-MIB::udp (partial support)
- SNMPv2-MIB::snmp
- IPV6-MIB::ipv6IfTable

SNMP Traps

Each alarm trap OID from the SyncServer S6x0 represents a unique alarm. There are some objects defined in the S650ALARM.mib which are reserved and not supported. If the alarm ID is not listed in Appendix A [Table A-1](#), then the corresponding SNMP alarm object is not supported.

Each container contains the following sub-info in its own OID:

- Alarm/Event ID
- Date&Time
- Severity
- Alarm/Event Description
- Index
- Alarm Action
- Sequence Number

The alarm OIDs are under 1.3.6.1.4.1.9070.1.2.5.7.4.1.

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](#).



Note: The SNMP MIB can be downloaded from the SyncServer S6x0 on the Help web page. The LAST-UPDATED and REVISION fields in the MIB can be used to determine the revision of the MIB. Older versions of the S650ALARM MIB will be compatible with newer versions of firmware, but will not support newer features.

Provisioning to Generate v2 Traps

Use the `set snmp trapversion` command to provision the trap version to v2.

By default, the SyncServer S6x0 will generate v2 traps.

Table 6-31. Provisioning to Generate v2 Traps

Method	Steps	Notes
Web Interface	Network > SNMP Traps <ol style="list-style-type: none">1. Enter IP address for SNMP manager2. Select SNMPv2c3. Enter community name4. Click "Save"	
CLI	n/a	
Front Panel	n/a	

Provisioning to Generate v3 Traps

Table 6-32. Provisioning to Generate v3 Traps

Method	Steps	Notes
Web Interface	Network > SNMP Traps 1. Enter IP address of SNMP manager 2. Select SNMPv3 3. Enter SNMPv3 user name 4. Enter auth password 5. Select MD5 or SHA for auth 6. Enter privacy phrase 7. Click "Save"	For SNMPv3 traps, both a user and a trapuser need to be configured identically, depending on the SNMP trap manager. In addition, the SNMP manager should use the specified user/trapuser to connect to the SyncServer S6x0. This will ensure that a SNMPv3 trap will be successfully received by the manager using the corresponding trapuser username.
CLI	n/a	
Front Panel	n/a	

Updating v2 Communities

Table 6-33. Adding / Removing v2 Communities

Method	Steps	Notes
Web Interface	Network > SNMP 1. Update user / community names 2. Click "Save"	All character except (<), (&), (>), ("), ('), are accepted for SNMPv2 community names.
CLI	n/a	
Front Panel	n/a	

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 of up to 32 characters in length. The privacy settings are based on the AES encryption standard, with a key of up to 32 characters in length. All keys are uppercase.

Table 6-34. Adding/Removing SNMP v3 Trap Users

Method	Steps	Notes
Web Interface	Network > SNMP 1. Enter user name 2. Enter privacy phrase if required 3. Enter authentication phrase 4. Select authentication or "authentication & privacy" 5. Select MD5 or SHA 6. Click "Save"	
CLI	n/a	
Front Panel	n/a	



Note: All character except (<), (&), (>), ("), (') are accepted for SNMP usernames, authentication or privacy keys.

Provisioning HTTPS Certificate

Table 6-35. Provisioning a Self Signed HTTPS Certificate

Method	Steps	Notes
Web Interface	Security > HTTPS > Self Signed Certificate 1. Use the dropdown box to select the RSA Key bit. 2. Enter the Common Name. 3. Enter the Days to Expiration. 4. Enter the ISO Country Code. 5. Enter the State. 6. Enter the Locality. 7. Enter the Organization name. 8. Enter the Organizational Unit. 9. Enter the Email Address. 10. Click "Apply"	
CLI	n/a	
Front Panel	n/a	

Chapter 7 Maintenance, Troubleshooting & Part Numbers

This chapter describes maintenance and troubleshooting procedures for the SyncServer S6x0.

In This Chapter

- [Preventive Maintenance](#)
- [Safety Considerations](#)
- [ESD Considerations](#)[Troubleshooting](#)
- [Repairing the SyncServer S6x0](#)
- [Upgrading the Firmware](#)
- [SyncServer S6x0 Part Numbers](#)
- [Returning the SyncServer S6x0](#)
- [User's Guide Updates](#)
- [Contacting Technical Support](#)

Preventive Maintenance

The SyncServer S6x0 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 58, for electromagnetic compatibility conditions that may cause damage.



Caution: To avoid electromagnetic discharge damage to the circuitry, never attempt to vacuum the SyncServer S6x0.

[Table 7-1](#) lists preventive maintenance measures to be performed periodically. Do not disassemble components just for the purpose of inspection.

Table 7-1. 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 SyncServer S6x0 equipment. Plug the user-supplied wrist strap into the SyncServer S6x0.

Troubleshooting

LEDs, and System Messages can all be very helpful in troubleshooting the SyncServer S6x0. Use the Alarms page of the Web GUI to view system messages or use SNMP trap messages.



Note: The SyncServer S6x0 incorporates a system reboot function (watchdog) if any of the system's software become unresponsive. If the system's software is unresponsive for 15 minutes, then the watchdog timer will report an event in the event log (add the actual event here), and the system will reboot.

Diagnosing the SyncServer S6x0 – Reading LED Conditions

Table 7-2 shows the function of the LED indicators on the front panel of the unit.

Table 7-2. LED Conditions

Indicator	Label	Description	Corrective Action
Clock Status	SYNC	Green - Time or Frequency clock in Normal or Bridging state	n/a
		Amber - Time or Frequency clock in Freerun or Holdover state	Use the Web GUI to view alarm IDs and descriptions, Admin > Alarms, or expand the "Alarm(s)" tab to see a summary of active alarms. See Table A-1 in Appendix A, System Messages for corrective actions.

Table 7-2. LED Conditions (Continued)

Indicator	Label	Description	Corrective Action
Alarm/fault indicator	NETWO RK	Green - All configured ports are up	n/a
		Amber - Some configured ports are down (LAN2 to LAN4)	<p>Use the Web GUI to view the configuration and status of ports, Network > Ethernet or expand the “Network” tab to see the configuration of each port.</p> <p>See Table A-1 in Appendix A, System Messages for corrective actions.</p>
		Red - Management port (LAN1) is not configured or is down	<p>Use the Web GUI to view the configuration and status of ports, Network > Ethernet or expand the “Network” tab to see the configuration of each port.</p> <p>See Table A-1 in Appendix A, System Messages for corrective actions.</p>

Table 7-2. LED Conditions (Continued)

Indicator	Label	Description	Corrective Action
Ethernet RJ45 Port LEDs link/activity indicator	1	Left LED Amber - 100BT link	n/a
	2	Left LED Green - 1000BT link	
	3		
	4	Right LED Green blinking - Activity	
		Left LED Off - No link Right LED Off - No link	<p>Use the Web GUI to view alarm IDs and descriptions, Admin > Alarms , or expand the “Alarm(s)” tab on the Dashboard to see a summary of active alarms.</p> <ul style="list-style-type: none"> ■ Check the cable connections. ■ Verify that interface is enabled by using Web GUI page: Network > Ethernet. ■ Check that either Ethernet Auto Negotiation is enabled or that speed has been set to a compatible level with the connecting network element by using Web GUI page: Network > Ethernet. ■ Make sure that only full-duplex network devices are used. The SyncServer S6x0 does not support half-duplex devices, such as hubs, for NTP connections.

Repairing the SyncServer S6x0

The SyncServer S6x0 cannot be repaired in the field.

There are no field-serviceable fuses in the SyncServer S6x0. If a fuse blows in a SyncServer S6x0, the unit must be returned to the factory for repair.

Upgrading the Firmware

You can upgrade the firmware using the SyncServer S6x0's web interface and software available from Microsemi. When the SyncServer S6x0 is in the firmware download mode, it prevents all other sessions from making changes to the configuration. During the upgrade process, no new sessions are allowed. Refer to [SyncServer S6x0 Upgrade](#) below for details on the upgrade process. For releases after 1.1, if the upgrade process is used to load a previous (older) version of the software, then the unit will reset the configuration to factory default values.

The current firmware version can be found in the Dashboard > About window.

Upon receipt of any new/repaired equipment, perform the relevant software upgrade procedure below prior to putting the shelf into service.



Caution: To avoid a possible service call, do not issue a command to the SyncServer S6x0 during an upgrade and do not remove power from the SyncServer S6x0 during an upgrade. Doing so could corrupt the flash memory, disabling the SyncServer S6x0.

SyncServer S6x0 Upgrade

The upgrade process is simple, but there will be Loss of Service (LOS) at reboot. The upgrade will take approximately 7 minutes to complete. The upgrade process requires an authorization file in order to proceed. This file verifies that this SyncServer unit is authorized to upgrade the selected upgrade file.

The SyncServer 6x0 does not contain a battery-backed real time clock. Therefore, it will always boot up with a default value for the system time. This time will be updated when it obtains time from a time reference such as GNSS, IRIG, or NTP. The default value for the date is the software build date. This date will be used for the first log entries when booting up the unit. The time will change to local time during the boot-up process if a time zone has been configured.

Table 7-3. Upgrading Firmware

Method	Steps	Notes
Web Interface	Admin > Upgrade 1. Navigate to the location of the authorization file and select it. 2. Navigate to the location of the upgrade file and select it. 3. Click the Install button.	
CLI	n/a	n/a
Front Panel	n/a	n/a



Note: If the upgrade terminates with an authorization error, then this system is not authorized to upgrade to new upgrade image, or the auth.dat file is for a different software version than the upgrade image file.



Note: If "upgrading" from revision 2.0 or higher to an older revision, then the system will set configuration to factory default values.



Note: Configuration changes made after the upgrade but before the reboot will not be available after the reboot.



Note: If the all-packets limit on LAN1 has been reduced on the Security > Packet Monitoring page, then it is recommended that the limit be temporarily increased back to the default value of 13000 packets/second. Otherwise, the file upload will be very slow and may timeout.

SyncServer S6x0 Part Numbers

The following sections provide part numbers for the system, accessories, and GNSS antenna kits.

System and Accessory Part Numbers

This section provides part numbers and descriptions for the system and accessories available for the SyncServer S6x0. See [Table 7-4](#) for Quickship part numbers. See [Table 7-5](#) for S600 Build to Order part numbers. See [Table 7-6](#) for S600 Build to Order part numbers. See [Table 7-7](#) for accessories.

Table 7-4. SyncServer S6x0 Quickship Part Numbers

Item	Part Number
S600 Quickship Models	
SyncServer S600	090-15200-601
SyncServer S600 + OCXO	090-15200-602
SyncServer S600 + Rubidium	090-15200-603
SyncServer S600 + Dual AC power supplies	090-15200-604
SyncServer S600 + OCXO + Dual AC power supplies	090-15200-605
SyncServer S600 + Rubidium + Dual AC power supplies	090-15200-606
S650 Quickship Models	
SyncServer S650+Timing I/O Module	090-15200-651
SyncServer S650+Timing I/O Module + Rubidium	090-15200-652
S650i Quickship Models	
SyncServer S650i+Timing I/O Module	090-15200-653
Quickship Options	
Security Protocols License Option	920-15201-002
Flex Timing Option for Timing I/O Module	920-15201-009
GNSS Option	920-15201-001
PTP Output Option	920-15201-003
PTP Input Option	920-15201-004
Measurement Option	920-15201-011
Programmable Pulse Option	920-15201-005



Note: The GNSS option is NOT available with the S650i.

The Flex Timing and Measurement options are only available with the Timing I/O module.

Table 7-5. SyncServer S600 Build to Order Part Numbers

Item	Part Number
S600 Build to Order	
SyncServer S600 Base Config, NO Power Supply	090-15200-600
S600 Power Supplies	
Single AC Power Supply	090-15201-001
Dual AC Power Supplies	090-15201-002
Dual DC Power Supplies	090-15201-010
S600 Oscillator Upgrades	
SyncServer OCXO Upgrade	090-15201-003
SyncServer Rubidium Upgrade	090-15201-004
S600 Software Enabled Options	
Security Protocols License Option	920-15201-102
GNSS Option	920-15201-101
PTP Master Option	920-15201-103
PTP Input Option	920-15201-104

Table 7-6. SyncServer S650 Build to Order Part Numbers

Item	Part Number
S650 Build to Order	
SyncServer S650 Base Config, NO Power Supply	090-15200-650
S650 Power Supplies	
Single AC Power Supply	090-15201-001

Table 7-6. SyncServer S650 Build to Order Part Numbers (Continued)

Item	Part Number
Dual AC Power Supplies	090-15201-002
Dual DC Power Supplies	090-15201-010
S650 Oscillator Upgrades	
SyncServer OCXO Upgrade	090-15201-003
SyncServer Rubidium Upgrade	090-15201-004
S650 Modules / Hardware	
SyncServer Timing I/O Module	090-15201-006
SyncServer LPN Module	090-15201-007
SyncServer ULPN Module	090-15201-008
10 GbE Card	090-15201-009
SyncServer Timing I/O Module with Telecom I/O	090-15201-011
SyncServer Timing I/O Module with HaveQuick/PTTI	090-15201-012
SyncServer Timing I/O Module with fiber optic input	090-15201-013
SyncServer Timing I/O Module with fiber optic outputs	090-15201-014
S650 Software Enabled Options	
Security Protocols License Option	920-15201-102
Flex Timing Option for Timing I/O Module	920-15201-109
PTP Master Option	920-15201-103
PTP Input Option	920-15201-104
Measurement Option	920-15201-111
GNSS Option	920-15201-101
Programmable Pulse Option	920-15201-105

GNSS Antenna Kits

Antenna cables and accessories enable versatile solutions that are easy to achieve. Inline GNSS amplifiers installed at the antenna are an easy way to extend cable runs from 225 feet to up to 900 feet, depending on cable type. Lightning arrestors provide valuable electrical protection to the SyncServer. Antenna cable splitters leverage a single antenna and cable for up to four GNSS receivers.

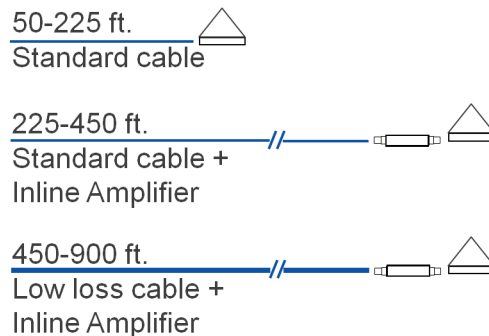
Ordering antenna components is a simple task. The most important thing the user needs to have is a rough idea of the total cable length needed between the SyncServer and the mounting location of the antenna. Any extra cable can be coiled to the side.

Preconfigured kits that include cable, antenna, and related mounting accessories are available, as shown in [Table 7-7](#). These kits vary by total cable length, and based on whether a lightning arrestor is required or not. For long cable runs (>225 ft.), the components are assembled individually. See [Figure 7-1](#).

To assist and simplify configuration, Microsemi has an Excel-based antenna configurator that helps the user determine the exact part numbers they need for the desired cable length and accessories. See Microsemi's website for the configurator:

<http://www.microsemi.com/products/timing-synchronization-systems/time-frequency-distribution/network-appliances-servers/syncserver/syncserver-s650#documents>.

Figure 7-1. Antenna Kits for Long Cable Runs



The antenna kit (part number 093-15202-001) includes a short SyncServer adapter cable (part number 060-00039-000) with BNC(m)-N(f) connectors. All primary antenna cables use N(m) connectors on either end. A single cable must be used between the adapter cable and the next accessory (lightning arrestor, inline amplifier, or antenna). Lightning arrestors include a 25 ft. cable to connect to the next accessory (inline amplifier or antenna).



Note: Lightning Arrest Kit includes 25 ft. cable. Total length includes the additional cable that is part of the Lightning Arrestor if selected.



Note: To receive GLONASS or BeiDou signals, the antenna system should be made of GLONASS and/or BeiDou compatible components.

Table 7-7. GNSS Antenna Kits & Accessories

Antenna Kit	Part Number
Kit: Total length: 50 ft, Cable: 50 ft; antenna kit (093-15202-001)	990-15202-050
Kit: Total length: 75 ft, Cable: 50 ft; lightning arrestor (112-43400-00-3); Cable: 25 ft; antenna kit (093-15202-001)	990-15202-075
Kit: Total length: 100 ft, Cable: 100 ft; antenna kit (093-15202-001)	990-15202-100
Kit: Total length: 125 ft, Cable: 100 ft; lightning arrestor (112-43400-00-3); Cable: 25 ft; antenna kit (093-15202-001)	990-15202-125
Kit: Total length: 150 ft, Cable: 150 ft; antenna kit (093-15202-001)	990-15202-150
Kit: Total length: 175 ft, Cable: 150 ft; lightning arrestor (112-43400-00-3); Cable: 25 ft; antenna kit (093-15202-001)	990-15202-175
Kit: Total length: 200 ft, Cable: 200 ft; antenna kit (093-15202-001)	990-15202-200
Kit: Total length: 225 ft, Cable: 200 ft; lightning arrestor (112-43400-00-3); Cable: 25 ft; antenna kit (093-15202-001)	990-15202-225
250 ft. Antenna Cable	060-15202-250
350 ft. Antenna Cable	060-15202-350
450 ft. Antenna Cable	060-15202-450
500 ft. Low Loss Antenna Cable	060-15202-500
750 ft. Low Loss Antenna Cable	060-15202-750
900 ft. Low Loss Antenna Cable	060-15202-900

Table 7-7. GNSS Antenna Kits & Accessories

Antenna Kit	Part Number
Kit: <ul style="list-style-type: none"> ■ GPS/GLONASS Antenna (112-00079-000) ■ Mounting Bracket (193-00044-000) ■ Adapter cable for chassis (060-15202-004) 	093-15202-001
Kit: Lightning Arrestor (112-43400-00-3) with 25 ft. cable	093-15202-002
Kit: Lightning Arrestor (112-43400-00-3) with 25 ft. low loss cable	093-15202-003
Kit: 1:4 GPS Only Splitter (58536A) With Two (2) x 3 ft. cables	093-15202-004
Inline Amplifier (112-15202-001) with adapter	093-15202-005
Kit: <ul style="list-style-type: none"> ■ GPS/GLONASS/BeiDou Antenna (112-15202-003) ■ Mounting Bracket (193-00044-000) ■ Adapter cable for chassis (060-15202-004) 	093-15202-006
Kit: GPS/GLONASS/BeiDou 1:4 splitter with Two (2) x 3 ft. cables	093-15202-007



Note: The required antenna is TALLYSMAN 32-3372-14-01, 40dB GNSS Antenna, N connector. Standard cable is LMR-240 or equivalent. Low loss cable is LMR-400 or equivalent.

Returning the SyncServer S6x0

You should return the equipment to Microsemi only after you have exhausted the troubleshooting procedures described earlier in this chapter, or if Microsemi FTD Services and Support 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 Microsemi FTD Services and Support for assistance.

Repacking the Unit

Return all units in the original packaging. If the original packaging is not available, contact Microsemi FTD Services and Support. 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 Microsemi for repair:

1. Call Microsemi FTD Services and Support 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.microsemi.com/ftdsupport

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 Microsemi, 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 Microsemi.

User's Guide Updates

When this manual is updated the updated version will be available for downloading from Microsemi'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.microsemi.com/ftdsupport



Note: If you are downloading a product manual for the first time, you will need to register with Microsemi 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 Microsemi Sales Department. See www.microsemi.com/sales-contacts/0 for sales support contact information. If you encounter any difficulties installing or using the product, contact Microsemi Frequency and Time Division (FTD) Services and Support:

U.S.A. Call Center:

including Americas, Asia and Pacific Rim
Frequency and Time Division (FTD)
3870 N 1st St.
San Jose, CA 95134

Toll-free in North America: 1-888-367-7966
Telephone: 408-428-7907
Fax: 408-428-7998
email: ftd.support@microsemi.com
Internet: www.microsemi.com/ftdsupport

Europe, Middle East, and Africa (EMEA)

Microsemi FTD Services and Support EMEA
Altlaufstrasse 42
85635 Hoehenkirchen-Siegertsbrunn
Germany

Telephone: +49 700 3288 6435
Fax: +49 8102 8961 533
E-mail: ftd.emeasupport@microsemi.com
ftd.emea_sales@microsemi.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.

In This Appendix

- [Message Provisioning](#)
- [System Notification Messages](#)

Message Provisioning

The SyncServer S6x0 supports logging of events using syslog defined facility and severity codes and system defined facility codes as follows:

Facility codes

- 4 Security/authorization messages
- 20 SyncServer S6x0 Messages (events and alarms)
- 21 SyncServer S6x0 Command History
- 22 SyncServer S6x0 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
- 6 Info: Informational



Notes: Severity codes 2, 3, and 4, are also indicated by the Alarm LED(s) on the front panel.

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 155

- Severity = Notify | Minor | Major | Critical (defined by severity code)
- MsgText = (see tables)

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. These messages can also be sent via email . Alarms can also generate an SNMP trap.



Notes: Transitory Events represent transitions that have no "Set and Clear" behavior, such as when the first lock occurs after power-up (see "first normal-track since powerup" alarm).

Table A-1. System Notification Messages

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
Enter/exit time/freq warmup	1	Minor	No	Entered time/frequency warm-up state	No action required
				Transitioned out of time/frequency warm-up state	No action required
Enter/exit time/freq freerun	2	Minor	No	Entered time/frequency free-run state	No action required
				Transitioned out of time/frequency free-run state	No action required
Enter/exit time/freq fast-track	3	Notify	No	Entered time/frequency fast-track state	No action required
				Transitioned out of time/frequency fast-track state	No action required

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
Enter/exit time/freq normal	4	Notify	No	Entered time/frequency normal state	No action required
				Transitioned out of time/frequency normal state	No action required
Enter/exit time/freq bridging	5	Notify	No	Entered time/frequency bridging state	No action required
				Transitioned out of time/frequency bridging state	No action required
Entered time/frequency holdover	6	Minor	No	Entered time/frequency holdover state	<ul style="list-style-type: none"> ■ Check input references ■ Check configuration for correct reference selection ■ Check reference status ■ Check ref configuration for Priority values.
				Transitioned out of holdover state	No action required
Entered time/frequency holdover recovery	8	Minor	No	Entered time/frequency holdover recovery state	No action required
				Transitioned out of holdover recovery state	No action required
First normal-track since power-up	9	Notify	Yes	First normal-track since Power-Up	No action required

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
Input ref poor quality	21	Minor	No	GNSS NTP J1A J2A J2A J2B Input Poor Quality	<ul style="list-style-type: none"> ■ If this persists for > 1hr check input reference. ■ For GNSS check signal quality.
				GNSS NTP J1A J2A J2A J2B Input poor quality cleared	No action required
Time input selected	24	Notify	Yes	GNSS NTP J1A J2A J2A J2B input selected as time reference	No action required
Freq input selected	25	Notify	Yes	GNSS NTP J1A J2A J2A J2B input selected as frequency reference	No action required
Input Alarm indication signal (AIS)	27	Minor	No	T1E1-[1 2] Input Alarm Indication Signal	Correct input signal.
				T1E1-[1 2] Input Alarm Indication Signal cleared	N/A
Input out of frame	28	Minor	No	T1E1-[1 2] Input out of frame	Correct input signal.
				T1E1-[1 2] Input out of frame cleared	N/A
Input CRC Error	29	Minor	No	T1E1-[1 2] Input CRC Error	Correct input signal.
				T1E1-[1 2] Input CRC Error cleared	N/A
Input BPV	30	Minor	No	T1E1-[1 2] Input Bipolar Violation	Correct input signal.
				T1E1-[1 2] Input Bipolar Violation cleared	N/A

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
GNSS Time Qualified	33	Notify	No	GNSS input time qualified	No action required
				Exit Input Time qualified cleared	No action required
NTP Time Qualified	34	Notify	No	NTP input time qualified	No action required
				Exit NTP Input Time qualified cleared	No action required
PTP Time Qualified	35	Notify	No	PTP input time qualified	No action required
				Exit PTP input time qualified	No action required
J1A Time Qualified	36	Notify	No	J1A input time qualified	No action required
				Exit J1A Input Time qualified cleared	No action required
J1B Time Qualified	37	Notify	No	J1B input time qualified	No action required
				Exit J1B Input Time qualified cleared	No action required
GNSS Freq Qualified	40	Notify	No	GNSS input freq qualified	No action required
				Exit Input Freq qualified cleared	No action required
NTP Freq Qualified	41	Notify	No	Reserved - event will never be reported	Reserved - event will never be reported
PTP Freq Qualified	42	Notify	No	PTP input frequency qualified	No action required
				Exit PTP input frequency qualified	No action required
J1A Freq Qualified	43	Notify	No	J1A input freq qualified	No action required
				Exit J1A Input Freq qualified cleared	No action required
J1B Freq Qualified	44	Notify	No	J1B input freq qualified	No action required
				Exit J1B Input Freq qualified cleared	No action required

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
J2A Freq Qualified	45	Notify	No	J2A input freq qualified	No action required
				Exit J2A Input Freq qualified cleared	No action required
J2B Freq Qualified	46	Notify	No	J2B input freq qualified	No action required
				Exit J2B Input Freq qualified cleared	No action required
J7A Freq Qualified	47	Notify	No	J7A input freq qualified	No action required
				Exit J7A Input Freq qualified cleared	No action required
J7B Freq Qualified	48	Notify	No	J7B input frequency qualified	No action required
				Exit J7B Input frequency qualified cleared	No action required
PTP Input Change	52	Notify	Yes	PTP input lost	No action required (PTP parent dataset changed)
				PTP input lost cleared	No action required
PTP master switch	53	Notify	Yes	PTP Master switched	No action required
PTP input not time/freq traceable	54	Notify	No	PTP input time freq not traceable	No action required
				PTP input time freq not traceable cleared	No action required
PCP client dropped	72	Notify	Yes	PTP client x dropped from LANx client list	No action required
PTP client added	73	Notify	Yes	PTP client x added to LANx client list	No action required
PTP client list refreshed	74	Notify	Yes	PTP client list on LANx refreshed	No action required
PTP state change to disabled	75	Notify	Yes	PTP state changed to disabled on LANx	No action required
PTP state change to listening	76	Notify	Yes	PTP state changed to listening on LANx	No action required

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
PTP state change to master	77	Notify	Yes	PTP state changed to master on LANx	No action required
PTP state change to passive	78	Notify	Yes	PTP state changed to passive on LANx	No action required
GNSS receiver comms failed	91	Major	No	GNSS receiver communications failed	<ul style="list-style-type: none"> ■ Reboot ■ If problem persists call SGS for support.
				GNSS receiver communications failure cleared	No action required
GNSS receiver not tracking satellites	92	Minor	No	GNSS receiver not tracking satellites	<ul style="list-style-type: none"> ■ Check Antenna installation ■ Check if Antenna cable is connected properly. ■ Installation should conform to the guidelines as described in Appendix C.
				GNSS receiver not tracking satellites cleared	No action required
GNSS Signal Low ¹	93	Minor	No	GNSS signal low	Improve antenna gain <ul style="list-style-type: none"> ■ Add amplifier ■ Reduce cable length ■ Or use low loss cable
				GNSS signal normal	No action required
GNSS ant short-circuit	96	Minor	No	GNSS antenna short-circuit	Check for short circuit in the antenna cable. If shorted antenna, then out-of-range and short-circuit alarms will be generated.
				GNSS antenna short-circuit cleared	No action required

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
GNSS ant open-circuit	97	Minor	No	GNSS antenna open-circuit	Check for Antenna not connected or AC coupled splitter. If using a splitter you must at least draw 10mA of current from the SyncServer S6x0. This can be achieved by adding a 50 ohm termination.
				GNSS antenna open-circuit cleared	If no antenna, then open-circuit and out-of-range alarms both will be generated No action required
GNSS PPS failure	98	Major	No	Reserved - event will never be reported	Reserved - event will never be reported
J1A Input LOS (LOSS OF SIGNAL)	99	Notify	No	J1A Input LOS	<ul style="list-style-type: none"> ■ Check if cable is securely connected. ■ Check signal source is present and configured properly.
				J1A Input LOS cleared	No action required
J1B Input LOS (LOSS OF SIGNAL)	100	Notify	No	J1B Input LOS	<ul style="list-style-type: none"> ■ Check if cable is securely connected. ■ Check signal source is present and configured properly.
				J1B Input LOS cleared	No action required
J2A Input LOS (LOSS OF SIGNAL)	101	Notify	No	J2A Input LOS	<ul style="list-style-type: none"> ■ Check if cable is securely connected. ■ Check signal source is present and configured properly.
				J2A Input LOS cleared	No action required

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
J2B Input LOS (LOSS OF SIGNAL)	102	Notify	No	J2B Input LOS	<ul style="list-style-type: none"> ■ Check if cable is securely connected. ■ Check signal source is present and configured properly.
				J2B Input LOS cleared	No action required
J7A Input LOS (LOSS OF SIGNAL)	103	Notify	No	J7A Input LOS	<ul style="list-style-type: none"> ■ Check if cable is securely connected. ■ Check signal source is present and configured properly.
				J2A Input LOS cleared	No action required
J7B Input LOS (LOSS OF SIGNAL)	104	Notify	No	J7B Input LOS	<ul style="list-style-type: none"> ■ Check if cable is securely connected. ■ Check signal source is present and configured properly.
				J7B Input LOS cleared	No action required
Excessive traffic on port ²	112	Minor	No	Excessive traffic on PORT [1 2 3 4 5 6]	<ul style="list-style-type: none"> ■ Check traffic level on network ■ Check for intrusion attempts. ■ Check broadcast traffic. <p>(See Footnote 1)</p>
				Excessive traffic on PORT [1 2 3 4 5 6]	No action required
RESERVED	113				<ul style="list-style-type: none"> ■

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
Ethernet Port1 link down	115	Minor	No	LAN1 port link down LAN1 port link down cleared	<ul style="list-style-type: none"> ■ Check cable. ■ Check the box the interface is connected to. ■ Check Auto-negotiation. <p>No action required</p>
Ethernet Port2 Port link down	116	Minor	No	LAN2 port link down LAN2 port link down cleared	<ul style="list-style-type: none"> ■ Check cable. ■ Check the box the interface is connected to. ■ Check Auto-negotiation. <p>No action required</p>
Ethernet Port3 Port link down	117	Minor	No	LAN3 port link down LAN3 port link down cleared	<ul style="list-style-type: none"> ■ Check cable. ■ Check the box the interface is connected to. ■ Check Auto-negotiation. <p>No action required</p>
Ethernet Port4 Port link down	118	Minor	No	LAN4 port link down LAN4 port link down cleared	<ul style="list-style-type: none"> ■ Check cable. ■ Check the box the interface is connected to. ■ Check Auto-negotiation. <p>No action required</p>

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
Ethernet Port 5 link down	119	Minor	No	LAN5 port link down	<ul style="list-style-type: none"> ■ Check cable ■ Check the box the interface is connected to
				LAN5 port link down	No action required
Ethernet Port 6 link down	120	Minor	No	LAN6 port link down	<ul style="list-style-type: none"> ■ Check cable ■ Check the box the interface is connected to
				LAN6 port link down	No action required
Service load limit exceeded ³	130	Minor	No	Service load limit exceeded on PORTx	Reduce service traffic on specified LAN port or increase service packet limit value. If using PTP unicast profile, reduce the number of PTP clients requesting service. (see Footnote)
				Service load limit exceeded on PORTx cleared	No action required
Power Out of Range	131	Major	No	[+13.2 +5 OSC +5 +3.3 +2.5 +1.5 +1.1 +1.0 osc current 3.8V 1.2V -5V] out of range ____ out of range cleared	<ul style="list-style-type: none"> ■ If alarm persists power cycle/reboot ■ Call SGS support if it persists after reboot/power cycle. n/a

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
Operational Failure:	132	Major	No	Operational failure: <name of item failing> Operational failure cleared	<ul style="list-style-type: none"> ■ If alarm persists power cycle/reboot ■ Call SGS support if it persists after reboot/power cycle. No action required
Synth unlock	137	Major	No	Synth unlock Synth unlock cleared	<ul style="list-style-type: none"> ■ If alarm persists power cycle/reboot ■ Call SGS support if it persists after reboot/power cycle. No action required
Rubidium unlock	138	Major	No	Rubidium unlock Rubidium unlock cleared	<ul style="list-style-type: none"> ■ If alarm persists power cycle/reboot ■ Call SGS support if it persists after reboot/power cycle. No action required
Temperature out of range	139	Minor	No	Temperature out of range Temperature out of range cleared	<p>Check your operating environment.</p> No action required
Fan Failure	140	Minor	No	Fan failed - [A B] Fan failure cleared	<ul style="list-style-type: none"> ■ If alarm persists power cycle/reboot ■ Call SGS support if it persists after reboot/power cycle. No action required

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
Timeline has been changed	152	Notify	Yes	Timeline has been changed n/a	n/a
Phase has been aligned	153	Notify	Yes	Phase has been aligned n/a	n/a
System Reboot	155	Notify	No	System reboot n/a	No action required. n/a
RESERVED	156				
Timing Quality > 1e ⁻⁶	157	Minor	No	Timing Quality > 1e ⁻⁶ set Timing Quality > 1e ⁻⁶ cleared	n/a
Timing Quality > 1e ⁻⁵	158	Minor	No	Timing Quality > 1e ⁻⁵ set Timing Quality > 1e ⁻⁵ cleared	n/a
Timing Quality > 1e ⁻⁴	159	Minor	No	Timing Quality > 1e ⁻⁴ set Timing Quality > 1e ⁻⁴ cleared	n/a
Timing Quality > 1e ⁻³	160	Minor	No	Timing Quality > 1e ⁻³ set Timing Quality > 1e ⁻³ cleared	n/a

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
NTP System Peer Changed	161	Notify	No	NTP System Peer Changed to < > n/a	No action required. n/a
NTP Stratum Changed	162	Notify	No	NTP System Peer Changed to < > n/a	No action required. n/a
NTP Leap Indicator Changed	163	Notify	No	NTP Leap Indicator Changed n/a	No action required. n/a
System Upgrade Available	164	Notify	No	System upgrade available n/a	Upgrade unit software. n/a
J1A IRIG Input Protocol Fault	170	Minor	No	J1A IRIG Input protocol fault J1A IRIG Input protocol fault cleared	Verify IRIG configuration matches source configuration. No action required
J1B IRIG Input Protocol Fault	171	Minor	No	J1B IRIG Input protocol fault J1B IRIG Input protocol fault cleared	Verify IRIG configuration matches source configuration. No action required

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
Holdover Exceeded	172	Minor	Yes	Holdover time error threshold exceeded	Same as for entering holdover
				Holdover time error threshold cleared	No action required
Leap event pending	173	Notify	Yes	Leap event pending	No action required
				Leap event pending cleared	
Excessive Frequency Adjustment	174	Major	Yes	Excessive frequency adjustment	n/a
				Excessive frequency adjustment cleared	
Input power not present	175	Minor	No	No power detected on [AC1 AC2 DC1 DC2]	Connect other power input to AC power (if dual power version) Verify backup supply is operational
				No power detected on [AC1 AC2 DC1 DC2] cleared	n/a
Full system configuration occurred	176	Notify	Yes	Reserved - event will never be reported	Reserved - event will never be reported
Configuration Change	177	Notify	Yes	Configuration changed	No action required.
				n/a	n/a
LPN oscillator unlock	179	Major	No	LPN oscillator unlock	<ul style="list-style-type: none"> ■ If alarm persists, power-cycle ■ Call support if it persists after power-cycle
				LPN oscillator unlock cleared	No action required

Table A-1. System Notification Messages (Continued)

Description	Event ID	Msg Level	Transitory	MsgText	Corrective Action
Manual Time Entry Mode Enabled	180	Minor	No	Entered Manual Time Entry Mode	No action required
				Transitioned out of Manual Time Entry Mode	
LPN oscillator lock state changed	181	Notify	No	LPN Oscillator lock status changed to xx	No action required
				LPN Oscillator lock status changed to xx cleared	No action required
NTP reflector state changed to passive	182	Notify	Yes	NTPr state changed to passive on port x	No action required
NTP reflector state change to server	183	Notify	Yes	NTPr state changed to Server on port x	No action required
Event Overflow	184	Notify	No	Event Overflow at Slot [A B] J1	Reduce frequency or bursts of J1 input signal
				Event Overflow at Slot [A B] J1 cleared	N/A

Note:

- ¹ The "GNSS signal low" alarm is created if the unit has achieved a position solution, but is not tracking at least 4 satellites with a C/No value greater than 37 for several minutes.
- ² The excessive traffic alarm is set if the count of Ethernet packets received in one second exceeds the user-settable "All Packets" threshold on the Security > Packet Monitoring form (license required). With no license the detection level is a fixed 13000 packets per second. All traffic received by the SyncServer S6x0 Ethernet ports, and not handled by the PTP GM or NTP reflector, is counted, such as ARP, ICMP, IGMP. The all-packets limit is set to a fixed 3000 packets/second if a timing service is configured on the port -- NTP reflector or PTP.
- ³ The service load limit alarm is set if the count of Ethernet packets received by the timing service (NTP reflector or PTP master) in one second exceeds the user-settable threshold on the Security > Packet Monitoring form (license required).

Appendix B Specifications and Factory Defaults

This appendix provides mechanical and electrical specifications and factory defaults for the SyncServer S6x0.

In This Appendix

- [Specifications](#)
- [Factory Defaults](#)

Specifications

This section provides the specifications for the SyncServer S6x0 input and output signals.

Mechanical

Table B-1. SyncServer S6x0 Mechanical Specifications

Parameter	Description
Mounting	19 in. or 23 in. Rack
Rack Mounting	See Figure 2-2 for drawings with detailed chassis dimensions.
Width	17.24 in. / 438 mm
Height	1.73 in. / 44 mm; 1 RU
Depth	15.00 in. / 381 mm 15.88 in. / 403 mm - including connectors on rear panel
Weight	
Unit	12.5 lb. / 5.7 kg
Shipping Package	16.3 lb. / 7.4 kg

Environmental

Table B-2. SyncServer S6x0 Environmental Specifications

Parameter	Description
Operating Temperature	-20° to 65° C, -4° to 149° F – Standard or OCXO [startup > -20°C (-4°F)] -5° to 55° C, 23° to 131° F – Rubidium oscillator
Storage Temperature	-40° to 85° C, -40° to 185° F
Operating Humidity	5% to 95% RH, maximum, non-condensing
Operating Altitude	25,000 feet, maximum
Storage Altitude	25,000 feet, maximum

Power

Table B-3. SyncServer S6x0 AC Power Specifications

Parameter	Description
Input Voltage Range	110/220 VAC (90 VAC to 250 VAC), 50/60 Hz
AC Power - Operating	50 W, 417 mA @ 120V

SyncServer S6x0 Dual DC Power Specifications

Parameter	Description
Input Voltage Range	20 VDC to 75 VDC
DC Power - Operating	50 W
Cable connector parts	Housing - Molex 03-12-1036, Terminals - 0018121222 (16-18 AWG tin plated)

Compliance & Certifications

Table B-4. SyncServer S6x0 Compliance Specifications

Parameter	Description
Safety Certifications	<ul style="list-style-type: none"> ■ UL1950 ■ UL60950-1/CSA C22.2 No. 60950-1, Second Edition
EMC Immunity	
Radiated Emissions	<ul style="list-style-type: none"> ■ FCC Part 15, Class A ■ EN 55011 ■ CISPR 22, Class A ■ EN55014
Conducted Emissions	<ul style="list-style-type: none"> ■ FCC Part 15, Class A ■ EN 55011 ■ CISPR 22, Class A ■ EN55014
Immunity Radiated	ENV50140 RF immunity, 10V/m, 80 – 1000MHz, 80% modulation; 900 MHz pulsed at 200 Hz
Immunity Conducted	<ul style="list-style-type: none"> ■ ENV50140 RF common mode immunity, 0.15 - 80 MHz, 10V, 80% modulation ■ EN61000-4-8 Magnetic Field immunity, 50Hz, 40A/m continuous, 1000A/m for 1 sec
Environmental & Physical	
Environmental Compliance	<ul style="list-style-type: none"> ■ FCC Part 15, Class A, ■ CISPR 22, Class A, ■ UL/CSA ■ 60950-1 ■ IEC 60950-1 ■ EN 60950-1 ■ PSE ■ VCCI ■ RoHS (6 of 6)
Shock and Vibration	<ul style="list-style-type: none"> Operational Storage: ETSI EN-300 019-2-3, Mil-STD-810G IEC 60068-2-6 Fc (sinusoidal vib), Mil-Std-810G, figure 514.6C-3 Transportation - Bounce: IEC 60068-2-27Ea (shock 18g) Transportation - Vibration: IEC 60068-2-64Fh (random vib) Transportation - Package Drop: IEC 60068-2-31 Ec Seismic: EN300 019-2-3, NEBS GR-63-CORE

Table B-4. SyncServer S6x0 Compliance Specifications (Continued)

Parameter	Description
Storage Temperature and Humidity Criteria	IEC 60068-2-1Ab (low temp soak), IEC 60068-2-2Bb (hi-temp soak) IEC 60068-2-14Nb (change of temp) IEC 60068-2-78Cb (humidity storage), IEC 60068-2-30Db (humidity condensation)
Operational Humidity Criteria	IEC 60068-2-78Cb, IEC 60068-2-30Db
General	
	<ul style="list-style-type: none"> ■ NTP (v3 - RFC1305, v4 - RFC5905) ■ NTP Unicast, Autokey, ■ MD5 (RFC1321) ■ SNTP (RFC4330) ■ SNMP v2c (RFC1441-1452), v3 (RFC3411-3418) ■ Custom MIB ■ DHCP (RFC2131) ■ DHCPv6 (RFC3315) ■ TACACS+ (RFC1492) ■ LDAPv3 (RFC4510-4521) ■ RADIUS (RFC2865) ■ HTTPS/SSL (RFC2616),high encryption cipher suite ■ SMTP Forwarding ■ SSHv2 ■ IPv4/IPv6 ■ Syslog 1 to 8 servers ■ Key management protocols can be individually disabled. ■ PORT 1: Management & Time protocols ■ PORT 2, 3 & 4: Time protocols only.

VCCI



この装置は、クラスA機器です。この装置を住宅環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

VCCI – A

VCCI-A: (This is a Class A product based on the standard of Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.)

Serial Port

Table B-5. SyncServer S6x0 Console Serial Port Specifications

Item	Description
Connector Type	9-pin, female D connector
Connector Label	CONSOLE
Interface	RS-232, data terminal equipment (DTE)
Baud Rate	57.6 Kbps
Data Bits	8
Parity Bit	None
Stop Bits	1
Flow Control	None

Input Signals

GNSS

Table B-6. SyncServer S6x0 GNSS Input Signal Specifications

Parameter	Specification
Signal Type	GNSS L1
Gain	Between 15 dB and 30 dB including gain of antenna and loss of cable

Table B-6. SyncServer S6x0 GNSS Input Signal Specifications (Continued)

Parameter	Specification
Frequency	GPS: 1575.42 MHz center frequency
Impedance	50 ohms
Coupling	DC (center pin provides DC power to the GNSS antenna or in-line amplifier)
Output to Antenna voltage current	9.7 VDC 100 mA (max)
Connector Type	BNC connector, female
Connector Label	GNSS

IRIG Input

IRIG inputs are available with the Optional Timing I/O Module.

Table B-7. SyncServer S6x0 IRIG Input Signal Specifications

Parameter	Specification
Impedance	50 Ω or high impedance (> 50 k Ω)
Connector Type	BNC
Connector Label	J1
Signal Level	AM: Ratio 2:1 to 3.5:1 Amp: 1 V to 8 V p-p, into 50 Ω DCLS: <0.8 V for logic 0, >2 V for logic 1

IRIG inputs are also available with the Optional Timing I/O Module with fiber optic input (090-15201-013).

Table B-8. SyncServer S6x0 Fiber IRIG Input Signal Specifications

Parameter	Specification
Connector Type	ST, fiber optic
Connector Label	J1
Wavelength	820 nm

Table B-8. SyncServer S6x0 Fiber IRIG Input Signal Specifications (Continued)

Parameter	Specification
Fiber	Multimode
Maximum Length	1000m using 62.5/125 um fiber

NTP Input

Table B-9. SyncServer S6x0 NTP Input Signal Specifications

Parameter	Specification
Connector Type	RJ45
Connector Label	1, 2, 3, 4

PPS Input

1PPS input is available with the Optional Timing I/O Module (090-15201-006).

Table B-10. SyncServer S6x0 PPS Input Signal Specifications

Parameter	Specification
Signal Type	TTL, rising edge active
Impedance	50 Ω or high impedance (> 50 k Ω)
Connector Type	BNC
Connector Label	J1

1PPS input is also available with the Optional Timing I/O Module with fiber optic input (090-15201-013).

Table B-11. SyncServer S6x0 Fiber PPS Input Signal Specifications

Parameter	Specification
Signal Type	Optical, rising edge active
Connector Type	ST, fiber optic
Connector Label	J1
Wavelength	820 nm

Table B-11. SyncServer S6x0 Fiber PPS Input Signal Specifications (Continued)

Parameter	Specification
Fiber	Multimode
Maximum Length	1000m using 62.5/125 um fiber

10M PPS Input

10M PPS input is available with the Optional Timing I/O Module.

Table B-12. SyncServer S6x0 PPS Input Signal Specifications

Parameter	Specification
Signal Type	< 0.8 V for logic 0, > 2 V for logic 1
Impedance	50 Ω or high impedance (> 50 k Ω)
Connector Type	BNC
Connector Label	J1

10MHz, 5MHz, 1MHz Input

The 10MHz, 5MHz, and 1MHz inputs are available with the Optional Timing I/O Module.

Table B-13. SyncServer S6x0 10/5/1 MHz Input Signal Specifications

Parameter	Specification
Signal Type	Sine Wave
Amplitude	1 Vpp to 8 Vpp
Impedance	50 Ω
Connector Type	BNC
Connector Label	J2

T1, E1 Input

The T1 and E1 inputs are available with the Optional Timing I/O Module with Telecom I/O (090-15201-011).

Table B-14. SyncServer S6x0 T1, E1 Input Signal Specifications

Parameter	Specification
Signal Type	T1: ANTSI T1.403. G.703 Section 5 Framed T1 Format: D4, ESF, 1544 kHz E1: G.703 Section 9 Framed E1, CAS or CCS, CRC4 enable/disable; or G.703 Section 13 2048 kHz Composite Clock (CC): 50/50 or 5/8 duty cycle Japanese Composite Clock (JCC): with or without 400 Hz Japanese Sine Wave (JSW): 6.312 MHz
Amplitude	0.2 Vpp to 6.5 Vpp
Impedance	110 Ω
Connector Type	RJ-48C, balanced pair
Connector Label	J7

HaveQuick Input

The J1 input is available as a HaveQuick input with the Optional Timing I/O Module with HaveQuick/PTTI (090-15201-012). J2 is used for the HaveQuick 1PPS input.

Table B-15. SyncServer S6x0 HaveQuick Input Signal Specifications

Parameter	Specification
Signal Type	HaveQuick HaveQuick 1PPS
Amplitude	5V or TTL
Impedance	50 Ω
Connector Type	BNC
Connector Label	J1 for HaveQuick J2 for HaveQuick 1PPS (only available if J1 used for HaveQuick input.

Timing Accuracy for Inputs

Table B-16 lists the expected timing accuracy when using different input references.

Table B-16. Timing Accuracy to Reference

Reference	Timing Accuracy to Reference	Comments
GPS	15 ns rms to UTC (USNO)	
IRIG AM		
A13x	$\pm 5 \mu\text{s}$	10 kHz
B12x	$\pm 10 \mu\text{s}$	1 kHz
E11x	$\pm 1 \text{ ms}$	100 Hz
E12x	$\pm 10 \mu\text{s}$	1 kHz
G14x	$\pm 5 \mu\text{s}$	100 kHz
NASA 36 AM	$\pm 10 \mu\text{s}$	1 kHz
XR3 AM	$\pm 10 \mu\text{s}$	250 Hz
2137 AM	$\pm 10 \mu\text{s}$	1 kHz
IRIG DCLS		
A00x	$\pm 100 \text{ ns}$	
B00x	$\pm 100 \text{ ns}$	
E00x	$\pm 100 \text{ ns}$	
G00x	$\pm 100 \text{ ns}$	
NASA 36	$\pm 100 \text{ ns}$	
XR3	$\pm 100 \text{ ns}$	
2137	$\pm 100 \text{ ns}$	
PTP client	$\pm 1 \mu\text{s}$, typical	
NTP client	$\pm 100 \mu\text{s}$, typical	Server on same subnet

Output Signals

NTP Output

Table B-17. SyncServer S6x0 NTP Output Signal Specifications

Parameter	Specification
Connector Type	RJ45
Connector Label	Ports 1, 2, 3, 4

The timestamps have been compensated for 1000BT. For 100BT, the NTP packets will have a bias of up to 1 microsecond.

PTP Master Output

PTP outputs are available with the PTP License option.

Table B-18. SyncServer S6x0 PTP Output Signal Specifications

Parameter	Specification
Connector Type	RJ45, 100/1000 Base-T
Connector Label	Ports 1, 2, 3, 4
PTP Profile	Enterprise

IRIG Output

IRIG outputs are available with the Timing Input/Output Module (090-15201-006). They are also available on ports J3-J6 on the Telecom module (090-15201-011) and the HaveQuick/PTTI module (000-15201-012). It is available on ports J3-J8 on the Fiber input module (090-15201-14), and ports J4, J6, and J8 on the Fiber output module (090-15201-013).

Table B-19. SyncServer S6x0 IRIG Output Signal Specifications

Parameter	Specification
Signal Type	IRIG B
Connector Type	BNC
Connector Label	J3, J4, J5, J6, J7, J8

Table B-19. SyncServer S6x0 IRIG Output Signal Specifications (Continued)

Parameter	Specification
Impedance	50 Ω
Signal Level	AM: Ratio 10:3 \pm 10% Amp: 3.5 \pm 0.5 Vpp, DCLS: <0.8 V for logic 0, >2.4 V for logic 1

IRIG outputs are also available with the Optional Timing I/O Module with fiber optic outputs (090-15201-014). Only DCLS signals are available on the fiber outputs.

Table B-20. SyncServer S6x0 Fiber IRIG Output Signal Specifications

Parameter	Specification
Connector Type	ST, fiber optic
Connector Label	J3, J5, J7
Wavelength	820 nm
Fiber	Multimode
Maximum Length	1000m using 62.5/125 μ m fiber

T1, E1 Output

The T1 and E1 outputs are available with the Optional Timing I/O Module with Telecom I/O (090-15201-011)..

Table B-21. SyncServer S6x0 T1, E1 Output Signal Specifications

Parameter	Specification
Signal Type	T1: ANTSI T1.403. G.703 Section 5 Framed T1 Format: D4, ESF, 1544 kHz E1: G.703 Section 9 Framed E1, CAS or CCS, CRC4 enable/disable; or G.703 Section 13 2048 kHz Composite Clock (CC): 50/50 or 5/8 duty cycle Japanese Composite Clock (JCC): with or without 400 Hz Japanese Sine Wave (JSW): 6.312 MHz
T1 Amplitude	2.4 Vpk to 3.6 Vpk, 100 Ω
E1 Amplitude	3 V \pm 0.3V, 120 Ω
CC Amplitude	3 Vpk \pm 0.4 V
JCC Amplitude	1 Vpk \pm 0.1V, nominal

Table B-21. SyncServer S6x0 T1, E1 Output Signal Specifications (Continued)

Parameter	Specification
JSW Amplitude	0 DBm +- 3dB, 120 Ω
1.054 or 2.048 MHz squarewave Amplitude	3 Vpp +- 0.3V
Connector Type	RJ-48C, balanced pair
Connector Label	J7, J8

HaveQuick Outputs

The J3 - J6 outputs are available as a HaveQuick outputs with the Optional Timing I/O Module with HaveQuick/PTTI (090-15201-012). These ports can also be configured as 1PPS or 1PPM outputs..

Table B-22. SyncServer S6x0 HaveQuick Output Signal Specifications

Parameter	Specification
Signal Type	HaveQuick TTL HaveQuick 5V
Amplitude	5V or TTL
Impedance	50 Ω
Connector Type	BNC
Connector Label	J3 - J6

Table B-23. SyncServer S6x0 1PPS/1PPM Output Signal Specifications on Timing I/O Module with HaveQuick/PTTI

Parameter	Specification
Signal Type	1PPS 1PPM
Amplitude	5V or 10V
Impedance	50 Ω
Connector Type	BNC
Connector Label	J3 - J6

PTTI Outputs

The J7 and J8 outputs are available as PTTI outputs with the Optional Timing I/O Module with HaveQuick/PTTI (090-15201-012)..

Table B-24. SyncServer S6x0 PTTI Output Signal Specifications

Parameter	Specification
Signal Type	PTTI BCD time code is a 50 bit (full) or 24 (bit abbreviated) message defining the UTC time of day, day of year, and TFOM Transmitted at 50 bps.
Amplitude	+2 V min to 100 Ω , +3 V typical
Impedance	110 Ω
Connector Type	RJ-48C, balanced pair
Connector Label	J7 - J8

TOD Output

Table B-25. SyncServer S6x0 1PPS+TOD Output Signal Specifications

Parameter	Specification
Connector Type	9-pin, female D connector
Connector Label	DATA/TIMING
Signal Level	RS-232
Timing Relationship between 1PPS and TOD	Transmission of a TOD message starts 10 ms (default) 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.

Table B-25. SyncServer S6x0 1PPS+TOD Output Signal Specifications (Continued)

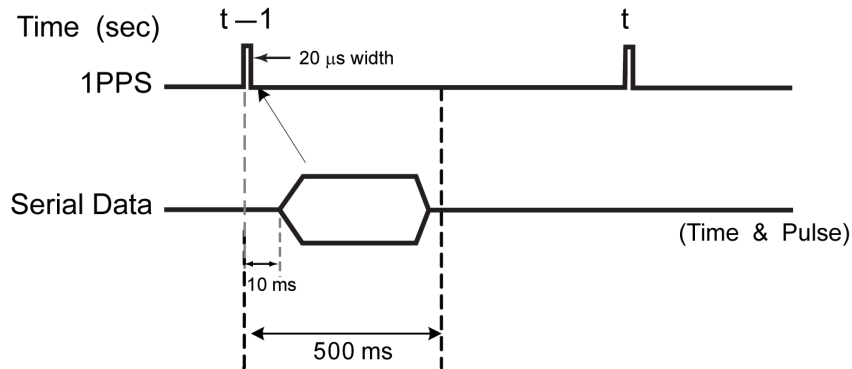
Parameter	Specification
TOD Frame	TOD messages use whole 8-bit bytes for transmission, with check sum protection. Message type and message ID are used to clarify messages. Follows Big Endian convention when a field is longer than one byte, where bit 0 represents the least significant bit (LSB), and bit 0 of each byte is transmitted first.
TOD Transmission Parameters Table B-15. SyncServer S6x0 1PPS+TOD Output Signal Specifications	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

PPS Output

Table B-26. Table B-15. SyncServer S6x0 1PPS+TOD Output Signal Specifications

Parameter	Specification
Connector Type	BNC female connector
Connector Label	1PPS
Impedence	50
Signal Level	3.25V, typical
Timing Relationship between 1PPS and TOD	Transmission of a TOD message starts 10 ms (default) after the rising edge of 1PPS signal, and the transmission is completed within 20 μ s, 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	1.5 ns, typical
Pulse Width	20 μ s
Active Edge	Rising

Figure B-1. Timing Relationship Between 1PPS and TOD for 1 PPS+TOD Outputs



10 / 5 / 1 MHz Output

The 10/5/1 MHz outputs are available with the Optional Timing I/O Module (090-15201-006). They are also available on ports J3-J6 on the Telecom module (090-15201-011) and the HaveQuick/PTTI module (000-15201-012). It is available on ports J3-J8 on the Fiber input module (090-15201-14), and ports J4, J6, and J8 on the Fiber output module (090-15201-013).

Table B-27. SyncServer S6x0 10 MHz Output Signal Specifications

Parameter	Specification
Signal type	Sine wave
Connector type	BNC male
Connector Label	J3 - J8
Impedance	50 Ω
Signal Level	2 - 3 Vpp

1PPS x N Output Signal Specifications

The 1PPS x N outputs are available with the Optional Timing I/O Module (090-15201-006). They are also available on ports J3-J6 on the Telecom module (090-15201-011) and the HaveQuick/PTTI module (000-15201-012). It is available on ports J3-J8 on the Fiber input module (090-15201-14), and on the Fiber output module (090-15201-013).

Table B-28. SyncServer S6x0 1PPS Output Signal Specifications

Parameter	Specification
Signal type	Rising edge on-time TTL or optical
Settings - Fixed Rate	<ul style="list-style-type: none"> ■ 10/5/1MPPS ■ 100/10/1/kPPS ■ 100/10/1/0.5PPS ■ 1PPM
Settings - Programmable Period	100 ns to 2 sec, step size of 10 ns
Pulse Width	<ul style="list-style-type: none"> ■ 50% for programmable pulse ■ 20μs for fixed-rate pulse periods of PPM, PP2S, and PPS ■ 50% for other periods of fixed-rate pulse
Connector type	BNC male, or ST for fiber
Connector Label	J3 - J8
Impedance	50 Ω for electrical

LPN Module Output Signal Specifications

The LPN outputs are available with the Optional LPN Module.

Table B-29. SyncServer S6x0 LPN Module Output Signal Specifications

Parameter	Specification
Phase Noise	1 Hz – 95 dBc/Hz
	10 Hz –125 dBc/Hz
	100 Hz –145 dBc/Hz
	1 kHz –150 dBc/Hz
	10 kHz –155 dBc/Hz
	100 kHz –155 dBc/Hz
	100 kHz –155 dBc/Hz
Allan Deviation	1 s $<3.0 \times 10^{-12}$
	10 s $<4.5 \times 10^{-12}$
	100 s $<7.0 \times 10^{-12}$
Output Level	13 dBm \pm 1.5 dB
Channel-to-Channel Isolation	100 dB at 10 MHz
Connector type	BNC male
Connector Label	J1 - J8
Impedance	50 Ω

ULPN Module Output Signal Specifications

The ULPN outputs are available with the Optional ULPN Module.

Table B-30. SyncServer S6x0 ULPN Module Output Signal Specifications

Parameter	Specification
Phase Noise	1 Hz –112 dBc/Hz
	10 Hz –135 dBc/Hz
	100 Hz –150 dBc/Hz
	1 kHz –158 dBc/Hz
	10 kHz –160 dBc/Hz
	100 kHz –160 dBc/Hz
	100 kHz –160 dBc/Hz
Allan Deviation	1 s $<4.5 \times 10^{-13}$
	10 s $<9.5 \times 10^{-13}$
	100 s $<5.0 \times 10^{-12}$

Table B-30. SyncServer S6x0 ULPN Module Output Signal Specifications (Continued)

Parameter	Specification
Output Level	13 dBm ± 1 dB
Channel Isolation	100 dB at 10 MHz
Connector type	BNC male
Connector Label	J1 - J8
Impedance	50 Ω

Table B-31. Holdover Performance

Oscillator	Holdover - 24 Hour (μsec)
Standard	400
OCXO	25
Rubidium	<1



Note: Holdover values are approximate and assume operation at constant temperature, no initial frequency or phase offset, and that the unit has been powered on for 2 weeks and locked to GNSS for three consecutive days.

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GNSS Antenna Kits Specifications

The basic antenna kit (093-15202-001) consists of the following

- GNSS Antenna (112-00079-000) with internal LNA
- Mounting Bracket (193-00044-000)
- Adapter cable for chassis (060-15202-004). This cable has an N-connector on one end and a BNC-connector on the other end.

Other components available in kits or separately include the following:

- Lightning arrestor (112-43400-00-3)
- Inline Amplifier (112-15202-001)
- GPS L1 4:1 Active Splitter (58536A)

See [Table 7-7](#) for antenna kit part numbers.

GNSS Antennas with Internal LNA Specifications

[Table B-32](#) provides specifications for the GNSS antenna with internal LNA.

Table B-32. GNSS Antenna with Internal Low-Noise Amplifier Specifications

Characteristic	Specification
Mechanical	
Diameter	66.5 mm
Height	21 mm
Weight	150 grams
Environmental	
Operating Temperature	-40 to +85 °C
Environmental	IP67, CE, REACH, and RoHS compliant
Salt Fog / Spray	MIL-STD-810F Section 509.4
Electrical	
1 dB Bandwidth	31 MHz
10 dB Return Loss Bandwidth	45 MHz

Table B-32. GNSS Antenna with Internal Low-Noise Amplifier Specifications (Continued)

Characteristic	Specification
Antenna Gain	4.5 dBic
Axial Ratio	<4 dB @ 1590 MHz, 8 dB typical at band-edges
Filtered LNA Frequency	1575 to 1606 MHz
Gain	40 dB minimum
Gain	flatness ± 2 dB, 1575 to 1606 MHz
Out-of-Band Rejection	
<1550 MHz	>50 dB
>1640 MHz	>70 dB
VSWR (at LNA output)	<1.5:1
Noise Figure	2.5 dB typical
Supply Voltage Range	+2.5 to 16 VDC nominal (12 VDC recommended maximum)
Supply Current	20 mA maximum at 85°C

Wideband GNSS Antennas with Internal LNA Specifications

Table B-33 provides specifications for the GNSS antenna with internal LNA

This wide-band antenna is a precision high gain GNSS antenna covering the BeiDou B1, Galileo E1, GPS L1, GLONASS L1, and SBAS (WAAS, EGNOS, QZSS, and MSAS) frequency band (1557 MHz to 1606 MHz). It provides very circular polarized signal reception through the entire bandwidth of the antenna, thereby providing superior multipath signal rejection. The antenna has a three stage low noise amplifier, comprised of one input LNA per feed, a mid section SAW to filter the combined output, and a final output gain stage. An additional pre-filter provides extra strong protection from near frequency and strong harmonic signals. An L-bracket for pole mounting and 3-foot BNC(m) to N(f) cable is also included.

Table B-33. Wideband GNSS Antenna with Internal Low-Noise Amplifier Specifications

Characteristic	Specification
Mechanical	
Diameter	66.5 mm
Height	21 mm
Weight	150 grams
Environmental	
Operating Temperature	-40 to +85 °C
Environmental	IP67, CE, REACH, and RoHS compliant
Salt Fog / Spray	MIL-STD-810F Section 509.4
Electrical	
2 dB Bandwidth	47 MHz
Antenna Gain (with 100 mm ground plane)	4.25 dBic
Axial Ratio	<2 dB typical, 3 dB max
Filtered LNA Frequency	1559 to 1606 MHz
Gain	40 dB minimum
Out-of-Band Rejection	
<1500 MHz	>50 dB
>1640 MHz	>70 dB
VSWR (at LNA output)	<1.5:1
Noise Figure	3 dB typical
Supply Voltage Range	+2.5 to 16 VDC nominal (12 VDC recommended maximum)
Supply Current	19 mA maximum at 85°C

GNSS Lightning Arrestor Specifications

Table B-34. Lightning Arrestor Specifications

Characteristic	Specification
Type	DC Pass
Mount Type	Bulkhead Mount
PIM Rated	N
Standards	CE Compliant, RoHS Compliant
Connector	N
Surge Side Connector	Bi-Directional N
Protected Side Connector	Bi-Directional N
Frequency Range	dc to 5 GHz
Turn On Voltage	150 Vdc (spark over)
RF Power	25 W
VSWR	<1.2 dB to 1
Insertion Loss	<0.1 dB
Protocol/Application	Gas tube, DC pass RF coaxial protection for dc to 5 GHz

GNSS L1 Inline Amplifier Specifications

The GNSS L1 Inline Amplifier (112-00076-000) option boosts the signal from the antenna. Use this amplifier on longer cable runs to maintain sufficient gain; it receives power from the GNSS radio receiver through the antenna coaxial cable connections. [Table B-35](#) provides mechanical and electrical specifications for the amplifier.

Table B-35. GNSS L1 Inline Amplifier Specifications

Characteristic	Specification
Mechanical	
Connectors, (In/Out)	N-Type
Dimensions, includes connectors	Length: 2.32 in (59 mm)

Table B-35. GNSS L1 Inline Amplifier Specifications (Continued)

Characteristic	Specification
Operating Temp.	-40 to +85 °C
Environmental	RoHS, REACH, and IP67
Electrical	
Nominal Gain	25 dB +4/-0 dB typical
Pass Band Ripple	± 2 dB
Impedance	50 Ohms
Noise Figure	2 dB typical
Bandwidth	1.2 to 1.8 GHz
Input VSWR	1.5 typical / 2 maximum
Output VSWR	1.5 typical / 2 maximum
Reverse Isolation	>35 dB
Output 1 dB	-10 dB
Output 3 dB	+5 dBm

GPS L1 1:4 Active Splitter Specifications

The GPS L1 1:4 active splitter (58536A) option splits the signal from the antenna. [Table B-36](#) provides mechanical and electrical specifications for the high isolation active splitter. Complete specifications for this Microsemi Model 58536A GPS Splitter can be found on the Microsemi web site.

Table B-36. GPS L1 1:4 Active Splitter Specifications

Characteristic	Specification
Number of Output Ports	4
Input/output impedance	50 ohms
VSWR (typical)	Input and output 1.6 at L1
Bandwidth (-3 dB)	L1 (1575.42 MHz) ±20 MHz
Gain (antenna input to any output at L1)	0 dB ±3 dB
Noise Figure	5 dB typical, at 25°C
Port-to-port isolation L1 +/-40 MHz	50 dB typical

Table B-36. GPS L1 1:4 Active Splitter Specifications (Continued)

Characteristic	Specification
DC power	+4.5 to +13 V DC
Damage threshold	18 V DC either polarity
Operating current	23 to 48 mA depending on voltage
Pass through current	450 mA
Group delay	40 ns typical
RF connectors	Female N-type

GPS/GLONASS/BeiDou 1:4 Active Splitter Specifications

The GPS/GLONASS/BeiDou 1:4 active splitter option splits the signal from the antenna. [Table B-36](#) provides mechanical and electrical specifications for the high isolation active splitter.

This L band frequency, RoHS compliant 4:1 active splitter makes it possible to use a single GPS referencing antenna and cable arrangement for multiple synchronization systems. The antenna DC bias select circuit allows for the active antenna DC input to be applied to any or all RF outputs. One DC voltage will be chosen to power the antenna while other inputs will be switched to DC loads. If the selected DC bias input should fail, the DC bias will automatically switch to another DC input to ensure an uninterrupted supply to the active antenna.

Complete specifications for this Microsemi Model 58536A GPS Splitter can be found on the Microsemi web site.

Table B-37. GPS L1 1:4 Active Splitter Specifications

Characteristic	Specification
Number of Output Ports	4
Input/output impedance	50 ohms
Frequency Range	1 GHz to 2 GHz
Noise Figure	2 dB max
Port-to-port isolation	30 - 40 dB
DC power	+3.3 to +12 V DC
Operating current	18 to 20 mA

Table B-37. GPS L1 1:4 Active Splitter Specifications (Continued)

Characteristic	Specification
Pass through current	250 mA
Group delay, L1	5 ns
RF connectors	Female N-type
RoHS 6/6	Compliant

GPS Antenna Coaxial Cable Specifications

Other cable types are available. [Table B-38](#) provides antenna cable specifications. Before using additional cables, verify that the total antenna system gain is acceptable.

Table B-38. Antenna Cable Specifications

Cable Type	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
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	

Table B-38. Antenna Cable Specifications (Continued)

Cable Type	Loss (@1.575 GHz dB per foot)	DC Resistance (Ω per foot)	Type Center Conductor	Flammability
LMR/CNT 240	0.101 dB	Inner Conductor – 0.0032 Outer Conductor – 0.00389	.056 inch diameter Solid BC	
LMR/CNT 600	0.034 dB	Inner Conductor – 0.00053 Outer Conductor – 0.0012	.176 inch diameter Solid BCCA1	

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Factory Defaults

Network

Table B-39. Network > Ethernet Parameters

Description	Default Value	Value Range
Speed	Auto	Auto Full_100 Full_1000
IPv4	IPv4 uncheck/static	IPv4 uncheck IPv4 check/DHCP IPv4 check/Static
IPv6v	IPv6 uncheck/ autoconfig /static	IPv6 uncheck IPv6 check/ Autoconfig uncheck/static IPv6 check/Autoconfig uncheck /DHCP IPv6 check/Autoconfig check/static IPv6 check/Autoconfig check/DHCP
Address (IPv4)	Blank (no value)	[<ipv4_address>]
Subnet (IPv4)	Blank (no value)	[<ipv4_address>]
Gateway (IPv4)	Blank (no value)	[<ipv4_address>]
Address (IPv6)	Blank (no value)	[<ipv6_address>]
Subnet (IPv6)	Blank (no value)	[<ipv6_address>]
Gateway (IPv6)	Blank (no value)	[<ipv6_address>]

Table B-40. Network > SNMP Parameters

Description	Default Value	Value Range
sysLocation	unknown	[<printable ASCII>], 1 - 49 chars
Read Community	microcommr	[<printable ASCII>], 1 - 49 chars
SysName	SyncServer	[<printable ASCII>], 1 - 49 chars
Write Community	microcommw	[<printable ASCII>], 1 - 49 chars
sysContact	admin@ localhost	[<printable ASCII>], 1 - 49 chars
Name (v3 User)	Blank (no val	[<printable ASCII>], 1 - 49 chars

Table B-40. Network > SNMP Parameters (Continued)

Description	Default Value	Value Range
Priv Phrase (v3 User)	Blank (no val	[<printable ASCII>], 1 - 49 chars
Auth Phrase (v3 User)	Blank (no val	[<printable ASCII>], 1 - 49 chars
Min Priv (v3 User)	Authentication	Authentication Authentication & Privacy
Auth Crypt (v3 User)	Blank (no value)	MD5 SHA

Table B-41. Network > SNMP Traps Parameters

Description	Default Value	Value Range
IP Address	Blank (no value)	<IPv4_address> <IPv6_address>
v2c and v3	No Select	No Select v2c v3
User / Community	Blank (no value)	[<printable ASCII>], 1 - 32 chars
Send as Inform	unchecked	unchecked check
Auth Phrase (v3)	Blank (no value)	[<printable ASCII>], 1 - 99 chars
MD5 / SHA (v3)	No check	If v3 check then [<MD5 check> <SHA check>]
Priv Phrase (v3)	Blank (no value)	[<printable ASCII>], 1 - 99 chars

NTP

Table B-42. NTP > NTP Configuration Parameters

Description	Default Value	Value Range
Role	Server	Server Peer Broadcast
Address	Blank (no value)	[<IPv4_address> <IPv6_address> <dns_name>]
Port	Default	LAN1 LAN2 LAN3 LAN4
Prefer	unchecked	unchecked check
Burst	N/A	N/A Burst iBurst Both
MinPoll	Default	Power-of-2 times in seconds range: default 16 32 64 ... 65536 MinPoll cannot be > MaxPoll
MaxPoll	Default	Power-of-2 times in seconds range: default 16 32 64 ... 65536 MaxPoll cannot be < MinPoll
Symmetric	None	None Auto 1 2 ... 17 18 19 20
TTL	7	1 to 7

PTP

Table B-43. PTP > PTP Configuration Parameters for Enterprise Profile

Description	Default Value	Value Range
Domain	0	0 to 127
Two-Step	Disabled	Disabled Enabled
Priority 1	128	0 to 255
Priority 2	128	0 to 255
Announce Interval	0	0 (fixed)
Sync Interval	0	-7 to 7
Delay Interval	3	-7 to 7
Announce Timeout	3	3 (fixed)
Client Timeout	300	10 to 3600

Table B-43. PTP > PTP Configuration Parameters for Enterprise Profile (Continued)

Description	Default Value	Value Range
Diffserv Code	0	0 to 63
Offset Scaled Log Variance Override	Not checked	Not checked or checked
Offset Scaled Log Variance	0x4e5d	0x0 to 0xffff
Time To Live (TTL)	16	1 to 255

Table B-44. PTP > PTP Master Configuration Parameters for Default Profile

Description	Default Value	Value Range
Domain	0	0 to 127
Two-Step	Disabled	Disabled Enabled
Priority 1	128	0 to 255
Priority 2	128	0 to 255
Announce Interval	0	-3 to 3
Sync Interval	0	-7 to 7
Delay Interval	3	-7 to 7
Announce Timeout	3	2 to 10
Client Timeout	300	10 to 3600
Diffserv Code	0	0 to 63
Offset Scaled Log Variance Override	Not checked	Not checked or checked
Offset Scaled Log Variance	0x4e5d	0x0 to 0xffff
Time To Live (TTL)	16	1 to 255

Table B-45. PTP > PTP Master Configuration Parameters for Telecom 2008 Profile

Description	Default Value	Value Range
Domain	0	0 to 127
Two-Step	Disabled	Disabled Enabled
Priority 1	128	0 to 255
Priority 2	128	0 to 255
Unicast negotiation	Enable	Disable Enable
Diffserv Code	0	0 to 63
Offset Scaled Log Variance Override	Not checked	Not checked or checked
Offset Scaled Log Variance	0x4e5d	0x0 to 0xffff
Time To Live (TTL)	16	1 to 255

Table B-46. PTP > PTP Master Configuration Parameters for Power IEC-61850-2016 Profile

Description	Default Value	Value Range
Domain	0	0 to 255
Two-Step	Disable	Disable Enable
Priority 1	128	0 to 255
Priority 2	128	0 to 255
Announce Interval	0	-4 to 4
Sync Interval	0	-7 to 7
Pdelay Resp Followup	Disable	Disable Enable
Announce Timeout	3	2 to 10
Client Timeout	300	10 to 3600 seconds
VLAN	Disable	Disable Enable
VLAN ID	0	0 to 4094
VLAN Priority	4	0 to 7

Table B-47. PTP > PTP Master Configuration Parameters for Power C37-238-2017 Profile

Description	Default Value	Value Range
Domain	254	0 to 127, 254
Two-Step	Disable	Disable Enable
Priority 1	128	0 to 255
Priority 2	128	0 to 255
Announce Interval	0	-4 to 4
Sync Interval	0	-7 to 7
Pdelay Resp Followup	Disable	Disable Enable
Announce Timeout	3	2 to 10
Client Timeout	300	10 to 3600 seconds
VLAN	Disable	Disable Enable
VLAN ID	0	0 to 4094
VLAN Priority	4	0 to 7
C37.238 TLV - Grandmaster ID	0	0 to 65535
Alternate Time Offset Indicator TLV		
State	Enable	Disable Enable
Current Offset	0	
Time of Next Jump	0	
Key	0	0 to 255
Jump Seconds	0	
Display Name		10 characters, maximum

Table B-48. PTP > PTP Master Configuration Parameters for Power C37-238-2011 Profile

Description	Default Value	Value Range
Domain	0	0 to 127
Two-Step	Disable	Disable Enable
Priority 1	128	0 to 255
Priority 2	128	0 to 255
Announce Interval	0	-4 to 4
Sync Interval	0	-7 to 7
Pdelay Resp Followup	Disable	Disable Enable
Announce Timeout	3	2 to 10
Client Timeout	300	10 to 3600 seconds
VLAN	Enable	Disable Enable
VLAN ID	0	0 to 4094
VLAN Priority	4	0 to 7
C37.238 TLV - Grandmaster ID	3	3 to 254
Alternate Time Offset Indicator TLV		
State	Enable	Disable Enable
Current Offset	0	
Time of Next Jump	0	
Key	0	0 to 255
Jump Seconds	0	
Display Name		10 characters, maximum

Table B-49. PTP > PTP Client Configuration Parameters for Telecom 2008 Profile

Description	Default Value	Value Range
Domain	0	0 to 255
Lease Duration	300	60 to 1000
Master 1		Valid IP address
Master 2		Valid IP address
Announce Interval	1	-3 to 1
Sync Interval	-6	-6 to -4
Delay Request Interval	-6	-6 to -4
Announce Timeout	3	2 to 10
Unicast negotiation	Enable	Disable Enable
Diffserv Code	0	0 to 63
Time To Live (TTL)	64	1 to 255
FPP Cluster Width 1	10000	1000 to 10000000
FPP Cluster Width 2	10000	1000 to 10000000

Timing

Table B-50. Timing > Holdover Configuration Parameters

Description	Default Value	Value Range
Time Error Limit	Computed from Holdover Duration default, result depends on oscillator type.	0.000100 ms to 100 ms
Holdover Duration	1 day	0.001 days to 200.00 days

Table B-51. Timing > Serial Parameters

Description	Default Value	Value Range
Output	Off	Off NMEA NENA Legacy
NMEA Detail	All Off	Any combination of the following allowed: ZDA on/off, GGA on/off, GSV on/off, RMV on/off
NENA Detail	DDD...	DDD... WWW ... YYYY ...

References

Table B-52. References > GNSS Configuration Parameters

Description	Default Value	Value Range
GNSS Constellation	GPS	{GPS, Galileo, QZSS}, GLONASS, BeiDou (up to 2 groups)
SBAS Enable	Not checked	Checked or Not checked
Elevation Mask	10	5 to 60 degrees Step size is 1 deg
Mode	Survey	Survey Position Hold Dynamic
Latitude (for Position Hold)	N 0:0:0.000	Ndd:mm:ss.ss or Sdd:mm:ss.sss 0 to 90 degrees
Longitude (for Position Hold)	W 0:0:0.000	Eddd:mm:ss.ss or Wddd:mm:ss.sss 0 to 180 degrees
Altitude (for Position Hold)	0.0 m	-1000.0 to +12000.0 m
Antenna Cable Delay	0	0 to 10000 ns
GNSS Receiver Reset	unchecked	checked unchecked

Security

Table B-53. Security > Users Parameters

Description	Default Value	Value Range
User	new user	new user list of existing users
Delete Selected User	not checked	not checked checked
New Username	Blank (no value) Only admin user is retained.	a-z, 0-9, _, 1 – 32 chars, First character must be a lowercase alpha character (not underscore or number)
New Password	Blank (no value)	[<printable ASCII>, 1 – 64 chars Passwords must contain at least 8 characters, including uppercase, lowercase letters, numbers and special characters. The following characters are not allowed for the password: (', ", <, >, &,), \$
Retype New Password	Blank (no value)	This is same as “New Password”
Recovery Question	No selection	[Birth City? Mother’s Maiden Name? Favorite pet’s name? Custom] <printable ASCII> , 1 – 34 chars
Answer	Blank (no value)	<printable ASCII>, 1 – 34 chars
Email Address	Blank (no value)	<printable ASCII>, 1 – 34 chars
SMTP Gateway	Blank (no value)	<printable ASCII>, 1 – 34 chars
Send Test Email	not checked	not checked checked

Table B-54. Security > Services State Parameters

Description	Default Value	Value Range
Webserver	Checked	Checked Not Checked
SNMP	Checked	Checked Not Checked
SSH	Checked	Checked Not Checked
TOD	Checked	Checked Not Checked
Telnet	Not Checked	Checked Not Checked

Table B-55. Security > HTTPS Web Server Parameters

Description	Default Value	Value Range
Protocols	TLS 1.2	TLS 1.1 TLS 1.2
Cipher Suites	SSL_HIGH_ENCRYPTION	SSL_HIGH_ENCRYPTION SSL_HIGH_AND_MEDIUM_ENCRYPTION
SSL Timeout	10 Minutes	5 to 1440 Minutes

Table B-56. Security > LDAP Settings

Description	Default Value	Value Range
Port - Server Binding	389	1 to 65535
Time Limit for Searching	300	120 to 65535 seconds
Time Limit for binding	300	120 to 65535 seconds
LDAP Protocol version	LDAPv3	LDAPv2 LDAPv3
Scope to search server	sub	base one sub

Admin

Table B-57. Admin > General Parameters

Description	Default Value	Value Range
Hostname	SyncServer	
Web Session Timeout	10 min	5 10 15 30 60 minutes
Check for Software Upgrades	checked	not checked checked

Table B-58. Admin > Alarm Relay Parameters

Description	Default Value	Value Range
Top Selection	Off	Any Major Alarm Any Major or Minor Alarm Off
System Restart Delay	0	0, 1, 2,..., 60 minutes

Table B-59. Admin > Alarms Parameters

Description	Default Value	Value Range
Name	N/A	Cannot be set by user. See Table A-1 for name of each alarm
State	Strictly condition driven	<ul style="list-style-type: none"> ■ Green = condition not set or has been acknowledged ■ Blue = condition set at Notify severity (and has not been user cleared or acknowledged) ■ Orange = condition set at Minor severity (and has not been user cleared or acknowledged) ■ Red = condition set at Major severity (and has not been user cleared or acknowledged) ■ Gray = this is a transient alarm
Clear Now	not checked (all rows)	not checked checked
Auto ACK (s)	0 (all rows)	0, 1, ..., 999, 1000
Severity	See Table A-1 for default severity for each alarm	Notify Minor Major
Reporting Delay (s)	0 (all rows)	0, 1, ..., 999, 1000
Send Trap	checked (all rows)	not checked checked
Write Log	checked (all rows)	not checked checked
Send Email	not checked (all rows)	not checked checked

Table B-60. Admin > Serial Port Config Parameters - Serial/Data Port

Description	Default Value	Value Range
Baud Rate	9600	4800 9600 19.2k 38.4k 57.6k 115.2k
Data Bits	8	7 8
Parity	none	none even odd
Stop Bits	1	1 2

Table B-61. Admin > Serial Port Config Parameters - Console Port

Description	Default Value	Value Range
Baud Rate	115.2k	4800 9600 19.2k 38.4k 57.6k 115.2k
Data Bits	8	8 (fixed)
Parity	none	none (fixed)
Stop Bits	1	1 (fixed)

Timing I/O Modules

Table B-62. Timing I/O Module Default Parameters

Description	Value Range
J1	Timecode; IRIG B; 1kHz, with year; 50 ohm; cable delay of 0 ns
J2	Sine; 10 MHz
J3	Timecode; IRIG B; no local time; B124; squelch never; phase offset of 0 ns
J4	Sine; 10 MHz; squelch never

Table B-62. Timing I/O Module Default Parameters (Continued)

Description	Value Range
J5	Timecode; IRIG B; no local time; B004; squelch never; phase offset of 0 ns
J6	Pulse; Fixed rate; 1PPS; squelch never; phase offset of 0 ns
J7	Off
J8	Off

Table B-63. Timing I/O Module - Telecom E1/T1 Default Parameters

Description	Value Range
J1	Timecode; IRIG B; 1kHz, with year; 50 ohm; cable delay of 0 ns
J2	Sine; 10 MHz
J3	Timecode; IRIG B; no local time; B124; squelch never; phase offset of 0 ns
J4	Sine; 10 MHz; squelch never
J5	Timecode; IRIG B; no local time; B004; squelch never; phase offset of 0 ns
J6	Pulse; Fixed rate; 1PPS; squelch never; phase offset of 0 ns
J7	T1 output; ESF
J8	E1 output; CCS; SSMbit 4; CRC enable; zero suppress on

Table B-64. Timing I/O Module - HaveQuick/PTTI Default Parameters

Description	Value Range
J1	Timecode; IRIG B; 1kHz, with year; 50 ohm; cable delay of 0 ns
J2	Sine; 10 MHz
J3	Timecode; IRIG B; no local time; B124; squelch never; phase offset of 0 ns
J4	Sine; 10 MHz; squelch never

Table B-64. Timing I/O Module - HaveQuick/PTTI Default Parameters (Continued)

Description	Value Range
J5	Timecode; IRIG B; no local time; B004; squelch never; phase offset of 0 ns
J6	Pulse; Fixed rate; 1PPS; squelch never; phase offset of 0 ns
J7	Off
J8	Off

Table B-65. Timing I/O Module - Fiber Input Default Parameters

Description	Value Range
J1	Pulse; Fixed rate; 1PPS; cable delay of 0 ns
J2	Sine; 10 MHz
J3	Timecode; IRIG B; no local time; B124; squelch never; phase offset of 0 ns
J4	Sine; 10 MHz; squelch never
J5	Timecode; IRIG B; no local time; B004; squelch never; phase offset of 0 ns
J6	Pulse; Fixed rate; 1PPS; squelch never; phase offset of 0 ns
J7	Off
J8	Off

Table B-66. Timing I/O Module - Fiber Output Default Parameters

Description	Value Range
J1	Timecode; IRIG B; 1kHz, with year; 50 ohm; cable delay of 0 ns
J2	Sine; 10 MHz
J3	Timecode; IRIG B; no local time; B1344 DCLS; squelch never; phase offset of 0 ns
J4	Sine; 10 MHz; squelch never

Table B-66. Timing I/O Module - Fiber Output Default Parameters (Continued)

Description	Value Range
J5	Timecode; IRIG B; no local time; B004; squelch never; phase offset of 0 ns
J6	Pulse; Fixed rate; 1PPS; squelch never; phase offset of 0 ns
J7	Off
J8	Off

Appendix C Installing GNSS Antennas

The GNSS L1 Reference Antenna is one component of a complete line of GNSS accessories for your GNSS antenna system provided by Microsemi. These accessories are designed to deliver precise GNSS signals over a wide temperature range and in harsh environmental conditions.

In This Chapter

- [Antenna Kits Overview](#)
- [Antenna Kits Accessories](#)
- [GNSS Antenna Installation](#)

Antenna Kits Overview

When deciding on which of the available antenna kits meets your needs, the key factor is the distance between the GNSS antenna and the SyncServer S6x0. There are several coaxial cable lengths available to assist in receiving proper gains from the GNSS antenna. Microsemi offers eight antenna kits for the SyncServer S6x0, plus separate GNSS antenna accessory parts including the antenna, cable, amplifier, lightning arrester, and splitter.

Considerations for Antenna Installation

The GNSS engine requires a net gain at the antenna connector input of the chassis to be between 15 to 30 dB.

All antenna kits include the GNSS L1 antenna, mounting bracket and a BNC cable adapter. The antennas, in-line amplifiers and the lightning arrester have N connectors.

All antenna kits supplied use a LMR-240 or LMR-400, or equivalent, low-loss coaxial cable. The L1 signal loss of LMR-400 is 0.173 dB/meter. The L1 signal loss of LMR-240 is 0.33 dB/meter. The L1 signal loss of a 90 V lightning arrester is typically less than 0.25 dB. See [Antenna Coaxial Cable](#), on page 368.

GNSS Antennas with Low Noise Amplifiers

The antenna used with the SyncServer S600/S650 is a high-gain (40dB) GNSS antenna covering the GPS L1, GLONASS L1, and SBAS (WAAS, EGNOS and MSAS) frequency band (1575 to 1606 MHz). The antenna has a three stage low-noise amplifier, with a mid-section SAW with a tight pre-filter to protect against saturation by high level sub-harmonics and L-Band signals making it excellent for timing applications. An L-bracket for pole mounting and 3-foot BNC(m) to N(f) cable is also included.

Figure C-1. GNSS Antenna



Accuracy of the antenna position determined using receiver survey depends on providing RF gain to the GNSS receiver within a required range of 15 to 30 dB and locating the antenna with an unobstructed field of view in a low multipath environment. If these conditions are not met, the receiver survey will either require longer than 20 minutes to complete or will not complete, preventing the GNSS input from being used by the system as a reference. Also, timing stability will not be optimized if these conditions are not met.

Table C-1. GNSS Antenna Kits & Accessories

Antenna Kit	Part Number	Total Delay (ns)
Kit: Total length: 50 ft, Cable: 50 ft; antenna kit (093-15202-001)	990-15202-050	107
Kit: Total length: 75 ft, Cable: 50 ft; lightning arrestor (112-43400-00-3); Cable: 25 ft; antenna kit (093-15202-001)	990-15202-075	137
Kit: Total length: 100 ft, Cable: 100 ft; antenna kit (093-15202-001)	990-15202-100	167
Kit: Total length: 125 ft, Cable: 100 ft; lightning arrestor (112-43400-00-3); Cable: 25 ft; antenna kit (093-15202-001)	990-15202-125	198
Kit: Total length: 150 ft, Cable: 150 ft; antenna kit (093-15202-001)	990-15202-150	228
Kit: Total length: 175 ft, Cable: 150 ft; lightning arrestor (112-43400-00-3); Cable: 25 ft; antenna kit (093-15202-001)	990-15202-175	258
Kit: Total length: 200 ft, Cable: 200 ft; antenna kit (093-15202-001)	990-15202-200	288
Kit: Total length: 225 ft, Cable: 200 ft; lightning arrestor (112-43400-00-3); Cable: 25 ft; antenna kit (093-15202-001)	990-15202-225	319
250 ft. Antenna Cable	060-15202-250	303
350 ft. Antenna Cable	060-15202-350	424

Table C-1. GNSS Antenna Kits & Accessories

Antenna Kit	Part Number	Total Delay (ns)
450 ft. Antenna Cable	060-15202-450	545
500 ft. Low Loss Antenna Cable	060-15202-500	600
750 ft. Low Loss Antenna Cable	060-15202-750	900
900 ft. Low Loss Antenna Cable	060-15202-900	1080
Kit: <ul style="list-style-type: none"> ■ GPS/GLONASS Antenna (112-00079-000) ■ Mounting Bracket (193-00044-000) ■ Adapter cable for chassis (060-15202-004) 	093-15202-001	46
Kit: Lightning Arrestor (112-43400-00-3) with 25 ft. cable	093-15202-002	31
Kit: Lightning Arrestor (112-43400-00-3) with 25 ft. low loss cable	093-15202-003	30
Kit: 1:4 GPS Splitter With Two (2) x 3 ft. cables	093-15202-004	44
Inline Amplifier (112-15202-001) with adapter	093-15202-005	1
Kit: <ul style="list-style-type: none"> ■ GPS/GLONASS/BeiDou Antenna (112-15202-003) ■ Mounting Bracket (193-00044-000) ■ Adapter cable for chassis (060-15202-004) 	093-15202-006	34 ¹ (28 ns for antenna only)
Kit: GPS/GLONASS/BeiDou 1:4 splitter (112-00118-000) with Two (2) x 3 ft. cables	093-15202-007	6 (2 ns for splitter only)

Note:

¹ 16 ns additional delay for BeiDou

Antenna Kits Accessories

Lightning Arrestor

Microsemi offers the lightning arrestor for installations that require antenna coaxial lead-in protection. The lightning arrestor passes DC power and frequencies in the 1.5 GHz range with L1 GNSS antennas. In most installations, the lightning arrestor mounts near the point at which the antenna lead enters the facility. See the [GNSS Lightning Arrestor Specifications](#), on page 340 for specifications.

Lightning does not have to strike the antenna to significantly damage the antenna or the GNSS receiver. Damage is often due to the effects of a lightning strike on a nearby structure, not a direct strike on the antenna itself. Since lightning strikes may induce damaging voltages in the antenna system when striking nearby objects, attempt to locate the antenna away from lightning rods, towers, and other structures that attract lightning. Also, locate the GNSS antenna lower than any nearby structures that are likely to attract a strike. See [Figure C-2](#).

Figure C-2. GNSS Lightning Arrestor



GNSS L1 In-line Amplifier

The GNSS L1 in-line amplifier (093-15202-005) option boosts the signal from the antenna with total cable lengths of 150 and 230 meters. See the [GNSS L1 Inline Amplifier Specifications](#), on page 340 for specifications.

Cable length is a common cause for signal loss between the GNSS antenna and the GNSS receiver. As with any electromagnetic radio wave, GNSS signals become attenuated as they pass through an electrical cable. The amount of signal loss depends on the length and type of cable used. The inline amplifier attaches inline between the antenna and the antenna cable. It uses the same power as the antenna and does not require extra wiring. The inline amplifier supports a total cable length up to 900 feet depending on the cable type. See [Figure C-3](#).

Figure C-3. Inline Amplifier



GPS L1 1:4 Active Splitter

The active splitter features four output ports, as shown in [Figure C-4](#). See the [GPS L1 1:4 Active Splitter Specifications](#), on page 341 for specifications. This high isolation device can be cascaded without adding separate amplifiers and bias-tees between splitters. The splitter delivers precise GPS signals over a wide temperature range and in harsh environmental conditions. It eliminates feedback and interaction between any GPS system connected to it.

Figure C-4. GPS L1 1:4 Active Splitter



GPS/GLONASS/BeiDou Splitter

This L band frequency, RoHS compliant 4:1 active splitter makes it possible to use a single GPS referencing antenna and cable arrangement for multiple synchronization systems. The antenna DC bias select circuit allows for the active antenna DC input to be applied to any or all RF outputs. One DC voltage will be chosen to power the antenna while other inputs will be switched to DC loads. If the selected DC bias input should fail, the DC bias will automatically switch to another DC input to ensure an uninterrupted supply to the active antenna.

Figure C-5. GPS/GLONASS/BeiDou Splitter



Antenna Coaxial Cable

Microsemi provides coaxial cables with N-type connectors on both ends. [Table C-2](#) lists the part numbers for the cables and its crimp kit. Also see [GPS Antenna Coaxial Cable Specifications](#), on page 343.

Table C-2. LMR-400 Antenna Coaxial Cable Accessories

Part Number	Description
121-32212-00-2	Type N (male) connector for LMR-400 cable
12813080-000-0	Crimp Kit for LMR-400 or equivalent (10 ea. N-Type connector, crimp tool, weatherproof tape)

Contact your sales office for available cable lengths and specific cable item number.

SyncServer Down/Up Converter

For very long antenna runs, down/up converters can be used. There are both coaxial and fiber-optic variations.

Microsemi/Microchip has sold the 142-1650 family of down/up converters, which supports the L1 frequency. Therefore it only supports GPS, Galileo, QZSS, and SBAS for GPS. This system uses a coaxial cable between the converters. The upconverter is inserted between the end of the coaxial cable and the SyncServer. The upconverter is powered by an external power supply.

The upconverter was designed to also operate from power supplied on the RF connector. However, the SyncServer S6x0 does not have sufficient power output to power the upconverter.

The upconverter may not operate correctly if the SyncServer S6x0 is powered up before the upconverter's external power supply.

Microchip recommends that users install a DC-block between the upconverter and the SyncServer S6x0.

GNSS Antenna Installation

This section provides information about planning and installing a GNSS antenna.

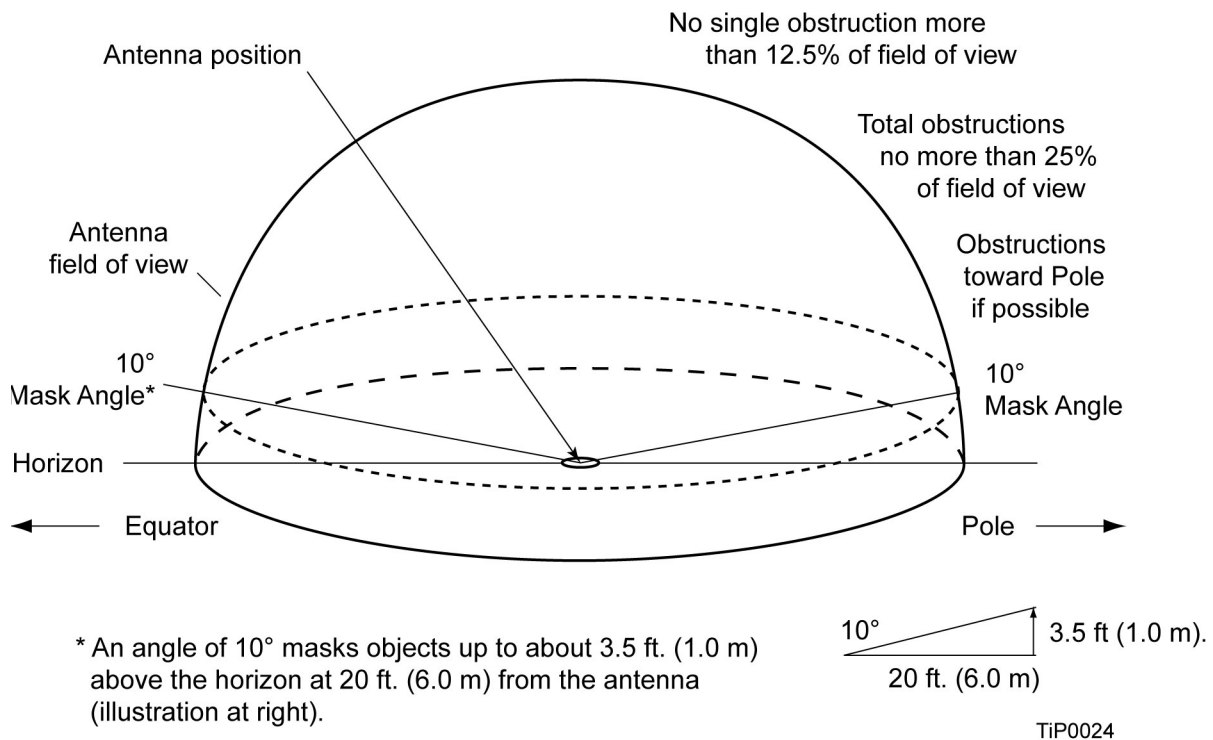
Planning the Antenna Location

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-6](#) as a guide to locate the antenna.

Figure C-6. Locating the GNSS Antenna



Warning: The SyncServer S6x0 GNSS interface uses the electrical current it supplies to power a GNSS antenna to determine whether or not the antenna is properly connected and functional. If the SyncServer S6x0 does not detect any current, it will assume a failed GNSS antenna and will consequently generate an alarm and switch to another timing (non-GNSS) source.

Some GNSS splitters can block the DC current, and if used with SyncServer S6x0, will cause the alarm condition described above. Usage of such GNSS splitters with the SyncServer S6x0 will require the installation of a 50 OHM load so that the SyncServer S6x0 GNSS interface is able to detect current and operate normally.



Caution: To avoid damage to the GNSS 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 GNSS 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 GNSS antenna near, under, or around high voltage lines.
 - Follow local building electrical codes for grounding using the frame ground lugs on the shelf.
 - The in-line amplifier receives DC power from the GNSS receiver, and is supplied on the center conductor of the coaxial cable.
 - Microsemi does not recommend cutting the antenna cables provided in the GNSS Antenna Kit.
-



Recommendation: Microsemi recommends that you consider the following location and environment influences before installing the GNSS 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-6](#).
 - 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 GNSS antenna at least 3.7 m (12 ft.) from metallic objects, if possible.
 - Locate the antenna high enough to avoid drifted snow.
 - Locate the lightning arrestor in a protected area to avoid contact with standing water.
 - Locate the antenna within 9.1 m (30 ft.) of the point at which the antenna cable enters the building.
 - Allow at least 3.0 m (10 ft.) of separation distance between GNSS 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 GNSS 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 lightning arrestors are used, they also need to be connected to the perimeter ground system or to the 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. The ground conductor must have a 9.1 m (30-ft.) radius for any bends made.
- Ensure that no painted surface insulates the lightning arrestor 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 (16 mm²) 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 (50 mm²) ground wire will maintain 1/10 the resistance of the coaxial shield.



Note: Larger ground conductors provide better transient elimination; that is, the larger the ground conductor, the less likely the chance of transients.

-
- Connect lightning arrestors, if part of the grounding scheme, to earth ground through a conductor.



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

-
- 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 GNSS antenna.

- Extra cable ties or acceptable cable clamps
- #6 AWG (16 mm²) copper ground wire (minimum)
- Eight-foot (2.9 m) ground electrode
- Custom mounting plates, U-bolts, PVC pipes, masonry bolt, etc. 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 multivoltmeter (DVM)



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

Microsemi recommends that you coil excess cable to avoid gain mismatch between the GNSS antenna and the GNSS receiver. Coiling the excess cable also allows you to use the factory-installed crimped connector.

Microsemi *does not* recommend cutting the antenna cables provided in the GNSS Antenna Kits. If you must cut the cables, please ensure that the following requirements are met.

Cable Requirements – The total cable length from the GNSS receiver to the antenna must not be shorter than the minimum cable lengths indicated in the GNSS Antenna Kits (see [Table C-1](#)).

Connector Requirements – The cables provided with the GNSS antenna kit have factory installed crimped connectors. If you cut these cables, you must supply and add a connector. Microsemi recommends that you use only crimp-style N-type connectors.

Installing the Antenna

This section provides procedures for installing the GNSS antenna (see [Figure C-7](#)).

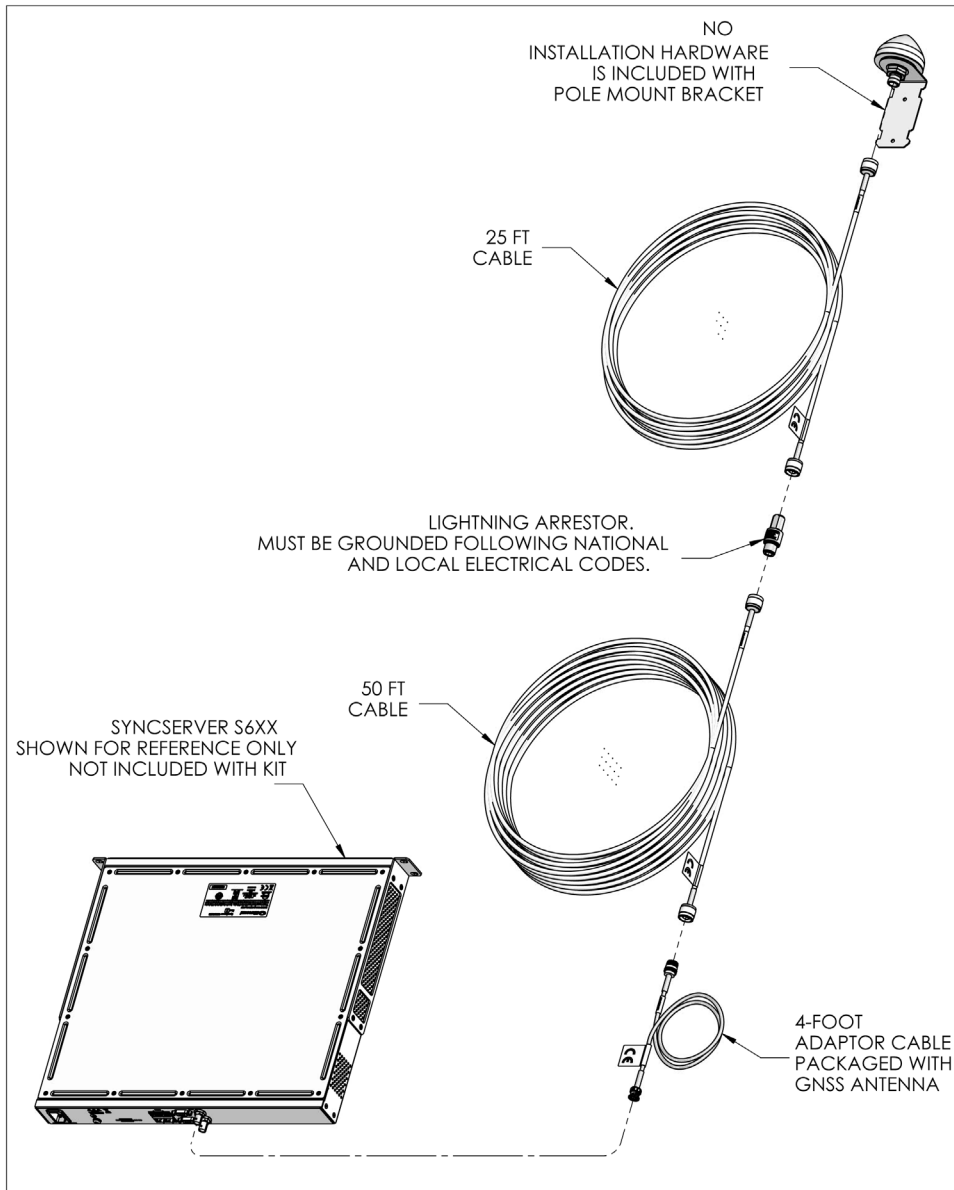
1. Insert the antenna into the right-angle mounting bracket and tighten it using the antenna nuts.
2. Mount the right-angle bracket to the mast using for example, U-bolts.
3. To secure the coaxial cable to the mast, use 8-inch cable ties or appropriate cable clamps.

4. Adhere to local building codes to determine the type and number of fasteners, screws, bolts, etc. that may be required.



Note: Follow local building electrical codes when installing the GNSS antenna.

Figure C-7. GNSS Antenna Installation



Connecting the Cable to the Antenna

This section describes how to connect the coaxial cable to the mounted antenna. See [Figure C-7](#).

1. Connect the 25 ft. cable to the antenna..



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.

2. Connect the other end of the 25 ft. cable to the lightning arrestor.
3. Connect the lightning arrestor to the long cable.
4. Connect the other end of the long cable with the 4 ft. BNC-N adapter cable.



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

Installing the Lightning Arrestor

Lightning arrestors should be installed in accordance with your antenna system grounding scheme. To install a lightning arrestor, follow these steps:

1. Mount the lightning arrestor within 30 ft. (9 m) of the GNSS antenna.
2. Connect the ground wire between the lightning arrestor and the proper grounding zone (building ground, master ground bar, or other) for the mounting location.



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

3. Wrap the connectors with weatherproof tape for added protection.
4. Verify that the antenna coaxial cable center conductor is not shorted to the shield of the cable.

Connecting the GNSS Antenna

You should install the antenna cable from the lightning arrestor to the SyncServer S6x0 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.

To connect the GNSS antenna, perform the following steps:

1. Using a DVM, 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 lightning arrestor. Therefore, apply the same measurements directly to the GNSS 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 BNC (f) antenna connector on the rear panel of the SyncServer S6x0.



Recommendation: Microsemi recommends coiling excess cable to avoid gain mismatch between the GNSS antenna and the SyncServer S6x0. 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.
- Microsemi does not generally recommend the use of GNSS splitters. However, if one is used, Microsemi recommends the use of [GPS L1 1:4 Active Splitter](#).

Appendix D Software Licenses

This product contains licensed third party software, including software available under the GPL licensing scheme. You can obtain these licenses and the open-source software by contacting Microsemi 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
- Europe, Middle East & Africa: 49 700 32886435

An administrative fee may be charged to obtain the source code.

By using the SyncServer S6x0, the user agrees to the terms of these licenses.

The licenses can be obtained using the following URL:

- www.gnu.org/licenses
- www.apache.org/licenses
- www.boost.org/users/license.html
- opensource.org/licenses/BSD-3-Clause
- opensource.org/licenses/BSD-2-Clause
- opensource.org/licenses/MIT
- opensource.org/licenses/Python-2.0
- spdx.org/licenses/bzip2-1.0.6.html
- spdx.org/licenses/AFL-2.1.html
- www.opensource.org/licenses/ISC
- www.openssl.org/source/license.html
- www.openldap.org/software/release/license.html
- www.opensource.org/licenses/Artistic-1.0
- www.zlib.net/zlib_license.html
- opensource.org/licenses/PHP-3.0

Third-Party Software

The following is a list of third-party software applications provided with the SyncServer S6x0 in software release 3.1.

- PACKAGE NAME: adduser
PACKAGE VERSION: 3.115
RECIPE NAME: adduser
LICENSE: GPLv2
- PACKAGE NAME: apache2
PACKAGE VERSION: 2.4.34
RECIPE NAME: apache2
LICENSE: Apache-2.0
- PACKAGE NAME: apr
PACKAGE VERSION: 1.5.2
RECIPE NAME: apr
LICENSE: Apache-2.0
- PACKAGE NAME: apr-util
PACKAGE VERSION: 1.5.4
RECIPE NAME: apr-util
LICENSE: Apache-2.0
- PACKAGE NAME: autoconf
PACKAGE VERSION: 2.69
RECIPE NAME: autoconf
LICENSE: GPLv2 GPLv3
- PACKAGE NAME: base-files
PACKAGE VERSION: 3.0.14
RECIPE NAME: base-files
LICENSE: GPLv2
- PACKAGE NAME: base-passwd
PACKAGE VERSION: 3.5.29
RECIPE NAME: base-passwd
LICENSE: GPLv2+
- PACKAGE NAME: bash
PACKAGE VERSION: 4.30
RECIPE NAME: bash
LICENSE: GPLv3+
- PACKAGE NAME: binutils
PACKAGE VERSION: 2.26
RECIPE NAME: binutils
LICENSE: GPLv3

- PACKAGE NAME: boost
PACKAGE VERSION: 1.60.0
RECIPE NAME: boost
LICENSE: BSL-1.0 MIT Python-2.0
- PACKAGE NAME: Bootstrap
PACKAGE VERSION: 2.3.2
LICENSE: Apache v2
- PACKAGE NAME: busybox
PACKAGE VERSION: 1.24.1
RECIPE NAME: busybox
LICENSE: GPLv2 bzip2
- PACKAGE NAME: ca-certificates
PACKAGE VERSION: 20160104
RECIPE NAME: ca-certificates
LICENSE: GPL-2.0+ & MPL-2.0
- PACKAGE NAME: conntrack-tools
PACKAGE VERSION: 1.4.0
RECIPE NAME: conntrack-tools
LICENSE: GPLv2+
- PACKAGE NAME: Codelgniter
PACKAGE VERSION: 3.1.0
LICENSE: MIT
- PACKAGE NAME: coreutils
PACKAGE VERSION: 8.25
RECIPE NAME: coreutils
LICENSE: GPLv3+
- PACKAGE NAME: cronie
PACKAGE VERSION: 1.5.0
RECIPE NAME: cronie
LICENSE: ISC & BSD-3-Clause & BSD-2-Clause & GPLv2+
- PACKAGE NAME: dbus
PACKAGE VERSION: 1.10.6
RECIPE NAME: dbus
LICENSE: AFL-2 GPLv2+
- PACKAGE NAME: dhcp-client
PACKAGE VERSION: 4.3.0
RECIPE NAME: dhcp
LICENSE: ISC
- PACKAGE NAME: diffutils
PACKAGE VERSION: 3.3
RECIPE NAME: diffutils
LICENSE: GPLv3+

- PACKAGE NAME: directc
PACKAGE VERSION: 0.1
RECIPE NAME: directc
LICENSE: GPLv2
- PACKAGE NAME: dosfstools
PACKAGE VERSION: 3.0.28
RECIPE NAME: dosfstools
LICENSE: GPLv3
- PACKAGE NAME: drivertestprogs
PACKAGE VERSION: 0.1
RECIPE NAME: drivertestprogs
LICENSE: GPLv2
- PACKAGE NAME: dtc
PACKAGE VERSION: 1.4.1+gitAUTOINC+302fca9f4c
RECIPE NAME: dtc
LICENSE: GPLv2 BSD
- PACKAGE NAME: e2fsprogs
PACKAGE VERSION: 1.42.99+1.43+gitAUTOINC+0f26747167
RECIPE NAME: e2fsprogs
LICENSE: GPLv2 LGPLv2 BSD MIT
- PACKAGE NAME: elfutils
PACKAGE VERSION: 0.148
RECIPE NAME: elfutils
LICENSE: GPLv3+ Elfutils-Exception
- PACKAGE NAME: ethtool
PACKAGE VERSION: 4.2
RECIPE NAME: ethtool
LICENSE: GPLv2+
- PACKAGE NAME: expat
PACKAGE VERSION: 2.1.0
RECIPE NAME: expat
LICENSE: MIT
- PACKAGE NAME: expect
PACKAGE VERSION: 5.45
RECIPE NAME: expect
LICENSE: PD
- PACKAGE NAME: factorycfg
PACKAGE VERSION: 1.0
RECIPE NAME: factorycfg
LICENSE: BSD
- PACKAGE NAME: fuse
PACKAGE VERSION: 2.9.3
RECIPE NAME: fuse
LICENSE: GPLv2 & LGPLv2

- PACKAGE NAME: gator
PACKAGE VERSION: 5.21.1+gitAUTOINC+f0ddf6b40e
RECIPE NAME: gator
LICENSE: GPLv2
- PACKAGE NAME: gawk
PACKAGE VERSION: 4.1.3
RECIPE NAME: gawk
LICENSE: GPLv3
- PACKAGE NAME: gdb
PACKAGE VERSION: 7.10.1
RECIPE NAME: gdb
LICENSE: GPLv2 GPLv3 LGPLv2 LGPLv3
- PACKAGE NAME: glib-2.0
PACKAGE VERSION: 2.46.2
RECIPE NAME: glib-2.0
LICENSE: LGPLv2+ & BSD & PD
- PACKAGE NAME: glibc
PACKAGE VERSION: 2.23
RECIPE NAME: glibc
LICENSE: GPLv2 & LGPLv2.1
- PACKAGE NAME: gmp
PACKAGE VERSION: 6.1.0
RECIPE NAME: gmp
LICENSE: GPLv2+ | LGPLv3+
- PACKAGE NAME: gnu-config
PACKAGE VERSION: 20150728+gitAUTOINC+b576fa87c1
RECIPE NAME: gnu-config
LICENSE: GPL-3.0-with-autoconf-exception
- PACKAGE NAME: grep
PACKAGE VERSION: 2.23
RECIPE NAME: grep
LICENSE: GPLv3
- PACKAGE NAME: inetutils-telnetd
PACKAGE VERSION: 1.9.4
RECIPE NAME: inetutils
LICENSE: GPLv3
- PACKAGE NAME: initscripts
PACKAGE VERSION: 1.0
RECIPE NAME: initscripts
LICENSE: GPLv2
- PACKAGE NAME: initscripts-microsemi
PACKAGE VERSION: 1.0
RECIPE NAME: initscripts-microsemi
LICENSE: BSD

- PACKAGE NAME: ipdynaddrd
PACKAGE VERSION: 1.1
RECIPE NAME: ipdynaddrd
LICENSE: BSD
- PACKAGE NAME: iperf
PACKAGE VERSION: 2.0.5
RECIPE NAME: iperf
LICENSE: BSD-2-Clause
- PACKAGE NAME: iproute2
PACKAGE VERSION: 4.4.0
RECIPE NAME: iproute2
LICENSE: GPLv2+
- PACKAGE NAME: iptables
PACKAGE VERSION: 1.6.0
RECIPE NAME: iptables
LICENSE: GPLv2+
- PACKAGE NAME: iputils
PACKAGE VERSION: s20151218
RECIPE NAME: iputils
LICENSE: BSD GPLv2+
- PACKAGE NAME: JQuery
PACKAGE VERSION: 2.2.2
LICENSE: MIT, GPL v2, BSD
- PACKAGE NAME: jqBarGraph
PACKAGE VERSION: 1.0
LICENSE: MIT, GPL
- PACKAGE NAME: kernel
PACKAGE VERSION: 4.1.22+git999
LICENSE: GPLv2
- PACKAGE NAME: kbd
PACKAGE VERSION: 2.0.3
RECIPE NAME: kbd
LICENSE: GPLv2+
- PACKAGE NAME: kmod
PACKAGE VERSION: 22+gitAUTOINC+42f32b8ae4
RECIPE NAME: kmod
LICENSE: GPL-2.0+ LGPL-2.1+
- PACKAGE NAME: ldd
PACKAGE VERSION: 2.23
RECIPE NAME: glibc
LICENSE: GPLv2 LGPLv2.1

- PACKAGE NAME: libacl
PACKAGE VERSION: 2.2.52
RECIPE NAME: acl
LICENSE: LGPLv2.1+
- PACKAGE NAME: libattr
PACKAGE VERSION: 2.4.47
RECIPE NAME: attr
LICENSE: LGPLv2.1+ GPLv2+
- PACKAGE NAME: libbz2
PACKAGE VERSION: 1.0.6
RECIPE NAME: bzip2
LICENSE: bzip2
- PACKAGE NAME: libcap
PACKAGE VERSION: 2.24
RECIPE NAME: libcap
LICENSE: BSD GPLv2
- PACKAGE NAME: libcomerr
PACKAGE VERSION: 1.42.99+1.43+gitAUTOINC+0f26747167
RECIPE NAME: e2fsprogs
LICENSE: GPLv2 LGPLv2 BSD MIT
- PACKAGE NAME: libcrypto
PACKAGE VERSION: 1.0.2h
RECIPE NAME: openssl
LICENSE: openssl
- PACKAGE NAME: libdw
PACKAGE VERSION: 0.164
RECIPE NAME: elfutils
LICENSE: GPL-2+ Elfutils-Exception
- PACKAGE NAME: libe2p2
PACKAGE VERSION: 1.42.99+1.43+gitAUTOINC+0f26747167
RECIPE NAME: e2fsprogs
LICENSE: GPLv2 LGPLv2 BSD MIT
- PACKAGE NAME: libelf
PACKAGE VERSION: 0.164
RECIPE NAME: elfutils
LICENSE: GPL-3+ Elfutils-Exception
- PACKAGE NAME: libevent
PACKAGE VERSION: 2.0.22
RECIPE NAME: libevent
LICENSE: BSD
- PACKAGE NAME: libext2fs2
PACKAGE VERSION: 1.42.99+1.43+gitAUTOINC+0f26747167
RECIPE NAME: e2fsprogs
LICENSE: GPLv2 LGPLv2 BSD MIT

- PACKAGE NAME: libffi
PACKAGE VERSION: 3.2.1
RECIPE NAME: libffi
LICENSE: MIT
- PACKAGE NAME: libgcc
PACKAGE VERSION: linaro-5.2
RECIPE NAME: libgcc
LICENSE: GPL-3.0-with-GCC-exception
- PACKAGE NAME: libgcrypt
PACKAGE VERSION: 1.6.2
RECIPE NAME: libgcrypt
LICENSE: LGPLv2.1+
- PACKAGE NAME: libgpg-error
PACKAGE VERSION: 1.21
RECIPE NAME: libgpg-error
LICENSE: GPLv2+ LGPLv2.1+
- PACKAGE NAME: libidn
PACKAGE VERSION: 1.32
RECIPE NAME: libidn
LICENSE: (LGPLv2.1+ | LGPLv3) & GPLv3+
- PACKAGE NAME: libkmod
PACKAGE VERSION: 22+gitAUTOINC+42f32b8ae4
RECIPE NAME: kmod
LICENSE: LGPL-2.1+
- PACKAGE NAME: libltdl
PACKAGE VERSION: 2.4.6
RECIPE NAME: libtool
LICENSE: GPLv2 LGPLv2.1
- PACKAGE NAME: liblzma
PACKAGE VERSION: 5.2.2
RECIPE NAME: xz
LICENSE: PD
- PACKAGE NAME: libmcrypt
PACKAGE VERSION: 2.5.8
RECIPE NAME: libmcrypt
LICENSE: LGPLv2.1
- PACKAGE NAME: libmnl
PACKAGE VERSION: 1.0.3
RECIPE NAME: libmnl
LICENSE: LGPLv2.1+
- PACKAGE NAME: libmysqlclient
PACKAGE VERSION: 5.5.52
RECIPE NAME: mariadb
LICENSE: GPLv2

- PACKAGE NAME: libnetfilter-contrack
PACKAGE VERSION: 1.0.2
RECIPE NAME: libnetfilter-contrack
LICENSE: GPLv2+
- PACKAGE NAME: libnetfilter-cthelper
PACKAGE VERSION: 1.0.0
RECIPE NAME: libnetfilter-cthelper
LICENSE: GPLv2+
- PACKAGE NAME: libnetfilter-cttimeout
PACKAGE VERSION: 1.0.0
RECIPE NAME: libnetfilter-cttimeout
LICENSE: GPLv2+
- PACKAGE NAME: libnetfilter-queue
PACKAGE VERSION: 1.0.2
RECIPE NAME: libnetfilter-queue
LICENSE: GPLv2+
- PACKAGE NAME: libnfnetlink
PACKAGE VERSION: 1.0.1
RECIPE NAME: libnfnetlink
LICENSE: GPLv2+
- PACKAGE NAME: libnfsidmap
PACKAGE VERSION: 0.25
RECIPE NAME: libnfsidmap
LICENSE: BSD
- PACKAGE NAME: libpam
PACKAGE VERSION: 1.2.1
RECIPE NAME: libpam
LICENSE: GPLv2+ BSD
- PACKAGE NAME: libpcap
PACKAGE VERSION: 1.7.4
RECIPE NAME: libpcap
LICENSE: BSD
- PACKAGE NAME: libpci
PACKAGE VERSION: 3.4.1
RECIPE NAME: pciutils
LICENSE: GPLv2+
- PACKAGE NAME: libpcre
PACKAGE VERSION: 8.38
RECIPE NAME: libpcre
LICENSE: BSD
- PACKAGE NAME: libpq
PACKAGE VERSION: 9.2.4
RECIPE NAME: postgresql
LICENSE: BSD

- PACKAGE NAME: libsqlite3
PACKAGE VERSION: 3.13.0
RECIPE NAME: sqlite3
LICENSE: PD
- PACKAGE NAME: libss
PACKAGE VERSION: 1.42.99+1.43+gitAUTOINC+0f26747167
RECIPE NAME: e2fsprogs
LICENSE: GPLv2 LGPLv2 BSD MIT
- PACKAGE NAME: libssl
PACKAGE VERSION: 1.0.2h
RECIPE NAME: openssl
LICENSE: openssl
- PACKAGE NAME: libstdc++
PACKAGE VERSION: linaro-5.2
RECIPE NAME: gcc-runtime
LICENSE: GPL-3.0-with-GCC-exception
- PACKAGE NAME: libsysfs
PACKAGE VERSION: 2.1.0
RECIPE NAME: sysfsutils
LICENSE: LGPLv2.1
- PACKAGE NAME: libsystemd
PACKAGE VERSION: 229+gitAUTOINC+714c62b463
RECIPE NAME: systemd
LICENSE: GPLv2 LGPLv2.1 MIT
- PACKAGE NAME: libtirpc
PACKAGE VERSION: 1.0.1
RECIPE NAME: libtirpc
LICENSE: BSD
- PACKAGE NAME: libudev
PACKAGE VERSION: 229+gitAUTOINC+714c62b463
RECIPE NAME: systemd
LICENSE: GPLv2 & LGPLv2.1
- PACKAGE NAME: libusb-1
PACKAGE VERSION: 1.0.20
RECIPE NAME: libusb1
LICENSE: LGPLv2.1+
- PACKAGE NAME: libwrap
PACKAGE VERSION: 7.6
RECIPE NAME: tcp-wrappers
LICENSE: BSD
- PACKAGE NAME: libxerces-c
PACKAGE VERSION: 3.1.1
RECIPE NAME: xerces-c
LICENSE: Apache-2.0

- PACKAGE NAME: libxml2
PACKAGE VERSION: 2.9.4
RECIPE NAME: libxml2
LICENSE: MIT
- PACKAGE NAME: logrotate
PACKAGE VERSION: 3.9.1
RECIPE NAME: logrotate
LICENSE: GPLv2
- PACKAGE NAME: ltrace
PACKAGE VERSION: 7.3+gitAUTOINC+01b10e191e
RECIPE NAME: ltrace
LICENSE: GPLv2
- PACKAGE NAME: m4
PACKAGE VERSION: 1.4.17
RECIPE NAME: m4
LICENSE: GPLv3
- PACKAGE NAME: make
PACKAGE VERSION: 4.1
RECIPE NAME: make
LICENSE: GPLv3 LGPLv2
- PACKAGE NAME: microsemi-app
PACKAGE VERSION: 1.0
RECIPE NAME: microsemi-app
LICENSE: BSD
- PACKAGE NAME: microsemi-misc
PACKAGE VERSION: 1.0
RECIPE NAME: microsemi-misc
LICENSE: GPLv2
- PACKAGE NAME: minicom
PACKAGE VERSION: 2.7
RECIPE NAME: minicom
LICENSE: GPLv2+
- PACKAGE NAME: msmtplib
PACKAGE VERSION: 1.6.6
LICENSE: GPL v3
- PACKAGE NAME: mtd-utils
PACKAGE VERSION: 1.5.2
RECIPE NAME: mtd-utils
LICENSE: GPLv2+
- PACKAGE NAME: ncurses
PACKAGE VERSION: 6.0+20160213
RECIPE NAME: ncurses
LICENSE: MIT

- PACKAGE NAME: net-snmp
PACKAGE VERSION: 5.7.1
LICENSE: BSD
- PACKAGE NAME: nettle
PACKAGE VERSION: 3.2
RECIPE NAME: nettle
LICENSE: LGPLv3+ | GPLv2+
- PACKAGE NAME: net-tools
PACKAGE VERSION: 1.60-26
RECIPE NAME: net-tools
LICENSE: GPLv2+
- PACKAGE NAME: netbase
PACKAGE VERSION: 5.3
RECIPE NAME: netbase
LICENSE: GPLv2
- PACKAGE NAME: network-scripts
PACKAGE VERSION: 1.0
RECIPE NAME: network-scripts
LICENSE: BSD
- PACKAGE NAME: nfs-utils
PACKAGE VERSION: 1.3.3
RECIPE NAME: nfs-utils
LICENSE: MIT GPLv2+ BSD
- PACKAGE NAME: NTP
PACKAGE VERSION: 4.2.8p12
LICENSE: BSD like
- PACKAGE NAME: openldap
PACKAGE VERSION: 2.4.39
RECIPE NAME: openldap
LICENSE: OpenLDAP
- PACKAGE NAME: openssh
PACKAGE VERSION: 7.4p1
RECIPE NAME: openssh
LICENSE: BSD
- PACKAGE NAME: openssl
PACKAGE VERSION: 1.0.2h
RECIPE NAME: openssl
LICENSE: openssl
- PACKAGE NAME: oprofile
PACKAGE VERSION: 1.1.0
RECIPE NAME: oprofile
LICENSE: LGPLv2.1+ GPLv2

- PACKAGE NAME: os-release
PACKAGE VERSION: 1.0
RECIPE NAME: os-release
LICENSE: MIT
- PACKAGE NAME: packagegroup-core-boot
PACKAGE VERSION: 1.0
RECIPE NAME: packagegroup-core-boot
LICENSE: MIT
- PACKAGE NAME: pam-plugin
PACKAGE VERSION: 1.2.1
RECIPE NAME: libpam
LICENSE: GPLv2+ BSD
- PACKAGE NAME: pam_ldap
PACKAGE VERSION: 186
LICENSE: GPL v2
- PACKAGE NAME: pam_radius
PACKAGE VERSION: 1.3.17
LICENSE: GPL v2
- PACKAGE NAME: pam_tacplus
PACKAGE VERSION: 1.3.8
LICENSE: GPL v2
- PACKAGE NAME: parted
PACKAGE VERSION: 3.2
RECIPE NAME: parted
LICENSE: GPLv3+
- PACKAGE NAME: pciutils
PACKAGE VERSION: 3.4.1
RECIPE NAME: pciutils
LICENSE: GPLv2+
- PACKAGE NAME: perl
PACKAGE VERSION: 5.22.1
RECIPE NAME: perl
LICENSE: Artistic-1.0 GPL-1.0
- PACKAGE NAME: php
PACKAGE VERSION: 5.6.33
RECIPE NAME: php
LICENSE: PHP-3.0
- PACKAGE NAME: popt
PACKAGE VERSION: 1.16
RECIPE NAME: popt
LICENSE: MIT

- PACKAGE NAME: portmap
PACKAGE VERSION: 6.0
RECIPE NAME: portmap
LICENSE: BSD
- PACKAGE NAME: postgresql
PACKAGE VERSION: 9.2.4
RECIPE NAME: postgresql
LICENSE: BSD
- PACKAGE NAME: procps
PACKAGE VERSION: 3.3.11
RECIPE NAME: procps
LICENSE: GPLv2+ LGPLv2+
- PACKAGE NAME: rpcbind
PACKAGE VERSION: 0.2.3
RECIPE NAME: rpcbind
LICENSE: BSD
- PACKAGE NAME: run-postinsts
PACKAGE VERSION: 1.0
RECIPE NAME: run-postinsts
LICENSE: MIT
- PACKAGE NAME: rwi-mod
PACKAGE VERSION: 0.1
RECIPE NAME: rwi-mod
LICENSE: GPLv2
- PACKAGE NAME: sed
PACKAGE VERSION: 4.2.2
RECIPE NAME: sed
LICENSE: GPLv3+
- PACKAGE NAME: setserial
PACKAGE VERSION: 2.17
RECIPE NAME: setserial
LICENSE: GPLv2.0
- PACKAGE NAME: shadow
PACKAGE VERSION: 4.2.1
RECIPE NAME: shadow
LICENSE: BSD Artistic-1.0
- PACKAGE NAME: sipcalc
PACKAGE VERSION: 1.1.6
RECIPE NAME: sipcalc
LICENSE: BSD
- PACKAGE NAME: smarty
PACKAGE VERSION: 3.1.17
RECIPE NAME: smarty
LICENSE: GPL

- PACKAGE NAME: sqlite3
PACKAGE VERSION: 3.13.0
RECIPE NAME: sqlite3
LICENSE: PD
- PACKAGE NAME: sshfs-fuse
PACKAGE VERSION: 2.5
RECIPE NAME: sshfs-fuse
LICENSE: GPLv2
- PACKAGE NAME: strace
PACKAGE VERSION: 4.11
RECIPE NAME: strace
LICENSE: BSD
- PACKAGE NAME: sudo
PACKAGE VERSION: 1.8.15
RECIPE NAME: sudo
LICENSE: ISC BSD Zlib
- PACKAGE NAME: sysfsutils
PACKAGE VERSION: 2.1.0
RECIPE NAME: sysfsutils
LICENSE: GPLv2
- PACKAGE NAME: sysklogd
PACKAGE VERSION: 1.5.1
RECIPE NAME: sysklogd
LICENSE: GPLv2+ BSD
- PACKAGE NAME: systemd
PACKAGE VERSION: 229+gitAUTOINC+714c62b463
RECIPE NAME: systemd
LICENSE: GPLv2 LGPLv2.1 MIT
- PACKAGE NAME: systemd-compat-units
PACKAGE VERSION: 1.0
RECIPE NAME: systemd-compat-units
LICENSE: MIT
- PACKAGE NAME: systemd-serialgetty
PACKAGE VERSION: 1.0
RECIPE NAME: systemd-serialgetty
LICENSE: GPLv2+
- PACKAGE NAME: tar
PACKAGE VERSION: 1.28
RECIPE NAME: tar
LICENSE: GPLv3
- PACKAGE NAME: tcl
PACKAGE VERSION: 8.6.4
RECIPE NAME: tcl
LICENSE: BSD-3-Clause

- PACKAGE NAME: tcpdump
PACKAGE VERSION: 4.6.1
RECIPE NAME: tcpdump
LICENSE: BSD
- PACKAGE NAME: tzcode
PACKAGE VERSION: 2.2.3
RECIPE NAME: tzcode
LICENSE: PD BSD
- PACKAGE NAME: tzdata
PACKAGE VERSION: 2018c
RECIPE NAME: tzdata
LICENSE: PD BSD
- PACKAGE NAME: udev
PACKAGE VERSION: 229+gitAUTOINC+714c62b463
RECIPE NAME: systemd
LICENSE: GPLv2 LGPLv2.1 MIT
- PACKAGE NAME: update-alternatives-opkg
PACKAGE VERSION: 0.1.8+gitAUTOINC+53274f0875
RECIPE NAME: opkg-utils
LICENSE: GPLv2+
- PACKAGE NAME: update-rc.d
PACKAGE VERSION: 0.7
RECIPE NAME: update-rc.d
LICENSE: GPLv2+
- PACKAGE NAME: usbutils
PACKAGE VERSION: 008
RECIPE NAME: usbutils
LICENSE: GPLv2+
- PACKAGE NAME: util-linux
PACKAGE VERSION: 2.27.1
RECIPE NAME: util-linux
LICENSE: GPLv2+ LGPLv2.1+ BSD
- PACKAGE NAME: valgrind
PACKAGE VERSION: 3.11.0
RECIPE NAME: valgrind
LICENSE: GPLv2 GPLv2+ BSD
- PACKAGE NAME: volatile-binds
PACKAGE VERSION: 1.0
RECIPE NAME: volatile-binds
LICENSE: MIT
- PACKAGE NAME: wget
PACKAGE VERSION: 1.17.1
RECIPE NAME: wget
LICENSE: GPLv3

- PACKAGE NAME: xerces-c
PACKAGE VERSION: 3.1.1
RECIPE NAME: xerces-c
LICENSE: Apache-2.0
- PACKAGE NAME: xinetd
PACKAGE VERSION: 2.3.15
RECIPE NAME: xinetd
LICENSE: BSD
- PACKAGE NAME: yp-tools
PACKAGE VERSION: 2.14
RECIPE NAME: yp-tools
LICENSE: GPL-2.0
- PACKAGE NAME: ypbind-mt
PACKAGE VERSION: 1.38
RECIPE NAME: ypbind-mt
LICENSE: GPL-2.0
- PACKAGE NAME: zlib
PACKAGE VERSION: 1.2.8
RECIPE NAME: zlib
LICENSE: Zlib

Appendix E IP Port Details

In This Appendix

- [Ethernet Port Isolation](#)
- [Management Port Rules](#)
- [Timing Port Rules](#)

Ethernet Port Isolation

The SyncServer S600 Series Network Time Servers have four Ethernet ports. These independent ports allow the SyncServer to connect to distinct Ethernet subnets. There is only one CPU in the SyncServer, so all of the Ethernet traffic, with the exception of the NTP Reflector, is ultimately handled by the protocol stack of the operating system.

The SyncServer uses the operating system IP packet filtering facilities to secure the SyncServer from unwanted access. The SyncServer also creates rules to filter IP packets based on the pre-assigned role of each Ethernet port. The SyncServer assigns different roles to the Ethernet ports. The LAN1 port serves the distinction of being the management port. The other ports serve as timing ports only. Each role is defined as the set of supported protocols allowed for that Ethernet port. By default, the SyncServer is configured to reject all TCP/UDP IP packets.

Management Port Rules

The management port allows the following types of IP packets:

- HTTP: inbound and outbound TCP packets on port 80
- HTTPS: inbound and outbound TCP packets on port 443
- SNMP: inbound and outbound UDP packets on port 161
- SSH: inbound and outbound packets TCP on port 22
- NTP: inbound and outbound UDP packets on port 123

The management port uses the following types of IP packets, but the ports do not show as open on a port scanner:

- SMTP: inbound and outbound TCP packets on port 25

- DNS: inbound and outbound UDP and TCP packets on port 53
- DHCP: inbound and outbound UDP packets on port 67 and 68
- SNMPTRAP: inbound and outbound UDP packets on port 162
- syslog: outbound UDP packets on port 514
- RADIUS: inbound and outbound UDP packets, outbound on port 1812 or 1645
- TACACS+: inbound and outbound TCP/UDP packets, outbound on port 49
- LDAP: inbound and outbound TCP/UDP packets, outbound on port 389

Note that the rules allow inbound packets only, outbound packets that are part of the session are allowed to go out of the port.

Timing Port Rules

The three timing ports allow the following types of IP packets.

- NTP: inbound and outbound UDP packets on port 123
- PTP: inbound and outbound UDP packets on ports 319 and 320

The timing ports use the following types of IP packets, but the ports do not show as open on a port scanner:

- DHCP: inbound and outbound UDP packets on port 67 and 68

Appendix F PQL Mapping

This appendix provides details about the mapping between PQL and various frequency synchronization quality level scales for input and output signals.

In This Appendix

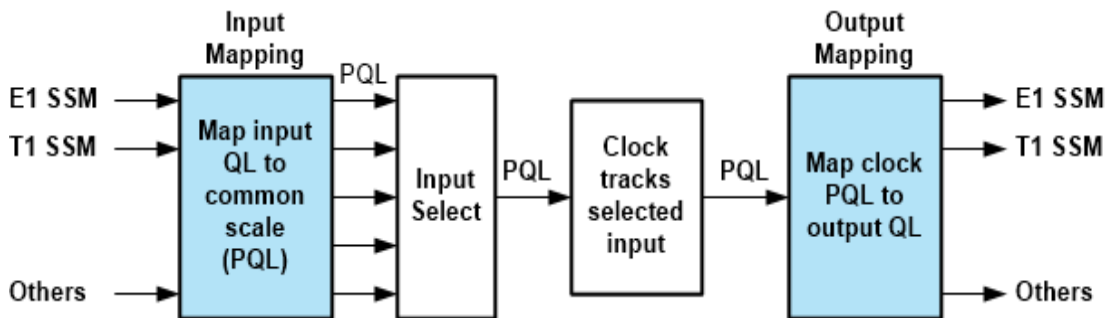
- [Purpose of Input and Output Mapping Tables](#)
- [PQL Input Mapping](#)
- [PQL Output Mapping](#)

Purpose of Input and Output Mapping Tables

When the SyncServer S6x0 has 1 or 2 Timing I/O Modules with Telecom I/O Connections (090-15201-011) the topic of Synchronization Status Messaging (SSM) becomes relevant. In this context, SSM provides a frequency quality measure that can be passed between equipment to identify "how good" the frequency "on the wire" is. E1 and T1 frequency references have a long history of support for SSM, but since they don't use the same quality scales a mechanism is needed to merge the scales to allow inter-operability of these signal types. The telecom module supports E1 and T1 input (J7 connection) as well as E1 and T1 output (J7 and J8 connections), so the inter-operability case is possible. For example, J7 can be configured to use an SSM-capable T1 as input frequency reference while J8 is providing an SSM-capable E1 output. This section addresses the question that arises in these cases: what is the input-to-output mapping of SSM? Figure F-1 shows the overall end-to-end process.

Reference inputs may use different scales for quality level. At the input, these different scales of quality level are mapped to a common scale called PQL (priority quality level). The PQL scale is a number from 1 to 16, with 1 being the highest quality and 16 being the lowest. Once all input quality levels are mapped to PQL, internal processing will only use PQL as the quality indicator. See [PQL Input Mapping](#), on page 405 for PQL mapping of frequency inputs.

Figure F-1. PQL Input and Output Mapping



E1 and T1 Signals That Embed SSM

For E1 configurations, they all support embedded SSM except for these: CAS or CCS frame types with CRC state disabled, 2.048 MHz SquareWave.

For T1 configurations, only the ESF frame type supports embedded SSM.

For the cases when one of these SSM-capable signals is configured as a frequency input to the S6xx, the SSM content will be expected and processed as described here. Note that T1 and E1 inputs can only be configured on J7 connection. As with all system references, to use any input it must be enabled on the Timing > Input Control form.

Figure F-2. Enabling J7 Telecom Input

<input type="checkbox"/>	GNSS	1
<input type="checkbox"/>	Slot A J1 Timecode	2
<input type="checkbox"/>	Slot B J1 Timecode	3
<input type="checkbox"/>	PTP	4
<input type="checkbox"/> Ignore UTC corrections from GPS reference and serve GPS timescale. Not applicable to any reference (i.e. Timecode, NTP, etc.)		
Frequency Reference Priority		
Enable	Reference	Priority
<input type="checkbox"/>	Slot A J2 (Frequency)	1
<input type="checkbox"/>	Slot B J2 (Frequency)	2
<input type="checkbox"/>	Slot A J1 (10MPPS, 10PPS)	3
<input type="checkbox"/>	Slot B J1 (10MPPS, 10PPS)	4
<input checked="" type="checkbox"/>	Slot A J7 (T1, E1)	5

Here's a summary of how SSM-capable inputs are processed:

1. The SSM value is extracted from the input.

If it is an E1 signal, the legal SSM encodings are shown in left column of [Table F-4](#). Each of these have a mapping to an internal-use-only PQL value, shown in the rightmost column. For example if 0x4 is decoded on the input, it will result in PQL = 6. As will be seen, the purpose of PQL is to provide a common scale for merging E1 and T1 signals onto a single quality comparison scale. PQL never actually appears on any signals, it is an internal comparison scale.

If the input is a T1 ESF-framed signal, the legal SSM encodings are shown in the left column of table F-5. The legal SSM encodings are shown in the left column and associated PQL value in rightmost column.

For any of these signals, if an illegal SSM code is read (anything not in the associated table) then the input will not be qualified for use (it would remain in red on Dashboard > Timing, Frequency References row).

2. Assuming an SSM code is actually being read from the input, that value is shown on the References > Status form. Look for the row labeled Slot A J7 (or Slot B J7), the Type column will summarize the input signal configuration and show the SSM value. If J7 has been configured as an output that will also be shown here to help with troubleshooting.

Using the mapping to PQL covered in step 1, this value is compared with a PQL value that is assigned to the internal reference oscillator in this S6xx. These assignments are shown in Table F-1. The type of oscillator in the unit can be

observed on Help > About. Using the PQL mapping of the input and the appropriate value from F-1 a very simple decision is made: If the input PQL is a larger number than the internal oscillator PQL then the input will NOT be used (the larger the PQL, the worse the frequency performance). The purpose of this comparison test and possible rejection of the input is based the following basic concepts:

- The reference oscillator in the S6xx is also a frequency reference, it just happens to be embedded inside the product.
- If the candidate externally-supplied frequency reference (the signal with the embedded SSM information) is indicating worse quality than the quality of S6xx internal reference, then it is better to just use the internal reference and reject the candidate reference.

If the candidate input is rejected due to failure of this comparison test, it will remain red on Dashboard > Timing frequency references row, indicating that it is not qualified for use.

Keep in mind that the input SSM is continually being read, so if the SSM value from the candidate improves, this reference could become qualified. The process is dynamic.

3. Assuming the candidate reference is not rejected by the prior step, then it can become qualified (it will be shown in green on Dashboard > Timing frequency references row). For simplicity of this explanation, assume that the T1 or E1 SSM-capable reference is the only external candidate reference being provided. In this case, it will not only be qualified for use (meaning that it could be selected from the pool of qualified candidates), it will actually be selected as the frequency reference for the S6xx.
4. To follow the complete SSM input-to-output path we'll use an example. In this case the unit has a telecom module in Slot A which has been configured as a reference input, specifically a T1 ESF-framed signal. A valid T1 ESF signal is provided containing a known SSM value (taken from another Microsemi product).

From the References > Status form (shown below) we can see the configuration of the J7 input as well as the current SSM value that is being read: 0x0C. Using table F-5 (used for T1 SSM inputs) we find that 0x0C maps to PQL = 4. This form also shows at the top that J7 connection is the current input reference for this S650. This means that the PQL=4 value is sourcing SSM for any T1 and E1 outputs that might be configured.

Figure F-3. SSM input values shown in Type column on References ' Status form

Current Input Reference		SLOT A J7
Input Reference(s)	Status	Type
GNSS	Disabled	N/A
PTP	Disabled	
NTP	Not Qualified	N/A
Slot A J1	Disabled	N/A
Slot A J2	Disabled	N/A
Slot B J1	Disabled	N/A
Slot B J2	Disabled	N/A
Slot A J7	Qualified	Frametype ESF; T1 SSM: 0x0c

- The form will not self-update this status. To ensure that current value is being shown, refresh the form.
- The format of the SSM values is not correctly shown, but the content is correct. Ignore the trailing "FF" for E1 values.

Another view of the overall system status can be seen on Dashboard > System Timing. The Current Reference row shows that the input at AJ7 is the selected reference for the system. It also shows that the system is frequency locked. Note that since there is no time-reference into the system, the Time of Day Status remains in freerun.

Figure F-4. S6xx Frequency Locked to T1 ESF Input on Slot A J7

Timing	
Time of Day Status	Freerun
Current Reference	Slot A J7 (Freq status: Locked)
Timing References	
Frequency References	Slot A J7 (Frametype ESF)

We can use tables F-6 and F-7 to identify the SSM values that will be encoded onto E1 or T1 outputs (if they are capable of encoding SSM). Since we already identified that the PQL level of the current reference is 4, then we just look up the corresponding output SSM for each signal type. Table F-6 shows that a PQL of 4 maps to output E1 SSM of 0x4 (it is SSM that will be encoded on any SSM-capable E1 output). Similarly, table F7 shows the mapping for a T1 ESF signal. The PQL of 4 maps to SSM of 0x0CFF.

The S6xx performs this conversion automatically and displays these values on the Dashboard > Slot Modules form. As shown, whenever the S6xx contains a telecom module, the T1 and E1 current output SSM values will always be shown here, even if there are currently no actual outputs of this type being generated. As can be seen, the values match what was determined from the tables (note the T1 should have the appended "FF", not the E1 on the form shown, but the actual outputs will be encoded correctly).

Figure F-5. Dashboard > Slot Modules always shows T1 and E1 output SSM encodings

Slot Modules		
Modules	Type	Status
Slot A	Timing I/O + Telecom Card	Installed T1 Output SSM: 0x0C: E1 Output SSM: 0x04FF
Slot B	Timing I/O + Fiber Output Card	Installed

Frequency References That Don't Provide SSM

The prior section covered SSM processing for input frequency reference configurations that are SSM capable. All other frequency inputs on S6xx are not SSM-capable, so there is nothing to decode. However, since it is always possible to have SSM-capable outputs (regardless of selected input reference) there must be an input-to-output mapping process for these cases.

This category is handled just the same as the prior section except, for these non-SSM inputs, the PQL value is always assigned the value 1, which is equivalent to saying this is the best possible frequency quality. From there the mapping process is identical. Here's an example where the J7 input has been changed to T1 frametype D4, which is NOT SSM capable and therefore PQL is assigned the value 1.

Figure F-6. Using a non-SSM capable input PQL is always assigned value of 1

Time of Day Status	Freerun
Current Reference	Slot A J7 (Freq status: Locked)
Timing References	
Frequency References	Slot A J7 (Frametype D4)

Use tables F-6 and F-7 to see the values that will be encoded onto SSM-capable outputs. From F-6 (E1 encodings) it is seen that PQL = 1 will encode SSM 0x2. From F-7 (T1 encodings) it is seen that PQL = 1 will encode SSM 0x04FF.

As always, this information is provided on the Dashboard > Slot Modules form, in the row associated with the telecom module (note the T1 should have the appended "FF", not the E1 on the form shown, but the actual outputs will be encoded correctly).

Slot Modules		
Modules	Type	Status
Slot A	Timing I/O + Telecom Card	Installed T1 Output SSM: 0x04; E1 Output SSM: 0x02FF
Slot B	Timing I/O + Fiber Output Card	Installed

The current set of frequency inputs that are NOT capable of encoding SSM include:

- Any E1 signal with CRC disabled, E1 2.048 MHz
- T1 framed D4, T1 1.544 MHz
- Frequency inputs on J2 (1 MHz, 5 MHz, 10 MHz)
- Frequency inputs on J1 (1PPS, 10MPPS)

Any of these, when selected as the system frequency reference will set PQL = 1.

Selection of Frequency References

The selection of which frequency reference to use in a situation where there are multiple candidates is fundamentally unchanged by the addition of SSM-capable input references. Here are the key points:

- Use the priority control (see Timing > Input Control, Frequency Reference Priority group) to define the preferred order of frequency input selection. When there are multiple qualified candidates the one with highest priority will be selected.
- While the SSM value for use on T1 or E1 outputs (that can encode SSM) will be based on the PQL of the selected frequency reference (process covered in prior sections), the PQL is not used to modify the selection criteria for frequency inputs. In other words, if the PQL of a higher priority reference is worse than the PQL of a lower priority reference, it will not affect the selection decision: the highest priority qualified reference always gets selected.
- The one situation where SSM can impact frequency reference selection is if the decoded SSM maps to a PQL that is worse than the static PQL of the internal reference. When that occurs, the reference become disqualified and therefore can't be selected (regardless of its priority).

Table F-1. Oscillator PQL Values

OSCILLATOR	PQL
Rubidium	4
OCXO	6
Standard	12

Quality Levels Defined by ITU-T

The mapping between PQL and various frequency synchronization quality level scales conforms to the frequency synchronization quality levels defined in ITU-T G.781 (for SSM) and ITU-T G.8265.1 (SSM).

G.781 defines five valid QL and SSM values for Option I network (2048 kbps hierarchy), as shown in [Table F-2](#).

Table F-2. G.781 QL and SSM values for Option I Network (2048 kbps hierarchy)

QL	SSM	Clock Quality Definition
PRC	0x2	G.811
SSU-A	0x4	G.812 type I or V
SSU-B	0x8	G.812 type VI
SEC	0xB	G.813, or G.8262 option I
DNU	0xF	Should not be used for synchronization

G.781 defines ten valid QL and SSM values for Option II network (1544 kbps hierarchy), as shown in [Table F-3](#).

Table F-3. G.781 QL and SSM values for Option II Network (1544 kbps hierarchy)

QL	SSM	Clock Quality Definition
PRS	04FF	G.811
STU	08FF	Synchronized - traceability unknown
ST2	0CFF	G.812 type II
TNC	78FF	G.812 type V

Table F-3. G.781 QL and SSM values for Option II Network (1544 kbps hierarchy)

QL	SSM	Clock Quality Definition
ST3E	7CFF	G.812 type III
ST3	10FF	G.812 type IV
SMC	22FF	G.813, or G.8262 option I
PROV	40FF	Provisionable by network operator
DUS	30FF	Should not be used for synchronization

PQL Input Mapping

Table F-4 shows PQL values converted from SSM for Option I Network frequency references. Table F-5 shows PQL values converted from SSM for Option II Network frequency references.

Table F-1 shows PQL values associated with clock types for rubidium and quartz oscillators. Table F-8 shows PQL values associated with various clock states for rubidium and quartz oscillators.

Table F-4. PQL Input Mapping for Option I Network - Converted from SSM

Input E1 SSM	Input QL	To Input PQL
0x2	QL-PRC	3
0x4	QL-SSU-A	6
0x8	QL-SSU-B	9
0xB	QL-SEC/EEC1	13
0xF	QL-DNU	16
invalid_SSM		

Table F-5. PQL Input Mapping for Option II Network - Converted from SSM

Input T1 SSM	Input QL	To Input PQL
04FF	QL-PRS	1
08FF	QL-STU	2
0CFF	QL-ST2	4
78FF	QL-TNC	6
7CFF	QL-ST3E	11
10FF	QL-ST3	12
22FF	QL-SMC/EEC2	14
40FF	QL-PROV	15
30FF	QL-DUS	16
invalid SSM		

PQL Output Mapping

Output signal quality level is determined by the quality level of the internal clock. When the internal clock is tracking a reference, the quality level (PQL value) of the internal clock is the PQL of the selected reference. At the outputs, the frequency PQL is converted to the appropriate quality levels for different output signal types, as shown in [Figure F-1](#). See [Table F-6](#) below for PQL output mapping for Option I networks. See [Table F-7](#) below for PQL output mapping for Option II networks.

When the internal clock is not tracking a reference, the quality level of the internal clock is determined by its clock state and its oscillator quality. [Table F-8](#) shows the internal clock quality level for different oscillator types and clock states.

Table F-6. PQL Output Mapping for Option I Network - Converted to SSM

From Output PQL	Output E1 SSM	Output QL
1	0x2	QL-PRC
2		
3		

Table F-6. PQL Output Mapping for Option I Network - Converted to SSM (Continued)

From Output PQL	Output E1 SSM	Output QL
4	0x4	QL-SSU-A
5		
6		
7	0x8	QL-SSU-B
8		
9		
10		
11		
12	0xB	QL-SEC/EEC1
13		
14		
15	0xF	QL-DNU
16		

Table F-7. PQL Output Mapping for Option II Network - Converted to SSM

From Output PQL	Output T1 SSM	Output QL
1	04FF	QL-PRS
2	08FF	QL-STU
3	04FF	QL-PRS
4	0CFF	QL-ST2
5	78FF	QL-TNC
6		

Table F-7. PQL Output Mapping for Option II Network - Converted to SSM (Continued)

From Output PQL	Output T1 SSM	Output QL
7	7CFF	QL-ST3E
8		
9		
10		
11		
12	10FF	QL-ST3
13	22FF	QL-SMC/EEC2
14		
15	40FF	QL-PROV
16	30FF	QL-DUS
	invalid SSM	

Table F-8. PQL Values for Clock States

CLOCK STATE	Rb	OCXO	Standard
Warmup	16	16	16
Freerun	4	6	12
Locking	4	6	12
Locked	Freq PQL for Selected Ref.	Freq PQL for Selected Ref.	Freq PQL for Selected Ref.
Bridging	Freq PQL for Selected Ref.	Freq PQL for Selected Ref.	Freq PQL for Selected Ref.
Holdover	4	6	12
Extended Holdover	4	6	12
Relocking	4	6	12

Appendix G Configuring Remote Auth Servers in the SyncServer S600/S650

This appendix provides details about installing and configuring remote auth servers in the SyncServer S600/S650.

In This Appendix

- [Install and configure RADIUS server](#)
- [Install and configure Tacplus server](#)
- [Install and configure OpenLDAP server](#)

The task of setting up the remote authentication servers is usually not trivial for any first time user. Ideally, you can simply follow these instructions and get the job done. Note that the instructions are based on the open source server software at the time of this writing (April, 2018). Also, RADIUS, TACACS+ and LDAP are only enabled when the Security Protocol License Option Key is installed.

In order to confirm the accuracy of the instructions, Microchip repeated the same testing by following the instructions. If you read this document at some later time, the instructions may not be as accurate. In that case we suggest you open a browser and do Google search for answers.

Install and configure RADIUS server

Microchip uses the widely available open source RADIUS server software FreeRADIUS. The FreeRADIUS binaries exist for different platforms. This note describes how to download, build and install the FreeRADIUS server from source on a 64bit Ubuntu 14.04/16.04. The instructions are the same for both Ubuntu 14.04/16.04.

1. Download FreeRADIUS

Use the <http://freeradius.org/releases/> to download the latest stable release source. As of this writing, the stable version is 3.0.15.

2. Download and Install 'talloc'

The FreeRADIUS has a dependency on the talloc package which is not installed on either Ubuntu 14.04 or Ubuntu 16.04. In fact, apt-get install fails to find the talloc package. Use <https://www.samba.org/ftp/talloc/> to download talloc source code. As of this writing, the 2.1.10 release is the latest.

```
tar xzf talloc-2.1.10.tar.gz
cd talloc-2.1.10
./configure
make
sudo make install
```

3. Install FreeRADIUS

```
tar xzf freeradius-server-3.0.15.tar.gz
cd freeradius-server-3.0.15
./configure
make
sudo make install
```

4. Configure FreeRADIUS

The configuration files are under `/usr/local/etc/raddb` directory. You want to 'su' to be 'root' before making edits since all the files and directories under `/usr/local/etc/raddb` are owned by 'root'.

```
su -  
cd /usr/local/etc/raddb
```

Note that we assume you enabled 'root' on the Ubuntu installation. If not, you want to add 'sudo' to commands you run that requires 'root' privilege.

4.1 Run FreeRADIUS with OpenSSL vulnerability

By default, the FreeRADIUS exits immediately if the OpenSSL it uses has known vulnerabilities. For our testing purposes, we want to disable this check. Open the `radiusd.conf`. Search for the security section, starting with

```
security {  
.....  
}
```

Comment out the line 'allow_vulnerable_openssl = no' (before the '}') and add a line below that line 'allow_vulnerable_openssl = yes'

```
#allow_vulnerable_openssl = no  
allow_vulnerable_openssl = yes
```

4.2 Configure clients

Open `clients.conf`, at the top of file immediately below the comment line "Define RADIUS clients (usually a NAS, Access Point, etc.)", add

```
client k2 {  
    ipaddr = *  
    proto = *  
    secret = myk2secret  
}
```

Note that 'ipaddr = *' is to allow any RADIUS client (IPv4 or IPv6) to be authenticated. You can use individual IPs or subnets to restrict the clients the server is going to authenticate. The secret 'myk2secret' is to be configured on the SyncServer's RADIUS page and they must match.

4.3 Configure listening on legacy port 1645

Open `sites-enabled/default`, after the 'listen { }' section, add

```
listen {  
    type = auth
```

```
        ipaddr = *
        port = 1645
        limit {
            max_connections = 16
            lifetime = 0
            idle_timeout = 30
        }
    }
```

4.4 Configure users

Open `mods-config/files/authorize`, below the top comment section, add

```
admin Cleartext-Password := "myrad-passwd"
testk2user01 Cleartext-Password := "mscck2userpass01"
```

You have added two users 'admin' and 'testk2user01' to the RADIUS server.

4.5 Run the RADIUS server

If you are now 'su' as the 'root', enter

```
# radiusd
```

Otherwise, enter

```
% sudo radiusd
```

On the console, you can watch all the RADIUS client requests and server responses information.

4.6 Run the RADIUS server in debug

```
# radiusd -X
```

or

```
% sudo radiusd -X
```

5. Configure RADIUS server on the SyncServer

On the SyncServer Security -> RADIUS page, enter

```
RADIUS Server IP Address = IP of the RADIUS server
Secret Key                 = myk2secret
Timeout                   = 5
```

Now, you can login to the SyncServer with both 'admin' or 'testk2user01'.

Login as RADIUS 'admin' user

```
Username = admin  
Password = myrad-passwd
```

Login as RADIUS 'testk2user01' user

```
Username = testk2user01  
Password = mscck2userpass01
```

Note that you can still login as the SYncServer local 'admin' user

```
Username = admin  
Password = Microsemi
```

In this case, the RADIUS server authentication fails to authenticate the 'admin' user but the Linux pam continues with the local user authentication using /etc/passwd, which is successful.

Note on pam_radius_auth module password hash

For products using the pam module pam_radius_auth.so (used in the SyncServer S600) to communicate with the RADIUS server, the module applies a MD5 hash with xor algorithm on the user password and puts the hashed result in the packet payload. The module does not support any challenge response type protocol such as MSChap. The pam_radius_auth author Alan DeKok welcomes anyone to add these additional protocol support to the pam_radius_auth package.

Install and configure Tacplus server

We use the widely available open source TACACS+ server software tac_plus. We describe how to download and configure the tac_plus server on a 64bit Ubuntu 14.04/16.04.

1. Download and install tac_plus server

```
sudo apt-get install tacacs+
```

2. Verify the tac_plus server running

```
ps -ef | grep tac_plus
```

It shows "..... 00:00:00 /usr/sbin/tac_plus -C /etc/tacacs+/tac_plus.conf"

3. Tac_plus server man pages

The tac_plus.conf man page is at

http://manpages.ubuntu.com/manpages/bionic/man5/tac_plus.conf.5.html

The tac_plus daemon man page is at

http://manpages.ubuntu.com/manpages/bionic/man8/tac_plus.8.html

4. Configure tac_plus

The configuration files are under /etc/tacacs+. You want to 'su' to be 'root' before making edits since the file is owned by 'root'.

```
su -  
cd /etc/tacacs+
```

Note that we assume you enabled 'root' on the Ubuntu installation. If not, you want to add 'sudo' to commands you run that requires 'root' privilege.

4.1 Configure key

Below the comment line: "This is the key that clients have to user to access Tacacs+", edit the key to match the key defined in the SyncServer TACACS+ "Secret Key". Here we change the key to be "k2testing0123456789".

```
#key = testing123  
key = k2testing0123456789
```

4.2 Configure users

4.2.1 Default user authentication

The tac_plus allows you to use the local users available on the Linux PC running tac_plus server for remote authentication. This is kind of convenient since you can quickly add a test user to the Linux PC to immediately test TACACS+ remote authentication.

To enable local users for TACACS+ remote authentication, uncomment the line

```
#default authentication = file /etc/passwd
```

to be

```
default authentication = file /etc/passwd
```

4.2.2 Add users to the tac_plus.conf

To add a new TACACS+ user (not Linux user) with clear text password.

```
# password is "k2pw_TEST"
user = k2testuser {
    name = "K2 Test User"
    pap = cleartext "k2pw_TEST"
}
```

In order to add a new TACACS+ user with encrypted password, you need to run the command 'tac_pwd'. This command takes a password as input and outputs the DES (by default) or MD5 (-m) encryption of the input.

```
tac_pwd
Enter: HardPassword
Output: oTdl1euJ96jLc
```

```
# password is "HardPassword"
user = a_k2tacuser {
    name = "Another K2 TACACS+ user"
    pap = des "oTdl1euJ96jLc"
}
```

4.3 Restart the tac_plus server

```
sudo /etc/init.d/tac_plus restart
```

4.4 Run the tac_plus server in debug

Run the tac_plus in foreground enable debug

```
sudo /usr/sbin/tac_plus -C /etc/tacacs+/tac_plus.conf -g -d 2
-d 16 -d 32 -d 128 -d 512
```

Note that you can user a single number after -d by adding them all as "-d 690".

5. Configure TACACS+ server on the SyncServer

On the SyncServer Security -> TACACS+ page, enter

```
TACACS+ Server IP Address = IP of the TACACS+ server
Secret Key                 = k2testing0123456789
```

```
Timeout = 6
```

Now, you can login to the SyncServer with user on the Linux PC, k2testuser, a_k2tacuser

```
Login as TACACS+ Linux PC user
Username = <PC user>
Password = <PC password>
```

```
Login as TACACS+ 'k2testuser' user
Username = k2testuser
Password = k2pw_TEST
```

```
Login as TACACS+ 'a_k2tacuser' user
Username = a_k2tacuser
Password = HardPassword
```

Note that you can still login as the SyncServer local 'admin' user

```
Username = admin
Password = Microsemi
```

In this case, the TACACS+ server authentication fails to authenticate the 'admin' user but the Linux pam continues with the local user authentication using /etc/passwd, which is successful.

6. Note on pam_tacplus module password hash

For products using the pam module pam_tacplus.so (used in the SyncServer S600) to communicate with the TACACS+ server, the module supports Chap and Pap (default). The user password is hashed accordingly before putting into the packet payload.

Install and configure OpenLDAP server

We use the widely available open source OpenLDAP server software. We describe how to download and configure the OpenLDAP server on a 64bit Ubuntu 16.04.

1. Download and install OpenLDAP server

```
sudo apt install slapd ldap-utils
```


2. Verify the slapd server running

```
ps -ef | grep slapd
```

It shows

```
"..... 00:00:00 /usr/sbin/slapd -h ldap:/// ldapi:/// -g  
openldap -u openldap -F /etc/ldap/slapd.d"
```

or

```
systemctl status slapd
```

3. OpenLDAP server man pages

The slapd.conf man page is at

<http://manpages.ubuntu.com/manpages/bionic/man5/slapd.conf.5.html>

The slapd daemon page is at

<http://manpages.ubuntu.com/manpages/bionic/man8/slapd.8.html>

4. Re-configure slapd

You were asked to enter a top dn during the installation. If you chose default, the top dn was "dc=example,dc=com". Here we show you to create a different top dn "dc=utopia,dc=net". This is done via re-configuration. Since re-configuring requires root privilege, you use either 'sudo' or become 'root'. Note that we want to stop the slapd daemon first. We assume you enabled 'root' on the Ubuntu installation. If not, you want to add 'sudo' to commands you run that requires 'root' privilege.

```
su -  
/etc/init.d/slapd stop  
  
dpkg-reconfigure slapd  
1st dialog: <No>  
2nd dialog: utopia.net  
3rd dialog: utopia  
4th dialog: TopSecretYah  
5th dialog: TopSecretYah  
6th dialog: MDB          ⓓ any choice is okay. Our default is  
MDB  
7th dialog: <No>  
8th dialog: <Yes>  
9th dialog: <No>
```

The slapd starts automatically after the re-configuration finishes. You can restart the slapd at any time with either of followings.

```
/etc/init.d/slapd restart
systemctl restart slapd
```

5. Add users

We create a "ou=people" serving as the container for the users and then add two users "Ashley Simon" and "Jack Kandell". The easiest way to do this is to create a .ldif file (utopia.ldif). Since each user needs a password, we have to create it first and put it in the utopia.ldif.

For "Ashley Simon", the password is "Letmein". Enter the following.

```
slappasswd -h {SSHA}
Letmein
Letmein
```

The output is "{SSHA}wV5U887AlqhE7QKBzKVgjZvYJSdG9ej7". Note that your output most probably does not match the output shown here. That is because the slappasswd uses a dynamic salt value.

For "Jack Kendall", the password is "Whynot!". Enter the following.

```
slappasswd -h {SSHA}
Whynot!
Whynot!
```

The output is "{SSHA}OG4oszEpvOHctVvSolaNI8JkvKOCJQ4S". Again, your output most probably does not match the output shown here.

Put the following into the file "utopia.ldif" in your home directory.

```
dn: ou=people,dc=utopia,dc=net
ou: people
description: All people in organisation
objectclass: organizationalunit

dn: cn=Ashley Simon,ou=people,dc=utopia,dc=net
objectclass: inetOrgPerson
cn: Ashley Simon
sn: Smith
uid: asimon
userPassword: {SSHA}wV5U887AlqhE7QKBzKVgjZvYJSdG9ej7
description: super engineer
ou: Engineering
```

```
dn: cn=Jack Kendall,ou=people,dc=utopia,dc=net
objectclass: inetOrgPerson
cn: Jack Kendall
sn: Kendall
uid: jkendall
userpassword: {SSHA}OG4oszEpv0HctVvSoIaNI8JkvKOCJQ4S
description: sweet guy
ou: Human Resources
```

Run the following command.

```
ldapadd -H ldap:/// -x -D "cn=admin,dc=utopia,dc=net" -f
$HOME/utopia.ldif -w TopSecretYah
```

6. Debug OpenLDAP server

Run the slapd in foreground enable debug

```
sudo /usr/sbin/slapd -h "ldap:/// ldapi:///" -g openldap -u
openldap -F /etc/ldap/slapd.d -d 1 -d 64 -d 256 -d 512 -d 1024
-d 2048
```

Note that you can add the number together for "-d" as "-d 3905".

7. Configure LDAP server on the SyncServer

On the SyncServer Security -> LDAP page, enter

```
Port -Server Binding = 389
Time Limit for Searching(sec) = 300
Time Limit for binding(sec) = 300
LDAP Protocol Version = LDAPv3
Scope to search server with = sub
Server 1 = IP of the OpenLDAP server
Search Base Name = dc=utopia,dc=net
Search Filter = objectClass=*
```

All the other fields are left with blank.

Now, you can login to the SyncServer with user asimon, jkendall.

Login as LDAP 'asimon' user

```
Username = asimon
Password = Letmein
```

```
Login as LDAP 'jkendall' user
```

```
Username = jkendall  
Password = Whynot!
```

We can also use user's common name to login. On the SyncServer Security -> LDAP page, enter

```
Login Attribute = cn
```

Now, you can login to the SyncServer with user's common name (default is 'uid' as shown earlier).

```
Login as LDAP 'Ashley Simon' user  
Username = Ashley Simon  
Password = Letmein
```

```
Login as LDAP 'Jack Kendall' user  
Username = Jack Kendall  
Password = Whynot!
```

Note that you can still login as the SyncServer local 'admin' user. The LDAP admin user "cn=admin,dc=utopia,dc=net" is the so called RootDN which is special user that is not used for directory user authentication.

```
Username = admin  
Password = Microsemi
```

In this case, the LDAP server authentication fails to authenticate the 'admin' user but the Linux pam continues with the local user authentication using /etc/passwd, which is successful.

Note on pam_ldap module password hash

For products using the pam module pam_ldap.so (used in the SyncServer S600/S650) to communicate with the LDAP server, the module supports all the RFC defined challenge response protocols as well as SSL handshake protocol. The current SyncServer Web UI does not expose all the configuration options. In terms of password encryption, it uses the default {SSHA} scheme. To illustrate, the below screen shows the pam_ldap.so dependencies in comparison to pam_radius_auth.so, and pam_tacplus.so.

```
syu@Ub14-Dev: ~
root@SyyuTest-K2:/lib/security# ldd pam_radius_auth.so
ldd: warning: you do not have execution permission for `./pam_radius_auth.so'
libpam.so.0 => /lib/libpam.so.0 (0x76f21000)
libdl.so.2 => /lib/libdl.so.2 (0x76f0e000)
libc.so.6 => /lib/libc.so.6 (0x76dce000)
/lib/ld-linux-armhf.so.3 (0x54b7c000)
root@SyyuTest-K2:/lib/security#
root@SyyuTest-K2:/lib/security# ldd pam_tacplus.so
ldd: warning: you do not have execution permission for `./pam_tacplus.so'
libpam.so.0 => /lib/libpam.so.0 (0x76f63000)
libc.so.6 => /lib/libc.so.6 (0x76e23000)
libdl.so.2 => /lib/libdl.so.2 (0x76e10000)
/lib/ld-linux-armhf.so.3 (0x54b49000)
root@SyyuTest-K2:/lib/security#
root@SyyuTest-K2:/lib/security# ldd pam_ldap.so
ldd: warning: you do not have execution permission for `./pam_ldap.so'
libldap-2.4.so.2 => /usr/lib/libldap-2.4.so.2 (0x76eb4000)
liblber-2.4.so.2 => /usr/lib/liblber-2.4.so.2 (0x76e9a000)
libnsl.so.1 => /lib/libnsl.so.1 (0x76e76000)
libcrypt.so.1 => /lib/libcrypt.so.1 (0x76e35000)
libresolv.so.2 => /lib/libresolv.so.2 (0x76e10000)
libpam.so.0 => /lib/libpam.so.0 (0x76df5000)
libdl.so.2 => /lib/libdl.so.2 (0x76de2000)
libc.so.6 => /lib/libc.so.6 (0x76ca2000)
libgnutls.so.30 => /usr/lib/libgnutls.so.30 (0x76b94000)
libz.so.1 => /lib/libz.so.1 (0x76b70000)
libidn.so.11 => /usr/lib/libidn.so.11 (0x76b30000)
libnettle.so.6 => /usr/lib/libnettle.so.6 (0x76ae8000)
libhogweed.so.4 => /usr/lib/libhogweed.so.4 (0x76aad000)
libgmp.so.10 => /usr/lib/libgmp.so.10 (0x76a40000)
libgcrypt.so.20 => /usr/lib/libgcrypt.so.20 (0x7698f000)
libgpg-error.so.0 => /usr/lib/libgpg-error.so.0 (0x76970000)
libcap.so.2 => /lib/libcap.so.2 (0x7695d000)
/lib/ld-linux-armhf.so.3 (0x54b22000)
root@SyyuTest-K2:/lib/security#
```

You are encouraged to learn more and share your findings with us to make future improvements.

LDAP client browser

There are many freely available LDAP directory browser open source software packages. They let you browse your directory and optionally add new element, modify and delete elements to your directory. The phpLDAPAdmin package is recommended.

