SyncServer S100

User Guide

Rev. B1, May 2015

Part Number: 997-01520-03

CD Number: 998-01520-03

This page intentionally left blank

Notices

Copyright

Due to continued product development this information may change without notice. If you find any errors in the documentation, please report them to us in writing. Microsemi, Inc. does not warrant that this document is error-free.

Limited Product Warranty

Hardware and embedded software – Depending on the product, for a period of one, or two years from date of shipment by Microsemi, Microsemi warrants that all Products shall be free from defects in design, material, and workmanship; shall conform to and perform in accordance with Microsemi's published specifications, if any; shall be free and clear of any liens and encumbrances; and shall have good and valid title. This warranty will survive inspection, acceptance, and payment by Buyer. Microsemi does not warrant that the operation of such Products will be uninterrupted or error free. This warranty does not cover failures caused by acts of God, electrical or environmental conditions; abuse, negligence, accident, loss or damage in transit; or improper site preparation.

This warranty shall be null and void in the event (i) Buyer or any third party attempts repair of the goods without Microsemi's advance written authorization, or (ii) defects are the result of improper or inadequate maintenance by Buyer or third party; (iii) of damage to said goods by Buyer or third party-supplied software, interfacing or supplies; (iv) of improper use (including termination of non-certified third party equipment on Microsemi's proprietary interfaces and operation outside of the product's specifications) by Buyer or third party; or (v) the goods are shipped to any country other than that originally specified in the Buyer's purchase order.

Goods not meeting the foregoing warranty will be repaired or replaced, at Microsemi's option, upon return to Microsemi's factory freight prepaid; provided, however that Buyer has first obtained a return materials authorization number ("RMA Number") from Microsemi authorizing such return. The RMA Number shall be placed on the exterior packaging of all returns. Microsemi will pay shipping costs to return repaired or replacement goods to Buyer. Microsemi reserves the right to disallow a warranty claim following an inspection of returned product. When a warranty claim is questioned or disallowed, Microsemi will contact Buyer by telephone or in writing to resolve the problem.

Limitation of Liability

The remedies provided herein are the Buyer's sole and exclusive remedies. In no event or circumstances will Microsemi be liable to Buyer for indirect, special, incidental or consequential damages, including without limitation, loss of revenues or profits, business interruption costs, loss of data or software restoration, or damages relating to Buyer's procurement of substitute products or services. Except for liability for personal injury or property damage arising from Microsemi's negligence or willful misconduct, in no event will Microsemi's total cumulative liability in connection with any order hereunder or Microsemi's Goods, from all causes of action of any kind, including tort, contract, negligence, strict liability and breach of warranty, exceed the total amount paid by Buyer hereunder. SOME JURISDICTIONS DO NOT ALLOW CERTAIN LIMITATIONS OR EXCLUSIONS OF LIABILITY, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO ALL BUYERS.

Contact Information

Microsemi, Inc.
3870 N. 1st Street
San Jose, CA 95134
For Sales, Technical Support, and Return Materials Authorization, please See " Microsemi Customer Assistance" on page 5

Microsemi Customer Assistance

To find the Microsemi representative closest to your location, please visit ***Microsemi Worldwide Sales***http://www.microsemi.com/sales-contacts/0 online.

To reach a Microsemi Customer Assistance Center, call one of the following numbers:

- Worldwide Main Number: 1-408-428-7907
- US Toll-free Number: 1-888-367-7966
- Europe, Middle East & Africa: 49 700 32886435

This page intentionally left blank

Table of Contents

.

This page intentionally left blank

S100 SyncServer Quick Start

This Quick guides the user on how to:

- Mount and make the necessary connections to the SyncServer.
- Configure a SyncServer that still has its original factory configuration.
- Verify the operation of the SyncServer by reading the front panel status LEDs, and by monitoring the web user interface.
- Shut the SyncServer down correctly.

1. Connecting the SyncServer

Recommended Tasks

GPS antennas not rated for 12 VDC power may be damaged if connected to the SyncServer.

a. Mount the standard L1 GPS antenna (supplied) in a location that offers good visibility of GPS satellites, such as a rooftop or outdoor antenna mast with wide open views of the sky and horizon. Avoid obstructions and sources of Radio Frequency Interference. Observe building codes and regulations. Also see ***Using GPS*** (on page 94) and ***WARNING: GPS Antenna*** (on page 87).

b. On the rear panel:

   - Connect the GPS antenna cable (supplied) to the **GPS Ant** connector.
   - Connect **LAN 1** to the network.
   - Consult ***Warnings and Cautions*** (on page 86) for safety information regarding grounding and power.
   - Connect the power and turn the power switch on.

2. Configuring the SyncServer

Configuring your network settings:
Once the connections have been made to the server, there are two methods of configuring your network settings:

Method 1: Command Line Interface via Serial Port

1. Connect a DCE RS-232 cable between the serial port located on the front panel and a computer. (Note: This is the serial cable that is supplied with the SyncServer).
2. Open a command line interface window
3. Configure your serial port settings as below using the terminal program:
   - Rate: **9600 Baud**
   - Data Bits: **8**
   - Parity: **None**
   - Stop Bits: **1**
4. Open the connection to the serial port.
5. Power up the S100 server. When prompted to do so, login. Default username: admin , Password: symmetricom
6. Set the IP address:
   Static (preferred method):
   - Using the command IPV4ADDRESS xxx.xxx.xxx.xxx substituting the IP address the unit should have. (e.g., IPV4ADDRESS 192.168.52.22)

   DHCP:
   - Note: It is not recommended to use DHCP permanently as the DHCP server may change the IP address of the device unexpectedly.
   - Enter command IPV4DHCP and after hitting Enter the prompt will verify that you want to enable DHCP on LAN 1, enter Y. If a DHCP server is not available, the program will hang-up; connect to a DHCP server and retry or use a static IP address.
   - If a DHCP server is found, the IP address, netmask and gateway will be set. Use the IPV4ADDRESS command without an (xxx.xxx.xxx.xxx) argument to get the IP address.
7. When using a static address, the netmask and gateway must also be set.
   - To set the netmask, use the command IPV4MASK xxx.xxx.xxx.xxx substituting the desired netmask. (e.g., IPV4MASK 255.255.255.0)
   - To set the gateway, use the command IPV4GATEWAY xxx.xxx.xxx.xxx substituting the desired gateway. (e.g., IPV4GATEWAY 192.168.52.1)
8. The web interface should now be accessible to make further configuration changes, See " Login" on page 23.

Method 2: Direct Connection to Ethernet Port

1. This method requires connecting directly from the Ethernet port on your computer to the Ethernet port on the SyncServer.

2. After connecting to the SyncServer, ensure your computer is set up to send traffic to the default IP address of the SyncServer: 192.168.0.100. This may require manually setting the IP address of the network card to the same subnet. (e.g., 192.168.0.2). See your network administrator for help in manually setting the IP address with your specific operating system.
3. In a browser, enter 192.168.0.100 in the URL field. The login screen should appear. The default login is username: **admin**, password: **symmetricom**.
4. Once logged in, click on **Network** button on the left side of the web user interface and then the EDIT button to the left of LAN 1.
5. Enter the desired IP address, netmask and gateway. Note: Using DHCP is not recommended as the SyncServer will attempt to find a DHCP server while still connected directly to your computer.
6. Hit **Apply** to close the LAN 1 Configuration window. Then click **Apply** again to commit the changes. Note: your IP address has now been set.
7. The SyncServer can now be connected to the network and the web interface accessed from the set IP address.
8. The web interface should now be accessible to make further configuration changes, See " Login" on page 23.

3. Verifying the Operation

Once the SyncServer has been configured correctly, its operation can be verified from the front panel status LEDs, and the web user interface.In the web interface:

Status LEDs

The SyncServer is providing synchronized time to the network when the SYNC LED (front panel) is orange or green.

The four tricolor LEDs provide the following status information:

	Red	Orange	Green	Dark
Sync	SyncServer is not synchronized to a reference. NTP Stratum 16.	SyncServer is synchronized to a remote NTP server. NTP Stratum 2-15.	SyncServer is synchronized to an Input Reference or the modem. NTP Stratum 1.	Power off.
Network	Link failure on the LAN 1.		The configured port is operational.	Power off.
NTP	>7000 NTP packets per second.	> 5000 packets per second.	NTP activity within the last second.	No NTP activity in the last second.
Alarm	Major Alarm.	Minor Alarm.	No Current/Enabled Alarms.	Power off.

Web Interface

The S100 web interface is compatible with:

- Internet Explorer 7 and 8
- Firefox 3.x

Login

Use the **Login** page to:

- Log in to the SyncServer's web interface.
- Recover lost passwords.
- View system status.

The Login page includes the following elements:

- **Username**: Enter the username here. (Factory default: "admin")
- **Password**: Enter the corresponding password here. (Factory default: "symmetricom")
- **Secure**: Opens an encrypted web session (HTTPS, port 443). For this feature to be available, the user must enable it by using the **SERVICES - HTTP** page.
- **Recover Password**: Prompts the user to answer a password recovery question. If the user answers correctly, the Sync Server resets the password to a random string and emails it to the user's email address. For this feature to be available, the user must enable it using the **ADMIN - Users** page.

Use the **ADMIN - Web** page to configure the status information on the **Login** page.

Also see ***Logging in to the Web Interface***) and ***Recovering a Password*** .

Optional Tasks

In the web interface:

- Use the **NTP – Config** page to synchronize the SyncServer with any other NTP servers.
- When the SyncServer is completely configured, use **WIZARDS - Backup** to save a backup file of the configuration to a safe location. Write the location of the backup file on this printed document and store it in a location that is easy to find.

4. Halting the SyncServer

Microsemi recommends shutting the operating system down before removing the power.

Using the web interface:

1. Go to the **SERVICES - Startup** page.
2. Select **Halt** and click the **APPLY** button.
3. Wait approximately 30 seconds before removing power.

Product Overview

The SyncServer Network Time Server offers the following protocols for synchronizing equipment over a network:

- NTP
- SNTP
- Time (TCP and UDP versions)
- Daytime (TCP and UDP versions)

These protocols are capable of synchronizing computers, servers, and networking equipment on an enterprise-scale network to within milliseconds of official UTC time. This degree of synchronization is desirable for precise time-stamping of events and data correlation.

Key Features

- Ultra High-Bandwidth NTP Time Server
- Stratum 1 Operation via GPS Satellites
- One Independent 10BASE-T/100BASE-TX Port
- Independent Time Reference: GPS
- Stratum 2 Operation via NTP Servers
- Secure Web-Based Management
- SSH, SSL, SNMP, Custom MIB, HTTPS, Telnet, and more
- IPv6 and IPv4 Compatible
- Nanosecond Time Accuracy to UTC
- Rubidium & OCXO Oscillator Upgrades

Key Benefits

- Synchronize Hundreds of Thousands of Client, Server & Workstation Clocks
- Very Reliable and Secure Source of Time for Your Network
- NTP Port for Easy Network Configuration and Adaptation
- Extremely Accurate Time Source for Network Synchronization
- Enhanced Network & Security Features
- Access Multiple Time Sources for Reliable and Secure Time
- Intuitive Web Interface for Easy Control & Maintenance

Comparison by Model

Time Protocols	SyncServer Model Comparison	Enterprise Class			Advanced Timing	
	Feature	S100	S200	S300	S250	S350
	NTP Server (v2, v3, v4)	Y	Y	**Y**	Y	**Y**
	NTP Broadcast Server/Client	Y	Y	**Y**	Y	**Y**
	NTP Peering/Client	Y	Y	**Y**	Y	**Y**
	NTP Multicast Server/Client	Y	Y	**Y**	Y	**Y**
	IEEE 1588 PTP Grandmaster (optional)			**Y**		**Y**
	SNTP, Time, Daytime	Y	Y	**Y**	Y	**Y**
	NTP performance, requests/second	3200	3200	**7000**	3200	**7000**

Time References (inputs)	SyncServer Model Comparison	Enterprise Class			Advanced Timing	
	Feature	S100	S200	S300	S250	S350
	GPS (12 channel)	Y	Y	**Y**	Y*	**Y**
	NTP Peering	Y	Y	**Y**	Y	**Y**
	Dial-up internal modem (ACTS, JJY, ITU-R TF583.4)			**Y**		**Y**
	Low Frequency Radio (WWVB, JJY, DCF77) (optional)			**Y**		**Y**
	10MHz input				Y	**Y**
	1PPS input				Y	**Y**
	IRIG B AM Input				Y	**Y**
	IRIG A/B/E/G/NASA36/XR2/2137 inputs (AM & DCLS)					**Y**
	T1/E1 input (optional)					**Y**
	Time Interval Measurement & Charting (S350 PTP Option)					**Y**
	Reference priority, user configurable					**Y**

* The S250i model uses a timecode input instead of GPS as its primary Input Reference.

Network Security Protocols	SyncServer Model Comparison	Enterprise Class			Advanced Timing	
	Feature	S100	S200	S300	S250	S350
	HTTP/HTTPS/SSL	Y	Y	**Y**	Y	**Y**
	Telnet (w/disable fcn.)	Y	Y	**Y**	Y	**Y**
	SNMP V1, V2c, V3 with Custom MIB II	Y	Y	**Y**	Y	**Y**
	DHCP (w/disable can.)	Y	Y	**Y**	Y	**Y**
	SSH/SCP (w/disable fcn.)	Y	Y	**Y**	Y	**Y**
	IPv6 and IPv4/IPv6	Y	Y	**Y**	Y	**Y**
	MD5 for NTP	Y	Y	**Y**	Y	**Y**
	NTP v4 Autokey (Server and Client)			**Y**		**Y**
	RADIUS Authenticated login			**Y**		**Y**
	1000Base-T equipped port (Gigabit)			**Y**		**Y**
	Total number of Ethernet ports	1	3	**4**	3	**4**

User Interface	SyncServer Model Comparison	Enterprise Class			Advanced Timing	
	Feature	S100	S200	S300	S250	S350
	Web Interface	Y	Y	**Y**	Y	**Y**
	Vacuum fluorescent display/multi-line		Y	**Y**	Y	**Y**
	Numeric keypad		Y	**Y**	Y	**Y**
	LED’s: Sync, Network, Alarm, NTP	Y	Y	**Y**	Y	**Y**
	USB	Y	Y	**Y**	Y	**Y**
	RS-232 Console Port	Y	Y	**Y**	Y	**Y**
	Alarm relays			**Y**		**Y**
	Keypad lockout			**Y**		**Y**

Oscillator	SyncServer Model Comparison	Enterprise Class			Advanced Timing	
	Feature	S100	S200	S300	S250	S350
	OCXO upgrade	Y	Y	**Y**	Y	**Y**
	Rubidium upgrade	Y	Y	**Y**	Y	**Y**

Timing Outputs	**SyncServer Model Comparison**	**Enterprise Class**			**Advanced Timing**	
	Feature	**S100**	**S200**	**S300**	**S250**	**S350**
	Timing accuracy +/-50 ns	Y	Y	**Y**	Y	**Y**
	Sysplex output (dedicated port)		Y	**Y**	Y	**Y**
	1PPS output				Y	**Y**
	10MHz output				Y	**Y**
	IRIG B AM output				Y	**Y**
	IRIG A/B/E/G/NASA36/XR2/2137 outputs (AM & DCLS)					**Y**
	T1/E1 output (optional)					**Y**

Misc.	**SyncServer Model Comparison**	**Enterprise Class**			**Advanced Timing**	
	Feature	**S100**	**S200**	**S300**	**S250**	**S350**
	General server status logs	**Y**	Y	**Y**	Y	**Y**
	Autocheck for firmware upgrades	**Y**	Y	**Y**	Y	**Y**
	Email alerts		Y	**Y**	Y	**Y**
	Serve NTP in UTC or GPS Timescale	**Y**	Y	**Y**	Y	**Y**

Web Interface

This section provides a topic for each page in the web interface, with an explanation of each field, notes, and links to related topics.

This section contains

Login

Use the **Login** page to:

- Log in to the SyncServer's web interface.
- Recover lost passwords.
- View system status.

The Login page includes the following elements:

- **Username**: Enter the username here. (Factory default: "admin")
- **Password**: Enter the corresponding password here. (Factory default: "symmetricom")
- **Secure**: Opens an encrypted web session (HTTPS, port 443). For this feature to be available, the user must enable it by using the **SERVICES - HTTP** page.
- **Recover Password**: Prompts the user to answer a password recovery question. If the user answers correctly, the Sync Server resets the password to a random string and emails it to the user's email address. For this feature to be available, the user must enable it using the **ADMIN - Users** page.

Use the **ADMIN - Web** (on page 57) page to configure the status information on the **Login** page.

Also see ***Logging in to the Web Interface*** (on page 103) and ***Recovering a Password*** (on page 115).

Properties of User Names and Passwords

Usernames

Quantity & Length

There is an upper limit of 32 individual users, each username has a maximum of 32 characters in length.

Character set (Charset)

Each username is limited to the following printable ASCII characters:

- Upper case letters {A-Z}
- Lower case letters {a-z}
- Numbers {0-9}
- Period {.}
- Dash {-}
- Underscore {_}
- Plus {+}

Usernames may **NOT** contain any of the following:

- Standard ASCII keyboard characters not described above, i.e. ! @ # $ % ^ & * ( ) = { } [ ] | \ ; : ' " < > ? , /

- Grave accent {`}
- Tilde {~}
- Whitespace characters (space, tab, linefeed, carriage-return, formfeed, vertical-tab etc.)
- Non-ASCII characters
- Non-printable characters

Passwords

Length

The password can have a maximum of 64 characters in length.

Character set (Charset)

Passwords **must** contain, at minimum, either a mix of upper and lowercase letters, or a mix of letters and numbers.

Passwords are limited to the following printable ASCII characters:

- Upper case letters {A-Z}
- Lower case letters {a-z}
- Numbers {0-9}
- Tilde {~}
- Most standard ASCII keyboard symbols, i.e. ! @ # $ % ^ & * ( ) _ - = { } [ ] | : ; " < > , . ? /

Passwords may **NOT** be all-lowercase, all-uppercase, all-numeric, or match the username. They additionally may **NOT** contain any of the following:

- Single-quote / apostrophe {'}
- Grave accent {`}
- Plus {+}
- Backslash {\}
- Whitespace characters (space, tab, linefeed, carriage-return, formfeed, vertical-tab etc.)
- Non-ASCII characters
- Non-printable characters

STATUS - General

Overall System Information

- **Hostname**: The network hostname of the SyncServer, which can be configured on the **SYSTEM - General** web page.
- **Model**: The model number of the SyncServer.
- **Serial Number**: The unique serial number of the SyncServer.
- **Local Time**: The local time, determined by the time zone setting on the **TIMING - Time Zone** web page.

- **Release Version**: The system release version.
- **Software Version**: The software version.
- **Hardware Clock Version**: The version of the software on the Hardware Clock.
- **Up Time**: The time elapsed since the operating system started.
- **Load Average**: A figure of merit for the operating system “load” for the previous 1, 5, and 15 minutes (left to right).
- **Memory Used (Mbyte)**: The amount of memory occupied by the system.
- **Memory Free (Mbyte)**: The amount of free memory remaining.
- **Flash:** The type of compact flash card installed.
- **CPU Vendor**: The CPU vendor/manufacturer.
- **Model**: The CPU model.
- **Number**: The CPU number.

STATUS - Network

Network Status for the SyncServer's network port:

- The name of the **Port**.
- The following **Address** information for the network port:
  - **mac**: The MAC Address.
  - **v4**: The IPv4 Address, if used.
  - **v6 link**: The IPv6 Address, if used.
- The **State** of the physical network port device (not of the connection). An "Up Arrow" means it is "running". A "Down Arrow" means it is "not running".

Management Port DNS Servers: Both user-entered and DHCP-assigned DNS Server addresses that are available from the LAN 1 port.

The SyncServer requires at least one valid DNS server to resolve domain names, which may be used in NTP associations, and SMTP gateways (email). Without a DNS server, any function that uses a DNS name instead of an IP address may be affected. These can include NTP and password recovery.

STATUS - Timing

Hardware Clock Status

Current Sync Source: The Input Reference currently used by the Hardware Clock. Consult the **TIMING - HW Clock** topic for more information.

Hardware Clock Time: The time according to the Hardware Clock.

Hardware Clock Status: "Locked" means the Hardware Clock is synchronized to one of its references, or to the internal oscillator in "Holdover". "Unlocked" means the Hardware Clock doesn't have an Input Reference and the Holdover period has expired. Also see ***TIMING - HW Clock*** (on page 48) and ***TIMING - Holdover*** (on page 50).

Oscillator Type: The type of the oscillator installed in the Hardware Clock for operation and holdover.

For each of the following **Input Status** lines, "Locked" means that the reference is valid and can be selected by the Hardware Clock. "Unlocked" means the reference is not valid, and is therefore not available for use by the Hardware Clock. Also see ***TIMING - HW Clock*** (on page 48) to arrange the priority of the Input References.

Some of these references are options or are only available in specific SyncServer models. (Consult ***Product Overview*** (on page 17) for more information about features and models):

- **GPS Input Status**

Leap Warning: The state of the ***Leap Indicator*** (on page 140) as reported by the current input reference.

STATUS - GPS

GPS Receiver Operation

This page displays the status of the GPS Receiver.

Receiver Description: "GPS" indicates the presence of a 12-channel GPS receiver.

Receiver Status:

- Receiver Down: The Hardware Clock can't communicate with the receiver.
- Unknown Mode: An undefined mode of the GPS receiver.
- Acquiring Signal: The receiver is attempting to track a GPS signal.
- Bad Geometry: The geometry of the tracked satellites is unsatisfactory for a position solution.
- Propagate Mode: A position estimation mode used in highly dynamic environments.
- 2d Solution: The receiver is able to perform position fixes for latitude and longitude but does not have enough satellites for altitude.
- 3d Solution: The receiver is now able to perform position fixes for latitude, longitude and altitude.

- Position Hold: Position fixes are no longer attempted, and the surveyed or user-entered position is used.
- Time Valid: The receiver has valid timing information from GPS satellites (including GPS-UTC Offset and Leap Indicator). If the GPS receiver and antenna are set up correctly, the receiver status should eventually reach and remain in this state.

Mode:

- Survey: The receiver is surveying and averaging its position. When it has finished surveying, the receiver switches to Position Hold mode. Survey mode and Position Hold mode are appropriate for static applications, such as a typical server room environment. This is the default mode when the SyncServer starts.
- Dynamic: The GPS receiver surveys continuously to determine its position and doesn't switch to another mode. This mode must be initiated by a user, and is appropriate for mobile applications such as ships, land vehicles, and aircraft. The degree of accuracy this mode offers is fine for NTP time over networks, but is less than optimal for the timing outputs available on some SyncServer models.
- Position Hold: The GPS receiver has completed Survey mode and switched to this mode, or the user has manually entered a position and "forced" it into this mode. The accuracy and stability of the SyncServer's timing outputs are optimal when the receiver has its exact position and is in this mode.

Antenna Cable Delay (nS):

The user-configured value (on the **REFERENCES - GPS** page) to compensate for GPS signal propagation from the antenna along the length of the cable to the receiver.

Antenna Status:

The GPS receiver supplies power to the GPS antenna through the antenna cable. It also monitors the current to that circuit to detect open or short circuits.

- Good: The current to the GPS antenna and cable is normal.
- Open: The current is too low. The GPS antenna or cable is probably disconnected or broken. Some splitters may cause this condition as well.
- Short: The current is too high. The GPS antenna or cable probably has a short circuit.

Position: The latitude and longitude of the GPS antenna in degrees, minutes, and fractional seconds. Referenced to WGS-84.

Altitude: The altitude of the antenna in meters. Referenced to WGS-84.

Satellites: The list of GPS satellites visible to the receiver:

- Sat Number: The GPS satellite's Satellite Vehicle (SV) number, a unique identification number
- Signal: The relative strength of the GPS signal (dBW = decibels relative to 1 Watt).
- Status: "Current" means that the receiver is using the GPS signal in its timing solution. "Tracked" means the receiver is tracking the signal, but isn't using it in the timing solution.

WARNING: GPS Position and Altitude

GPS position and altitude are for timing purposes only. They are not intended for navigation or other critical applications.

AVERTISSEMENT : La position et l'altitude de GPS sont seulement pour la synchronization. Elles ne sont pas prévues pour la navigation ou d'autres situations critiques (situations de la vie-ou-mort).

STATUS - NTP

NTP Daemon Status

This page displays the status of the NTP daemon. Many of the fields below are based on the ***NTP Packet*** (on page 141). Also see ***http://www.ntp.org***.

system peer: 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 system peer identified as "SYMM_TE(0)" is the local SyncServer Hardware Clock. Also see ***Hardware Clock*** (on page 140).

system peer mode: The relationship of the SyncServer to a system peer, usually a "client". Depending the configuration, the mode can be:

- **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.

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.

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.

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.

leap indicator (LI):

The Leap Indicator (LI) is a two-bit binary number in the NTP packet header that provides the following information:

- 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. The settings on the ***NTP - Prefs*** (on page 46) page affect LI behavior.

LI	Value	Meaning
00	0	No warning.
01	1	Leap second insertion: Last minute of the day has 61 seconds.
10	2	Leap second deletion: Last minute of the day has 59 seconds.
11	3	Alarm condition (Not synchronized)

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.

stratum:

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:

Stratum	Definition
0	Hardware Clock when locked.
1	Primary server
2-15	Secondary server
16-255	Unsynchronized, unreachable.

For example, the SyncServer is:

- 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.

The settings on the ***NTP - Prefs*** (on page 46) page affect stratum behavior.

precision: 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.

root distance (also **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.

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 (e.g., GPS, 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.

reference time (also **reference timestamp**): 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., GPS, IRIG) and in an interval of 64-1024 seconds for a readily accessible remote NTP server.

system flags: These flags define the configured behavior NTP daemon running on the SyncServer. The definition of the variables is provided.

- **kernel:** The NTP daemon is enabled for the precision-time kernel support for the ntp_adjtime() system call.
- **monitor:** The NTP daemon is enabled its monitoring facility.
- **ntp:** Enables the server to adjust its local clock by means of NTP.
- **stats:** The NTP daemon is enabled itsstatistics facility.
- **auth:** The NTP daemon is enabled itsauthentication facility.

jitter: Jitter (also called timing jitter) refers to short-term variations in frequency with components greater than 10 Hz.

stability: Stability refers to how well the SyncServer can maintain a constant frequency over time. It is usually affected by aging, environment changes, etc. The value is expressed units of parts per million (ppm).

broadcastdelay: 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. The value is always set to 0.004 seconds on the SyncServer.

authdelay: 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.

STATUS - Alarms

Current Major or Minor Alarms

Alarms with Severity set to:

- *Major* are displayed in red text.
- *Minor* are displayed in orange text.
- *Notify* are not displayed.

Alarms can be configured using the **ADMIN - Alarms** page.

For each listing:

Time: The local date and time at which the alarm was raised.

Severity: The severity of the alarm event (Major/Minor).

Name: The name of the alarm, from the list of alarms on the **ADMIN - Alarms** page.

NETWORK - Ethernet

Use this page to get status and configure Ethernet LAN port network settings, including DNS servers.

Ethernet Port Configuration

Edit the network port configuration and view network port status.

EDIT: Clicking this button opens a dialog box for configuring the network port.

Pending Changes: A check mark indicates that settings have changed, reminding the user to click the **APPLY** button.

Port: The name of the network port.

IP Address: The port's MAC, IPv4, and/or IPv6 network addresses.

Usage: These icons summarize information about the port:

- ☑ (Checkmark): The user has changed the configuration, but hasn't clicked the APPLY button at the bottom of the page yet.

- 💻 (Management Port): This network port is configured as the management port (web interface, SNMP, email, DNS).
- ⬆ (Up Arrow): The physical network port is enabled and functioning (does not indicate a valid physical connection or configuration).
- DHCP (DHCP): The network configuration is automatic via DHCP
- ? (Question Mark): Status unknown - usually when there are pending changes.
- 6 (Number "6"): Uses IPv6

DNS Servers

The DNS Server fields display the IP addresses of Domain Name Service (DNS) servers. The SyncServer requires a valid DNS server address to resolve domain names. If a DNS server isn't provided, NTP associations (**NTP - Config**) and the SMTP Gateway (**SERVICES - Email**) must be specified using an IP address. DNS messages are only communicated through LAN 1 port. The specified DNS servers must be reachable from the LAN 1 port.

- **Management Port User DNS Servers**: Manually enter one or more DNS Server IP addresses here, if not supplied by DHCP.
- **Management Port DHCP DNS Servers (Read Only):** If LAN 1 has DHCP enabled, and DHCP is configured to supply DNS server addresses, displays the DNS server IP addresses supplied by DHCP. These values are not user-editable.

Note: If the SMTP Gateway (which supports Password Recovery and Email Notification of Alarms) and NTP associations are addressed using domain names, a valid DNS server address must be supplied to the SyncServer.

Network Port Configuration

To edit the settings for a network port, click the corresponding EDIT button on the **NETWORK - Ethernet** page. This opens a dialog box titled with the name of the port followed by "Configuration".

To apply configuration changes, click **APPLY** buttons on both this configuration window and later on the **NETWORK - Ethernet** page.

Connection Mode:

- **Static**: A user must configure the network port manually.
- **DHCP**: A DHCP server will automatically configure the network port when changes are applied. Not available for IPv6.
- **Disabled**: This disables the network port.

Note: If the Connection Mode is DHCP and the lease expires or the SyncServer reboots, a DHCP server could assign a new IP address to the SyncServer’s network port. If this occurs with the LAN 1 port, use the See " Command Line Interface" on page 71 to obtain the new IP address. Furthermore, if it occurs to a network port servicing NTP requests, NTP clients will no longer be able to get a response from that port. In that case, the NTP clients would have to use an alternate NTP source or become unsynchronized. For this reason, Microsemi recommends using static IP addresses, only using DHCP for convenience during temporary installations.

IP Version:

- **IPv4:** The port uses IPv4 exclusively. (Static or DHCP)
- **IPv6:** The port uses IPv6 exclusively. The user must enter a static IPv6 address.

IP Address: The port's IPv4 address (e.g., "192.168.0.100") or IPv6 address(es) with scope (e.g., fe80::2a0:6dff:fe00:10).

Mask: The port's IPv4 subnet mask (e.g., "255.255.255.0"). With IPv6, the mask is the length of the prefix.defined in CIDR format (Classless Inter Domain Routing). Typically, the IPv6 mask is 64.

Note: The SyncServer does not support masks on IPv6 gateway entry. While the user interface will accept/display a user entered mask, such as “/64” for the IPv6 gateway, the underlying software checks for the entered mask and removes it, before sending the unmasked IPv6 gateway address down to the lower level Linux system components to configure the network interface.

Gateway: The port's IPv4 or IPv6 gateway (e.g., "192.168.0.1"). This is an optional configuration parameter.

Management: Reserved for future use.

Allowed Access: Restricts the LAN 1 port to access by specified IP addresses or address ranges. If the user leaves this field blank, the LAN 1 port accepts connections from any IP address. Allowed Access applies to all forms of network traffic, including NTP and HTTP connections. Reconfiguring the IP address of the LAN port erases the Allowed Access list.

The user can specify address ranges by setting the IP address followed by the mask prefix length, as described RFC 1518 and RFC 1519 for Classless Interdomain Routing. The **mask prefix length** specifies the number of masked bits **starting from the left-most position**. For example, to allow access from the network represented by 192.168.0.0, 255.255.0.0, the user would enter 192.168.0.0/16. In other words, the first 16 bits of the address, 192.168, are masked bits representing the network address The remaining bits are host address which is set to 0.

Note: When configuring **Allowed Access**, take care to avoid blocking DNS, HTTP, NTP, RADIUS, SMTP, SNMP, and SSH traffic.

Speed/Duplex: Sets the network port speed automatically (**Auto**), to **10** or **100**. Sets the transmission to **Full** or **Half** duplex. User must exercise caution when changing speed and duplex settings on the SyncServer port. Speed and duplex settings on the network port is negotiated with its network link partner. Depending on the settings of the port’s link partner, the requested settings may not be actually taken. Sometimes the network link between the port and its link partner may be lost due to changing of the speed and duplex settings. Microsemi recommends using the **Auto** setting.

Side Effects

Applying changes to the Ethernet port configuration restarts the NTP and xinetd daemons (services). During that time:

- The NTP daemon, NTP stratum, web interface are temporarily unavailable.

- The Status LEDs, NTP stratum, and Alarms change states.

Attach Cables to IPv6 Configured Ports

The NTP daemon rescans all interface ports every five minutes.

If a cable is not attached to an IPv6 configured port when the network settings are applied, the NTP daemon will not be able to bind to that IPv6 port. If a cable is attached later to the IPv6 configured port, up to five minutes can pass before the next rescan. At the time of the next rescan, the NTP daemon would then be able to bind the port, and respond to NTP packets.

The solution to this behavior is to have the cable connected to the SyncServer IPv6 configured port before applying the network settings.

NETWORK - SNMP

This page provides configuration of basic SNMP settings and the creation of SNMPv3 users.

Basic Configuration

Establish the identity and community membership of the device.

sysLocation: Identify the location of the SyncServer (e.g. Server Room A, Company Division B, etc). Used by network management consoles.

sysName: Provide the SyncServer with a unique name. (This is distinct and separate from "hostname" on the **SYSTEM - General** and **STATUS - General** pages.) Used by network management consoles.

sysContact: The name of the individual responsible for the SyncServer. Used by network management consoles.

Read Community: The SNMP read community string. The string must be provided for SNMP v1/v2c GETS/WALKS to gain access.

Write Community: The SNMP write community string.

Note: At this time, the SyncServer does not support any writable SNMP variables.

V3 Users

SNMP user names are separate and distinct from the access control list usernames used to log in to the SyncServer's user interfaces. SNMP user names are used by the network management software.

This is the list of SNMP v3 users. To delete a user, select the checkbox for a user name and click the **DELETE** button. When prompted, enter the passphrase specified when the user was created. The SNMP admin user cannot be deleted.

(Using SNMP v3 requires an SNMP v3 user on the recipient systems' SNMP v3-capable agent/client)

User Name: Name of v3 User.

Mode: Currently only rouser (read-only user) mode is supported.

Level: Shows the Min Priv level of the user (see Min Priv, below):

- auth: Authentication
- noauth: No Authentication
- priv: Auth and Privacy
- blank: default level for admin

Add v3 User

To create an SNMPv3 user, complete the form and click the **SAVE** button.

Name: Alphanumeric user name, with no spaces or special characters.

Auth Phrase: Create a unique authentication passphrase for the user. It must be at least eight characters long.

Auth Crypt: The authentication type, MD5 or SHA1. It uses the Auth Phrase as its key when calculating the message hash.

Priv Phrase: Creates a unique encryption passphrase for messages exchanged between the network management software and the SyncServer. It must be at least eight characters long.

Min Priv: Establishes the minimum authentication level required for the user. One of the following must be selected:

- Authentication (Auth): Auth Phrase is always required
- Auth and Privacy (Priv): Auth and Priv Phrase are always required

NETWORK - SNMP Traps

Use this page to configure, add, or delete SNMP trap recipients. The page is divided into two sections. The first section displays the current recipients. The second section provides a form for adding recipients or modifying existing recipients. The first section only displays basic information for each recipient.

Trap Recipients

Destination: The IP address to which traps are to be sent.

Ver: The SNMP version (v1, v2c or v3).

(Send as Inform): If trap is to be sent as inform, ‘inform’ is written, otherwise is blank.

User/Community: For SNMPv1/v2c traps, an optional community. For SNMPv3 traps, a required SNMP v3 user on the recipient system. (Using SNMP v3 requires an SNMP v3 user on the recipient systems' SNMP v3-capable agent/client)

Add/Edit Trap Recipient

IP Address: The IP address to which traps are to be sent.

The SNMP version: **v1**, **v2c**, or **v3**.

User/Community: For SNMPv1/v2c traps, an optional community. For SNMPv3 traps, a required SNMP v3 user on the recipient system.

Send as Inform: Sends an INFORM-PDU, otherwise a TRAP-PDU or TRAP2-PDU is sent.

Auth Phrase: For SNMPv3 traps, an optional Auth Phrase.

The hash algorithm used for the Auth Phrase: **MD5** or **SHA1**.

Priv Phrase: For SNMPv3 traps, an optional Priv Phrase.

To edit a trap recipient, select the checkbox of a specific recipient and click the **EDIT** button. Edit the values displayed in **Add/Edit Trap Recipient** and click the **SAVE** button. Similarly, use the **DELETE** button to remove trap recipients from the list.

NETWORK - Ping

Network Ping Test

Use this page to PING a network node from the SyncServer's network port. This feature can be used to test and troubleshoot network connectivity issues.

To use PING:

1. Select the network port from which to send the PING packets. See "Ping 6 Command" on page 36
2. For IPv6 networks, select **Ping 6**.
3. Enter the **IP address** of the host and click the **APPLY** button. **Ping Output** displays the results five seconds after clicking apply.

Note: The approximate command line equivalent is "ping -c 5 -w 5", where "-c 5" means "send five request packets to the requested destination" and "-w 5" means "timeout after 5 seconds if no responses". The network port that sends the ping request also receives the responses.

Ping 6 Command

The SyncServer software executes the following command when pinging an IPv6 address.

```
ping6 -c 5 -w 5 -I <eth dev> ipv6address
```

-c 5 sends 5 ping requests.

-w 5 times out after 5 seconds regardless of the target is reachable or not.

ipv6address is the target address (Customer inputs this address in the SyncServer entry box)

-I <eth dev> specifies the interface which corresponds to the drop down choice:

LAN1 – “-I eth0”

LAN2 – “-I eth1”

LAN3 – “-I eth2”

LANG – “-I eth3”.

The drop down choice of the interface, suggests that it corresponds to where the ping6 packet will be sent from. This is not entirely correct.

For example, the “-I eth0” only means to set the source IP address in the ping packet to that of the eth0, it does not specify which interface it actually will always use to send out the packets. The interface the ping6 uses to send out the packets is entirely determined by the Linux kernel routing table.

If the target Ipv6address is a link-local IPv6 address, the -I <eth dev> must also be a link-local address as specified in the way that SyncServer port was configured.

For example:

ping6 -c 5 -w 5 -I <LAN1> ipv6address

If the ipv6address is a **link-local address**, then the LAN1 specified from the SyncServer drop down menu on the ping page must also be configured with a link-local address. If it is configured that way then the ping packet will be sent out that LAN1 port.

If the ipv6address address is a **global address**, then the -I <eth dev> information is ignored and the Linux kernel routing table decides which port to send the ping packet out of. This is how it is possible to specify a global address to send a ping6 to, but not have the packet exit the specified LAN port. It is because either the LAN port did not have a global address specified, or if it did, the Linux kernel chose not to send the packet out that port, but rather another LAN port that had a global address assigned.

NTP - Sysinfo

NTP Daemon Status

This page displays the status of the NTP daemon. Many of the fields below are based on the ***NTP Packet*** (on page 141). Also see http://www.ntp.org.

system peer: 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 system peer identified as "SYMM_TE(0)" is the local SyncServer Hardware Clock. Also see ***Hardware Clock*** (on page 140).

system peer mode: The relationship of the SyncServer to a system peer, usually a "client". Depending the configuration, the mode can be:

- **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.

A host operating in client mode (a workstation, for example) occasionally sends a 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.

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.

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.

leap indicator (LI):

The Leap Indicator (LI) is a two-bit binary number in the NTP packet header that provides the following information:

- 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. The settings on the ***NTP - Prefs*** (on page 46) page affect LI behavior.

LI	Value	Meaning
00	0	No warning.
01	1	Leap second insertion: Last minute of the day has 61 seconds.
10	2	Leap second deletion: Last minute of the day has 59 seconds.
11	3	Alarm condition (Not synchronized)

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.

stratum:

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:

Stratum	Definition
0	Hardware Clock when locked.
1	Primary server
2-15	Secondary server
16-255	Unsynchronized, unreachable.

For example, the SyncServer is:

- 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.

The settings on the ***NTP - Prefs*** (on page 46) page affect stratum behavior.

precision: 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.

root distance (also **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.

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 (e.g., GPS, 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.

reference time (also **reference timestamp**): 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., GPS, IRIG) and in an interval of 64-1024 seconds for a readily accessible remote NTP server.

system flags: These flags define the configured behavior NTP daemon running on the SyncServer. The definition of the variables is provided.

- **kernel:** The NTP daemon is enabled for the precision-time kernel support for the ntp_adjtime() system call.
- **monitor:** The NTP daemon is enabled its monitoring facility.
- **ntp:** Enables the server to adjust its local clock by means of NTP.
- **stats:** The NTP daemon is enabled itsstatistics facility.
- **auth:** The NTP daemon is enabled itsauthentication facility.

jitter: Jitter (also called timing jitter) refers to short-term variations in frequency with components greater than 10 Hz.

stability: Stability refers to how well the SyncServer can maintain a constant frequency over time. It is usually affected by aging, environment changes, etc. The value is expressed units of parts per million (ppm).

broadcastdelay: 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. The value is always set to 0.004 seconds on the SyncServer.

authdelay: 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.

RESTART Button

After changing the NTP configuration, click 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.

NTP - Assoc

Use this page to view the status of NTP associations listed on the **NTP - Config** page.

Also see ***NTP Associations*** (on page 141) in the Glossary.

NTP Associations

NTP associations with non-valid IP addresses and domain names are not shown. (If a known good domain name does not appear on this list, there may be a problem with the DNS server configuration on the **NETWORK - Ethernet** page, or with the DNS service itself.)

Remote: 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.

The character in the left margin indicates the mode in which this peer entry is operating:

- * (asterisk) the association with which the NTP daemon is synchronizing (the *system peer* on **NTP - Sysinfo**), marked "synchronizing".
- + (plus) indicates the SyncServer is *symmetric active* mode.
- - (minus) indicates the SyncServer is *symmetric passive* mode.
- = (equal) means the SyncServer is in *client* mode, marked "being polled".
- ^ (caret) indicates that the SyncServer is broadcasting to the remote node, marked "broadcasting to".
- ~ (tilde) denotes that the remote node is broadcasting to the SyncServer.

Local: The IP address of the SyncServer network port at the local end of the NTP association. For the Hardware Clock it is "127.0.0.1", the IP address of the loopback port.

St: 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 GPS. 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).

Poll: 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.

Reach: 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.

Delay: 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.

Offset: 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.

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.

Disp: 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.

RESTART Button

After changing the NTP configuration, click 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.

NTP - Config

Use this page to create, edit, or delete NTP associations.

Also see Configuring NTP for more information.

Current NTP Associations

To edit or delete an association, select it using the checkbox and then click the **EDIT** or **DELETE** button below. If the user selects **EDIT**, the details for that association are displayed under *Add/Edit NTP Association* for the user to edit. Use the **SAVE** button to save the changes and the **RESTART** button to make any changes take effect.

The list of Current NTP Associations always includes the Hardware Clock, which:

- Cannot be deleted or edited.
- Is configured as a preferred server ("server 127.127.45.0 prefer # pseudoaddress for the timing engine" in ntp.conf).
- Is displayed at the top of the list.

Additionally, the factory default configuration includes three Stratum 1 NTP servers operated by Microsemi on the Internet.

The user should consider adding NTP servers available on the local network to the list of Current NTP Associations.

Add/Edit NTP Association

Use Add/Edit NTP Association to edit existing associations or to add new ones. The SyncServer can have multiple associations, each with a different *Role*.

In the following explanations, the term "SyncServer" means "the local NTP daemon on the SyncServer".

Role

- **Server**:

    - Addressing: Use with IPv4 class A, B and C addresses.
    - Description: 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. Also see *system peer mode: client* under ***NTP Daemon Status*** (on page 28).
    - Typical Usage: 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. The NTP servers operated by Microsemi that are part of the factory default configuration are an example of this.
- **Peer:**
    - Addressing: Use with IPv4 class A, B and C addresses.
    - Description: 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. See *system peer mode: symmetric-active* under ***NTP Daemon Status*** (on page 28).
    - Typical Usage: 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 peers can synchronize to the node that has the best remaining reference.
- **Broadcast:**
    - Addressing: Use an IPv4 broadcast address of the local subnet. To broadcast NTP messages on a subnet, if the local interface IP address were 192.168.61.58 and the mask were 255.255.255.0, the broadcast address could be 192.168.61.255.
    - Description: 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** value.
    - This type of association requires *authentication on both the server and the clients*. See ***Using NTP Authentication*** (on page 112).
    - Typical Usage: *Broadcast* associations to reduce network traffic with a large number of NTP clients.
- **Broadcast Client:**
    - Addressing: The user does not specify an address with this setting.

    - Description: Creates an association that listens for NTP broadcast messages on all of the network interfaces. Upon receiving the first broadcast message, the broadcast client association initiates a brief exchange with the server to calibrate the propagation delay. Afterwards, the broadcast client association listens to and gets the time from the broadcast server messages. This type of association requires *authentication on both the server and the clients*. See ***Using NTP Authentication*** (on page 112).
    - Typical Usage: Broadcast client associations can get authenticated time on networks that have a broadcast server.
- **Multicast Server:** Create a **Broadcast** association with members of a multicast group. The multicast address is a class D address starting from 224.0.0.1. (The IANA assigned 224.0.1.1 to be the NTP multicast address.) However, user can choose any class D address that is not used on the local network by other protocols. Routers can be configured to transmit multicast messages to adjacent subnets.
- **Multicast Client:**
    - Addressing: Use the same IPv4 class D multicast address as the Multicast Server (potentially 224.0.1.1).
    - Description: Creates an association that listens for NTP multicast messages on all of the network interfaces. Upon receiving the first message, the multicast client association initiates a brief exchange with the server to calibrate the propagation delay. Afterwards, the multicast client association listens to and gets the time from the server messages. This type of association requires *authentication on both the server and the clients*. See ***Using NTP Authentication*** (on page 112).
    - Typical Usage: Multicast client associations can get authenticated time on networks that have a multicast server.

Note: When authentication is configured, the same authentication scheme is available for all NTP associations and over all network interfaces.

Prefer: The NTP daemon will synchronize with an association marked *prefer* over an equivalent association that is not.

Address: The IP address or DNS name of the NTP association.

(If present, configure the Modem phone number using the **REFERENCES - Modem** page.)

Port: (Factory Default = "Default") 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 LAN 1. 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.

Burst

- **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.

- **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.

Version: Specifies the version number to be used for outgoing NTP packets. Versions 1-4 are the choices, with version 4 the default.

Minimum / Maximum Poll Interval: These options specify the minimum and maximum poll intervals 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). The minimum poll interval defaults to 6 (64 s), but can be decreased to a lower limit of 4 (16 s).

MD5 Key: Use this field to authenticate NTP messages to and from the SyncServer for this specific association. When enabled, the NTP packet header includes authentication fields encrypted using either the MD5 key number (1 to 16) or autokey. Prior to selecting either option, the user must configure the **NTP - MD5 Keys**, **NTP - Autokey**, or **NTP - Autokey Client** pages.

Time to Live: This option is used only with broadcast association. It specifies the time-to-live on broadcast server. Consult with the network administrator to specify a correct value. If this field is left blank, the value of TTL defaults to 127.

RESTART Button

After changing the NTP configuration, click 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.

NTP - MD5 Keys

Use this page to generate or manipulate keys generated using the RSA Message Digest 5 (MD5) algorithm authentication method. MD5 Keys are used to authenticate (not encrypt) NTP messages sent or received by the SyncServer, using a cryptochecksum.

Also see ***Using MD5 Keys on a SyncServer*** (on page 113).

NTP MD5 Security Keys

Use this page to manage MD5 keys as follows:

- View and copy 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.

Generate: This button generates new random MD5 keys, immediately replacing any previous MD5 keys and erasing Autokey certificates and keys.

Current Keys: This window displays the current list of keys.

The first line gives the SyncServer's hostname and the NTP time stamp of when the keys were created. The second line shows the local time and date the keys were generated.

Each row of key information provides the following information:

- The key number, 1 through 16
- The key type, "MD5".
- The key, an ASCII string containing only displayable characters. As an example, the random key generator may produce "\jdh.u$r;x"y:upH"
- A comment that identifies the key type. For example: "# MD5 key"

Upload Keys: Use this text field, with the **BROWSE** button, to enter the file path of the keys file. Then click the **UPLOAD** button to load the keys to the SyncServer.

Download Keys: Press the **Save As...** button to save the Current Keys to your PC as a file.

After keys are generated, the user can select **Key** and a *key number* in the **MD5 key** field on the **NTP - Config** page.

Note: Disregard the "Unable to Open Key File" message while the Current Keys field is empty.

Restart button

After changing the NTP configuration, click 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.

NTP - Prefs

The settings on this page determine whether the NTP daemon, once synchronized, can report an unsynchronized state.

Note: Microsemi recommends keeping the default **Standard NTP Rules** setting below. The **Override Behavior** setting is mostly a "compatibility" setting for custom systems built around legacy TrueTime GPS clocks such as the NTS-200.

Out of the three following stages of operation, the **NTP - Prefs** settings only apply during the *Loss of All References* stage:

1. *Startup*: Upon starting, before synchronizing with any NTP associations, the NTP daemon reports to potential NTP clients that it is unsynchronized by setting leap indicator to 11 and stratum to 16.
2. *Typical Operation*: After synchronizing to an NTP association the NTP daemon uses leap indicator and stratum normally. Leap indicator reports whether a leap event is pending (usually 00 - no alarm). Stratum reports the stratum of the NTP daemon relative to the *system peer* (usually 1 through 3).
3. *Loss of All References*: If the NTP daemon cannot get the time from any association:
    - With **Standard NTP Rules** (Factory Default) The *stratum* and *leap indicator* remain the same as they were in the *Typical Operation* stage. The *system peer* remains the unchanged, but the *reference time stamp* isn't updated and the *reach* statistic gradually decreases to zero.

- With **Override Behavior**, if the estimated time error exceeds the *Time Error Limit* on the *TIMING - Holdover* page, *stratum* reports 16 and *leap indicator* reports 11, as they did during in the *Startup* stage.

After *Loss of All References*, if the NTP daemon synchronizes with an NTP association again, it resumes *Typical Operation*.

Comments:

- Given a pool of NTP associations from which to choose, an NTP client typically synchronizes with the best one, and does not require *Override Behavior* to eliminate poor associations.
- Given a lack of NTP associations from which to choose, an NTP client may reject a SyncServer with better timing accuracy and stability than itself, if Override Behavior is enabled.
- The SyncServer's NTP daemon can get time from a server, peer, broadcastclient, and multicastclient associations.
- Also see ***NTP Daemon Status*** (on page 28), ***TIMING - HW Clock*** (on page 48), ***TIMING - Holdover*** (on page 50), ***Leap Indicator*** (on page 140), and ***Stratum*** (on page 145).

RESTART Button

After changing the NTP configuration, click 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.

TIMING - Time Zone

Local Time Zone

The Local Time Zone is shown displayed on the **STATUS - General** web page.

The Time Zone setting does not affect NTP or any of the other timing outputs.

To set the time zone, select a profile from the list of **Time Zones** and click the **APPLY** button.

Each profile contains the offset from UTC to the time zone, plus any rules for daylight saving time or summer time adjustments.

The Time Zones are alphabetically organized as follows:

- Most Time Zones are sorted by *continent* and *city name*.
- Some Time Zones are sorted by *country* and *city name*.
- Some Time Zones are sorted by *acronym* (e.g., UTC, EST).
- Some *islands* are sorted by ocean (e.g., Atlantic, Pacific, Indian) or national affiliation.

Current shows the time zone in effect and the local time at the moment the page was generated.

TIMING - HW Clock

Hardware Clock Configuration

Manage the references listed under **Clock Source Priorities** as follows:

- Enable or disable the reference using the checkboxes under **Enable**. Checking the box enables the reference, clearing it disables the reference.
- Change the priority of the reference by highlighting it and then using the **Up/Down Arrow** buttons move it up or down in priority.
- Restore the default priority and availability settings by clicking the **DEFAULTS** button.
- Each reference shows its default priority. For example, "GPS [Default 1]".

Microsemi recommends using the default priorities.

The **Forced Timing Source** setting affects all timing outputs and displays:

- **Auto**: The SyncServer automatically synchronizes with a Hardware Clock Input Reference , or a synchronizing NTP association.
- **Free Run:** The user sets the time on the SyncServer by entering the UTC date and time under **UTC Time**. The SyncServer uses its internal oscillator to keep time. This setting overrides the Hardware Clock's Input References. However, a synchronizing NTP association can override the FreeRun setting:
  - If the user intends to use UTC time, Microsemi recommends keeping the current NTP configuration.
  - If the user intends to distribute non-UTC time, Microsemi recommends changing the current NTP configuration by deleting all synchronizing NTP associations. See ***Setting the Time Manually*** (on page 121) and ***Distributing Non-UTC Time*** (on page 124).

Microsemi recommends using the **Auto** setting.

Also see ***Hardware Clock*** (on page 140).

IMPORTANT: If the user is preparing to switch from **Free Run** to **Auto** and the time is more than 1000 seconds off UTC time, manually set it within 1000 seconds of UTC time before switching to **Auto**.

Ignore UTC Corrections from GPS Reference

When the Hardware Clock is locked to the GPS receiver, the GPS receiver passes *GPS time* and a *GPS-UTC offset* to the Hardware Clock.

When *Ignore UTC Corrections from GPS Reference* setting is:

- Unselected, the Hardware Clock uses the GPS-UTC offset and passes UTC time to the NTP daemon. (Recommended) (Factory Default)
- Selected, the Hardware Clock ignores the GPS-UTC offset and passes GPS time to the NTP daemon.

To use this setting, consult ***Distributing GPS Time*** (on page 122).

This setting has no effect when the Hardware Clock is locked to non-GPS references.

WARNING: The *Free Run* and *Ignore UTC Corrections from GPS Reference* settings can have serious effects upon timing networks and systems that expect UTC time. These settings should only be used by knowledgeable and authorized persons under carefully controlled conditions.

Use the **APPLY** button to apply changes to the configuration.

TIMING - Holdover

Overview

The SyncServer uses holdover to continue operating as a stratum 1 NTP server/peer for a period of time if the Input References become unavailable.

For example: A SyncServer in a downtown office building gets time from GPS. Surrounding skyscrapers occasionally block signals from the GPS satellites as they move across the sky, causing "gaps" that last several hours. The SyncServer uses holdover to continue operating as a stratum 1 NTP server during these gaps.

The factory default settings are appropriate for most situations. However, the user should consider extending holdover to cover the longest anticipated "gap" if more than one of the following conditions is true:

- The SyncServer is the only NTP server available to the NTP clients.
- The SyncServer only has one Hardware Clock Input Reference.
- The Hardware Clock is the only NTP association listed on the **NTP - Assoc** page.
- Restoring an Input Reference would take longer than the holdover period in days.

Please note the Holdover settings on this page also affect NTP if *Override Behavior* is selected on the **NTP - Prefs** page.

Also see ***Stratum*** (on page 145).

The Settings

The user can simply set the number of days **Holdover** lasts, or specify a **Time Error Limit**. Setting either field generates an equivalent value in the other field.

About *Time Error*: When no Input References are available, the oscillator drifts away from the correct time, accumulating *time error*. The type of oscillator affects how quickly time error grows. The SyncServer keeps an ongoing estimate of the time error. Holdover ends when the estimated time error is equal to or greater than the user-configured Time Error Limit.

The **Oscillator Type** affects the rate at which the oscillator accumulates time error when no Input References are available.

- **TCXO** – The standard temperature-compensated oscillator.
- **OCXO** – The optional oven-compensated oscillator is more stable and offers better holdover performance than the TCXO.
- **Rubidium** – The optional rubidium oscillator has the best stability and holdover performance.

Several methods are available for the user to adjust Holdover or Time Error Limit:

- Entering a value for **Holdover Limit** or **Time Error Limit** and click the **SET** button.
- Sliding the green vertical bar on the *Holdover* graph left or right.
- Sliding the one of the black spheres under **Holdover Limit** or **Time Error Limit** left or right.

In Depth

Before entering holdover:

- The Hardware Clock is synchronized to one of the Input References and reports Stratum 0 to the NTP daemon.
- The NTP daemon is synchronized to the Hardware Clock "reference clock" and reports Stratum 1 to the network.

The Hardware Clock enters holdover when the Input Reference becomes unavailable and no other Input References are available.

While in holdover:

- The Hardware Clock uses the internal oscillator to keep time (flywheeling).
- The NTP daemon (Stratum 1) remains synchronized to the Hardware Clock (Stratum 0, Reference = the name of the last Input Reference).
- The SyncServer estimates the time error (difference) between the oscillator-based Hardware Clock time and UTC.
- If two or more synchronizing NTP associations are available and the Hardware Clock accumulates too much time error, the NTP daemon "drops" the Hardware Clock and synchronizes with the best association, with a corresponding adjustment to its Stratum.

The Hardware Clock leaves holdover when one of the following occurs:

- An Input Reference becomes available again. (As a result, the NTP daemon returns to Stratum 1 operation.)
- The estimated time error exceeds the user-configurable *Time Error Limit*.

If the estimated time error exceeds the user-configurable *Time Error Limit*:

- The Hardware Clock reports to the NTP daemon that it is unsynchronized (Stratum 16).
- If one or more synchronizing NTP associations are available, the NTP daemon synchronizes with the best one, with a corresponding change to its stratum.
- If no synchronizing NTP associations are available, the NTP daemon's behavior is determined by the settings on the **NTP - Prefs** page. See ***NTP - Prefs*** (on page 46).
- With the S100, S300 and S350, the Hardware Clock synchronizes to the NTP daemon.
- With the S200, S250, and S250i, the Hardware Clock "flywheels" on the internal oscillator until an Input Reference becomes available again.

REFERENCES - GPS

GPS Position and Operating Mode

This page can be used to view or set the GPS receiver's Position and Mode, as well as the GPS Antenna Cable Delay.

Status: Indicates whether the GPS receiver is a valid reference (locked) or not (unlocked).

Current Position: The GPS antenna position in Latitude and Longitude by degrees, minutes, and seconds, and the cardinal points of the compass followed by the altitude in Meters. These values can be permanently set when the **GPS Mode** is set to **Position Hold**.

Mode:

- **Survey**: In this mode, the receiver surveys and averages its position before switching to Position Hold mode. Use this setting for stationary applications, such as server rooms.

This is the default setting.

- **Dynamic**: In this mode, the receiver continuously updates its position. Use this setting if the position of the SyncServer could change occasionally or continuously, such as vehicles, aircraft, and ships. This setting provides lower timing precision and accuracy than the Survey and Position Hold modes.
- **Position Hold**: In this mode, the receiver calculates the time based on a fixed position that has been provided by Survey Mode or entered by the user. Use this setting if GPS visibility is poor and the receiver has difficulty establishing its position using Survey mode after one day. The accuracy of the user-entered position affects the accuracy of the timing solution from the GPS reference. Also see ***Operating in "Window Mode"*** (on page 98).

Antenna Cable Delay:

Use this setting to achieve the highest timing precision and accuracy on the timing outputs. This setting has a negligible effect on NTP synchronization because the scale of the adjustment (nanoseconds) is not significant compared to millisecond latencies on typical networks.

The Antenna Cable Delay *advances* the Hardware Clock slightly to cancel out the signal *delay* caused by the length of the GPS antenna cable.

To calculate the adjustment, select the signal propagation rate for the appropriate cable type from the table below and multiply it by the length of the cable.

Type	Rate per foot	Rate per meter
RG-58	1.4 nS/foot	4.59 nS/meter
RG-59	1.24 nS/foot	4.06 nS/meter

For example, the standard 50 foot RG-59 antenna cable x 1.24 nS/foot = 62 nS of Antenna Cable Delay.

Or, using meters, the standard 15.24 meter RG-59 antenna cable x 4.06 nS/meter = 62 nS of Antenna Cable Delay.

SYSTEM - General

Use this page to manage:

- The network Hostname for the SyncServer.
- Automatically check for software upgrades.

Hostname: (Default: "SyncServer") The hostname identifies the SyncServer on the network and is also an important element of NTP autokey authentication. When operating multiple SyncServers on a network domain, or when using NTP autokey, replace the hostname with a unique descriptive string composed of alphanumeric characters with no spaces or special characters. The field has been programmed to reject invalid characters.

Software Update Availability Check: (Default: Enabled) When enabled, the SyncServer checks a file on the Symmetricom web site for software upgrades shortly after noon, local time, Monday through Friday, as determined by the *Local Time Zone* setting on the **TIMING - Time Zone** page. If the software *Release* and *Revision* on upgradeS300.txt are more recent than that of the software on the SyncServer, the SyncServer displays a notice on the **STATUS - General** page, and generates a *System Upgrade Alarm* on the **ADMIN - Alarms** page.

In order for the *Software Update Availability Check* to function, LAN 1 must have:

- Firewall access to the Internet (port 80)
- A valid DNS server

To manually check if an upgrade is available, or if network conditions prevent *Software Update Availability Check* from checking automatically, compare ***http://update.symmetricom.com/upgradeS300.txt*** with the **STATUS - General** page.

For example, compare "Version=1.10" and "Last Checkpoint: 1.103" on upgradeS300.txt with "Release Version 1.10 Build 1.103" on the **STATUS - General** page. Since the values are the same, no upgrade is available.

Note: The default configuration of the *System Upgrade Alarm* on the **ADMIN - Alarms** page is "Severity = Minor", "Send SNMP trap", and "Write to log" when upgrades become available. SNMP must be configured correctly to function.

The user can also contact ***Microsemi Customer Assistance*** (on page 5) for information about upgrades.

SYSTEM - Upgrade

Use this page to upgrade the SyncServer's software. This can be done using the web interface to upload the new software. Please consult ***Upgrading System Software*** (on page 105) before upgrading the software.

Note: Please avoid decompressing the *.tar upgrade file prior to upgrading the SyncServer. The SyncServer will not install software from an upgrade file that has been modified or decompressed and recompressed. If needed, please download a new software file from Microsemi.

Upload Upgrade Package to SyncServer

BROWSE button: Choose an upgrade file that's accessible from your workstation, such as a network drive or Desktop.

UPLOAD button: Upload the upgrade file to the SyncServer.

Manage Files in SyncServer

Current Files: This window displays upgrade files and an upgrade history file.

Optional Parameters: This field can be used to supply optional installation parameters, if required. This field is not required for normal operation.

INSTALL button: To install the upgrade file, select the file and click the INSTALL button.

VIEW button: To see the upgrade history, select the upgradehist.txt file and click the VIEW button.

DELETE button: To delete a file, select the file and click the DELETE button. It may be necessary to upload a file before the upgradehist.txt file can be selected and deleted.

SYSTEM - Factory Reset

Use this page to reset the SyncServer to its original factory default configuration.

Before resetting the factory defaults, the user may want to back up the current configuration if they intend to use it again in the future.

To reset the factory defaults, select **Reset to Factory Defaults** and click the **APPLY** button. This clears *ALL* of the current settings on the SyncServer, restores the original factory default configuration, and reboots the SyncServer.

After restarting, the user may need to configure LAN 1 before reconnecting to the web interface. The default username and password (admin, symmetricom).

A partial list of the defaults restored by this operation:

- Network port settings
- NTP Associations
- Hostname
- All settings defined on the **ADMIN** pages (Web, Users, Alarms, Logs Config), including the username and password settings.
- All services are reset to their default modes of operation.
- Hardware Clock settings, including forced mode, Time Zone, Position and Time Error Limit.
- All cryptographic materials (NTP keys, sshd keys, SNMP users and communities) deleted.
- Logs are erased.

Also see ***Backing Up/Restoring Configurations*** (on page 116), ***Configuring LAN 1*** (on page 102), and ***Logging in to the Web Interface*** (on page 103).

Factory Default Settings

NETWORK – Ethernet

For LAN 1:

Connection Mode: Static

IP Version: IPv4

IP Address: 192.168.0.100

Mask: 255.255.255.0

Gateway: 192.168.0.100

Redundant: 000.000.000.000

Allowed Access: Null

Speed/Duplex: Auto

NETWORK – SNMP

sysLocation: unknown

sysName: SyncServer

sysContact: admin@localhost

Read Communitysymmpublic

Write Communitysymmprivate

User Name: admin
Mode: rouser
Level: Null

NETWORK – SNMP Traps

Destination: None
Ver: None
(Inform): None
User/Community: None

NTP – Config

For HW Clock:
Checkbox: Grayed
Role: Server
Prefer*
IP Address: Hardware Clock
Poll Min: Null
Poll Max: Null
Key: Null
Burst: Null
For 69.25.96.11, 69.25.96.12, and 69.25.96.14:
Checkbox: Active
Role: Server
Prefer: Null
IP Address: 69.25.96.11, 69.25.96.12, and 69.25.96.14
Poll Min: Null
Poll Max: Null
Key: Null
Bursti: Burst

NTP – Prefs

Leap Indicator Bits/StratumFollow Standard NTP rules (Default)

TIMING – Timezone

Time Zones: UTC

TIMING – HW Clock

Clock Source PrioritiesGPS
Enable: All enabled
Forced Timing Source: Auto
Ignore GPS - UTC Correction: Disabled

TIMING – Holdover

Time Error Limit: 1 ms

REFERENCES – GPS

ModeSurvey
Latitude: 0 degrees,   0 minutes,   0 seconds,   North
Longitude: 0 degrees,   0 minutes,   0 seconds,   East
Altitude: 0 Meters
Antenna Cable Delay: 0

SYSTEM – General

Hostname: SyncServer
Check for software Upgrades: Checked

ADMIN – Web

For Login Page Configuration:
Appearance Graphic (login page with configurable system information)
Title: Null
Time, Hostname, LED's: Checked
NTP Status: Checked
Hardware Clock Status: Checked
GPS Receiver Status and Satellite Count: Checked
Highest Severity Alarm: Checked
Version Info, Uptime: Checked
IP Address for the configured LAN port: Checked
For Configuration Settings:
Warn when Navigating without saving changes: Checked
Update the configuration backup file when configuration changes are applied: Checked
Send Browser hint to not Auto Complete Passwords: Not checked

ADMIN – Users

Username: admin
Password: symmetricom
See also: ***Properties of User Names and Passwords*** (on page 23)

ADMIN – Alarms

Under the ADMIN - Alarms topic, see ***Factory Default Settings for Alarms*** (on page 63).

ADMIN – Logs Config

auth.log: Notice
daemon.log: Notice
kern.log: Notice
syslog: Notice
messages: Debug, Info, Notice, Warning

Remote Log System: Null

SERVICES – Startup

Web Server: On, Auto
NTP: On, Auto
SNMP: On, Auto
SSH: On, Auto
Time: On, Auto
Time-UDP: On, Auto
Daytime: On, Auto
Telnet: Off
System Control: Run

SERVICES – HTTP

Security: Standard (Port 80) Only

SERVICES – SSH

Protocol: SSH-1 & SSH-2
Log Level: INFO
Server Key Bits: 768
Key Regeneration: 3600 Seconds

ADMIN - Web

Use this page to:

- Configure the appearance and information displayed on the login page.
- Modify the behavior of the web interface.

Login Page Configuration

The settings in this section configure the Login page to:

- Display status information. This is convenient for monitoring status without logging in, particularly if LAN 1 is on a private administrative network.
- Remove status and information that identifies the SyncServer from the login page. This makes it more difficult for unauthorized users to recognize the SyncServer via its web interface.

The login page choices are:

- **Plain:** Login page does not contain any identifying text or graphics.
- **Graphic**: Login page contains identifying text, graphics, and user-selected status information.

The configurable system information includes the following choices:

- **Title**: A user-determined text string at the top of the login page.
- **Time, Hostname and LEDs**: The local time, the hostname, and the status LEDs.
- **NTP Status**: The NTP Stratum and Reference ID.
- **Hardware Clock Status**: The current Sync Source and whether the Hardware Clock is locked.
- **GPS Receiver Status and the Satellite Count**: GPS receiver is providing timing information and the number of satellites visible.
- **Highest Severity Alarm:** The name of the most recent and most severe pending alarm.
- **Version Information and Uptime**: The model number, software version, and uptime since the unit was started.
- **IP Addresses for Configured LAN Port**: The MAC, IPv4, and IPv6 addresses of the LAN port.

Save Configuration Settings

Beyond the login page, the user can determine the behavior of the web pages.

Warn when Navigating without saving Changes: (Enabled by default)

- When this feature is enabled, the SyncServer sends warnings messages if the user makes settings changes and navigates away from the page without clicking the **APPLY** button. This reduces the possibility of accidentally losing unsaved changes.
- When this feature is disabled, the SyncServer suppresses these warning messages.

Save Configuration Changes when Submitted: (Enabled by default)

- When this feature is enabled, the SyncServer updates the configuration *backup file* in non-volatile memory when the user applies or saves changes to the configuration. This may slow the web interface's response time, but ensures that the current configuration is backed up and will be restored if the SyncServer is rebooted.
- When this feature is disabled, the SyncServer does not update the backup file when the user applies or saves changes to the configuration. This may improve the web interface's response time to applied changes but leaves the backup file unchanged. This option can be useful for keeping a "known good configuration" available while trying out experimental configurations. If the experimental configurations aren't satisfactory, use the **WIZARDS - Restore** page to restore the known good configuration. Once the desired configuration is reached, manually save the configuration backup file to non-volatile memory using the **WIZARDS - Backup** page.

Send Browser hint to not Auto Complete Passwords: (Disabled by default)

- Enabling this setting enhances security. It prompts browsers to suppress the "auto-complete" and "remember password" features. This makes it more difficult for unauthorized users to gain access to the SyncServer from an authorized user's workstation or by exploiting stored browser settings.

ADMIN - Users

Use this page to:

- Add a new user
- Set a new password
- Enable and configure password recovery

- Send a test email for password recovery

For information about creating and deleting users, or changing passwords and enabling password recovery, see ***Managing Users*** (on page 119).

Note: All users have complete administrative privileges.

User Creation, Deletion and Password Maintenance

User: Select *New User* to create a new username or select a current username from the list to change its settings.

Delete Selected User: To delete a current username, select this box and click the APPLY button. The web interface prevents the last remaining username from being deleted.

New Username: When *User* is set to *New User*, enter the username to create. See also: ***Properties of User Names and Passwords*** (on page 23)

Old Password: When *User* is set to a current username, enter the corresponding password to authenticate changes being made elsewhere on this page.

New Password: To change the password, enter a new password with six or more characters, including lower and upper case letters, or letters and at least one number. See also: ***Properties of User Names and Passwords*** (on page 23)

Retype New Password: Confirm the spelling of the password by entering it one more time.

Password Recovery: Select this checkbox to enable password recovery from the Login page. With password recovery enabled, the user can reset the password from the Login page by correctly answering the password recovery question. The SyncServer then sends an email message containing a new automatically generated password to the email address supplied on the **ADMIN - Users** page. After logging in, the user can reset the password to a known value.

Note: The SyncServer does not provide a method for recovering forgotten usernames. If all usernames have been forgotten, restore the factory configuration using the hardware jumper. See ***Restoring the Factory Default Configuration*** (on page 117).

Recovery Question: Select one of the standard recovery questions, or create a custom question.

Answer: Enter the answer to the recovery question. Case sensitive.

Email Address: The email address to which the password recovery message is sent.

SMTP Gateway: The email server that forwards the password recovery message (e.g., smtp.domainname.com). The SyncServer must have a valid SMTP Gateway addresses for password recovery to work. If LAN 1 is unable to reach a DNS server, the SMTP gateway must be entered as an IP address, not as a DNS name. If needed, contact a network administrator to obtain this information.

Send Test Email: Select this option to verify that password recovery by email is configured correctly and works.

Note: Once applied, recovery question, answer, and email address data do not remain visible on the page. The SMTP Gateway entered here is also used for email notification of alarms.

ADMIN - Alarms

Alarm Configuration and Notification

Use this page to view alarm status and to perform the following tasks:

- Configuring Alarm Severity (ALARM LED color).
- Manually clearing alarms.
- Configuring Alarms to clear automatically after 15 minutes.
- Logging of alarms, notification events.

The **Alarm LED** at the top left corner of the web interface and on the front panel indicates the highest severity alarm on the **ADMIN - Alarms** page:

- Red: Alarm with severity = *Major*.
- Orange: Alarm with severity = *Minor.*
- Green: Alarm with severity = *Notification*, or no alarms.

Alarm Configuration and Notification

Name: Describes the system event that causes the alarm. Also see ***Alarm Descriptions*** (on page 61).

State: A graphic LED indicating the alarm *state* and *severity* at the time the page was generated:

- Grey LED: Severity is set to *Notify*.
- Green LED: Severity is *Major* or *Minor*, and there is no alarm.
- Orange LED: Severity is set to *Minor*, and there is an alarm.
- Red LED: Severity is set to *Major*, and the alarm there is an alarm.

Note: To check the current state, click the refresh icon (rotating arrows) at the lower right corner of the page.

Clear Now: This checkbox is only available during an alarm. To clear the alarm, select the *Clear Now* checkbox and click the APPLY button. Doing so returns the alarm to a "No Alarm" state.

Auto Clear: Automatically clears the alarm after 15 minutes, regardless of the condition that caused it.

Severity: Determines the Alarm LED response to an alarm and sets the "Level:" in the SNMP trap, email message, and log entry.

- Notify: Does not raise an alarm (No change to Alarm LED color).
- Minor: Raises a minor system alarm (Alarm LED = Orange).
- Major: Raises a major system alarm (Alarm LED = Red).

Note: If enabled, *Send Trap*, and *Write Log* operate in response to alarms, regardless of Severity.

Send Trap: Sends an SNMP trap when the alarm occurs and ends. SNMP must be configured correctly on the **NETWORK - SNMP** and **NETWORK – SNMP Traps** pages for this to work.

Write Log: Generates a log entry in syslog when the alarm occurs and ends. The log can be viewed from the **LOGS - syslog** page.

Note: When *Clear Now* and *Auto Clear* are used to clear an alarm, *Send Trap*, and *Write Log*, do not generate notification messages or log entries.

Alarm Descriptions

Note: Alarm indicators for optional features or equipment appear when the related option is present and enabled.

NTP System Peer Change Alarm: The SyncServer's current NTP synchronization peer has changed.

NTP Stratum Change Alarm: The NTP Stratum level has degraded. For example, the NTP Stratum has gone from 1 to 2.

NTP Leap Change Alarm: The SyncServer raises this alarm when the *leap indicator* changes state. See ***STATUS - NTP*** (on page 28).

This change of state has two potential causes: The first is that the SyncServer was reconfigured, causing the NTP daemon to be restarted. More rarely, this can occur when the SyncServer is within 24 hours of a leap second adjustment.

System Network Alarm: Alarms if the configured port has no connection (network link). This alarm clears if the configured port has connections.

System Upgrade Alarm: The SyncServer checks for software upgrades and raises this alarm if a software upgrade is available. Microsemi recommends leaving this alarm enabled. Microsemi recommends enabling *Send Trap* for this alarm on the **ADMIN - Alarms** page.

Note: In order to detect upgrades, the SyncServer must be correctly configured with a DNS server and must have http access to the Internet through port 80. This feature is enabled by default, but can be disabled on the **SYSTEM - General** page.

System Config Change Alarm: Generates an alarm if the system configuration has been changed. If the Auto Clear is not selected, this alarm will remain pending until cleared by the administrator.

System Health Alarm: The web interface has been unable to automatically save user configuration changes to the backup file. The user might need to perform a manual backup using the **WIZARDS - Backup** page.

System Up/Down Alarm: Reserved for future use.

System Authentication Alarm: The SyncServer detected a failed login attempt on the web interface.

Timing No Source Alarm: The Hardware Clock does not have a valid timing reference.

Timing GPS Source Alarm: (Displayed on GPS-equipped SyncServers only) The GPS time reference is not providing valid timing information. This may be caused by:

- An insufficient number of visible GPS satellites.

- The GPS satellite signals may be blocked from reaching the antenna, or are too weak to be detected by the receiver.
- The GPS antenna cable may be disconnected, broken, shorted, or too long.

Timing GPS Antenna Short Alarm: (Displayed on GPS-equipped SyncServers only) The GPS receiver detects an overcurrent condition on the GPS antenna cable. The likely cause is a short circuit.

Timing GPS Antenna Open Alarm: (Displayed on GPS-equipped SyncServers only) The GPS receiver detects too little current in the power supplied to the GPS antenna. The likely cause is a disconnected or broken GPS antenna cable. A GPS splitter may also cause this condition.

Timing Oscillator DAC Range Alarm: The SyncServer is applying the maximum or minimum DAC value to steer the oscillator. If this recurs frequently or over a sustained period of time, there may be a problem with the oscillator.

Timing Oscillator Unlock Alarm: The Hardware Clock's oscillator frequency is not locked to the reference source.

Timing Source Change: The Hardware Clock has switched timing references.

Timing Source Change Lower Accuracy Input: The Hardware Clock has switched to a lower-priority timing source.

Timing PLL Unlock Alarm: The Hardware Clock oscillator's PLL unlocked.

Timing Time Quality 1e-6 Alarm: The Hardware Clock's estimated time error has exceeded 1e-6 seconds (1 microsecond).

Timing Time Quality 1e-5 Alarm: The Hardware Clock's estimated time error has exceeded 1e-5 seconds (10 microseconds).

Timing Time Quality 1e-4 Alarm: The Hardware Clock's estimated time error has exceeded 1e-4 seconds (100 microseconds).

Timing Time Quality 1e-3 Alarm: The Hardware Clock's estimated time error has exceeded 1e-3 seconds (1 millisecond).

Timing Leap Event Alarm: The leap indicator from the Hardware Clock's GPS indicates that a leap event is pending. The pending event can be a Leap Second Insertion, Leap Second Deletion, or Clear Alarm, which indicates that the alarm has passed. See ***STATUS - Timing*** (on page 26) for more information.

LAN 1 Link Alarm: A network connection is not available on LAN 1. Note that if LAN 1 is down, SNMP does not work and the web interface is not available.

Note: The Network LED indicates the status of the "LAN* Link Alarms". Please consult ***Status LEDs*** (on page 15).

Timing NTP Daemon Alarm: The NTP Daemon is no longer a valid source of timing to the Hardware Clock.

System Reset Default Config Alarm: Typically, during a reboot, the SyncServer applies the current configuration. This alarm is raised when the system failed to initialize itself to the current configuration and it automatically restored itself to the default configuration. The circumstances are usually caused by missing or corrupted current configuration.

Factory Default Settings for Alarms

Name	Auto Clear	Severity	Send Trap	Write Log	Send Email
NTP System Peer Change		Notify		Y	
NTP Stratum Change	Y	**Major**	Y	Y	
NTP Leap Change	Y	Notify		Y	
System Network	Y	Notify		Y	
System Upgrade		*Minor*	Y	Y	
System Config Change		Notify		Y	
System Health	Y	**Major**	Y	Y	
System Up/Down	Y	*Minor*	Y	Y	
System Authentication	Y	Notify		Y	
Timing No Source	Y	**Major**	Y	Y	
Timing GPS Source	Y	**Major**	Y	Y	
Timing GPS Antenna Short	Y	**Major**	Y	Y	
Timing GPS Antenna Open	Y	**Major**	Y	Y	
Timing Oscillator DAC Range		Notify		Y	
Timing Oscillator Unlock		Notify		Y	
Timing Source Change		Notify		Y	
Timing Source Lower Accuracy Input		Notify		Y	
Timing PLL Unlock	Y	Notify		Y	
Timing Quality 1e-6	Y	Notify		Y	
Timing Quality 1e-5	Y	Notify		Y	
Timing Quality 1e-4	Y	Notify		Y	
Timing Quality 1e-3	Y	Notify		Y	
Timing Leap Event	Y	Notify		Y	
LAN 1 Link	Y	**Major**		Y	
Timing NTP Daemon	Y	Notify		Y	
System Reset Default Config		**Major**		Y	

SERVICES - Startup

Daemon Current State and Startup

The SyncServer uses a number services that operate continuously to support its functions.

Use this page to:

- View the current state of the services and to turn them on or off.
- Enable or disable services from starting automatically when the SyncServer is started.
- Run, Reboot, or Halt the SyncServer's operating services and operating system.

Daemon

A list of the user controllable daemons supported by the SyncServer:

Web Server (HTTPD): Provides the SyncServer's web interface. If Auto Startup is deselected and the SyncServer reboots, the web interface will not be available.

To start the web server after it has been stopped, open a command line session through the *Console RS-232* port located on the front panel or, if available, through a Telnet session with LAN 1 port. Once logged in, restart the web server by typing "HTTP on".

NTP: Network Time Protocol daemon. Supports all NTP functions.

SNMP: Simple Network Management Protocol daemon. Responds to SNMP requests and sends SNMP traps.

SSH: Secure Shell daemon. Provides an encrypted channel for command line sessions with the SyncServer through the LAN 1 port.

Time: Time Protocol requests per RFC 868 over TCP.

Time - UDP: Time Protocol requests per RFC 868 over UDP.

Daytime: Daytime Protocol per RFC 867 over TCP.

Daytime - UDP: Daytime Protocol per RFC 867 over UDP.

Current State/Startup

Shows the current state of the service. To change the state, select the desired state and click the **APPLY** button.

On: The service is running.

Off: The service is stopped.

Auto: When selected, the service starts automatically when the SyncServer reboots.

Note: Services that cannot be directly turned off display grayed out **On** and **Off** radio buttons. These services can only be controlled by selecting or deselecting Auto Startup. Applying the change will then stop or start the service as appropriate.

System Control

Run: The SyncServer continues to operate normally. This is the default setting.

Reboot: Reboots the SyncServer. During this process, the browser displays "This browser will attempt to reconnect..." When the SyncServer finishes rebooting, the browser displays the login screen (provided DHCP hasn't changed the IP address).

Halt: Halts the operating system after about 15 seconds, typically. While the SyncServer is halting, the web interface displays "Halting System - This browser session cannot continue..." and the front panel display states "Shutting down. Please wait...". Wait at least 15 seconds, and shut the power switch off.

SERVICES - HTTP

Web Server Configuration

The SyncServer's web interface allows both standard and secure (encrypted) network access. Standard access is provided by default. To use encrypted access, a secure certificate must be created. The SyncServer can only use self-signed certificates.

Creating a new certificate overrides previously created certificates. The certificate values used are not significant to the SyncServer. They are provided to any user using the certificate. All of the fields must contain values.

When a certificate has been created, the *Secure* log in option appears on the login page. The entire session uses the selected communication method.

Security

Standard (Port 80) Only: The web interface is available using a standard non-encrypted http connection. This is the factory default configuration.

Secure (Port 443) and Standard (Port 80): The web interface is available using either type of connection.

Secure (Port 443) Only: The web interface is available using an SSL-encrypted connection.

Note: To connect to Port 443, the URL in the browser must begin with "https".

Certificate Info:

Common Name: SyncServer's hostname, as entered on the **SYSTEM - General** page. The default factory configuration is "SyncServer".

Bits: Number of RSA Key Bits, 1024 or 2056 bits. The default factory configuration is "1024".

Days to Expiration: The number of days before the certificate expires.

ISO Country Code: The Two-Character International Country Code.

State: The state where the SyncServer is located.

Locality: The locality where the SyncServer is located.

Organization: The organization or company the SyncServer belongs to.

Organizational Unit: The organizational unit or division that uses or is responsible for the SyncServer.

Email Address: The email address of the administrator responsible for the SyncServer.

SERVICES - SSH

SSH Security Configuration

After setting the other options on this page, select **Regenerate SSH Secure Keys** and click the **APPLY** button to generate a new set of SSH secure keys. This step is required before the user can log in to LAN 1 using SSH.

Protocol: Sets the protocol to **SSH-1 & SSH-2**, **SSH-1 Only**, or **SSH-2 Only**.

Allowed Users: List user names that are allowed SSH access.

Denied Users: List user names to exclude from SSH access.

Note: Use a space character between user names. This list supports the ? wild card as a substitute for an individual character, and the * wild card as a substitute for the rest of a word. For example, *Allowed Users* = Bird* would let *Bird1* and *Birddog* log in. *Allowed Users* = Bird? would let *Bird1* log in, but not *Birddog*.

Log Level: The level of verbosity level for logging ssh messages. Can be set to QUIET, FATAL, ERROR, INFO, VERBOSE, or DEBUG.

Server Key Bits: The number of bits to use when generating the keys. Can be set to 512, 768, 1024, or 2048.

Key Regeneration: The interval, in seconds, with which to regenerate keys.

LOGS

System Event Log

The Logs page provides access to system activity and messages that are generated by the various subsystems in the SyncServer. The logs are separated by function. Each of the logs records a series of time-stamped events.

In the case of the system, auth, daemon, kern and messages logs, the entries take the standard form defined by the syslog daemon. These entries are:

date time system facility message: Here "system" is the hostname that generated the message. The "facility" is a component of the system generating the message. This could be anything like the kernel itself, system daemons and even applications. Finally, there is the text of the message itself. Here are two messages on the system SyncServer. One is from daemon.log and the other from the kernel:

```
Sep 19 19:20:26 SyncServer ntpd[3577]: ntpd 4.2.0b@1.1396-o Tue Aug 9
01:05:42 UTC 2005 (7)
Sep 10 00:06:18 SyncServer kernel: Jida-Driver installed
```

In the case of the event log, the entries take the form of:

```
Date time user source description
```

Here "user" is the user logged into the web interface, "source" is the IP address of the remote system using the web interface and "description" provides information regarding the nature of the event. Here is a message showing a successful remote login along with the user id and IP address of the contact.

```
10/01/2005 22:36:28 admin     192.168.7.16    Successful login
```

Events: The events log is not configurable. This log is maintained outside syslogd and contains configuration and event data related to operations performed in the web interface.

syslog: syslog holds messages about system level events. Examples of system events are privilege changes (e.g., sudo) and messages about regularly schedules events such as cron.

auth.log: The authentication log contains entries regarding authentication events from login or PAM (Pluggable Authentication Module).

daemon.log: The daemon log contains entries submitted by the daemon processes that provide the services in the SyncServer. Examples of daemon log entries are NTP changes, SNMP events, and xinetd events.

kern.log: The kernel log contains entries submitted by the kernel. Examples of kernel events are network errors or hardware changes.

messages: The messages file is something of a catchall file. By selecting various priorities, it is possible to capture large amounts of data regarding system operation. However, the volume of data becomes impractical to manage quickly. As such, this file is cleared at each power cycle or reboot.

Every 20 minutes, if no new messages were logged, the Syslog daemon logs a -- MARK -- message to indicate that it is alive and well.

WIZARDS - Backup

The Backup wizard guides the operator through saving the SyncServer’s current configuration to nonvolatile memory in the SyncServer, and optionally transfers the backup configuration to a remote location. The backup file can be used to:

- 'Clone' the configuration to other SyncServers with the same Software Version.
- Restore the SyncServer's configuration if it is lost or becomes unusable.

WIZARDS - Restore

Use the **WIZARDS - Restore** page to restore a saved configuration from a backup file, or to restore the factory default configuration.

Reset to Factory Defaults: Returns the SyncServer to its original factory configuration, removing ALL user-entered and operational information including password, IP addressing, GPS position, and time zone. See ***SYSTEM - Factory Reset*** **(on page** 53**).**

Restore Last Backup from SyncServer: Restores the configuration as it was when the user created the most recent backup configuration file. The backup file is located in the SyncServer’s nonvolatile memory.

Restore From USB flash drive: Restores the configuration from a backup file located on a USB drive attached either of the USB ports on the front panel.

Restore backup from workstation hard-drive or network directory: Restores the configuration from any backup file located on local or network drive accessible to the browser.

Note: Resetting or restoring the configuration reboots the SyncServer. If LAN 1 is configured to use DHCP, the DHCP server may assign a new IP address to LAN 1. If needed, use the front panel STATUS button to view the new IP address on the LAN 1 STATUS screen.

WIZARDS - Upgrade

Use **WIZARDS - Upgrade** to update the SyncServer software.

SyncServer upgrade packages are available at ***http://www.microsemi.com/ftdsupport*** and then following the links from the Support menu.

Users are required to register in order to download software. Some export restrictions may apply.

To upgrade the software, download the upgrade package file to:

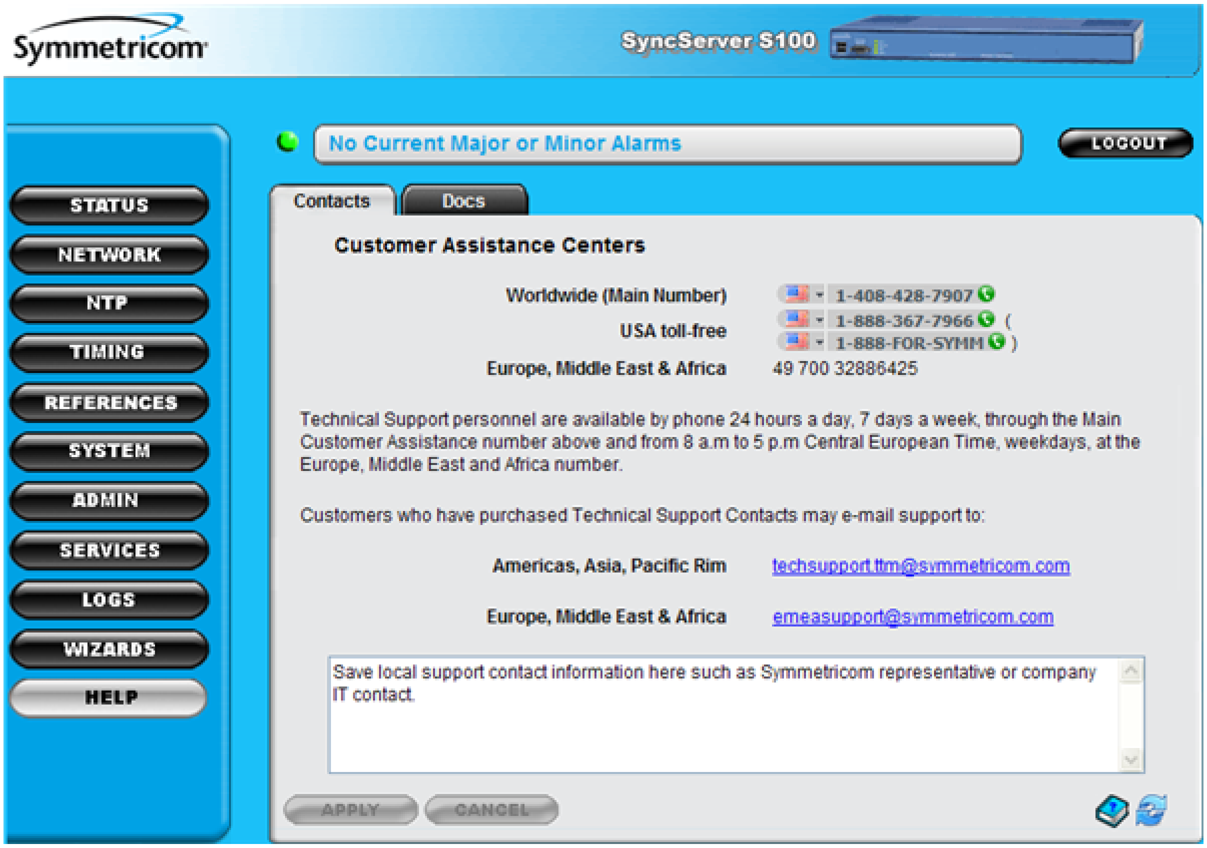
- A file area that is accessible to the web browser.
- To a USB flash drive, or to an area where it can be copied to a USB flash drive.

Then use **WIZARDS - Upgrade** to copy the upgrade file to the SyncServer and perform the upgrade.

Note: The SyncServer automatically decompresses the software upgrade ".tar" file. Please do not decompress the ".tar" file prior to upgrading the SyncServer.

HELP - Contacts

From Help > Contacts, the following page can be accessed:



No Current Major or Minor Alarms

Customer Assistance Centers

Worldwide (Main Number)	1-408-428-7907
USA toll-free	1-888-367-7966 (1-888-FOR-SYMM)
Europe, Middle East & Africa	49 700 32886425

Technical Support personnel are available by phone 24 hours a day, 7 days a week, through the Main Customer Assistance number above and from 8 a.m to 5 p.m Central European Time, weekdays, at the Europe, Middle East and Africa number.

Customers who have purchased Technical Support Contacts may e-mail support to:

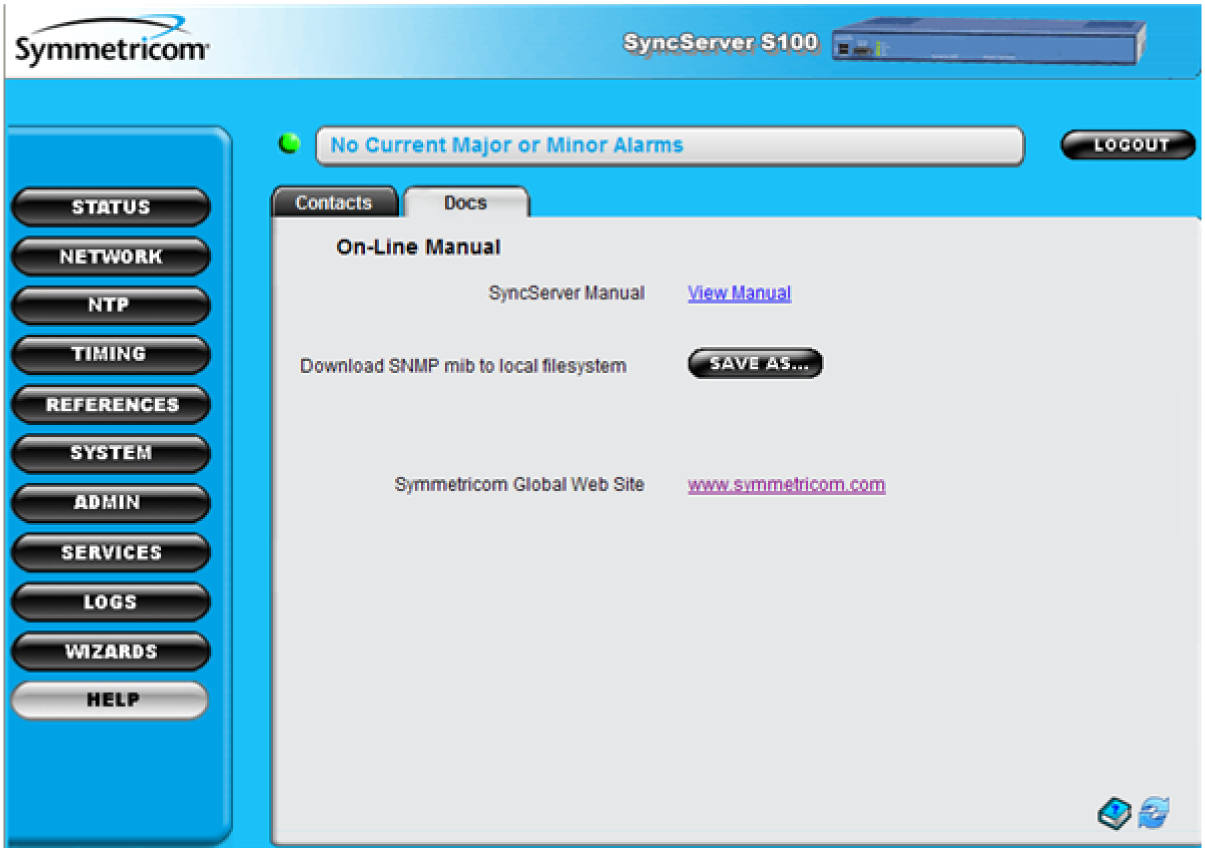
Americas, Asia, Pacific Rim	techsupport.ttm@symmetricom.com
Europe, Middle East & Africa	emeasupport@symmetricom.com

Save local support contact information here such as Symmetricom representative or company IT contact.

This page holds the Microsemi Customer Center's worldwide phone numbers and email addresses.

HELP - Docs

Select Help > Docs to view the following page.



On-Line Manual

SyncServer Manual View Manual

Download SNMP mib to local filesystem

Symmetricom Global Web Site www.symmetricom.com

From this page the:

- SyncServer S100 Help can be viewed
- SNMP mib can be downloaded
- Microsemi web site can be accessed

This page intentionally left blank

Command Line Interface

The Command Line Interface (CLI) is available on LAN 1 and the Console RS-232 port.

The user can connect to LAN 1 using SSH or TELNET. By default, SSH is on and TELNET is off. Use the **SERVICES - Startup** web page to change these settings.

The username and login are the same as for the web interface.

Note: Physical access to the console port on the SyncServer should be controlled. The interactive bootloader could allow a malicious user to override boot parameters and gain restricted access to the device. If more information is required, contact ***Microsemi Customer Assistance*** (on page 5).

The CLI command structure has two levels: a top-level command set of system commands and an intrinsic help command set. Commands are entered as ASCII strings typed at the command prompt. The specific commands available at the particular tree level can be displayed by entering a "?" ("?" followed by "Enter" on the keyboard).

The CLI interface interprets the input on a character-by-character basis. As a result, only enough characters to uniquely identify the command need to be entered for the CLI to recognize which command you want to invoke. The CLI also accepts multiple commands on a single line when they are separated by spaces, so you don't have to press Enter after each command.

It is suggested that commands marked "Use all caps" be entered in all caps. This helps prevent accidental entry of those commands.

The following commands are available from the CLI. Refer to the Command Description section for the syntax of each command.

Top-level Commands

GPSSTRENGTH: (Status only) Displays the GPS satellite tracking information in the following format:

```
N,X1,Y1,Z1,...,XN,YN,ZN
```

Defined as follows:

- N = Number of satellites. If one or more satellites are available, Xi,Yi,Zi follows N.
- X1 = Satellite vehicle number.
- Y1 = Satellite signal strength in dBW where less than -200 dBW means no signal.
- Z1 = Z1 can be either T or C:
  - T(racking) means the SyncServer receives the information from the satellite but the information is not used in its timing solution.
  - C(urrent) means the SyncServer currently uses satellite information in its timing solution.

For example, no satellites:

```
0
```

For example, one satellite with vehicle number 16:

```
1,16,C,-158
```

For six satellites:

```
6,12,C,-156,14,C,-155,8,T,-162,24,C,-158,18,C,161,6,C,-160
```

HALT: Halts the operating system. After entering the command, it prompts "Enter 'Y' to confirm". Halt the SyncServer before turning the power off. Action only command.

REBOOT: Halts and reboots the operating system. After entering the command, it prompts you . Enter “Y” to confirm. Action only command.

DEFAULTS: Replaces the current configuration of the SyncServer with the factory default configuration. After entering the command, it prompts ‘Enter “Y” to confirm’. The command also halts and reboots the SyncServer. Action only command.

IPV4ADDRESS <aaa.bbb.ccc.ddd>: Displays or sets the LAN 1 IPv4 address. Without input, the command displays the current IPv4 address. With input, the command sets the new IPv4 address. Query and action command.

IPV4MASK <aaa.bbb.ccc.ddd>: Displays or sets the LAN 1 IPv4 subnet mask. Without input, the command displays the current IPv4 subnet mask. With input, the command sets the new IPv4 subnet mask. Query and action command.

IPV4GATEWAY <aaa.bbb.ccc.ddd>: Displays or sets the LAN 1 IPv4 gateway. Without input, the command displays the current IPv4 gateway. With input, the command sets the new IPv4 gateway. Query and action command.

IPV4DHCP: Enables DHCP for LAN 1. Action only command.

IPV6AUTO: Enables the automatically generated IPv6 link local address for LAN 1. Action only command.

HTTP <on|off>: Without input, the command returns the current status of the SyncServer http daemon (running or stopped). Use input “on” or “off” to start or stop the SyncServer http daemon. Query and action command.

SETTIMEOFYEAR <time>: Sets the current time in UTC. The <time> input format can be any one of the following

```
mm/dd/yyyy hh:mm:ss.x
yyyy ddd hh:mm:ss.x
mm dd yyyy hh:mm:ss.x
hh:mm:ss.x
```

Enter the command without any input, it displays the allowable input time format. Action only command.

ADJUSTTIMEOFYEAR <seconds>: Adjust the current time by a user determined number of seconds. The input can be a positive or a negative integer. If the input is negative, the time is adjusted backward. Action only command.

INTRINSIC HELP: Traverse to the intrinsic command tree.

Intrinsic Help Commands

Intrinsic help commands are commands that can be used in any tree level as a basic shell command tool. Below is the list of available intrinsic commands.

pop: Moves the command shell to the previous level. When issued from the main shell directory (i.e., the root) this disconnects the session.

root: Moves the command shell to point to the main shell directory. This is a convenience command for navigating the command shell. The command “root pop <Enter>” disconnects the session.

exit: Exits the Telnet client session while it is active. This command has no effect if it is executed from a serial session.

trace: Displays the current contents of the trace buffers. Most of the commands currently do not use the trace buffer facility. It is normal that the trace buffers are empty.

clear: Clears the trace buffers.

stamp: Queries the time stamp of the internal operating system clock, which is set to zero when the SyncServer is powered on. The time stamp of the internal operating system clock is in milliseconds.

history: Displays the last fifteen commands that have been executed.

pause <milliseconds>: Waits for user specified number of milliseconds and then executes the next command if it is provided in the same command line following the number. For example, the “pause 5000 history” command would wait for five seconds and then execute the history command. Input any integer number as the number of milliseconds to pause.

repeat <count>: This commands repeats execution user specified number of times of a command specified before it. For example, the “GPSSTRENGTH repeat 5” executes GPSSTRENGTH five times.

# : (pound sign followed by a space) Creates a comment from the space to the end-of-line character. This is useful for adding a comment to a command being recorded in a logfile. For example, “GPSSTRENGTH pause 1000 repeat 1000 # monitor GPS sats <enter>”. Also, the command could be used to simply have the system ignore the remaining part of a long string of commands. For example, “ipv4address 192.168.2.2 ipv4mask 255.255.255.0 # gateway 192.168.2.1 <enter>” will set the IP address and subnet mask but not the gateway.

?: (question mark) Displays commands available at the current tree level.

Command Examples

Below are a few select examples of commands.

DEFAULTS example

Entering **DEFAULTS** replaces the current configuration of the SyncServer with the factory configuration. Enter "Y" to confirm. For example:

```
1 ? DEFAULTS
Restore SyncServer default factory configuration? Enter "Y" to confirm:
Y
```

REBOOT example

Entering **REBOOT** halts and reboots the SyncServer's operating system. Enter "Y" to confirm. For example:

```
1 ? REBOOT
Reboot SyncServer operating system? Enter "Y" to confirm: Y
```

HALT example

Entering **HALT** halts the operating system. Do this before turning the power switch off. Enter "Y" to confirm. Enter "Y" to confirm. For example:

```
> HALT
Halt SyncServer operating system? Enter "Y" to confirm: Y
```

IPV4ADDRESS example

Entering **IPV4ADDRESS** displays/sets the IPv4 address. For example:

```
1 ? IPV4ADDRESS
192.168.47.150
2 ? IPV4ADDRESS 192.168.46.144
```

IPV4MASK example

Entering IPV4MASK displays/sets the IPv4 subnet mask. For example:

```
3 ? IPV4MASK
255.255.255.0
4 ? IPV4MASK 255.255.0.0
```

IPV4GATEWAY example

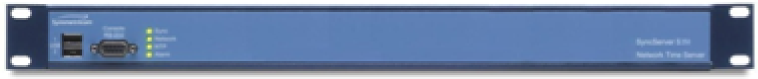
Entering IPV4**GATEWAY** displays/sets the IPv4 gateway address. For example:

```
5 ? IPV4GATEWAY
192.168.47.1
6 ? IPV4GATEWAY 192.168.46.1
```

Specifications

In this section

Front Panel



The following elements are located on the front panel, from left to right.

USB Ports

Description: Two USB 2.0 ports (**USB 1, 2**).

Functionality: Connects with a USB flash drive device, which can be used for loading software upgrades to the SyncServer, as well as for backing up and restoring the SyncServer configuration.

Connection: Requires a compatible USB memory device, such as a SanDisk cruzer micro USB device (recommended). Not all USB flash drives are compatible with the SyncServer's USB ports.

Also see: See " SYSTEM - Upgrade" on page 53, See " WIZARDS - Upgrade" on page 68, See " WIZARDS - Backup" on page 67, See " WIZARDS - Restore" on page 67

Console RS-232 Port

Description: A bi-directional EIA standard RS-232C serial port (**Console RS-232**) located on the front panel.

Functionality: Provides access to a the command line interface for limited status and configuration of the SyncServer.

Connection: DCE (Data Communications Equipment). (Use a "straight through" serial cable, not a "null modem" crossover cable.)

- Data Rates: **9600 baud**
- Parity: **None**
- Data Bits: **8**
- Stop Bits:**1**

Connector: Female 9-pin D subminiature

Also See " Command Line Interface" on page 71 .

Pin Assignment (Pinout):

- 1N/C
- 2Tx
- 3Rx
- 4N/C
- 5GND
- 6N/C
- 7CTS

- 8RTS
- 9N/C

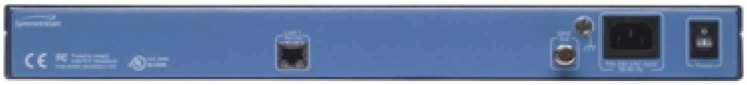
Status LEDs

The four tricolor LEDs provide the following status information:

	Red	Orange	Green	Dark
Sync	SyncServer is not synchronized to a reference. NTP Stratum 16.	SyncServer is synchronized to a remote NTP server. NTP Stratum 2-15.	SyncServer is synchronized to an Input Reference or the modem. NTP Stratum 1.	Power off.
Network	Link failure on the LAN 1.		The configured port is operational.	Power off.
NTP	>7000 NTP packets per second.	> 5000 packets per second.	NTP activity within the last second.	No NTP activity in the last second.
Alarm	Major Alarm.	Minor Alarm.	No Current/Enabled Alarms.	Power off.

Also see ***Stratum*** (on page 145).

Rear Panel



The following elements are located on the rear panel, from left to right.

Network Port

Description: One 10/100 Mbps Ethernet port (LAN 1)

Connector: One standard RJ-45 8-pin connector

Frame Format for LAN 1: See "Network Port" on page 77

- IEEE 802.3 (10Base-T at 10 Mbps)
- IEEE 802.3u (Fast Ethernet at 100 Mbps)

Roles:

- LAN 1:
  - Web interface (HTTP), command line interface (TELNET)
  - The default port for most NTP functions

  - DNS, SMTP, SNMP
- The port responds to NTP (port 123), TIME (port 37), and DAYTIME (port 13) requests.

Factory default static IPv4 addresses:

- LAN 1: 192.168.0.100

Note: The SyncServer's network port requires Category 5 (or better) network cable.

GPS Receiver

Description: The internal GPS Receiver is the preferred reference for the SyncServer's Hardware Clock. The GPS receiver must be connected to a 12-VDC capable antenna using the **GPS Ant** connector.

Connector:**GPS Ant,** BNC female, 12 VDC antenna power feed, detects Open and Short circuits.

Frequency: 1575.42 MHz (L1 signal)

Code: Coarse Acquisition (C/A) code

Tracking: Up to 12 satellites. All 32 PRN's.

Position Accuracy: Typically <10m w. four satellites. Available from web interface.

1PPS Accuracy: 50 nS RMS, 150 nS Peak to UTC-USNO

Time standard: UTC

Signal strength: 1 sat ≥ -166 dBW to acquire, and ≥ -171 dBW to track.

Cabling options:

- ≤ 150 ft. of Belden 9104 (RG-59 type)
- 300 ft. with inline amplifier
- Compatible with down/up converter

Also see:

- See " GPS Antenna" on page 81
- ***GPS Cable Configurations/Options*** (on page 100)

Chassis Grounding Screw

Description:The chassis grounding screw provides a secure contact for grounding the SyncServer to a reliable earth ground.

Also see: **WARNING: Grounding (on page 78)**

WARNING: Grounding

Microsemi recommends that the user connect the chassis grounding screw to a reliable earth ground.

AVERTISSEMENT : Microsemi recommande que le châssis soit relié à une terre fiable.

VAC Power Supply

Description:Universal type VAC Power supply

Connector:IEC 320

Input Voltage Range:90-264 VAC

Input Frequency Range:47-63 Hz

Max. Power:

	Initial Power On	Continuous
With Rubidium Osc	45 watts	35 watts
Without Rubidium Osc	25 watts	21 watts

Also see:***CAUTION: VAC Power*** (on page 79)

CAUTION: VAC Power

- The VAC Power Supply specification reflects the overall Power Supply ratings. For UL and CE compliance the Power Supply must only be operated at 100 – 240 VAC, 50-60 Hz.
- The SyncServer should only be plugged into a grounded receptacle.

ATTENTION :

- Les spécifications d'approvisionnement de courant alternatif ci-dessus reflètent les estimations globales d'alimentation d'énergie. Pour la conformité d'UL et de CE l'alimentation d'énergie doit être seulement opérée à 100 - 240 VCA, 50-60 hertz.
- Relier le SyncServer à une prise de courant avec contact adéquat de mise à la terre.

Power Switch

Description:The power switch provides a method to shut off the VAC power.

Also see:***Halting the SyncServer*** (on page 16)

Physical

Size (in.):1.75 in. high x 17 in. wide x 11.25 in. deep

Size (cm):4.5 cm high x 43.2 cm wide x 28.6 cm deep

Weight: 6.70 lbs., 3.04 kg configured with a standard oscillator or optional OCXO

7.70 lbs., 3.5 kg with the optional rubidium oscillator

Mounting:Standard 19 in. (48.2 cm) EIA Rack System, rack mount ears, tapped holes for Telco mid-mounts and all necessary mounting hardware included.

Standards:NEBS (Network Equipment Building System) compatible. Chassis depth <12 in. (30.5 cm) with an allowance for attached cable radius.

Environmental

Operating Temp:0° to +50° C (+32° F to +122° F)

Storage Temp:-10° to +70° C (14° F to +158° F)

Humidity:0 - 95%, non-condensing

Altitude:0 - 4000 meters AMSL

WARNING: Install the SyncServer to allow adequate airflow through and around the unit. Microsemi recommends leaving 1.4 in. (3.6 cm) above and below the SyncServer or enough space to allow 5 CFM.

AVERTISSEMENT : Installez le SyncServer pour permettre un flux d'air autour et a travers l'unité. Microsemi recommande de laisser 1.4 in. (3.6 cm) au-dessus et au-dessous du SyncServer ou assez d'espace pour permettre 5 CFM.

Shock and Vibration

The SyncServer has been designed and tested to withstand the following shock and vibration per Telcordia GR-63 Specifications:

- Packaged Equipment Shock (Drop):Packaged for shipment, Drop from 29.5 in. - Surface, edge and corner drops.
- Unpackaged Equipment Shock (Drop):Unpackaged. Drop from 3.9 in. - Surface, edge and corner drops.
- Office Vibration Environment:Locked to 0.1 g - In equipment rack.
- Transportation Vibration:To 1.5 g - Packaged for shipment.

Accuracy & Stability - Timing Performance

Synchronization Source	Timing Accuracy to Reference	Comments
GPS, >= 4 Satellites tracked	150 nS peak; 50 nS RMS to UTC(USNO)	Highest Performance Mode
GPS, 1 Satellite, position known within 50m	<5 uS to UTC(USNO)	Position from satellite fix or entered by the user.
GPS, 1 Satellite, position known within 1 km	<100 uS to UTC(USNO)	Position from satellite fix or entered by the user.
GPS, 1 Satellite, position known within 10,000 km	<1 mS to UTC(USNO)	User must provide a guess at the position within 10,000 km
NTP Client Mode, Local server	±10 mS	Local server means on same subnet

The stability of the various outputs depends on the oscillator installed. Shown below is the Allan Deviation Stability of the system when synchronized to GPS.

1x10-12 at 1 day	All oscillators
3x10-12 at 100 sec	Rb Only

GPS Antenna

Frequency:1575 +/- 2 MHz

Impedance:50 ohms

Voltage:5 - 18 VDC

Power handling:1 watt

Enclosure:All weather

Operating temp:-55 °C to +85 °C (-67 °F to +185 °F)

Timing Holdover

Temperature Compensated Crystal Oscillator (TCXO)

Feature:Standard

Drift rate:18 milliseconds/day typical after having been locked to a stable reference for at least 30 minutes. (Assumes less than 5°C temperature change over this time period).

Oscillator Aging:Typical aging for the TCXO is <1E-06/month.

Oven Controlled Crystal Oscillator (OCXO)

Feature:Option

Drift Rate:1 millisecond/day typical after having been locked to a stable reference for at least 1 hour. (Assumes less than 5°C temperature change over this time period).

Oscillator Aging:Typical aging for the OCXO is <1E-07/month.

Rubidium Oscillator

Feature:Option

Drift Rate: 6 microseconds/day typical after having been locked to a stable reference for at least 1 hour. (Assumes less than 5°C temperature change over this time period).

Oscillator Aging:Typical aging for the rubidium oscillator in an S350 is <5E-11/month.

Network Protocols

The SyncServer supports the following protocols:

- NTP (v2 - RFC1119, v3 - RFC1305, v4 - No RFC) (Port 123)
- NTP Unicast, Broadcast, Multicast
- SNTP v4 for IPv4, IPv6 and OSI (RFC 2030)
- TIME (RFC868) (Port 37)

- DAYTIME (RFC867) (Port 13)
- HTTP/SSL/HTTPS (RFC2616)
- DHCP (RFC2131)
- SSH/SCP (Internet Draft)
- SNMP v1/v2/v3 (RFC3584)
- MIB II (RFC1213)
- Telnet (RFC854)
- MD5 Authentication (RFC1321)
- SMTP Forwarding
- IPv4 and v6

NTP

Description:Network Time Protocol Version 4 for synchronizing networked devices to UTC (standard).

Timestamp accuracy (network port):Microsecond-caliber NTP

NTP packet throughput rate:Up to 3200 packets/second while maintaining NTP timestamp accuracy.

Client synchronization accuracy:Approx. 0.5-2 ms typical on a LAN

Supports:IPv4 and IPv6

Security: MD5 Symmetric Key

Alarms:System Peer Change, Stratum Change, Leap Change, and Timing NTP Daemon.

Also see: ***STATUS - NTP*** (on page 28), ***NTP - Sysinfo*** (on page 37), ***NTP - Assoc*** (on page 40), ***NTP - Config*** (on page 42), ***NTP - MD5 Keys*** (on page 45), ***NTP - Prefs*** (on page 46), ***WIZARDS - NTP*** (on page 1), ***ADMIN - Alarms*** (on page 60), and ***Status LEDs*** (on page 15).

CE/WEEE/RoHS Conformance

Declaration of Conformity

In accordance with ISO/IEC GUIDE 22 and EN 45014:

Microsemi Corporation
Frequency and Time Division
3870 N. 1st Street
San Jose, Ca 95134 USA

Declares under our sole legal responsibility that the SyncServer Network 1520R-SXXX Network Time Server (Both AC and DC Models):

- MODEL 1520R-S100
- MODEL 1520R-S200, MODEL 1520R-S200-DC
- MODEL 1520R-S250i, MODEL 1520R-S250i-DC
- MODEL 1520R-S250, MODEL 1520R-S250-DC
- MODEL 1520R-S300, MODEL 1520R-S300-DC, MODEL 1520R-S300-RB, MODEL 1520R-S300-RB-DC

- MODEL 1520R-S350, MODEL 1520R-S350-DC, MODEL 1520R-S350-RB, MODEL 1520R-S350-RB-DC

CONFORMS TO THE FOLLOWING EUROPEAN UNION DIRECTIVES:

Safety

- 2006/95/EC Low Voltage Directive (LVD)
- IEC 60950-1: 2005 (2nd Edition)
- EN 60950-1:2006

Electromagnetic Compatibility

- 2004/108/EC Electromagnetic Compatibility (EMC) Directive
- EN55022 (2006) EMC Emissions for ITE, Class A
- EN55024 (1998) EMC Immunity for ITE
- EN61000-3-2 (2006) Harmonic Current Emissions
- EN61000-3-3 (1995) Voltage Fluctuation and Flicker Emissions

WEEE

Waste Electrical and Electronic Equipment Directive (WEEE) 2002/95/EC

The SyncServer Model 1520R_SXXX is considered WEEE Category 3 (IT and Telecommunication Equipment) as defined by the WEEE Directive and therefore falls within the scope of the WEEE Directive.

For more information about Microsemi's WEEE compliance and recycle program, please visit Microsemi's website at ***http://www.microsemi.com***.

RoHS

Restriction of the Use of Certain Hazardous Substances Directive 2002/95/EC

The SyncServer Model 1520R_SXXX is considered WEEE Category 3 (IT and Telecommunications Equipment) as defined by the WEEE Directive and therefore falls within the scope of the RoHS Directive.

These units are RoHS Compliant except that they will be manufactured using the RoHS Directive exemption allowing the use of lead in "solders for servers, storage and storage array systems, network infrastructure equipment for switching, signaling, transmission as well as network management for telecommunications". Reference RoHS Directive Annex Point 7 as amended by 2005/747/EC.

Note: This certification applies to all standard options and accessories supplied with the SyncServer System

Signature

First Date of Marketing with CE Mark: 31 August 2005

I declare that the equipment specified above conforms to the above Directives and Standards.

Signed: Robert Mengelberg, Compliance Engineer

Date: 29 March 2007

Safety Standards

Meets the following safety standards:

- 2006/95/EC Low Voltage Directive (LVD)
- EN 60950-1:2006
- UL 60950-1 1st Edition 2007-10-31
- CSA 22.2 No. 60950-1-003 1st Edition 2006-07
- IEC 60950-1: 2005 (2nd Edition)
- AS/NZ 60950-1
- PSE Japan

EMC Standards

Meets the following EMC standards:

- FCC Part 15 Subpart B
- 2004/108/EC Electromagnetic Compatibility (EMC) Directive
- EN61000-3-2 (2006) Harmonic Current Emissions
- EN61000-3-3:1995 Voltage Fluctuations and Flicker
- EN55022 (2006) EMC Emissions for ITE, Class A
- EN55024 (1998) EMC Immunity for ITE
- VCCI: Japan EMC Standard
- ICES-003 Canada EMC Standard

VCCI Compliance Information

This is a Class A product based on the standard of the 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.

この装置は、情報処理装置等電波障害自主規制協議会
（ＶＣＣＩ）の基準に基づくクラスA
情報技術装置です。この装置を家庭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。

Listing of Memory Devices

The following devices contain either volatile or non-volatile memory:

ETX Module

- 512MB SDRAM. The 512MB Synchronous Dynamic RAM is installed on the ETX Module in a DIMM socket. This part is used as system RAM memory for the ETX Module's x86 processor. The content in this device is volatile and is lost when the SyncServer is powered down. This part is socketed (ETX).
- BIOS. 512KB FLASH memory used on the ETX module for system BIOS. This part is soldered to the ETX module. This part is not reprogrammed in normal operation. The content in this device is non-volatile and there is no procedure to clear this memory.

87-611x PCA

- 512MB CompactFlash Primary (J3). The 512MB CompactFlash device is installed on the 87-611x PCA. This part is used as a virtual Hard Drive by the ETX Module’s x86 processor. There is no procedure to clear this memory. This part is socketed (J3).
- 512MB CompactFlash Secondary (J4). The 512MB CompactFlash device is installed on the 87-611x PCA. This part is used as a virtual Hard Drive by the ETX Module’s x86 processor. There is no procedure to clear this memory.
- U41 is a Xilinx XC2S200 FPGA that is re-programmed each time the board is powered up. The program for this part is contained in J3’s CompactFlash memory and is downloaded into U41 by U39. The content of this device is volatile and is lost when the board is powered down. This part is soldered to the PCB.
- M93C46 1Kb Serial Microwire EEPROM for system configuration (U40), controlled by PCI9030. This non-volatile part is used to store unit specific data. This part is a DIP that is mounted in an 8-pin socket.

MC9S12DG256 (U2)

- (U2) 256KB Flash program memory. This Flash memory is used for microprocessor program storage. This part is not reprogrammed in normal operation. The content in this device is non-volatile and there is no procedure to clear this memory. This part is soldered to the PCB.
- (U2) 12KB RAM. This RAM is embedded in U2 and is used as operating memory. The content in this device is volatile and is lost when the SyncServer is powered down. This part is soldered to the PCB.
- (U2) 4KB EEPROM. This EEPROM is embedded in U2 and is used to store non-volatile configuration data. This part is soldered to the PCB.

Reliability

MTBF:>50,000 hours (5.7 years) for all supported display intensity settings. Calculated per Telcordia (Bellcore) SR332, Issue 1.

Maintainability

This unit contains no user-serviceable parts. Please return to Microsemi for servicing.

The SyncServer functions without user adjustments throughout its life span.

Web Interface

The S100 web interface is compatible with:

- Internet Explorer 7 and 8
- Firefox 3.x

Software

Upgrades

Microsemi makes software updates available as downloads on the Internet.

See " Microsemi Customer Assistance" on page 5 for contact information.

Users are required to register in order to download software. Some export restrictions may apply.

Licenses

This product contains licensed third party software, including software available under the GPL licensing scheme. The text of each license is available in the "License" folder located on the Product Information CD-ROM that is supplied with the SyncServer. Additionally, these licenses and the source code for the related public software can be obtained by contacting ***Microsemi Customer Assistance*** (on page 5).

These licenses include, but are not limited to the following:

- Apache Software License
- NTP Software License
- GNU General Public License
- UCD-SNMP Software License

By using the SyncServer, the user agrees to the terms of these licenses.

Failure Detection and Reporting

The SyncServer is self-monitoring during normal operation. To the extent possible, any failures in the unit are isolated, to differentiate them from input signal failures, and reported. The SyncServer provides debug and troubleshooting variables of the current status of the unit at the request of an administrator.

Warnings and Cautions

WARNING: Grounding

Microsemi recommends that the user connect the chassis grounding screw to a reliable earth ground.

AVERTISSEMENT : Microsemi recommande que le châssis soit relié à une terre fiable.

Note: To connect a ground to the chassis, use a 3/8" 10-32 screw.

WARNING: GPS Antenna

- Avoid electrocution and RF safety hazards such as power lines and high-energy radio transmission antennas.
- Where potential hazards exist, have a qualified technician perform the installation.
- Observe local codes and regulations.
- Use a lightning arrestor when needed.
- Antennas not rated for 12 VDC may be damaged when connected to the SyncServer. The GPS antenna supplied with the SyncServer is rated for 12 VDC.
- **Safe Antenna and Cable Connection**: An outside antenna or cable system must be properly grounded to provide some protection against built up static charges and voltage. Section 810 of the National Electrical Code, ANSI/NFPA 70 (In Canada, part 1 of the Canadian Electrical Code) provides information regarding proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.
- **Keep Antenna Clear of High Voltage Power Lines or Circuits**: Locate an outside antenna system well away from power lines and electric light or power circuits so it will never touch these power sources should it ever fail. When installing an antenna, absolutely never touch power lines, circuits, or other power sources, as this could be fatal.

AVERTISSEMENT :

- Evitez et les dangers de sûreté électriques et RF, tels que les lignes à haute tension et les antennes de transmission de radio de haute énergie.
- Où les dangers potentiels existent, ayez un technicien qualifié exécute l'installation.
- Observez des codes et des règlements locaux.
- Utilisez un "arrestor" d'éclair quand nécessaire.
- Les antennes qui n'ont pas étés évalués pour un courant de 12 VDC peuvent être endommagées quand ils sont connectés au SyncServer.
- **Jonction Sûre d'Antenne et de Câble** : Relier ce système d'antenne ou de câble extérieur avec un contact adéquat de mise à la terre pour assurer une protection contre l'accumulation des charges statiques et du voltage. La section 810 du code électrique national, ANSI/NFPA 70 (au Canada, partie 1 du code électrique canadien) fournit des informations concernant le rattachement à une mise a la terre du mât et de la structure, le rattachement à une mise a la terre du fil d'entrée à une unité de décharge d'antenne, la taille des conducteurs pour la mise à la terre, le placement de l'unité de décharge d'antenne, le reliment aux électrodes de la mise à la terre, et les conditions requises pour l'électrode de la mise à la terre.
- **Gardez l'Espace Libre d'Antenne des Lignes Electriques ou des Circuits à Haute Tension** : Localisez un puits extérieur de système d'antenne loin des lignes électriques et des circuits de lumière électrique ou de puissance a fin qu'il ne touche jamais ces sources d'énergie s'il devait faillir. En installant une antenne, ne touchez jamais les lignes électriques ou d'autres sources d'énergie, sous peine de danger d'électrocution mortelle.

WARNING: GPS Position and Altitude

GPS position and altitude are for timing purposes only. They are not intended for navigation or other critical applications.

AVERTISSEMENT : La position et l'altitude de GPS sont seulement pour la synchronization. Elles ne sont pas prévues pour la navigation ou d'autres situations critiques (situations de la vie-ou-mort).

WARNING: Removing Power

Prior to removing the top cover, disconnect all power connections.

AVERTISSEMENT : Avant d'enlever le couvercle, débranchez le courant électrique..

CAUTION: VAC Power

- The VAC Power Supply specification reflects the overall Power Supply ratings. For UL and CE compliance the Power Supply must only be operated at 100 – 240 VAC, 50-60 Hz.
- The SyncServer should only be plugged into a grounded receptacle.

ATTENTION :

- Les spécifications d'approvisionnement de courant alternatif ci-dessus reflètent les estimations globales d'alimentation d'énergie. Pour la conformité d'UL et de CE l'alimentation d'énergie doit être seulement opérée à 100 - 240 VCA, 50-60 hertz.
- Relier le SyncServer à une prise de courant avec contact adéquat de mise à la terre.

CAUTION: DHCP Not Available

If the user selects DHCP, the SyncServer tries to reach a DHCP server for approximately 90 seconds before stopping. Please do not disconnect the power during this time.

ATTENTION : Si l'utilisateur choisit *DHCP,* le SyncServer essaye d'atteindre un serveur de DHCP pendant approximativement 90 secondes avant de s'arrêter. Veuillez ne pas enlever le courrant pendant ce temps.

CAUTION: Stopping the SyncServer

Avoid removing power while the SyncServer is operating. Stop the operating system before removing power.

ATTENTION : Évitez de couper le courant électrique pendant que le SyncServer fonctionne. Veuillez fermer le système d'exploitation avant d'enlever le courant.

CAUTION: Lithium Battery

The SyncServer contains a Lithium Battery that maintains the system's Real Time Clock (RTC) when the SyncServer's power is off. Replace the Lithium Battery only with the same or equivalent type. Do not dispose of the Lithium Battery in a fire or incinerator, or the battery may explode. Follow disposal regulations in your area for Lithium Battery disposal.

ATTENTION : Le SyncServer contient une batterie de lithium pour maintenir l'horloge en temps réel pendent que le courant est debranché. Remplacez la batterie de lithium seulement avec une batterie de type équivalent. Ne vous débarrassez pas de la batterie de lithium dans un feu ou un incinérateur, car la batterie pourrait exploser. Débarrassez-vous de la batterie usagée de lithium selon les instructions du fabricant.

This page intentionally left blank

Tasks

In this section

Installation Guide

To install the SyncServer in a production environment, or some other of long-term installation, follow the steps in this Installation Guide. To get the SyncServer up and running quickly in order learn about its features, consult the ***Quick Start Guide*** (on page 1).

Unpacking

Open the SyncServer packaging carefully to avoid damaging its contents.

Verify that the box contains the following standard items:

- Printed Quick Start Guide
- SyncServer Network Time Server
- VAC Power cord
- GPS antenna kit
    - 12V GPS antenna
    - PVC antenna-mounting tube
    - 50 ft. Belden 9104 coaxial cable
    - 2 pipe clamps
- Product CD (contains the User Guide and other supporting documentation)
- Standard serial cable
- Standard 6 ft. network cable

Please also verify that the box also contains any options purchased with the SyncServer.

If the box is missing any items, please contact ***Microsemi Customer Assistance*** (on page 5).

Rack Mounting

The SyncServer is designed for mounting in a standard 19-inch (48.26 cm) rack. Follow the rack manufacturer's instructions for mounting the SyncServer.

Avoid the following conditions:

- **Elevated Operating Temperatures**: If the SyncServer is installed in a closed or multi-unit rack assembly, the ambient temperature of the rack environment may be greater than the SyncServer's Maximum Operating Temperature of 50°C/122°F. Install the SyncServer in an environment that is compatible with the SyncServer's operating temperature range, which is 0 °C to 50 °C, or 32 °F to 122 °F

- **Reduced Air Flow**: Position the SyncServer with enough space above, below, and adjacent to the chassis to allow an adequate flow of air so that it may operate safely. Microsemi recommends leaving 1.4 in. (3.6 cm) above and below the SyncServer or enough space to allow 5 CFM air flow.
- **Uneven Mechanical Loading**: Mount the equipment so as to avoid uneven mechanical loading that could cause hazardous conditions.
- **Circuit Overloading:** Observe the power ratings on the SyncServer's nameplate and the additional load the SyncServer may place on the supply circuit.
- **Proper Grounding:** Maintain reliable grounding (earthing) of rack-mounted equipment.

Grounding the SyncServer

- For VAC power, verify that a properly grounded three-prong outlet is available for the standard power cord.
- Connect the Chassis Grounding Screw on the rear panel to a reliable earth ground.
- Verify that the equipment rack and other equipment are grounded correctly.

WARNING: Grounding

Microsemi recommends that the user connect the chassis grounding screw to a reliable earth ground.

AVERTISSEMENT : Microsemi recommande que le châssis soit relié à une terre fiable.

Note: To connect a ground to the chassis, use a 3/8" 10-32 screw.

Connecting VAC Power

For units equipped with the standard VAC power supply:

- Verify that the power switch, located on the rear panel, is off. (Press "O".)
- Connect the **VAC Input** connector on the rear panel to a grounded three-prong outlet using the standard power cord supplied.

CAUTION: VAC Power

- The VAC Power Supply specification reflects the overall Power Supply ratings. For UL and CE compliance the Power Supply must only be operated at 100 – 240 VAC, 50-60 Hz.
- The SyncServer should only be plugged into a grounded receptacle.

ATTENTION :

- Les spécifications d'approvisionnement de courant alternatif ci-dessus reflètent les estimations globales d'alimentation d'énergie. Pour la conformité d'UL et de CE l'alimentation d'énergie doit être seulement opérée à 100 - 240 VCA, 50-60 hertz.
- Relier le SyncServer à une prise de courant avec contact adéquat de mise à la terre.

Electrical Installations in Norway and Sweden

For Electrical Installations in Norway and Sweden

Equipment connected to the protective earthing of the building installation through the mains connection or through other equipment with a connection to protective earthing - and to a cable distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a cable distribution system has therefore to be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN60728-11).

Note: In Norway, due to regulation for installations of cable distribution systems, and in Sweden, a galvanic isolator shall provide electrical insulation below 5 MHz. The insulation shall withstand a dielectric strength of 1.5 kV r.m.s. 50 Hz or 60 Hz for 1 minute.

FÖR ELEKTRISKA INSTALLATIONER I NORGE OCH SVERIGE

Utrustning som är ansluten till skyddande jordning av bygginstallationer genom nätuttaget samband eller genom annan utrustning med en anslutning till skyddande jordning-och en kabel distributionssystemet använder koaxialkabel, kan i vissa fall framkalla brandfara. Anslutning till en kabel distributionssystemet har därför tillhandahållas genom en anordning som elektrisk isolering under en viss frekvensområdet (galvaniskt isolator, se EN60728-11).

Anmärkning: i Norge, till följd av förordningen för installationer av kabel distributionssystem, och i Sverige, en galvaniskt isolator skall ge elektrisk isolering under 5 MHz. isolering skall tåla ett dielektriskt av 1,5 kV r.m.s. 50 Hz eller 60 Hz för 1 minut.

Using GPS

This section guides the user through the process of selecting a good site for the GPS antenna, installing the antenna, and how to use GPS when a good site is not available.

WARNING: GPS Antenna

- Avoid electrocution and RF safety hazards such as power lines and high-energy radio transmission antennas.
- Where potential hazards exist, have a qualified technician perform the installation.
- Observe local codes and regulations.
- Use a lightning arrestor when needed.
- Antennas not rated for 12 VDC may be damaged when connected to the SyncServer. The GPS antenna supplied with the SyncServer is rated for 12 VDC.
- **Safe Antenna and Cable Connection**: An outside antenna or cable system must be properly grounded to provide some protection against built up static charges and voltage. Section 810 of the National Electrical Code, ANSI/NFPA 70 (In Canada, part 1 of the Canadian Electrical Code) provides information regarding proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of

grounding conductors, location of antenna discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.

- **Keep Antenna Clear of High Voltage Power Lines or Circuits**: Locate an outside antenna system well away from power lines and electric light or power circuits so it will never touch these power sources should it ever fail. When installing an antenna, absolutely never touch power lines, circuits, or other power sources, as this could be fatal.

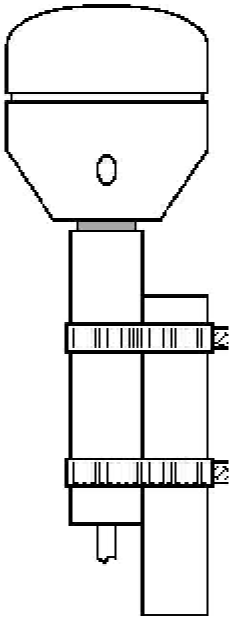
AVERTISSEMENT :

- Evitez et les dangers de sûreté électriques et RF, tels que les lignes à haute tension et les antennes de transmission de radio de haute énergie.
- Où les dangers potentiels existent, ayez un technicien qualifié exécute l'installation.
- Observez des codes et des règlements locaux.
- Utilisez un "arrestor" d'éclair quand nécessaire.
- Les antennes qui n'ont pas étés évalués pour un courant de 12 VDC peuvent être endommagées quand ils sont connectés au SyncServer.
- **Jonction Sûre d'Antenne et de Câble** : Relier ce système d'antenne ou de câble extérieur avec un contact adéquat de mise à la terre pour assurer une protection contre l'accumulation des charges statiques et du voltage. La section 810 du code électrique national, ANSI/NFPA 70 (au Canada, partie 1 du code électrique canadien) fournit des informations concernant le rattachement à une mise a la terre du mât et de la structure, le rattachement à une mise a la terre du fil d'entrée à une unité de décharge d'antenne, la taille des conducteurs pour la mise à la terre, le placement de l'unité de décharge d'antenne, le reliment aux électrodes de la mise à la terre, et les conditions requises pour l'électrode de la mise à la terre.
- **Gardez l'Espace Libre d'Antenne des Lignes Electriques ou des Circuits à Haute Tension** : Localisez un puits extérieur de système d'antenne loin des lignes électriques et des circuits de lumière électrique ou de puissance a fin qu'il ne touche jamais ces sources d'énergie s'il devait faillir. En installant une antenne, ne touchez jamais les lignes électriques ou d'autres sources d'énergie, sous peine de danger d'électrocution mortelle.

Selecting a Site for the Antenna

Roof Antenna Placement: When selecting a site for the roof antenna, find an outdoor location that provides the best visibility of the sky and horizon. In most cases, this means locating the antenna in a high location, such as a roof top. Avoid obstructions that could block GPS satellite signals and delay acquisition.

A short mounting mast and hose clamps are provided with the roof antenna to mount the antenna to a pole or the peak of a building. The antenna mounting mast and clamps are well suited to attach the antenna to a vent pipe or mast affixed to the roof. The pipe must be rigid and able to withstand high winds without flexing.



A typical roof antenna mounting.

GPS Receivers can be susceptible to reflected GPS signals called multipath signals. Multipath interference is caused by reflected signals that arrive at the antenna out of phase with the direct signal. This interference is most pronounced at low elevation angles from 10 to 20 degrees above the horizon. The height of the mast/antenna may be extended upward to lessen multipath interference. The antenna should also be at least three to six feet (1-2 m) from a reflecting surface.

Use the criteria below to select a good outdoor site for the GPS antenna.

The best locations provide:

- Unobstructed views of the sky and horizon.
- Low electro-magnetic interference (EMI) and radio frequency interference (RFI) - away from high-power lines, transmitting antennas, and powerful electrical equipment.
- Convenient access for installation and maintenance.
- Reasonable access for the antenna cable to reach the SyncServer.
- Safety from hazards to people and equipment.

Avoid:

- Overhanging foliage
- Blocked views
- Strong EMI RFI interference
- Multipath interference (caused by adjacent structures that reflect GPS signals)

Mounting structures:

- GPS antenna masts, vent pipes, or railings are usually satisfactory.
- Radio towers may require the services of a specialist, and may be subject to signal interference.
- Must be able to withstand very high winds.

If a good site is not available, consult ***Operating in "Window Mode"*** (on page 98).

Installing the GPS Antenna

1. Observe all relevant safety precautions and building code regulations. Avoid:
   - Electrocution, RF, lightning, and falling hazards.
   - RFI and EMI sources such as transmitting antennas.
   - Crimping or making sharp bends in the cable.
2. Mount the standard L1 GPS antenna at the selected site:
   - Position the GPS antenna vertically, with its top pointing toward the sky, and the PVC mounting mast and connector pointing down.
   - Secure the PVC mounting mast to the structure using the pipe clamps provided with the antenna kit.
3. Run the antenna cable or cables to the SyncServer. Use a lightning arrestor and grounding, as required to meet building and safety codes.
4. Connect the antenna cable to the **GPS Ant** connector on the rear panel.

Note: Microsemi recommends posting a "Do not paint" notice to prevent the GPS antenna from being painted accidentally.

Tips:

- The user can access the connector underneath the GPS antenna by removing the four recessed screws in the lower half of the GPS antenna with a Phillips-head screwdriver, (see Figure A below). It is a relatively easy task and does not violate the weatherproofing design of the antenna. Typically, users do this to attach an optional in-line amplifier inside the PVC mounting mast or to replace the standard cable with a longer one, (see Figure B below). (Avoid unscrewing the PVC mounting mast from the base of the GPS antenna as this may require a vice and lots of torque.)

Figure A

The arrows show two of the four UNC 4-40 screws

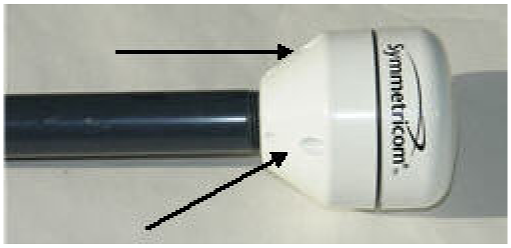
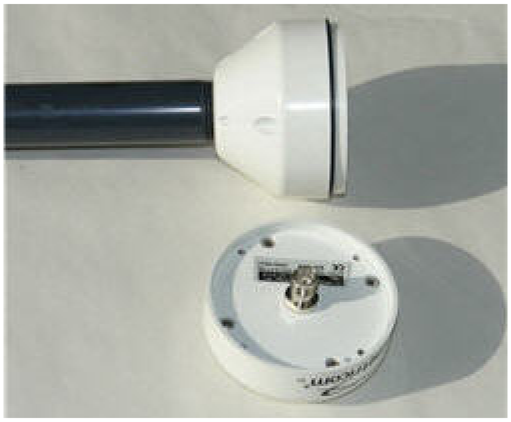


Figure B



- When extending the length of the cable, observe the recommended configurations in ***GPS Cable Configurations/Options*** (on page 100). Avoid exceeding the recommended lengths by combining the standard 50 foot (15.24 m) cable with the extended-length cable.

Operating in "Window Mode"

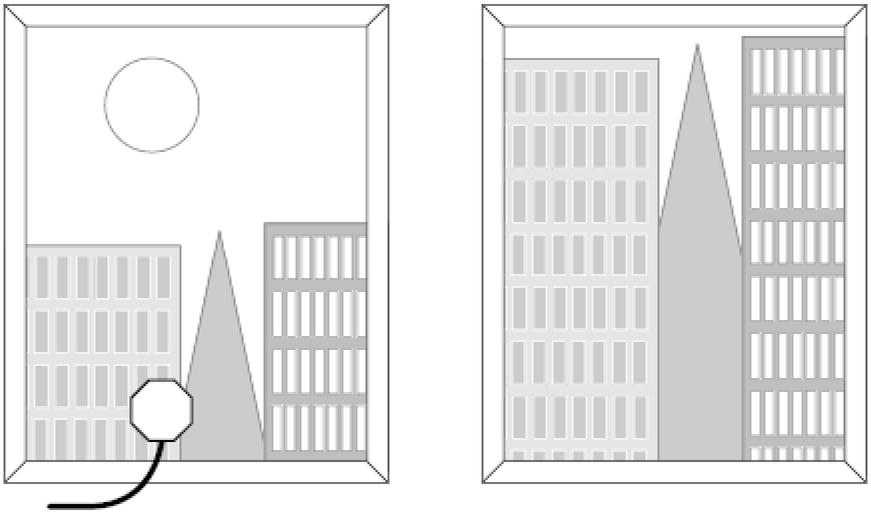
The SyncServer can provide can provide excellent synchronization to UTC if the GPS receiver has an accurate fix on its position and one *current* GPS satellite most of the time. This capability is known as *Window Mode*.

When a good antenna site isn't available, the user may be able to use sites with limited visibility of GPS satellites and reduced signal strength, such as:

- Indoors, in a window or skylight.
- Outdoors, on a balcony railing, building corner, or surrounded by tall structures (limited view)

Window Antenna Placement

For window mounted antenna installations, use the window with the best view of the sky. For windows with equivalent views, orientations that face the equator are preferred. Generally more satellites will be in view toward the equator than away from it. East or west facing windows will also work. Polar facing windows will also work but in general are not preferred. Windows that have the best view of the sky are always preferred regardless of orientation.



A typical window mounting with the antenna is shown in the preferred window.

Guidelines

For best results with window mode:

- Position the antenna near the lower windowsill. This improves upward visibility of the sky.
- If multiple sites are available, choose the one with the *widest* view of the sky and tilt the antenna toward the "opening".

- On the side of a building, the corners offer better visibility (270 degrees) than flat walls (180 degrees).
- A SyncServer equipped with the high-stability Rubidium oscillator option can provide precise time for extended periods while GPS is unavailable.
- Secure the antenna so it won't fall or get knocked out of position.
- To improve signal strength, test different window locations, shorten the antenna cable length, avoid unnecessary connectors, and use an in-line amplifier option. (Signal strength is visible on the **STATUS - GPS** page.)
- Avoid windows with metallic film coatings, window blinds, overhead obstructions, and foliage, all of which can block GPS signals.
- Verify that the **NTP - Associations** page is configured with valid NTP servers or peers that the SyncServer can rely on if GPS is unavailable.

Configuring Window Mode

After setting up the antenna:

1. On the **TIMING - Holdover** page, set the *Time Error Limit* (milliseconds) to the highest acceptable value for absolute timing error (to UTC). Microsemi recommends a value greater than or equal to 4 milliseconds.
2. On the **STATUS - GPS** page, if the GPS receiver has a valid position (latitude, longitude, altitude), the user can skip to step 3. Otherwise:
   - Determine the approximate latitude, longitude, and altitude of the GPS antenna. This can be done using a handheld GPS device, an online reference such as Google Earth, or by looking up the Latitude and Longitude information provided on the SyncServer Product Information CD-ROM.
   - On the **REFERENCES - GPS** page, enter the approximate latitude, longitude, and altitude.
3. Set the *Mode* to **Position Hold** and click the **APPLY** button.

Other Considerations

The accuracy of the user-entered position affects the timing accuracy of the GPS reference. When GPS status is locked:

Position Accuracy	Timing Accuracy
< 50 m (< 164 feet)	< 0.005 ms
< 1 km (< 0.62 mile)	< 0.1 ms
< 10 km (< 6.2 miles)	< 1.0 ms

During window mode operation, if the GPS receiver is not locked to any satellites and no other Input References are available, the GPS receiver enters holdover mode and is subject to oscillator drift. Also see ***Oscillators*** (see "Timing Holdover" on page 81).

Verifying the GPS Installation

Verify the GPS antenna installation can also be accomplished in the web interface using the **STATUS - GPS** page.

Verify synchronization over a 24-hour period to ensure that the GPS antenna installation meets requirements. This can be accomplished by:

- Observing the **SYNC** LED or **STATUS - GPS** page.
- Configuring alarm notification (SNMP) to receive notification of the **Timing GPS Source Alarm** on the **ADMIN - Alarm** page.
- Using FIND on the LOGS - messages page to search for "Timing GPS Source Alarm".

If the GPS installation does not meet requirements:

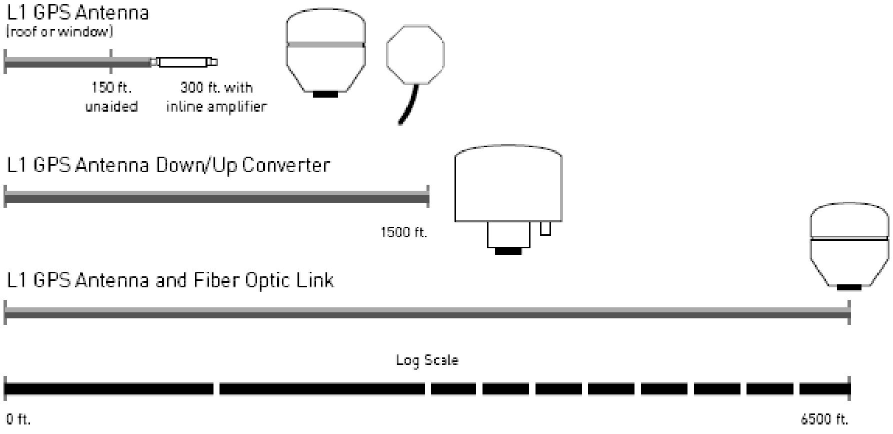
- Review the GPS topics in this user guide
- Troubleshoot for issues with the GPS antenna and cable.
- Contact ***Microsemi Customer Assistance*** (on page 5).

GPS Cable Configurations/Options

GPS satellites signals operate in the L1 band (1575.42 MHz). GPS receivers require a minimum signal level of -162.0 dBW. Practically speaking the antenna must have an unobstructed view of the sky and thus be mounted on a roof, or in some cases in a window. GPS provides almost continuous operation day and night, and under poor weather conditions.

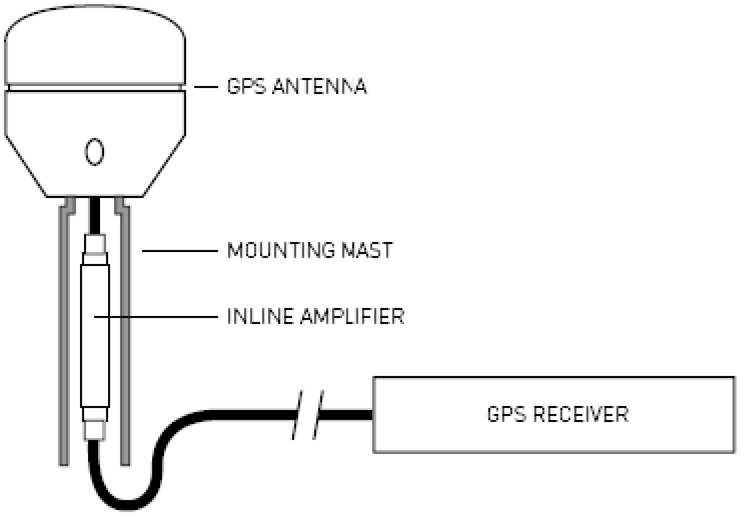
Since the GPS signal is very weak, the antenna amplifies the signal to drive it through the cable to the receiver. Antenna cable however offers some resistance and the GPS signal strength will attenuate as it travels down the cable. GPS receiver sensitivity is finite so if the cable length is too long the signal will be too weak for the receiver to detect it. Consequently it is very important to know the distance in advance between the antenna and the receiver so that the proper cable solution can be installed.

Antenna cabling solutions typically vary depending on how far the antenna is installed from the GPS receiver. The unaided cable length limit for the SyncServer is 150 feet (45 m). Adding a GPS inline amplifier extends the cable length an additional 150 feet (45 m) to a total of 300 feet. Beyond 300 feet (90 m) alternative methods may be used. The following figure highlights the cable lengths and the antenna solutions that enable them:



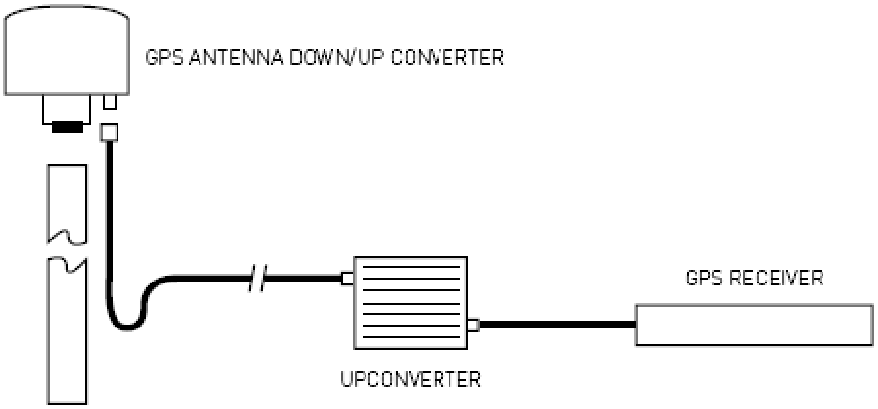
Cable lengths and antenna solutions

In-line Amplifier: In-line amplifiers overcome signal attenuation by amplifying the GPS signal, allowing an additional 150 feet (45 m) of cable, to a total of 300 feet. The inline amplifier attaches directly in line with the antenna cable near the antenna and uses the same power as the antenna; no extra wiring is required. Mounting the amplifier inside the mounting mast helps protect it from moisture and exposure to the elements. See the following figure of a typical mast mount application:



Typical mast mount of in-line amplifier

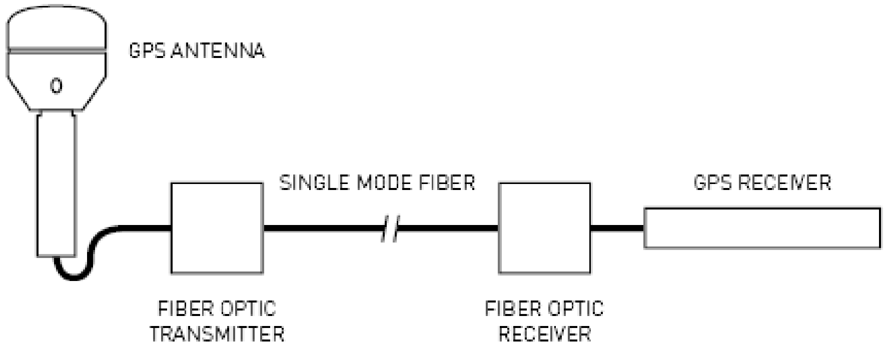
GPS Down/Up converter: The GPS Down/Up converter makes cable runs of 250 to 1500 feet (75 m to 457 m) possible. GPS signal down conversion requires a special GPS antenna and corresponding signal up-converter. The antenna module converts the signal down to a lower frequency that has less attenuation, and transmits it the length of the cable to the up-converter. The up-converter restores the signal to the normal GPS signal frequency for use by the receiver.



GPS down/up converter

The down/up conversion process is transparent to the GPS receiver. As with any precision GPS timing receiver, only cable delay and down conversion delays need to be entered into the receiver. Power is supplied by the GPS receiver or an external power supply. It is important to note that the cable used in GPS down/up conversion is different from the standard cable.

Fiber Optic Links: Fiber-optic connections function as a transparent link between the antenna and GPS receiver equipment. These links eliminate the limitations of copper systems by enabling longer transmission distances while retaining the highest level of signal quality. In addition, fiber optics provide several other significant network advantages, including simplified network design, and immunity from EMI/RFI and lightning.



Fiber optic connections

Lightning Arrestor: In-line lightning arrestors are mounted on a low impedance ground between the antenna and the point where the cable enters the building. They require no additional power or wiring except the ground lead.

For more information about any of the options described above, please contact ***Microsemi Customer Assistance*** (on page 5).

Configuring LAN 1

During installation, the user configures LAN 1 to gain access to the web interface.

The factory default settings for the LAN 1 network port are as follows:

- IP Address:192.168.0.100
- Mask: 255.255.255.0
- Gateway: 0.0.0.0

CAUTION: DHCP Not Available

If the user selects DHCP, the SyncServer tries to reach a DHCP server for approximately 90 seconds before stopping. Please do not disconnect the power during this time.

ATTENTION : Si l'utilisateur choisit *DHCP,* le SyncServer essaye d'atteindre un serveur de DHCP pendant approximativement 90 secondes avant de s'arrêter. Veuillez ne pas enlever le courrant pendant ce temps.

Logging in to the Web Interface

1. Use the See " Command Line Interface" on page 71 to get the LAN 1 IP address.
2. Using Internet Explorer, enter the IP address as a URL. This displays the **Login** page.
3. At the SyncServer Login page, log in. The username is *admin* and password is *symmetricom*.

Note: When entering the IP address as a URL, leave off any leading zeroes in the IP address. For example, instead of 192.168.047.025, enter 192.168.47.25.

Configuring the Network Port

Configure the network port using **NETWORK - Ethernet**.

Microsemi Recommends:

- Using static IP addresses. (See explanation below.)
- Using **Allowed Access** to protect the network port from unauthorized IP addresses or address ranges.

Explanation: NTP associations and authentication may rely on static network addresses. If a DHCP server assigns a new address to a network port that has DHCP enabled, the associations and authentication may stop working.

Also see ***NETWORK - Ethernet*** (on page 31).

Adding Server Associations

NTP server and peer associations provide an important backup source of time if the SyncServer's Input References are unavailable. Having two or more server or peer associations is important for reliability and redundancy.

(Optional) The user can add associations for NTP servers that reside on the company network:

- For NTP servers that the user cannot configure, add *server* associations, as described below.
- For NTP servers that the user can configure, add *peer* associations as described in ***Adding Peer Associations*** (on page 108).

Note: Avoid creating *server* associations on two NTP servers that point to each other. Use *peer* associations instead.

(Optional) If the SyncServer is located outside the United States, the user can also add at least one *server* association that points to a local NTP server. This provides a shorter network path, which improves timing precision and accuracy. Often, public NTP servers are operated by national timekeeping authorities, telecommunications companies, and universities. To find a local NTP server, search the Internet for "Public NTP servers". Include the name of your country at the end of the search string. When available, select NTP servers that are stratum 1 over those that are stratum 2.

To add a server association:

1. Go to **NTP - Config** in the web interface.
2. Under *Add/Edit Association*, for **Role**, select **Server**.
3. For **Address**, enter an IP address (recommended) or domain name.
4. (Optional) Configure the other settings under *Add/Edit Association.* For more information, see ***NTP - Config*** (on page 42).
5. Click **SAVE**.
6. Click **RESTART**.

After restarting, the NTP daemon sends regular requests to the server and uses the replies to compare the NTP server with other servers and peers. The NTP daemon selects the best server or peer and synchronizes with it.

Also see ***Configuring NTP Clients*** (on page 111).

Troubleshooting

The following troubleshooting scenarios provide high-level guidance on how to solve a range of potential problems with the SyncServer.

- A bullet is a proposed solution. The user should try each solution in turn until the problem is solved.
- A numbered step is a procedure. The user should complete the procedure to solve the problem.

For additional help, contact ***Microsemi Customer Assistance*** (on page 5).

Passwords

You've tried logging in and the password doesn't work.

- Passwords are case sensitive. Check that that **Caps Lock** isn't on.
- Use the **Recover Password** feature, if it is available and configured.
- Have another user log in and change your password settings.
- If all else fails, restore the factory default configuration using the hardware jumper. See ***Restoring the Factory Default Configuration*** (on page 117).

See also: ***Properties of User Names and Passwords*** (on page 23)

Alarms and Notification

You're not receiving alarm notifications by snmp.

- Check that the alarm notification settings are enabled, as shown in the ***Factory Default Settings for Alarms*** (on page 63) topic.

- To receive SNMP traps, verify that the **NETWORK - SNMP** and **NETWORK - SNMP Traps** pages are configured correctly.
- Verify that LAN 1 is configured with a valid DNS server address.

NTP Clients

The NTP clients can't reach or synchronize with the SyncServer. On the SyncServer:

- The **Network** LED on the front panel should be green. Otherwise, check the physical network port connections. Also see ***Status LEDs*** (on page 15).
- Check the configuration of the network port on the **NETWORK - Ethernet** page, described in ***Configuring the Network Port*** (on page 103).
- If the **Sync** LED on the front panel is red, the SyncServer is unsynchronized and NTP clients won't synchronize to it. Configure the SyncServer with a valid reference input. Also see ***Using GPS*** (on page 94) and ***Adding Server Associations*** (on page 103).

Upgrading System Software

Overview of the Software Upgrade Process

In its factory default configuration, the SyncServer automatically checks for software upgrades every weekday shortly after noon local time. If an upgrade is available, the SyncServer generates a *System Upgrade Alarm*.

The user responding to the alarm logs into the web interface. The status bar at the top of the window may show that an alarm has been triggered, and on the **STATUS - General** page, "Release Version" states that an upgrade is available.

Before upgrading, as a precaution, the user should back up the configuration of the SyncServer (**WIZARDS - Backup**). Normally, the SyncServer transfers its settings from one version of the software to the next. However, if the upgrade process is interrupted (e.g., loss of power), the settings may be lost. Having the backup makes it possible to restore the previous settings if that happens.

The user downloads the software upgrade file from the Microsemi web site to their workstation and then follows the steps given below for upgrading the software on the SyncServer.

Note: Please avoid decompressing the *.tar upgrade file prior to upgrading the SyncServer. For security, the SyncServer will reject any file that has been modified or decompressed and recompressed. If needed, download a new software file from Microsemi.

Prerequisites for the System Upgrade Alarm to Work

The SyncServer notifies the user when a software upgrade is available, provided all of the following items are true:

- The *Check for software upgrades* setting is enabled on the **SYSTEM - General** page (factory default = enabled).
- The LAN 1 port is configured correctly and has a DNS server on the **NETWORK - Ethernet** page (typically configured during installation).

- The LAN 1 port can reach www.symmetricom.com on the Internet using port 80. Most proxy servers and firewall devices allow this type of traffic, but some may be configured to block it. Consult your network administrator for more information.
- The *System Upgrade Alarm* and its notification settings are enabled on the **ADMIN - Alarms** page (factory defaults = enabled).
- The user is reachable by one or more of the Alarm notification methods: Alarm LED, or SNMP (typically configured during installation).

See also:

- ***WIZARDS - Backup*** (on page 67)
- ***SYSTEM - Upgrade*** (on page 53)
- ***ADMIN - Alarms*** (on page 60)

Checking if an Upgrade is Available

- Check the *System Upgrade Alarm* on the **ADMIN - Alarms** page to see if a software upgrade is available.
- Or, manually check for an upgrade by comparing the *Release Version* on the **STATUS - General** page with the *Version* at http://update.symmetricom.com/upgradeS300.txt.

Downloading the Upgrade

1. Unless instructed to use another URL, download the software from ***Microsemi's online portal***http://www.microsemi.com.
2. Save the software to your workstation or to the USB flash drive.
3. (Optional) Back up the SyncServer configuration to your workstation or USB flash drive. Also see ***Creating a Backup File*** (on page 117).

Upgrading the Software

The user can upgrade the software using any one of the three methods given below.

Note: Please wait approximately 5 - 10 minutes while the SyncServer upgrades, shuts down, and reboots. Avoid disconnecting or switching the power off during the upgrade process.

Method 1: Using the **WIZARDS - Upgrade** page:

1. Click the **BROWSE** button (*STEP 1: Transfer Upgrade File to SyncServer*).
2. In the **Choose file** window, locate and double-click the upgrade file.
3. Click the **NEXT** button (*STEP 1: Transfer Upgrade File to SyncServer*).
4. Click the **FINISH** button. (*STEP 2: Perform Upgrade*).

Method 2: Using the **SYSTEM - Upgrade** page:

1. On the **SYSTEM - Upgrade** page, click the **BROWSE** button.
2. In the **Choose file** window, locate and double-click the upgrade file.
3. On the **SYSTEM - Upgrade** page, click the **UPLOAD** button. The SyncServer reports "Downloading Upgrade File!"

4. Select the upgrade file in the *Current Files* window and click the **INSTALL** button.

(Optional) After the upgrade:

When the SyncServer is finished rebooting, the browser shows the login page.

- Log in to the web interface and check the Release Version on the **STATUS - General** page to ensure that it matches the desired version
- Check the overall configuration to verify that the settings are still correct.

Web Interface

You can't reach the web interface.

- Check that LAN 1 is physically connected to the network.
- Ping the IP Address of LAN 1.
- The *Web Server* may be turned off.
    - Cycle the power off and on again. Depending on the configuration of the **SERVICES - Startup** page, the web server may be available when the SyncServer finishes rebooting. See ***Halting the SyncServer*** (on page 16).
    - Otherwise, log into the command line interface and turn the web server on using the *HTTP on* command. See ***Command Line Interface*** (on page 71).
    - After logging in to the web interface, select **Auto** for Web Server on the **SERVICES - Startup** page.
- The **SERVICES - HTTP** page may be configured for *Secure (Port 443) Only*. If so, edit the URL in the browser so that it begins with "https" instead of "http".

Using NTP

Adding Server Associations

NTP server and peer associations provide an important backup source of time if the SyncServer's Input References are unavailable. Having two or more server or peer associations is important for reliability and redundancy.

(Optional) The user can add associations for NTP servers that reside on the company network:

- For NTP servers that the user cannot configure, add *server* associations, as described below.
- For NTP servers that the user can configure, add *peer* associations as described in ***Adding Peer Associations*** (on page 108).

Note: Avoid creating *server* associations on two NTP servers that point to each other. Use *peer* associations instead.

(Optional) If the SyncServer is located outside the United States, the user can also add at least one *server* association that points to a local NTP server. This provides a shorter network path, which improves timing precision and accuracy. Often, public NTP servers are operated by national timekeeping authorities, telecommunications companies, and universities. To find a local NTP server, search the Internet for "Public NTP servers". Include the name of your country at the end of the search string. When available, select NTP servers that are stratum 1 over those that are stratum 2.

To add a server association:

1. Go to **NTP - Config** in the web interface.
2. Under *Add/Edit Association*, for **Role**, select **Server**.
3. For **Address**, enter an IP address (recommended) or domain name.
4. (Optional) Configure the other settings under *Add/Edit Association.* For more information, see ***NTP - Config*** (on page 42).
5. Click **SAVE**.
6. Click **RESTART**.

After restarting, the NTP daemon sends regular requests to the server and uses the replies to compare the NTP server with other servers and peers. The NTP daemon selects the best server or peer and synchronizes with it.

Also see ***Configuring NTP Clients*** (on page 111).

Adding Peer Associations

A pair of *peer* associations lets two NTP servers evaluate each other as part of their clock selection algorithms, but prevents "timing loops" where both servers lock to each other. This approach is typically applied to clusters of NTP servers on a LAN or WAN, and provides excellent synchronization and redundancy.

To create a pair of peer associations:

1. On the SyncServer, go to **NTP - Config** in the web interface.
2. Under *Add/Edit Association*, for **Role**, select **Peer**.
3. For **Address**, enter the IP address (recommended) or domain name of the peer.
4. (Optional) Configure the other settings under *Add/Edit Association.* For more information, see ***NTP - Config*** (on page 42).
5. Click **SAVE**.
6. Click **RESTART**.
7. Log into the other NTP server and repeat the process of creating a peer association that points to the IP address or domain name of the SyncServer. For example, on a generic NTP daemon, add the following line to the ntp.conf file:

```
peer 192.168.61.54
```

Verifying Server and Peer Associations

After configuring server and peer associations, verify that they are reachable.

To verify *the factory default configuration*, observe the SYNC LED for several minutes after turning the power on. If the SYNC LED transitions from red to orange (stratum 2), the SyncServer has synchronized with one of three default NTP servers. (Afterward, if the SYNC

LED transitions from orange to green the SyncServer has synchronized to a Hardware Clock Input Reference and is operating at stratum 1.)

To verify other configurations, visit the **NTP - Assoc** page. After several minutes of operation, *Reach* should show a value greater than 0 for each association. If *Reach* equals 0, that association is "unreachable".

For unreachable associations, check the following items:

- The physical network connections.
- The IP addresses of the NTP associations.
- On the **NETWORK - Ethernet** page:
  - If the NTP association uses a domain name instead of an IP address, the management port (LAN 1) must have a valid DNS server address.
  - If *Allowed Access* is configured, check that it isn't blocking traffic with the NTP associations and DNS server.

Adding Broadcast Associations

Broadcast associations can be used to:

- Reduce network traffic when a very large number of NTP clients are present on a LAN.
- Reduce the NTP load on the SyncServer if the NTP LED is orange or red.

A SyncServer with a broadcast server association broadcasts NTP messages to the subnet approximately every 64 seconds. After exchanging calibration messages with the server, the NTP broadcast clients settle into a routine of listening for, and synchronizing with, the NTP broadcast messages.

Microsemi recommends consulting with your IT department or network administrator before broadcasting NTP. The user should configure the scope of the broadcast address to cover the intended subnet. Also note that some network routers are configured to block broadcast messages.

Note: To protect against broadcasts from an unauthorized source, the user must configure NTP authentication on the broadcast server and broadcast clients.

For more information, see ***NTP - Config*** (on page 42).

Creating a broadcast association

To configure the SyncServer as a broadcast server:

1. Configure authentication as described in ***Using NTP Authentication*** (on page 112). For example, use **NTP - MD5** to generate and download keys to your workstation.
2. Add or edit an association on the **NTP - Conf** page.
3. For **Role**, select **Broadcast**.
4. For **Address**, enter an appropriate broadcast address for the subnet.
5. For **MD5 Key**, select the appropriate method, **Key** or **Auto**.
6. If selecting **Key**, also select a key number, 1 through 16.
7. Click the **SAVE** button.

8. Click the **RESTART** button. When the NTP daemon finishes restarting, it broadcasts NTP messages every 64 seconds.

Creating a broadcastclient association

To configure an NTP client as a broadcast client, consult the manufacturer's documentation.

To configure a generic NTP broadcast client with MD5 authentication, the user would upload the ntp.keys file to the /etc directory and add the following lines to the ntp.conf file (example values italicized):

```
broadcastclient
enable auth
keys /etc/ntp.keys
trustedkey 1
```

The key number identified by *trustedkey* must match the key number on the SyncServer or broadcast server.

To configure a SyncServer as a broadcast client:

1. Configure authentication. For example, use **NTP - MD5** to upload the keys file.
2. Add or edit an association on the **NTP - Conf** page.
3. For **Role**, select **Broadcast Client**.
4. For **MD5**, select the appropriate method and **Key** if needed.
5. Click the **SAVE** button.
6. Click the **RESTART** button. When the NTP daemon finishes restarting, it listens for broadcast messages.

Also see:

- ***Working with Generic NTP Devices*** (on page 112)

Adding Multicast Associations

NTP multicasting is similar to broadcasting, but uses a routable multicast address so that the NTP messages can reach multiple subnets. Use the IANA-designated address for NTP multicasting, 224.0.1.1, or carefully select another non-conflicting address. Also take steps to protect multicast messages from affecting neighboring networks.

Also see ***Adding Broadcast Associations*** (on page 109) and ***NTP - Config*** (on page 42).

Configuring the multicast server

To configure a SyncServer as a multicast server:

1. Configure authentication as described in ***Using NTP Authentication*** (on page 112). For example, use **NTP - MD5** to generate and download keys to your workstation.
2. Add or edit an association on the **NTP - Conf** page.
3. For **Role**, select **Broadcast**.
4. For **Address**, enter 224.0.1.1 (or another carefully selected non-conflicting address)

5. For **MD5 Key**, select the appropriate method, **Key** or **Auto**. (If selecting **Key**, also select a key number, 1 through 16.)
6. Click the **SAVE** button.
7. Click the **RESTART** button. When the NTP daemon finishes restarting, it broadcasts NTP messages every 64 seconds.

Configuring the Multicast Client

To configure an NTP client as a multicast client, consult the manufacturer's documentation.

To configure a generic NTP multicast client with MD5 authentication, the user would upload the ntp.keys file to the /etc directory and add the following lines to the ntp.conf file (example values italicized):

```
multicastclient 224.0.1.1
enable auth
keys /etc/ntp.keys
trustedkey 1
```

The key number identified by *trustedkey* must match the key number on the multicast server association.

The SyncServer can also be configured as a multicast client, as follows:

1. Configure authentication.
   - For example, use **NTP - MD5** to upload the keys file.
2. Add or edit an association on the **NTP - Conf** page.
3. For **Role**, select **Multicast Client**.
4. For **MD5**, select the appropriate method and **Key** if needed.
5. Click the **SAVE** button.
6. Click the **RESTART** button. When the NTP daemon finishes restarting, it listens for broadcast messages.

Also see:

- ***Working with Generic NTP Devices*** (on page 112)
- ***Using MD5 Keys on a SyncServer*** (on page 113)
- ***Using NTP Authentication*** (on page 112)

Configuring NTP Clients

The user typically configures an NTP clients to synchronize with the SyncServer.

If available, consult the manufacturer's documentation for instructions on how to do this.

For a generic NTP device, this can be accomplished by adding one or more server associations to the ntp.conf file. For example:

```
server 192.168.61.50#NTP server 1
server 192.168.61.54#NTP server 2
server 192.168.61.58#NTP server 3
```

Save the changes and restart the device.

See ***Working with Generic NTP Devices*** (on page 112).

Working with Generic NTP Devices

This topic provides a starting point for users to work with NTP on a UNIX or Linux operating system. For more information, consult the manufacturer's documentation or search online for information about a particular device or operating system.

Log in as the *root* user.

The NTP configuration file, ntp.conf, is usually located at /etc/ntp.conf.

If needed, use the *find* command to locate a file under the current directory. The find command syntax is "find -name <filename>". For example, change directories by entering:

```
cd /
```

Then search for ntp.conf by entering:

```
find -name ntp.conf
```

Edit ntp.conf. For example, enter:

joe /etc/ntp.conf

Add associations to the ntp.conf file as described in specific NTP topics.

Save the changes to ntp.conf.

Restart the NTP daemon. The commands vary from system to system, but here are some examples:

```
ntpd -g -N
ntpd -g
/etc/init.d/ntpd restart
service ntpd restart
/etc/rc.d/init.d/ntpd restart
```

Otherwise, restart NTP by rebooting the operating system. This can usually be accomplished by entering:

shutdown -r now

To check NTP status, use the *ntpq* utility, included among the standard NTP packages.

Using NTP Authentication

NTP uses authentication to prevent spoofing, intercept, and replay-type attacks. The two standard methods of NTP authentication are available on the SyncServer:

- MD5 keys, a form of symmetric key cryptography.
- Autokey, a form of public key cryptography.

Only one method can be used at a time; MD5 keys and Autokey cannot be used concurrently on the SyncServer.

Note: Log in to the SyncServer securely (https/port 443) when configuring NTP authentication. Also see ***Enabling Secure Login*** (on page 115).

Using MD5 Keys on a SyncServer

A high level description of how to set up MD5 authentication between two NTP devices:

1. Generate the MD5 keys on one device.
2. Securely transfer the keys to the other device.
3. Configure the relevant NTP association(s) to use MD5 authentication.

Mix and match the sections in this topic with those in ***Using MD5 Keys on a generic NTP device*** (on page 114) as needed.

Recommendation: When configuring NTP authentication, log in to the SyncServer securely by selecting the **Secure** checkbox on the **Login** page. This opens an https session with port 443 on the SyncServer. Also see ***Enabling Secure Login*** (on page 115).

Generating and downloading MD5 keys

1. Log in to the SyncServer securely.
2. On **NTP - MD5 Keys** page, click the **GENERATE** button. This generates a new set of MD5 keys, overwriting any previous ones.
3. Use the **SAVE AS...** button and save *ntp.keys* to your computer.
4. Click the **RESTART** button. This restarts the NTP daemon, putting all of the keys into effect.

The SyncServer automatically trusts all of the NTP keys. This is equivalent to the following command in ntp.conf:

```
trustekey 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 ...
```

Enabling MD5 for a particular NTP association

The Role of the association must be *Server*, *Peer*, *Broadcast.*

1. Log in to the SyncServer securely.
2. Go to the **NTP - Config** page.
3. Create or edit an NTP association.
4. Set **MD5 Key** to **Key** and select a *key number*. That key number must be a *trustedkey* on the other device for authentication to work.
5. Click the **SAVE** button.
6. Click the **RESTART** button.

After several minutes go to **NTP - Assoc** and confirm that *Reach* for this association is greater than 0. If not, authentication isn't working.

Uploading the MD5 keys to a SyncServer

1. Log in to the other SyncServer securely.
2. On the **NTP - MD5 Keys** page, use the **BROWSE** button to locate the files on your computer.
3. Click the **UPLOAD** button. This copies the keys to the SyncServer.

4. Click the **RESTART** button. This restarts the NTP daemon, putting all of the keys into effect.

The SyncServer automatically trusts all of the NTP keys.

Using MD5 Keys on a Generic NTP device

This topic is a guide to configuring MD5 authentication for NTP on a UNIX or Linux operating system. Specifics, such as the location of files, vary by implementation.

Note: Use secure methods for configuring NTP authentication and transferring key files.

The following sections refer to the MD5 keys file:

- If you created the MD5 keys on the SyncServer, replace <keysfile> with *ntp.keys*
- If you created the MD5 keys using the *ntp-keygen* utility, replace <keysfile> with *ntpkey** so the steps apply to both the keys file *and the symbolic link file*. (The ntp-keygen utility is typically included with the standard open source NTP distribution).

Uploading MD5 keys to a generic NTP device

Securely transport the MD5 keys file to the destination NTP node. This can be done by a variety of means, such as physical media or encrypted communications such as *ssh* and *scp*. For example:

- Log in as root.
- Copy the MD5 keys file to /root:

```
cp /mnt/floppy/<keysfile> /root
```

- Make the MD5 keys file read/write for root:

```
chmod 600 <keysfile>
```

Edit ntp.conf

- Edit ntp.conf. For example, enter:

```
vi /etc/ntp.conf
```

- Add one of these two lines:

```
keys /root/ntp.keys#points to keys file from SyncServer
keys /root/ntpkeys_MD5_<hostname>#points to symbolic link from ntpkeygen
```

Note: <hostname> will be the hostname of the device on which the keys were generated. When the user periodically refreshes the keys file and symbolic link, the keys directive in ntp.conf file does not need to be updated.

- For each association that uses authentication, add "key" followed by the key number. For example:

```
server 192.168.61.54  iburst prefer key 1
peer  192.168.61.58  key 5
server  tock.usno.navy.mil
```

- Edit the trustedkey directive so it includes the key number of every key used for authentication. For example:

```
trustedkey 1 5 9 16 11
```

Note: Ntp.conf files do not include associations for NTP clients. However, if the NTP server has clients that use MD5 authentication, the key number specified by the client's server association must specified by *trustedkey* on the server. This is the case with key numbers 9, 16, and 11 in the example above.

Save the changes and close the file. In vi, press the Esc key and enter:

```
:wq
```

Restart ntpd. The most reliable way to do this is to reboot the system by entering:

```
shutdown -r now
```

When the system and ntpd restart, the new configuration should be in effect.

Note: Mismatched keys or partially configured authentication may prevent synchronization between two NTP nodes.

Enabling Secure Login

Logging into the SyncServer securely (open an https session with port 443) helps protect sensitive information when the user is performing sensitive tasks, such as creating new usernames and passwords, or viewing and transferring MD5 authentication keys or autokey certificates.

To enable secure login:

1. Log in to the web interface (using a normal http connection).
2. On the **SYSTEM - General** page, enter a unique hostname. This is required to differentiate the SyncServer from other SyncServers on the network.
3. On the **SERVICES - HTTP** page, select one of the options that includes *Secure (port 443)*.
4. Fill out the *Certificate Info* and click the **APPLY** button. This restarts the web server.

To view the Login page again, you may need to prefix the URL in your browser with *https* if you selected the *Secure (Port 443) Only* option on the **SERVICES - HTTP** page.

To log in securely, select the *Secure* checkbox on the **Login** page.

Recovering a Password

Enable *Recover Password* when setting up the SyncServer so it is available when needed. This can be done using the **ADMIN - Users** page.

To recover a lost or forgotten password:

1. Enter the username, select the **Recover Password** checkbox, and click the **LOGIN** button.
2. Answer the *Recovery Question* and click the **RESET** button. The SyncServer sends a message to the email address of the username.
3. When the email arrives, log into the SyncServer using the new password provided in the email message.
4. Change the password using the **ADMIN - Users** page.

If *Recover Password* wasn't enabled:

- If the SyncServer has multiple user accounts, you may be able to have another user log in and change the password for you.

- If there is no other way to log into the SyncServer, use the hardware jumper to restore the factory configuration. See ***Restoring the Factory Default Configuration*** (on page 117).

See also: ***Properties of User Names and Passwords*** (on page 23)

Halting the SyncServer

Microsemi recommends shutting the operating system down before removing the power.

Using the web interface:

1. Go to the **SERVICES - Startup** page.
2. Select **Halt** and click the **APPLY** button.
3. Wait approximately 30 seconds before removing power.

CAUTION: Stopping the SyncServer

Avoid removing power while the SyncServer is operating. Stop the operating system before removing power.

ATTENTION : Évitez de couper le courant électrique pendant que le SyncServer fonctionne. Veuillez fermer le système d'exploitation avant d'enlever le courant.

Backing Up/Restoring Configurations

SyncServer's configuration settings can be saved to a "backup" file, which is useful in the following scenarios:

- The user is testing multiple SyncServer configurations. The user saves the "original" configuration before testing, and then saves some of the more promising test configurations. When the testing is complete, the user selects the best configuration and applies it to the SyncServer.
- The user needs to configure several SyncServers. The user configures a single SyncServer, creates a backup file, and then uses the backup file to transfer the configuration to the remaining SyncServers.
- The user needs a "known good configuration" in case the SyncServer's configuration is inadvertently changed or lost.

The SyncServer's backup and restore features are available from two locations:

- From the web interface, using the **WIZARDS - Backup** and the **WIZARDS - Restore** pages.

The backup/restore features can use a variety of media:

- A USB flash drive plugged into either of the USB ports on the front panel.
- Any directory that is accessible to a browser.

Notes:
- Not all USB flash drives are compatible with the SyncServer's USB ports. Microsemi recommends using SanDisk cruzer micro USB devices.
- The backup file includes the configuration of the **NETWORK - Ethernet** page. If restoring a single configuration to multiple units, if the network port has a static IP address, avoid IP address conflicts by changing this address.
- Transferring configurations between a SyncServers with different hardware or software might not work. The user may want to back up the configuration of the "destination" SyncServer before applying the configuration of the "originating" SyncServer. One can also restore the Factory Defaults if the transfer doesn't work. See the ***Restoring the Factory Default Configuration*** (on page 117) topic.

Creating a Backup File

From the web interface

1. On the **WIZARDS - Backup** web page, click the **BACKUP** button to create a backup file on the SyncServer.
2. Then use the **SAVE AS** or **COPY** button to download the backup file to a your workstation or a USB device.

Restoring from a Backup File

From the web interface

On the **WIZARDS - Restore** web page, select one of the following options:

- Reset to Factory Defaults. See ***Restoring the Factory Default Configuration*** (on page 117).
- Restore last backup from SyncServer.
- Restore backup from USB flash drive.
- Restore backup from a workstation hard-drive or network directory.

Restoring the Factory Default Configuration

The user may wish to restore the factory default configuration in a variety of circumstances:

- When the password is lost and the *Recover Password* feature is disabled use the Hardware Jumper method.
- To erase the previous configuration prior to reconfiguring the SyncServer.
- To erase site-specific information such as the IP addresses and the GPS position, prior to sending the SyncServer off-site.

In some cases, the user may back up the current configuration of the SyncServer prior to restoring the factory default configuration. See ***Creating a Backup File*** (on page 117).

Restoring the default factory configuration removes the current network settings. Afterwards, the user may need to configure the LAN 1 port in order to use the web interface.

Using the Web Interface

To restore the factory configuration use the one of the following pages:

- **SYSTEM - Factory Reset**
- **WIZARDS - Restore** (select *Reset to Factory Defaults*).

To clear site-specific information from the SyncServer, disconnect all input network cables and GPS antenna cables from the rear of the SyncServer shortly after clicking the **APPLY** button, before the SyncServer has had time to restart.

Using the Hardware Jumper

This procedure requires:

- A jumper.
- Size 0 philips-head screwdriver
- Tweezers or needle-nosed pliers for handling the jumper.

Note: Observe static protection measures while working inside the SyncServer.

To restore the factory configuration:

1. Halt the SyncServer as described in ***Halting the SyncServer*** (on page 16).
2. **VERY IMPORTANT**: Disconnect power cord and remove the top cover as described in ***Removing the Top Cover*** (on page 118).
3. Position a jumper (not supplied) across the jumper pins marked *JP4*, next to the circular battery.
4. (Optional) To clear site-specific information, disconnect all network and GPS antenna cables from the rear of the SyncServer and do not reconnect them.
5. Connect the power cable and turn the power switch on. The SyncServer restores the factory configuration.
6. After 100 seconds, turn the power switch off and disconnect the power cable.
7. Remove the jumper from the JP4 jumper pins.
8. Secure the top cover to the SyncServer using the screws.
9. Reconnect the power cable and turn the SyncServer's power on. The default factory configuration has been restored.

WARNING: Removing Power

Prior to removing the top cover, disconnect all power connections.

AVERTISSEMENT : Avant d'enlever le couvercle, débranchez le courant électrique..

Removing the Top Cover

After halting the SyncServer as described in ***Halting the SyncServer*** (on page 16):

1. If needed, remove the SyncServer from the equipment rack.
2. Disconnect the power from the SyncServer.
3. Remove the top cover (lid):
    - Remove the six retaining screws from the top cover.
    - Lift the rear edge of the top cover from the chassis.
    - **SLOWLY** and firmly separate the top cover from the adhesive heatsink pad.

Replacing the Battery

To replace the battery:

1. Remove the SyncServer's top cover. Also see ***Removing the Top Cover*** (on page 118).
2. Locate the circular silver-colored disc-shaped lithium battery, located on the front right corner of the motherboard.
3. **Please do not lift or bend the metal clip**. Doing so may damage or break the battery holder, requiring repair.
4. Locate the sloping black plastic latch, opposite from the metal clip.
5. Depress the latch and slide the battery out of the holder
6. Dispose of the battery in accordance with local regulations.
7. Use the new battery to press the latch down while sliding the battery into the holder.

CAUTION: Lithium Battery

The SyncServer contains a Lithium Battery that maintains the system's Real Time Clock (RTC) when the SyncServer's power is off. Replace the Lithium Battery only with the same or equivalent type. Do not dispose of the Lithium Battery in a fire or incinerator, or the battery may explode. Follow disposal regulations in your area for Lithium Battery disposal.

ATTENTION : Le SyncServer contient une batterie de lithium pour maintenir l'horloge en temps réel pendent que le courant est debranché. Remplacez la batterie de lithium seulement avec une batterie de type équivalent. Ne vous débarrassez pas de la batterie de lithium dans un feu ou un incinérateur, car la batterie pourrait exploser. Débarrassez-vous de la batterie usagée de lithium selon les instructions du fabricant.

Managing Users

Use the **ADMIN - Users** page to add, delete, and edit user profiles, including passwords and password recovery. All users have full administrative privileges.

Changing the Password

1. Enter current user's **Old Password**.
2. Enter the **New Password** and **Retype New Password**.

3. (Optional) Configure password recovery for the current user as described in ***Enabling Password Recovery*** (on page 120).
4. Click the **APPLY** button.

See also: ***Properties of User Names and Passwords*** (on page 23)

Enabling Password Recovery

1. For new and current users, select the **Password Recovery** checkbox.
2. Select a **Recovery Question** and enter the **Answer**.
3. Enter an **Email Address** and the **SMTP Gateway**'s DNS name (if LAN 1 can reach a DNS server on the network) or IP address (if DNS is not available).
4. (Optional) Select the **Send Test Email** checkbox.
5. Click the **APPLY** button.

Creating a New User

1. Set **User** to *New User*.
2. Enter a **New username**.
3. Enter a **New Password** and **Retype New Password**.
4. (Optional) Configure password recovery for the new user.
5. Click the **APPLY** button.

See also: ***Properties of User Names and Passwords*** (on page 23)

Deleting a Current User

1. For **User**, select the username to delete.
2. Select the checkbox for **Delete Selected User**.
3. Click the **APPLY** button.

Estimating Worst Case Time Error when GPS is Unavailable

Use these instructions to estimate the worst case time error for periods of time while GPS becomes unavailable. These instructions only apply if:

- The SyncServer has no other sources of time such as Hardware Clock Input References or synchronizing NTP associations.

- The GPS antenna is in a location where it experiences periodic outages (Timing GPS Source Alarms).

Depending on obstructions and the latitude of the mounted antenna, there may be periods throughout the day where no satellite signals can reach the antenna. During these outages, the system runs on its internal oscillator until satellites come back into view and the GPS receiver provides valid time again.

To estimate the worst case accuracy, run the following script from the command line interface for 1 day, logging the data using a terminal emulator like Hyperterminal:

```
gpsstrength pause 1000 repeat 100000
```

Press enter to terminate the script. Now plot the first field in each line (total satellites tracked) and find the largest contiguous section of all zeros. Count the number of zeroes in a row, divide by 3600 (sec/hr) and multiply by the drift rate of your oscillator (ms/hr).

For example: if your max number of contiguous 'zero' data points is 10,800 this is equivalent to an outage of 10,800/3600 or 3 hours. If your SyncServer has a TCXO oscillator, the time error would be 0.875ms/hr * 3 hrs or 2.625 milliseconds. If your SyncServer has a Rubidium oscillator, the time error would be 0.001ms/hr * 3 hrs or 0.003 milliseconds.

Note: To minimize the accumulated time error during outages, Microsemi recommends purchasing SyncServer with the Rubidium oscillator option. A SyncServer equipped with a Rubidium oscillator can maintain time to better than one millisecond accuracy to UTC with GPS satellite outages of one month. Generally, for outages longer than several hours, the GPS receiver needs to track a satellite contiguously for several hours to acquire time and remove the accumulated time error.

Setting the Time Manually

The SyncServer has features for setting the time manually. These can be used for a variety of reasons, such as:

- Distributing approximate UTC time.
- Intentionally distributing non-UTC time.

Also see: ***Distributing Non-UTC Time*** (on page 124) and ***TIMING - HW Clock*** (on page 48).

In most cases, the user sets the time manually when:

- The Hardware Clock's Input References aren't available.
- NTP associations that are capable of providing time to the SyncServer aren't available.

Note: In the following instructions, enter UTC time using the 24-hour format. For example, instead of 06:00 PM, enter 18:00.

Using the web interface

1. On the **TIMING - HW Clock** page, enter the UTC date and time.
2. Set **Forced Timing Source** to **Free Run**.
3. Enter the UTC date and time.
4. Click **APPLY**.

Note: Once **Forced Timing Source** is set to **Free Run**, the Hardware Clock doesn't use the Input References until the user sets **Forced Timing Source** back to **Auto**. If synchronizing NTP associations are available, the SyncServer's NTP daemon may synchronize with one of them instead of the Hardware Clock.

Using the Command Line

1. Log in to the command line interface.
2. Enter the **SETTIMEOFYEAR** command followed by the time in one of the following formats:

- x.y
- mm/dd/yyyy hh:mm:ss.x
- yyyy ddd hh:mm:ss.x
- MON dd yyyy hh:mm:ss.x
- hh:mm:ss.x

In "x.y" format:

- x = UTC seconds (0-59)
- y = fractions of a second

In the remaining formats:

- mm = month 01 through 12
- dd = day 01 through 31
- ddd = day of year 001 through 366
- yyyy = four-digit year
- MON = first three letters of the month (e.g., "JAN")
- hh = hours 00 through 23
- mm = minutes 00 through 59
- ss = seconds 00 through 59
- x = fractions of a second

The SETTIMEOFYEAR command does not set the Hardware Clock to **Free Run** mode.

Distributing GPS Time

SyncServers can distribute GPS time in place of UTC time.

To distribute GPS Time:

1. On the **TIMING - HW Clock** page, select the checkbox next to *Ignore UTC Corrections from GPS Reference*.
2. (Recommended) On the **TIMING - HW Clock** page, disable all the references except GPS by deselecting the *Enable* checkbox next to each one.
3. Click the **APPLY** button.
4. On the **NTP - Config** page, delete all the NTP associations except Hardware Clock. (Exception: Keep NTP associations that are also configured to distribute GPS time instead of UTC.)
5. On the **SERVICES - Startup** page, under *System Control*, select *Reboot* and click the **APPLY** button.

6. (Optional) After the SyncServer restarts, compare the **Hardware Clock Time** seconds on **STATUS - Timing** page with some other accurate time display. The GPS time should be ahead of the UTC or standard time display by the value of the GPS-UTC Offset.

CAUTION: NTP time is based on the UTC time scale. Distributing GPS time over NTP is non-standard and can have serious consequences for systems that are synchronized to UTC. This action should only be performed by a person who is knowledgable and authorized to do so.

About distributing GPS Time

Network Time Protocol (NTP) is based on UTC. However, some users distribute GPS time over NTP to avoid leap second adjustments. This is a non-standard practice, and should not be undertaken without a comprehensive understanding of the effects that it can have on a timing network.

Coordinated Universal Time (UTC) is a discontinuous atomic time scale that is the basis for civil timekeeping around the world. Leap second adjustments are periodically applied to UTC so that it remains consistent with Earth's rotational time, which is variable and gradually slowing.

The Global Positioning System time (GPS time) is a continuous atomic time scale that does not include leap second adjustments. GPS time was synchronized to UTC at the beginning of the GPS epoch, on January 6th, 1980. The two time scales "tick" at the same rate, but are different by the number of leap seconds that have been applied to UTC since that date. This difference is known as the *GPS-UTC Offset*. As of January 1st, 2006, the offset from GPS to UTC was -14 seconds. This difference will continue to change and probably grow as future leap second adjustments are applied to UTC.

To generate UTC, the SyncServer gets the *GPS-UTC Offset* from the GPS navigation message and applies it to the GPS time. To generate GPS time, the SyncServer stops applying the GPS-UTC Offset, and uses unchanged GPS time.

Configuring the SyncServer to use GPS time affects **ALL** of the SyncServer's timing outputs, including:

- The NTP, SNTP, Time, and DAYTIME protocol outputs on the network port
- The web user interface

Notes:

- While configured to distribute GPS time, the SyncServer does not report *Leap Indicator* status or perform leap second adjustments.
- Regardless of the time zone setting, GPS time is reflected by the seconds in the time display.

CAUTION: Switching between GPS and UTC references while *Ignore UTC Corrections from GPS Reference* is enabled may have undesirable effects and should be avoided. Microsemi recommends disabling and removing all UTC-synchronized Hardware Clock Input References and NTP associations to prevent this from happening.

Distributing Non-UTC Time

The SyncServer and NTP are intended to operate with UTC as its standard time scale. However, if required, the SyncServer can be configured to operate with other time scales. This topic provides some useful pointers and tips for doing this.

Distributing non-UTC time can be accomplished by several methods:

- Configuring the SyncServer to distribute GPS time.
- Manually Setting the Time to non-UTC Time
- Synchronizing to non-UTC NTP.

Generally, the user should:

- Be aware that using non-UTC time, or switching between time scales, can have a serious impact upon systems.
- Perform extensive testing, and take extra measures to protect data and systems, before implementing non-UTC time.
- Distribute non-UTC NTP only on private or closed networks.
- Avoid distributing non-UTC NTP on open or public networks, or to systems that expect UTC time.
- Exercise good security practices to prevent this capability from being misused.
- Avoid broadcasting and multicasting non-UTC NTP.
- Use authentication to exclude UTC-based NTP clients.

Distributing GPS Time

See ***Distributing GPS Time*** (on page 122).

Manually Setting the Time to non-UTC Time

See the ***Setting the Time Manually*** (on page 121) topic. While reading the text, substitute "UTC time" with "non-UTC time".

Synchronizing to non-UTC NTP

1. On the **TIMING - HW Clock** page, disable all of the Input References and click the **APPLY** button.
2. On the **NTP - Config** page, delete UTC-based NTP associations that have the following roles: *server*, *peer*, *broadcastclient*, and *multicastclient*.
3. Add non-UTC *server*, *peer*, *broadcastclient*, and *multicastclient* associations.

Also see: ***Using NTP*** (on page 107).

Configuring SNMP

On the SyncServer, SNMP:

- Responds to requests for configuration and operational information.
- Sends traps in response to events, as configured on the **ADMIN - Alarms** page.
- Cannot be used to change the SyncServer's configuration (is read only).

SNMP-related pages on the SyncServer:

- **WIZARDS - SNMP:** Configure SNMP quickly (SNMP v1 and v2c only).
- **NETWORK - SNMP**: Configure SNMP and add v3 users.
- **NETWORK - SNMP Traps:** Configure trap recipients.
- **ADMIN - Alarms:** Select which events generate SNMP traps.
- **SERVICES - Startup:** Stop or start the SNMP daemon, and enable/disable it from starting automatically when the SyncServer reboots.

Configuring the SyncServer for SNMP queries

For SNMP v1/v2c queries, specify a *Read Community* string on the **NETWORK - SNMP** page.

For SNMP v3 queries, create *v3 Users* on the **NETWORK - SNMP** page.

Additional standard SNMP values, such as sysLocation and sysContact are also specified on the **NETWORK - SNMP** page.

The SyncServer Product CD includes a copy of the SyncServer custom MIB file that can be loaded into SNMP management stations.

Configuring the SyncServer to send SNMP Traps

To configure SNMP to send SNMP traps:

- Specify trap recipients on the **NETWORK - Traps** page.
    1. Select SNMP v1, v2c, or v3.
    2. (Optional) For v1 and v2c traps, specify a community string that will be included in the trap PDU.
    3. For v3 traps, create a v3 user for the destination management console. Specify an 8-character *Auth phrase*. (Optional) Specify a Priv phrase.
- On the **ADMIN - Alarms** page, specify which events generate SNMP traps.

SNMP MIB

The following text comes from the SyncServer's Custom MIB, *symm-smi.txt*, located on the Product Information CD:
SYMM-SMI DEFINITIONS ::= BEGIN
IMPORTS
OBJECT-TYPE,

```
MODULE-IDENTITY,
OBJECT-IDENTITY
FROM RFC-1212
DisplayString
FROM RFC1213-MIB
TRAP-TYPE
FROM RFC-1215
enterprises,
Integer32, Unsigned32
FROM RFC1155-SMI;

symmetricom MODULE-IDENTITY
LAST-UPDATED "1013061200Z"
ORGANIZATION "Symmetricom, Inc."
CONTACT-INFO
  "
Symmetricom, Inc.
2300 Orchard Parkway
San Jose, CA 95131"
DESCRIPTION
"This is the MIB Module for Symmetricom's enterprise specific
parameters."
REVISION "A"
DESCRIPTION "jflory - updated NTP, tyming, and etc descriptions"
::= {enterprises 9070 } --assigned by IANA

symmNetworkManagement OBJECT-IDENTITY
STATUScurrent
DESCRIPTION
"This is the root object identifier for all MIBS under the
Symmetricom tree."
::= { symmetricom 1 }

symmCmipManagement OBJECT-IDENTITY
STATUScurrent
DESCRIPTION
"This is the root object identifier for CMIP based objects."
::= { symmNetworkManagement 1 }

symmSnmpManagement OBJECT-IDENTITY
STATUScurrent
DESCRIPTION
"This is the root object identifier for SNMP based objects."
::= { symmNetworkManagement 2 }

symmTimePictra OBJECT-IDENTITY
STATUScurrent
DESCRIPTION
"This is reserved for objects related to Symmetricom's TimePictra
products."
```

```
::= { symmSnmpManagement 1 }

symmBroadband OBJECT-IDENTITY
STATUScurrent
DESCRIPTION
"The subtree that contains objects related to Symmetricom's GoWide
products."
::= { symmSnmpManagement 2 }

symmTTM OBJECT-IDENTITY
STATUScurrent
DESCRIPTION
"The subtree that contains objects related to Symmetricom's
Timing, Test and Measurement products."
::= { symmSnmpManagement 3 }

productsOBJECT IDENTIFIER ::= {symmTTM 1}
experiment  OBJECT IDENTIFIER ::= {symmTTM 99}
ts2000OBJECT IDENTIFIER ::= {products 1}
ntsOBJECT IDENTIFIER ::= {products 2}
ts2100OBJECT IDENTIFIER ::= {products 3}
s100OBJECT IDENTIFIER ::= {products 4}
syncserverOBJECT IDENTIFIER ::= {products 5}
xliOBJECT IDENTIFIER ::= {products 6}
versionOBJECT IDENTIFIER ::= {syncserver 1}
ntpSystemOBJECT IDENTIFIER ::= {version 1}
tymingOBJECT IDENTIFIER ::= {version 2}
gpsOBJECT IDENTIFIER ::= {version 3}
dialupOBJECT IDENTIFIER ::= {version 4}
netOBJECT IDENTIFIER ::= {version 5}
etcOBJECT IDENTIFIER ::= {version 6}
ntpSysLeap OBJECT-TYPE
SYNTAX INTEGER {
noWarning(0),
addSecond(1),
subtractSecond(2),
alarm(3)}
ACCESS read-only
STATUS current
DESCRIPTION
"NTP Leap Indicator.  This is a two-bit code
warning of an impending leap second to be inserted
into the NTP timescale.  The bits are set before
23:59 on the day of insertion and reset after 00:00
on the following day.  This causes the number of
seconds (rollover interval) in the day of insertion
to be increased or decreased by one.  In the case
of primary servers the bits are set by operator
intervention, while in the case of secondary servers
the bits are set by the protocol.  The two bits,
bit 0 and bit 1, respectively, are coded as follows:
======================================================
00     no warning
01     last minute has 61 seconds
10     last minute has 59 seconds
11     alarm condition(clock not synchronized)
======================================================
In all except the alarm condition(11), NTP itself
does nothing with these bits, except pass them on to
the time-conversion routines that are not part of
NTP.  The alarm condition occurs when, for whatever
reason, the local clock is not synchronized, such
as when first coming up or after an extended period
when no primary reference source is available."
::= {ntpSystem 1}

ntpSysStratum OBJECT-TYPE
SYNTAXInteger32 (0..255)
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Current NTP stratum level.  This is an integer
indicating the stratum of the local clock with
values defined as follows:
===================================================
0      unspecified
1      primary reference (e.g., calibrated atomic
clock, radio clock)
2-255   secondary reference (via NTP)
==================================================="
::= {ntpSystem 2}

ntpSysPrecision OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Current NTP precision value.  This is a signed
integer indicating the precision of the various
clocks, in seconds to the nearest power of two.
The value must be rounded to the next larger power
of two; for instance, a 50-Hz (20ms) or 60-Hz (16.17ms)
power-frequency clock would be assigned the value
-5 (31.25ms), while a 1000-Hz (1ms) crystal-controlled
clock would be assigned the value -9 (1.95ms)."
::= {ntpSystem 3}

ntpSysRootDelay OBJECT-TYPE
SYNTAXOCTET STRING
MAX-ACCESSread-only
```

```
STATUScurrent
DESCRIPTION
"Total roundtrip delay to the primary reference
source at the root of the synchronization
subnet, in seconds. Also known as root distance."
::= {ntpSystem 4}

ntpSysRootDispersion OBJECT-TYPE
SYNTAXOCTET STRING
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"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."
::= {ntpSystem 5}

ntpSysRefID OBJECT-TYPE
SYNTAX DisplayString (SIZE (1..40))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"NTP Reference Clock Identifier.  This is a
32 bit code identifying the particular reference
clock.  In the case of stratum 0 (unspecified) or
stratum 1 (primary reference), this is a four-
octet, left-justified, zero-padded ASCII string.
While not enumerated as part of the NTP spec, the
following are suggested ASCII identifiers:
================================================
DCN         DCN routing protocol
NIST        NIST public modem
TSP         TSP time protocol
DTS         Digital Time Service
ATOM          Atomic clock (calibrated)
VLF         VLF radio (OMEGA,etc.)
callsign    Generic radio
LORC          LORAN-C radionavigation
GOES          GOES UHF environment satellite
GPS         GPS UHF satellite positioning
================================================
The following ref ids are used by the SyncServer:
================================================
GPS         GPS satellite)
IRIG        IRIG B timecode
PPS         Ext. 1PPS input
E10M      Ext. 10MHz input
FREE          Internal Clock
FLY         Internal Clock after the Hardware
```

```
        Clock reference is lost
====================================================" 
::= {ntpSystem 6}

ntpSysRefTime OBJECT-TYPE
SYNTAX DisplayString (SIZE(1..40))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"NTP Reference Timestamp.  This is the time,
in timestamp format (converted to DisplayString),
when the local clock was last updated.  If the
local clock has never been synchronized, the value
is zero."
::= {ntpSystem 7}

ntpSysPollOBJECT-TYPE
SYNTAXInteger32
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Minimum interval between transmitted messages, in
seconds as a power of two.  For instance, a value
of six indicates a minimum interval of 64 seconds."
::= {ntpSystem 8}

ntpSysPeerOBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Current synchronization source.  In stratum > 1 this
variable returns the decimal representation of the
IPv4 address of its current peer. In stratum = 1 this
variable returns the decimal representation of the
hardware clock which is 2981759."
::= {ntpSystem 9}

ntpSysPhase OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..40))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"System clock offset from the selected source."
::= {ntpSystem 10}

ntpSysFreq OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..40))
MAX-ACCESSread-only
STATUScurrent
```

```
DESCRIPTION
"System clock frequency correction from ntpd."
::= {ntpSystem 11}

ntpSysError OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..40))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Current system error from ntpd."
::= {ntpSystem 12}

ntpSysClock OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..40))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Current system time from ntpd. This is usually
derived from the hardware clock but could be
from any other ntp source."
::= {ntpSystem 13}

ntpSysSystem OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..80))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Description of the current system."
::= {ntpSystem 14}
ntpSysProcessor OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..40))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Type of local processor."
::= {ntpSystem 15}
ntpSysNotrust OBJECT-TYPE
SYNTAX INTEGER (0..1)
ACCESS read-only
STATUS mandatory
DESCRIPTION
"Force authentication."
::= {ntpSystem 16}

ntpSysPktsReceived OBJECT-TYPE
SYNTAX INTEGER (0..32768)
ACCESS read-only
STATUS mandatory
DESCRIPTION
"This variable is a rollover counter which reflects
```

```
the number of ntp packets received by the SyncServer.
It is valid for all versions of the SyncServer."
::= {ntpSystem 17}

ntpSysMode OBJECT-TYPE
SYNTAX INTEGER {
unspecified (0),
symactive (1),
sympassive (2),
client (3),
server (4),
broadcast (5),
reservedctl (6),
reservedpriv (7)}
ACCESS read-only
STATUS mandatory
DESCRIPTION
"An integer indicating the NTP association mode
and are coded as follows:
==============================================
0     unspecified
1     symmetric active
2     symmetric passive
3     client
4     server
5     broadcast
6     reserved for NTP control messages
7     reserved for private use
=============================================="
::= {ntpSystem 18}

ntpSysVersion OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..80))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION"The version of the NTP daemon on the system."
::= {ntpSystem 19}
tymingStatus OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..80))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Indicates what status the Hardware Clock considers
itself to be as a timing source defined as follows:
 ==============================================
Good    HW Clock has a valid time reference.
Bad     HW Clock has no valid time reference.
 =============================================="
::= {tyming 1}
```

```
tymingSource OBJECT-TYPE
SYNTAX DisplayString (SIZE(1..40))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The time or frequency source currently in use
by the Hardware Clock defined as follows:
  ===============================================
0     None
  1     GPS
  8     IRIG
 16     External 1PPS
 24     External 10MHz
 31     Freerun
================================================"
::= {tyming 2}

tymingTime OBJECT-TYPE
SYNTAX DisplayString (SIZE(1..40))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The time according to the Hardware Clock in
the format of:

WWW MMM dd hh:mm:ss yyyy

defined as follows:
    ===============================================
   WWW          weekday
   MMM          character month
   dd           day of month
   hh:mm:ss     time
   yyyy         year

 Example      Thu Sep 21 23:46:09 2006
================================================"
::= {tyming 3}

tymingVersion OBJECT-TYPE
SYNTAX DisplayString (SIZE(1..40))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The version of the software on the SyncServer's
Hardware Clock."
::= {tyming 4}

tymingFlyPeriod OBJECT-TYPE
SYNTAX INTEGER
```

```
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This variable is not currently used and returns zero."
::= {tyming 5}

gpsPosition OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..80))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Returns the current position in the format of:

  A BB CC DD EEE F GGG HH II JJJ KK
defined as follows:
   ==================================================
A       sign of the latitude
        (1 = North, -1 = South)
 BB       degrees of the latitude
 CC       minutes of the latitude
 DD       seconds of the latitude
 EEE       milliseconds of the latitude
 F        sign of the longitude
        (1 = East, -1 = West)
 GGG       degrees of the longitude
 HH       minutes of the longitude
 II       seconds of the longitude
 JJJ      milliseconds of the longitude
 KK       altitude in meters
=================================================="
::= {gps 1}

gpsUTCOffset OBJECT-TYPE
SYNTAXINTEGER (0..127)
MAX-ACCESSread-only
STATUScurrent
     DESCRIPTION
"This variable is reserved for future use."
::= {gps 2}

gpsHealth OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..80))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"This is the GPS' receiver health status defined as
follows:
========================================================
 0 = Receiver Down      The Hardware Clock can't
                communicate with the receiver.
```

```
1 = Unknown Mode       An undefined mode of the GPS
            receiver.

 2 = Acquiring Signal   The receiver is attempting to
            track a GPS signal.

 3 = Bad Geometry       The geometry of the tracked
            satellites is unsatisfactory for
            a position solution.

4 = Propagate Mode      A position estimation mode used
            in highly dynamic environments.

5 = 2d Solution        The receiver is able to perform
            position fixes for latitude and
            longitude but does not have
            enough satellites for altitude.

 6 = 3d Solution        The receiver is now able to
            perform position fixes for
            latitude, longitude and altitude.

 7 = Position Hold      Position fixes are no longer
            attempted, and the user entered
            or surveyed position is used.

 8 = Time Valid         The receiver has valid timing
            information from GPS satellites
            (including current leap second
            information).  This is the final
            state for all configured GPS modes.
======================================================"
::= {gps 3}

gpsSatlist OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..128))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Displays the GPS satellite tracking information in the
format of:

N,X1,Y1,Z1,...,XN,YN,ZN

defined as follows:
======================================================
N      Number of satellites. If one or more satellites
     are available, Xi,Yi,Zi follows N.
```

```
Xi    Satellite vehicle number.

Yi    Satellite signal strength in dBW where less
     than -200 dBW means no signal.

Zi    Zi can be either T or C. T(racking) means the
     SyncServer receives the information from the
     satellite but the information is not used in its
     timing solution. C(urrent) means the SyncServer
     currently uses satellite information in its
     timing solution.
Examples

 For no satellites:
 0

For one satellite with vehicle number 16:
 1,16,C,-158

For six satellites:
 6,12,C,-156,14,C,-155,8,T,-162,24,C,-158,18,C,161,6,C,-160
============================================================"
::= {gps 4}

gpsMode OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..80))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"The mode of the GPS receiver defined as follows:
============================================================
 Receiver Mode: Survey.

The receiver is surveying and averaging its position.
When it has finished surveying, the receiver switches
to Position Hold mode. Survey mode and Position Hold
mode are appropriate for static applications, such as a
typical server room environment. This is the default mode
when the SyncServer starts.

Receiver Mode: Dynamic.

The GPS receiver surveys continuously to determine its
position and doesn't switch to another mode. This mode
must be initiated by a user, and is appropriate for mobile
applications such as ships, land vehicles, and aircraft.
The degree of accuracy this mode offers is fine for NTP
time over networks, but is less than optimal for the IRIG-B,
1PPS, 10MHz outputs available on some SyncServer models.
```

```
Receiver Mode: Hold.

The GPS receiver has completed Survey mode and switched to
this mode, or the user has manually entered a position and
forced it into this mode. The accuracy and stability of the
SyncServer's timing outputs are optimal when the receiver
has its exact position and is in this mode.
========================================================="
::= {gps 5}

etcVersion OBJECT-TYPE
SYNTAX DisplayString (SIZE(1..80))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Version info for SyncServer system."
::= {etc 1}

etcSerialNbr OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..40))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Unique serial number factory programmed into each unit."
::= {etc 2}

etcModel OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..40))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Model type factory programmed into each unit."
::= {etc 3}

etcUpgrade OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..1024))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Describes whether or not an upgrade is available from
the upgrade server described as follows:
=========================================================
0     No upgrade is available.
1     An upgrade is available.
========================================================="
::= {etc 4}

etcUpgradeServer OBJECT-TYPE
SYNTAXDisplayString (SIZE(1..1024))
MAX-ACCESSread-only
```

```
STATUScurrent
DESCRIPTION
"Address of the server where new upgrades can be
downloaded."
::= {etc 5}

etcAlarmString OBJECT-TYPE
SYNTAXDisplayString (SIZE(0..1024))
MAX-ACCESSread-only
STATUScurrent
DESCRIPTION
"Defines the format for the system alarm traps.  This is
only valid embedded in a trap message."
::= {etc 6}

etcAlarm TRAP-TYPE
ENTERPRISEsymmetricom
VARIABLES{etcAlarmString}
DESCRIPTION
"The trap provides notification of Hardware Clock, NTP,
system, and network alarms events.  The user can configure
which alarms send traps on the ADMIN - Alarms page."
::= 0

END
```

Glossary

Command Line

The command line is a text-based user interface available on most operating systems. For example, on Microsoft Windows, open the **Start** menu, select **Run**, and enter **cmd**.

The SyncServer has a very limited command line interface, available from the RS-232 console port located on the front panel, and also by opening a TELNET session to the LAN 1 network port (TELNET must be enabled on the SERVICES - . Consult the ***Command Line Interface*** (on page 71) for more detail.

GPS

Introduction

The Global Positioning System (GPS) is a worldwide radio-navigation system formed from a constellation of at least 24 satellites that continuously orbit the earth. Most GPS satellites have several atomic clocks that are precisely synchronized to UTC from the U.S. Naval Observatory (USNO). Coded signals are broadcast by each of the satellites with the exact time and position of the satellite. All GPS receivers use an antenna to receive these signals. Using a GPS receiver optimized for time (rather than position), it is possible to get extremely precise synchronization with the satellites' atomic clocks.

GPS Time and Date

From Wikipedia: "While most clocks are synchronized to Coordinated Universal Time (UTC), the Atomic clocks on the satellites are set to GPS time. The difference is that GPS time is not corrected to match the rotation of the Earth, so it does not contain leap seconds or other corrections which are periodically added to UTC. GPS time was set to match Coordinated Universal Time (UTC) in 1980, but has since diverged. [...]

The GPS navigation message includes the difference between GPS time and UTC, which as of 2006 is 14 seconds. Receivers subtract this offset from GPS time to calculate UTC and 'local' time. New GPS units may not show the correct UTC time until after receiving the GPS-UTC Offset message. The GPS-UTC offset field can accommodate 255 leap seconds (eight bits) which, at the current rate of change of the Earth's rotation, is sufficient to last until the year 2330.

As opposed to the year, month, and day format of the Julian calendar, the GPS date is expressed as a week number and a day-of-week number. The week number is transmitted as a ten-bit field in the C/A and P(Y) navigation messages, and so it becomes zero again every 1,024 weeks (19.6 years). GPS week zero started at 00:00:00 UTC [...] on January 6, 1980 and the week number became zero again for the first time at 23:59:47 UTC on August 21, 1999 [...]. To determine the current Gregorian date, a GPS receiver must be provided with the approximate date (to within 3,584 days) to correctly translate the GPS date signal. To address this concern the modernized GPS navigation messages use a 13-bit field, which only repeats every 8,192 weeks (157 years), and will not return to zero until near the year 2137."

Hardware Clock

The Hardware Clock manages the Input References:

- Gets the time from the highest priority reference that is available.
- Applies the UTC offset if the reference is GPS.
- Passes the time to the NTP daemon.

The NTP daemon includes a preferred server association for the Hardware Clock that cannot be edited or removed.

Also see TIMING - HW Clock, ***NTP - Config*** (on page 42), and ***Input References*** (on page 1).

Leap Indicator

The Leap Indicator (LI) is a two-bit binary number in the NTP packet header that provides the following information:

- 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. The settings on the ***NTP - Prefs*** (on page 46) page affect LI behavior.

LI	Value	Meaning
00	0	No warning.
01	1	Leap second insertion: Last minute of the day has 61 seconds.
10	2	Leap second deletion: Last minute of the day has 59 seconds.
11	3	Alarm condition (Not synchronized)

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.

NTP Associations

An NTP association is a configured relationship between the SyncServer's NTP daemon and another NTP node. The *Role* of the association determines the behavior between the NTP daemon and NTP node. The most common type of association (*Role*) is *Server*, which means the NTP node operates as a server to the SyncServer's NTP daemon.

The Hardware Clock (on all models) and the Modem (on the S100) are NTP nodes that exist within the SyncServer. All other NTP nodes exist on the network and can only be reached through the network interfaces on the SyncServer.

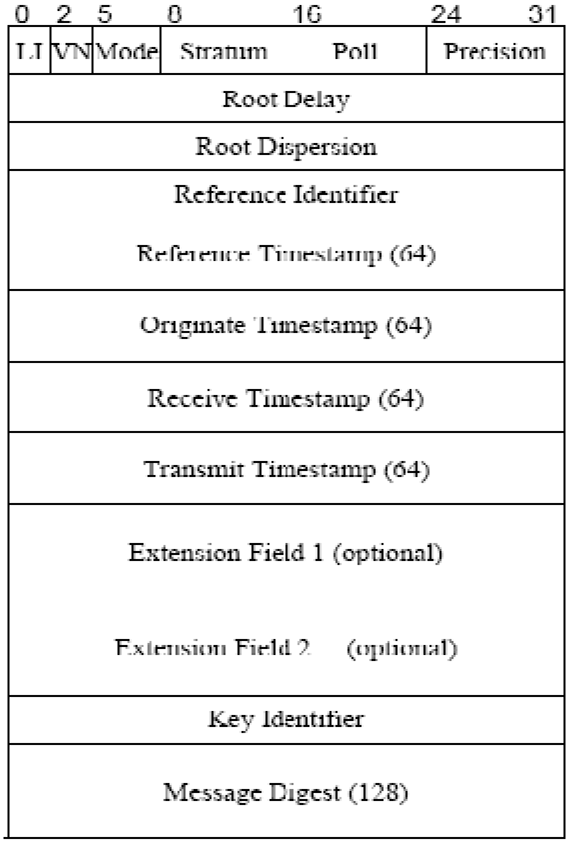
NTP Daemon

The Network Time Protocol (NTP) Daemon (a.k.a. "ntpd") listens for and responds to requests from NTP clients. It also sends NTP requests to each of the NTP Associations and qualifies each one. It synchronizes with the best NTP association and makes that time available to the clients.

See the ***NTP - Config*** (on page 42) topics for more information.

NTP Packet

The NTP packet, represented using big-endian 32-bit rows, appears as follows:



0	2	5	8	16	24 31
LI	VN	Mode	Stratum	Poll	Precision
Root Delay					
Root Dispersion					
Reference Identifier Reference Timestamp (64)					
Originate Timestamp (64)					
Receive Timestamp (64)					
Transmit Timestamp (64)					
Extension Field 1 (optional) Extension Field 2 (optional)					
Key Identifier					
Message Digest (128)					

Autokey uses the optional Extension Fields 1 and 2, which are not described below.

Autokey and Symmetric Key Authentication both use the Key Identifier and Message Digest fields.

Leap Indicator (LI)

The Leap Indicator (LI) is a two-bit binary number in the NTP packet header that provides the following information:

- 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. The settings on the ***NTP - Prefs*** (on page 46) page affect LI behavior.

LI	Value	Meaning
00	0	No warning.
01	1	Leap second insertion: Last minute of the day has 61 seconds.
10	2	Leap second deletion: Last minute of the day has 59 seconds.
11	3	Alarm condition (Not synchronized)

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.

Version Number (VN)

This is a three-bit integer representing the NTP version number, currently 4.

Mode

This is a three-bit integer representing the mode, with values defined as follows:

Mode	Description
0	Reserved
1	Symmetric active
2	Symmetric passive
3	Client
4	Server
5	Broadcast
6	NTP control message
7	Reserved for private use

Stratum

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:

Stratum	Definition
0	Hardware Clock when locked.
1	Primary server
2-15	Secondary server
16-255	Unsynchronized, unreachable.

For example, the SyncServer is:

- 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.

The settings on the ***NTP - Prefs*** (on page 46) page affect stratum behavior.

Poll Exponent

This is an eight-bit signed integer representing the maximum interval between successive messages, in seconds, to the nearest power of 2. The values can range from 4, indicating a poll interval of 16 seconds, to 17, indicating a poll interval of 131,072 seconds (~36.4 hours).

Precision

This is an eight-bit signed integer representing the precision of the system clock, in seconds, to the nearest power of 2. For instance, a value of −18 corresponds to a precision of about one µs. The precision is normally measured by NTP at startup and is defined as the minimum of several iterations of the time to read the system clock.

Root Delay

This is a 32-bit unsigned fixed-point number indicating the total roundtrip delay to the reference clock, in seconds, with the radix point between bits 15 and 16. This value is always positive.

Root Dispersion

This is a 32-bit unsigned fixed-point number indicating the maximum error relative to the reference clock, in seconds, with the radix point between bits 15 and 16. This value is always positive.

Reference Identifier

This is a 32-bit code identifying the particular server or reference clock. The interpretation depends on the value in the stratum field. For stratum 1 (reference clock) this is a four-octet, left-justified, zero-padded ASCII string assigned to the radio clock. The following have been used as ASCII identifiers:

GOESGeosynchronous Orbit Environment Satellite

GPSGlobal Positioning System

PPSGeneric pulse-per-second

IRIGInter-Range Instrumentation Group

WWVBLF Radio WWVB, Ft. Collins, CO, 60 kHz

DCF7LF Radio DCF77, Mainflingen, DE, 77.5 kHz

MSFLF Radio MSF, Rugby, UK, 60 kHz

JJYLF Radio JJY, Fukushima, JP, 40 kHz,

JJYLF Radio JJY, Saga, JP, 60 kHz

WWVHF Radio WWV, Ft. Collins, CO

WWVHHF Radio WWVH, Kaui, HI

NISTNational Institute of Standards and Technology telephone modem

PTBPhysikalisch-Technische Bundesanstalt telephone modem

For strata 2-15 secondary servers, this is the reference identifier of the system peer. If the system peer is using the IPv4 address family, the identifier is the four-octet IPv4 address. If the system peer is using the IPv6 address family, it is the first four octets of the MD5 hash of the IPv6 address.

Reference Timestamp

Time when the system clock was last set or corrected, in 64-bit NTP timestamp format. NTP timestamps are represented as a 64-bit unsigned fixed-point number, in seconds relative to 0h on 1 January 1900. The integer part is in the first 32 bits and the fraction part in the last 32 bits. In the fraction part, the non-significant low order bits are not specified and ordinarily set to 0.

Originate Timestamp

Time at the client when the request departed for the server, in 64-bit NTP timestamp format.

Receive Timestamp

Time at the server when the request arrived from the client, in 64-bit NTP timestamp format.

Transmit Timestamp

Time at the server when the response left for the client, in 64-bit NTP timestamp format.

Key Identifier

This is a 32-bit unsigned integer used by the client and server to designate a secret 128-bit MD5 key. Together, the Key Identifier and Digest fields collectively are called message authentication code (MAC).

Message Digest

This is a 128-bit string computed by the keyed MD5 message digest algorithm. Together, the Key Identifier and Digest fields collectively are called message authentication code (MAC).

PING

PING is a utility for testing network connectivity to a particular IP address or URL. The user typically sends a ping request by entering "ping" followed by the IP address or URL of the device to be reached. If the device is unreachable, the response is typically "request timed out." If the device was reachable, the response is "reply from..." followed by various ping statistics. The ping utility is available on the SyncServer's **NETWORK - Ping** page, and from the command line on most operating systems. For more information, search the Internet for "PING Man Page".

Stratum

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:

Stratum	Definition
0	Hardware Clock when locked.
1	Primary server
2-15	Secondary server
16-255	Unsynchronized, unreachable.

For example, the SyncServer is:

- 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.

The settings on the ***NTP - Prefs*** (on page 46) page affect stratum behavior.

Synchronizing NTP association

Synchronizing NTP associations are associations capable of providing time to the NTP daemon. On the SyncServer, these are associations whose *Role* is server, peer, broadcastclient, and multicastclient.

UTC

From Wikipedia: "**Coordinated Universal Time** (UTC) is a high-precision atomic time standard. UTC has uniform seconds defined by International Atomic Time (TAI), with leap seconds announced at irregular intervals to compensate for the earth's slowing rotation and other discrepancies. Leap seconds allow UTC to closely track Universal Time (UT), a time standard based not on the uniform passage of seconds, but on Earth's angular rotation."

Operational Configuration

A common configuration of the SyncServer needed for operation under a range of typical conditions. This is a concept rather than a specific configuration.

Index

This page intentionally left blank