SyncServer S300, S350, S350i

User Guide

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Revision History

Revision	Date	Description
B	August 2007	made corrections, moved and consolidated topics.
C	October 2010	Added VDC Power and Telecommunications topics.
D	August 2011	Added models 1520R-350i and 1520R-350i-RB.
D1	March 2013	Added TACACS+ user authentication, and support for extended character set in Radius and TACACS+ login.
E		Not released.
F	November 2013	Added IPv6 content.
F1	May 2015	Changed description of downloads for software updates.

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- Worldwide Main Number: 1-408-428-7907
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S300, S350 and S350i Quick Start Guide

In this section

This topic guides the user on how to:

- Configure a SyncServer that still has its original factory configuration.
- Read the status LEDs on the front panel.
- Shut the SyncServer down correctly.

For more information about the features and tasks described here, consult the following sections in the main User Guide:

- ***Web Interface*** (on page 21)
- ***Keypad/Display Interface*** (on page 101)
- ***Specifications*** (on page 111)
- ***Tasks*** (on page 135)

For your convenience, cross references in this Quick Start Guide provide the page numbers of topics in the main User Guide.

Configuring the SyncServer

Recommended Tasks

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

1. 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 140) and ***WARNING: GPS Antenna*** (on page 132).
    a. **Note:** For the **SyncServer 350i**, which doesn't have a GPS receiver, connect an IRIG signal to the **IRIG In** connector on the rear panel and skip references to GPS and antennas in the rest of this procedure.
2. On the rear panel:
    - Connect the GPS antenna cable (supplied) to the **GPS Ant** connector.
    - Connect **LAN1** and any of the other network ports to the network.

    - Consult ***Warnings and Cautions*** (on page 131) for safety information regarding grounding and power.
    - Connect the power and turn the power switch on.
3. Using the front panel keypad:
    - Configure **LAN1** with a static IP address using the **MENU** button and **1) LAN1**.
    - View the **LAN1** IP address by pressing the **STATUS** button repeatedly until the **LAN1 STATUS** screen is shown.
4. Go to the SyncServer **Login** page by entering the LAN1 IP address as the URL in Internet Explorer.
5. Log in. The user name is "admin". The password is "symmetricom".
6. Configure the SyncServer using **WIZARDS - 1st Setup**. Select the following options:
    - "Configure Password Recovery" (Ask the IT department for the IP address of the SMTP server).
    - "Send test mail when finished"
    - "Set Local Time Zone"
7. Configure the remaining network ports using **NETWORK - Ethernet**.
    - Assign static IP addresses.
    - Protect LAN1 and the other ports from unauthorized IP addresses or address ranges using the **Allowed Access** feature.
8. Configure the NTP clients on your network with the IP address(es) of the SyncServer's network ports.

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

Optional Tasks

In the web interface:

- Connect any other Input References to the rear panel and configure them using the pages under the **REFERENCES** section.
- Use the **NTP – Config** page to synchronize the SyncServer with any other NTP servers.
- Use **WIZARDS - SNMP** to set up alarm notification by SNMP.
- Use **SERVICES - Email** to set up alarm notification by email.
- 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.

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[1]. NTP Stratum 1.	Power off.
Network	Link failure on the LAN1.	Link failure on the LAN2, LAN3, or LANGBE.	All configured ports 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 202).

Halting the SyncServer

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

Using the keypad/display interface:

1. Press the **MENU** button.
2. Select **3) Sys Control**.
3. Select **2) Shutdown**.
4. Press the **ENTER** button.
5. When the display shows "System Stopped - OK to Turn Power Off Now!" turn the power off.

Or, 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.

[1] The SyncServer S350i does not include a modem.

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Product Overview

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

- NTP
- PTP Grand Master (option)
- SNTP
- Time (TCP and UDP versions)
- Daytime (TCP and UDP versions)
- Sysplex Output (dedicated port)

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
- Gigabit Ethernet port plus 3 additional Independent 10BASE-T/100BASE-TX Ports
- Internal Dial-up Modem* for Time Reference Redundancy
- Independent Time References: GPS, Timecodes, 1PPS, 10MHz
- Versatile Timing Outputs: IRIG A/B/E/G/NASA36/XR3/2137 AM or DCLS, 1PPS, 10MHz, Sysplex
- Stratum 2 Operation via NTP Servers
- RADIUS, NTPv4 Autokey, MD5 Authentication
- TACACS+ Authentication
- Secure Web-Based Management
- SSH, SSL, SCP, SNMP, Custom MIB, HTTPS, Telnet, and More
- IPv6 and IPv4 Compatible
- Nanosecond Time Accuracy to UTC
- Alarm Relays
- Rubidium & OCXO Oscillator Upgrades
- Upgrade to Radio Broadcast Time Sync
- IEEE 1588 / PTP Grandmaster Option
- Time Interval Measurement Option

* Note, the S350i SyncServer does not feature a GPS receiver, or modem.

Key Benefits

- Synchronize Hundreds of Thousands of Client, Server & Workstation Clocks
- Very Reliable and Secure Source of Time for Your Network
- Multiple NTP Ports for Easy Network Configuration and Adaptation
- Extremely Accurate Time Source for Network Synchronization

- Enhanced Network & Security Features
- User Prioritized Reference Selection between, GPS, Timecode, 1PPS and 10MHz
- 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	**S200**	**S300**	**S250**	**S35-0**
	NTP Server (v2, v3, v4)	Y	**Y**	Y	**Y**
	NTP Broadcast Server/Client	Y	**Y**	Y	**Y**
	NTP Peering/Client	Y	**Y**	Y	**Y**
	NTP Multicast Server/Client	Y	**Y**	Y	**Y**
	IEEE 1588 PTP Grandmaster (optional)		**Y**		**Y**
	SNTP, Time, Daytime	Y	**Y**	Y	**Y**
	NTP performance, requests/second	3200	**7000**	3200	**7000**

Time References (inputs)	**SyncServer Model Comparison**	**Enterprise Class**		**Advanced Timing**	
	Feature	**S200**	**S300**	**S250**	**S350**
	GPS (12 channel)	Y	**Y**	Y*	**Y***
	NTP Peering	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**
	Time Interval Measurement & Charting (S350 PTP Option)				**Y**
	Reference priority, user configurable				**Y**

* The S250i and 350i models use a timecode input instead of GPS as their primary Input Reference.

** The SyncServer S350i does not include a low frequency radio, or modem.

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

User Interface	SyncServer Model Comparison	Enterprise Class		Advanced Timing	
	Feature	S200	S300	S250	S350
	Web Interface	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**
	USB	Y	**Y**	Y	**Y**
	RS-232 Console Port	Y	**Y**	Y	**Y**
	Alarm relays		**Y**		**Y**
	Keypad lockout		**Y**		**Y**

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

Timing Outputs	SyncServer Model Comparison	Enterprise Class		Advanced Timing	
	Feature	S200	S300	S250	S35-0
	Timing accuracy +/-50 ns	Y	**Y**	Y	**Y**
	Sysplex output (dedicated port)	Y	**Y**	Y	**Y**

Timing Outputs	SyncServer Model Comparison	Enterprise Class		Advanced Timing	
	Feature	S200	S300	S250	S350
	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**

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

* The 350i model uses a timecode input instead of GPS as its primary Input Reference.

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 Sync Server'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** or **WIZARDS - 1st Setup** pages.

Use the **ADMIN - Web** (on page 82) page to configure the status information on the **Login** page.

Also see ***Logging in to the Web Interface*** (on page 149) and ***Recovering a Password*** (on page 164).

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 each of the SyncServer's network ports:

- The name of the **Port**.
- The following **Address** information for each 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 LAN1 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, password recovery, and email notification of alarms.

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 61) and ***TIMING - Holdover*** (on page 63).

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 61) 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** (note, the 350i SyncServer does not have a GPS receiver)
- **Timecode Input Status**
- **1PPS Input Status**
- **10MHz Input Status**
- **LFR Input Status**

* The SyncServer S350i does not have a GPS receiver.

Leap Warning: The state of the ***Leap Indicator*** (on page 197) as reported by the current input reference.

STATUS - GPS

GPS Receiver Operation[1]

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.

[1] The SyncServer S350i does not include a GPS receiver.

- 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 198). 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 196).

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 50) 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 50) 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[1], 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.

[1] The SyncServer S350i does not include a GPS receiver.

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 - PTP

This page will only appear if the IEEE-1588 2008 PTP option has been activated.

See "How to Activate the PTP Option" on page 53

From this page, the status of a list of PTP system parameters of the PTP Daemon can be viewed.

See "PTP - Master" on page 54

PTP Daemon Status

Field	Example of Field Value
Clock ID	00:a0:69:ff:fe:01:6e:8d
PTP Slaves Tracked	"0"
PTP Version	"2"
Clock Class	"6" (Synchronized)
Clock Accuracy	"21" (Within 100 ns)
Time Source	"20" (GPS)[1]
Current UTC Offset	"34 sec"
UTC Valid	True or False
Leap 59	True or False
Leap 61	True or False
Time Traceable	True or False
Frequency Traceable	True or False
Transport Protocol	The choices for the Transport Protocol are:

[1] The SyncServer S350i does not include a GPS receiver.

Field	Example of Field Value
	• IPv4/UDP – this is Default • 802.3
Sync Interval	"1 pkt/1 sec"
Delay Mechanism	"E2E"
ITT	"1"
E2E Delay Interval	"1 pkt/1 sec"
P2P Delay Interval	"1 pkt/1 sec"
Priority 1	"128"
Priority 2	"128"
Domain Number	"0"
Announce Transmit Interval	"2 sec"
Announce Timeout Multiplier	"3"

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
- B (Letter "B"): Configured for bonding with another port in a redundant pair.

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 LAN1 port. The specified DNS servers must be reachable from the LAN1 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 LAN1 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 LAN1 port, use the **STATUS** button on the front panel 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.

Redundant: Bonds LAN3 to LAN2 as virtual device with a single network address.

- **Active**: The Active port handles network traffic. LAN2 is "Active" by default.
- **Backup**: The Backup port handles network traffic if the connection to the Active port fails. LAN3 is the "Backup" port by default.

If the connection to LAN2 fails, LAN2 becomes backup and LAN3 becomes active. After repairing the connection, the user can manually reconfigure LAN2 as the **Active** port:

1. In the "LAN2 Configuration" window, select the "Redundant" checkbox, select "Active", and then click the **APPLY** button.
2. On the **NETWORK - Ethernet** page, click the **APPLY** button.

To release a redundant bond, deselect the "Redundant" checkbox and apply the changes. If the bond doesn't release, reboot the SyncServer.

Allowed Access: Restricts the LAN port to access by specified IP addresses or address ranges. If the user leaves this field blank, the LAN 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 Inter-domain 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 any of the SyncServer ports. Speed and duplex settings on a network port are 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 one of the SyncServer's network ports. 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 38
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.

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 198). 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 196).

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 50) 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 50) 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[1], 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

[1] The SyncServer S350i does not include a GPS receiver.

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 197) 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[1]. 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

[1] The SyncServer S350i does not include a GPS receiver.

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.

Note: The SyncServer S350i does not include either a modem or GPS receiver.

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 160).
  - 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 160).
  - 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 160).

- 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 LAN1. The user can override this by selecting a specific network port. If so, the address must be specified using an IP address instead of a DNS name. The *Port* setting is only available for *Server*, *Peer*, *Broadcast*, and *Multicast* associations.

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.

Note: MD5 and Autokey cannot be used on the SyncServer concurrently. Configuring one method erases the keys or certificates of the other.

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 161).

Note: MD5 and Autokey cannot be used on the SyncServer concurrently. Configuring one method erases the keys or certificates of the other.

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 - Autokey

Use this page to:

- Enable autokey authentication.
- Generate and download autokey keyfiles and certificates.
- Create peer, broadcast, and multicast associations that are configured for autokey.

Also see ***Using NTP Authentication*** (on page 160).

Note: MD5 and Autokey cannot be used on the SyncServer concurrently. Configuring one method erases the keys or certificates of the other.

Configuration of SyncServer as Autokey Server

Key Generation/Deletion

Identity Scheme: Select the scheme to be used on the SyncServer and the client.

- **PC**: Private Certificate
- **IFF**: Identification Friend or Foe
- **GQ**: Guillow-Quisquate

Note: The PC scheme does not have a group key file. The user installs the IFF and GQ group key file on the Autokey client.

Server Password: Enter an alphanumeric string to serve as an autokey password. Cryptographically, a string of random ASCII characters would be the strongest password. This is equivalent to the "crypto pw <server-password>" line in ntp.conf on a generic NTP device.

Client Password: When the IFF Identity Scheme is selected, enter a client password to be used by all of the Autokey clients associated with this server. When configuring the Autokey client, the user enters the client password on the **NTP - Autokey Client** page.

Use the **GENERATE** button to create the key file and/or certificate file. After the keys and/or certificates have been generated, **Auto** (autokey) becomes available in the **MD5 Keys** menu on the **NTP - Config** page. Use this field to apply autokey authentication to NTP associations.

Use the **DELETE** button to clear previous keys and certificates. This is a required step before generating new ones.

Key File Download

After using the **GENERATE** button, select the individual key or certificate files and click **SAVE AS** to download them to a secure location.

For the PC scheme, save both the server host key and certificate files to a secure location and install them on the Autokey clients. For the IFF and GQ schemes, save the group key file to a secure location and install it on the Autokey clients.

After downloading the keys, click the **RESTART** button *to make the key(s) active* on the NTP server.

Note: NTP Autokeys are not active until the user clicks RESTART.

Also see: ***Using Autokey*** (on page 163)

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.

See RESTART Button on page 49

NTP - Autokey Client

Use this page to manage (add or remove) Autokey keys for NTP associations where the SyncServer is an NTP client.

Note: MD5 and Autokey cannot be used on the SyncServer concurrently. Configuring one method erases the keys or certificates of the other.

Configuration of SyncServer as Autokey Client

Removal of Existing Client Relationship

To remove keys, select the checkbox of the key(s), and click the **DELETE** button. Existing keys are identified by their **Scheme** and **Filename**. Click **RESTART** to complete the removal process. Upon completing the removal process, the SyncServer will not be able to authenticate NTP packets from NTP servers that use those keys.

NTP Autokeys are not fully removed until the user clicks **RESTART**.

Addition of New Client Relationship

To add keys, use the following fields as described.

Select the **Identity Scheme** of the key.

- For PC and GQ identity schemes, enter the **Server Password**, the same password used while generating the keys or certificates on the Autokey server (using the **NTP - Autokey** page).
- For the PC scheme, use **BROWSE** to locate the **Server Host Key File** and **Server Certificate File** at a secure location. For IFF and GQ, use **BROWSE** to locate the group key file from a secure location.

Enter the **Server Password**, if needed.

Use **INSTALL** to upload the key and/or certificate files to the SyncServer.

After uploading the keys, click the **RESTART** button *to make the key(s) active* on the SyncServer.

Upon making the added keys active, the SyncServer will be able to authenticate NTP packets from NTP servers that use those keys.

Newly added NTP Autokeys are not active until the user clicks **RESTART**.

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.

Note: The SyncServer S350i does not include a GPS receiver.

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 61), ***TIMING - Holdover*** (on page 63), ***Leap Indicator*** (on page 197), and ***Stratum*** (on page 202).

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.

PTP Option and Time Interval Test

The precision time protocol (PTP) option allows the user to configure the S300 Series SyncServer into a IEEE 1588-2008 Grandmaster. This hardware based PTP option is only supported on **LAN2** of the S300 and S350 SyncServers. The Time Interval Measurement is included as part of the PTP option on the S350 only.

When the **PTP** option is not activated on a S300/S350 SyncServer, the PTP button (fourth from top) of the web interface will be grayed out. If PTP was not factory installed, See "How to Activate the PTP Option" on page 53.

Once the **PTP** option is activated on a S300/S350 SyncServer, the PTP button on the web interface will become active. In addition to the PTP option button, upon activation, several other web pages will become available. Four pages associated with the PTP button will enable you to:

- Set up PTP configuration parameters See "PTP - Master" on page 54
- Save and restore PTP configuration parameters See "PTP - Save-Restore" on page 60
- Monitor slave activity See "PTP - Slaves" on page 58
- Collect measurement data and view PTP performance over the network by running charts. See "PTP - Performance" on page 59

In addition to the pages associated with the PTP button, the following pages will allow further monitoring and control of the PTP option:

- The status of the PTP Daemon can be monitored at **STATUS > PTP** See "STATUS - PTP" on page 31

- In addition to existing alarms, alarms relevant to PTP are trapped at **Admin > Alarms** See " ADMIN - Alarms" on page 85
- PTP settings for Daemon current state and startup can be found at **Services > Startup** See " SERVICES - Startup" on page 95

Time Interval Test

The Time Interval Test feature is provided along with the PTP option in the S350.

Details of the Time Interval Test feature can be seen at **TIMING > Time Interval**

See "TIMING -Time Interval" on page 67

PTP and NTP Performance

The PTP daemon has the highest priority. When the PTP daemon is on it will adversely affect the number of NTP requests the SyncServer can process.

- With PTP turned on, the amount of NTP packets the SyncServer can handle is reduced to half or greater, depending on amount of PTP traffic.
- PTP Message Capacity is 4000 delay_requests per second.
- NTP vs PTP Capacity: PTP is a higher priority than NTP.

PTP delay_request messages/second	NTP Requests/second
10	3500
3000	2000
4000	1100

- The PTP daemon can process up to 6000 delay_reqests per second. However, any amount over 4000 results in Web UI being unresponsive.
- If the PTP Slave NIC rate is1000BASE-T, this will result a delay of 3 micro-seconds at the slave. It is important to note that the LAN2 port only works as 100BASE-TX, a slave that operates at a 1000BASE-T will have an issue, this can be resolved by reducing the slaves connection speed to 100BASE-TX. See the user manual for your slave device to determine how this can be done.

PTP Management Messages

Management Message Name	Actions Supported
NULL_MANAGEMENT	GET, COMMAND supported (no op)
CLOCK_DESCRIPTION	GET supported
USER_DESCRIPTION	GET supported
SAVE_IN_NON_VOLATILE_STORAGE	COMMAND supported
RESET_NON_VOLATILE_STORAGE	COMMAND supported
INITIALIZE	COMMAND supported
FAULT_LOG	NOT SUPPORTED

Management Message Name	Actions Supported
FAULT_LOG_RESET	NOT SUPPORTED
DEFAULT_DATA_SET	GET supported
CURRENT_DATA_SET	GET supported
PARENT_DATA_SET	GET supported
TIME_PROPERTIES_DATA_SET	GET supported
PORT_DATA_SET	GET supported
PRIORITY1	GET supported
PRIORITY2	GET supported
DOMAIN	GET supported
SLAVE_ONLY	GET supported
LOG_ANNOUNCE_INTERVAL	GET supported
ANNOUNCE_RECEIPT_TIMEOUT	GET supported
LOG_SYNC_INTERVAL	GET supported
VERSION_NUMBER	GET supported
ENABLE_PORT	COMMAND supported
DISABLE_PORT	COMMAND supported
TIME	GET supported
CLOCK_ACCURACY	GET supported
UTC_PROPERTIES	GET supported
TRACEABILITY_PROPERTIES	GET supported
TIMESCALE_PROPERTIES	GET supported
UNICAST_NEGOTIATION_ENABLE	NOT SUPPORTED
PATH_TRACE_LIST	NOT SUPPORTED
PATH_TRACE_ENABLE	NOT SUPPORTED
GRANDMASTER_CLUSTER_TABLE	NOT SUPPORTED
UNICAST_MASTER_TABLE	NOT SUPPORTED
UNICAST_MASTER_MAX_TABLE_SIZE	NOT SUPPORTED
ACCEPTABLE_MASTER_TABLE	NOT SUPPORTED
ACCEPTABLE_MASTER_TABLE_ENABLED	NOT SUPPORTED
ACCEPTABLE_MASTER_MAX_TABLE_SIZE	NOT SUPPORTED
ALTERNATE_MASTER	NOT SUPPORTED
ALTERNATE_TIME_OFFSET_ENABLE	NOT SUPPORTED
ALTERNATE_TIME_OFFSET_NAME	NOT SUPPORTED
ALTERNATE_TIME_OFFSET_MAX_KEY	NOT SUPPORTED
ALTERNATE_TIME_OFFSET_PROPERTIES	NOT SUPPORTED
DELAY_MECHANISM	GET supported
LOG_MIN_PDELAY_REQ_INTERVAL	GET supported

How to Activate the PTP Option

PTP in the 300 Series SyncServer can be activated at the time of purchase or at a later date. This section describes PTP activation after the SyncServer has left Microsemi.

A PTP option key is required to activate the PTP option in the S300 series SyncServer by following this process:

1. Log into your SyncServer, See " Logging in to the Web Interface" on page 149
2. Identify your SyncServer serial number on the following web page, **SYSTEM > Options**. The SyncServer **Serial Number** is shown on the left, towards the top of this web page.
3. Contact Microsemi sales at www.microsemi.com/sales-contacts/0 to purchase a PTP option key.
4. Enter the PTP option key in the **Option Key** text box of this web page.
5. Click the **Apply** button at the bottom left of the web page to activate the PTP option.
6. Once the SyncServer has accepted the Option Key, the PTP Grand Master option will show up on the right side under "Installed Options."
7. Go to **NETWORK > Ethernet** page and enable **LAN2** interface (preferably Static address).
8. Go to the **SERVICES >Startup** page and make sure the **PTP** daemon is turned on and set to **auto**.
9. Go to the **PTP > Master** page and change the settings as desired.

PTP - Master

Note: PTP is only supported on LAN2 of the 300 Series SyncServer

This page is used to set up parameters associated with the **IEEE-1588 2008 PTP Grandmaster Configuration**.

The following is a list of these configuration parameters:

Transport Protocol

Select from:

- **UDP**
- **802.3**

Sync Interval

The Sync Interval is used to specify the mean time interval between successive Sync messages (the syncInterval) when transmitted as multicast messages.

The configurable range is 2^{-6} to 2^{+6} (2^{-6} to 2^{+6}, is 1 second/64-packets to 64-packets/second).

Default is 2^{0}, which is 1 packet/second

Select from :

- 64pkt/1 sec
- 32 pkt/1 sec
- 16 pkt/1 sec
- 8 pkt/1 sec
- 4 pkt/1 sec
- 2 pkt/1 sec
- 1 pkt/1 sec
- 1 pkt/2 sec
- 1 pkt/4 sec
- 1 pkt/8 sec
- 1 pkt/16 sec
- 1 pkt/32 sec
- 1 pkt/64 sec

Note: The IEEE 1588-2008 requires the delay_request setting to be = or less than the sync interval. Bear this in mind as this Web UI does not enforce this.

Delay Mechanism

The choices for the Delay Mechanism are:

- E2E (End to End)
- P2P (Peer to Peer)

Packet TTL

(Time to live - TTL)

In this text box you can set the number of router hops up to 256 hops.

The TTL range is 1 to 256, if you enter 0 or >256 a message stating that the value of TTL is out of range will appear.

Note: 1588 multicast packets typically operate at a TTL of 1, changing this value may affect the quality of your network timing.

E2E Delay Interval

The end-to-end E2E Delay Interval controls the number of request packets from the slaves connected to this unit. See "Sync Interval" on page 54

When the **E2E** selection is made at the Delay Mechanism (see above), the following selections are available:

- 64pkt/1 sec
- 32 pkt/1 sec
- 16 pkt/1 sec
- 8 pkt/1 sec
- 4 pkt/1 sec

- 2 pkt/1 sec
- 1 pkt/1 sec
- 1 pkt/2 sec
- 1 pkt/4 sec
- 1 pkt/8 sec
- 1 pkt/16 sec
- 1 pkt/32 sec
- 1 pkt/64 sec

P2P Delay Interval

The peer-to-peer P2P Delay Interval controls the number of request packets from the slaves connected to this unit. See "Sync Interval" on page 54

When the **P2P** selection is made at the Delay Mechanism (see above), the following selections are available:

- 64pkt/1 sec
- 32 pkt/1 sec
- 16 pkt/1 sec
- 8 pkt/1 sec
- 4 pkt/1 sec
- 2 pkt/1 sec
- 1 pkt/1 sec
- 1 pkt/2 sec
- 1 pkt/4 sec
- 1 pkt/8 sec
- 1 pkt/16 sec
- 1 pkt/32 sec
- 1 pkt/64 sec

Priority 1

The priority field affects the result of the Best Master Clock Algorithm. The lower number in this field will win the BMC calculation. The initialization value of priority1 is specified in a PTP profile. Choices are:

- 0 – 255
- Default is 128

Priority 2

The priority field affects the result of the Best Master Clock Algorithm. The lower number in this field will win the BMC calculation. The initialization value of priority2 is specified in a PTP profile. Choices are:

- 0 – 255
- Default is 128

Domain Number

A domain consists of one or more PTP devices communicating with each other as defined by the protocol. A domain defines the scope of PTP message communication, state, operations, data sets, and timescale. PTP devices may participate in multiple domains; however, unless otherwise specified in the standard, the operation of the protocol and the timescale in different domains is independent.

The configurable range is 0 – 255

- Default is 0

Mean Announce Message Transmit Interval

This is the Announce Interval specified in IEEE 1588-2008 and is specified as the mean time interval between successive Announce messages.

Selections available:

- 1 sec
- 2 sec
- 4 sec
- 8 sec
- 16 sec
- 32 sec
- 64 sec

- Default is 2 seconds

Announce Receipt Timeout Multiplier

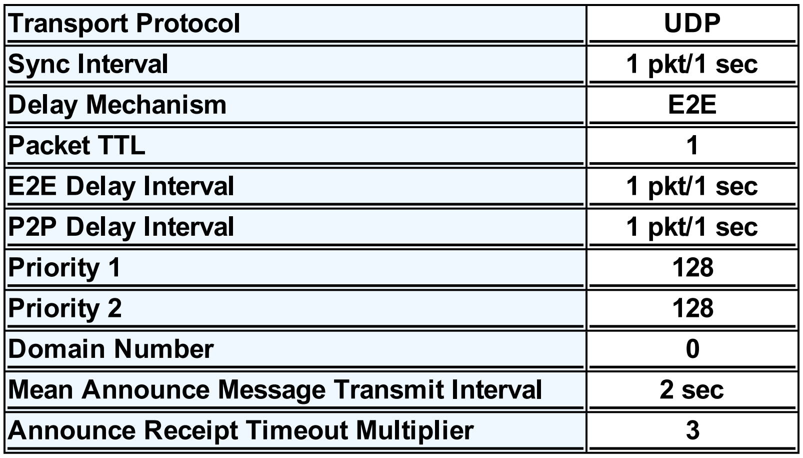
The value of Announce ReceiptTimeout is an integral multiple of the announceInterval (see section 7.7.3.1 of IEEE 1588-2008).

- The configurable range is 2 to 10 (2^2 to 2^{10}).
- Default is 3

Return to IEEE 1588-2008 Annex J Recommended Default Settings check box

If you are not sure what selections to make, click on this button to get the standard settings. Any slave should support theses settings as these settings meet the specification.

IEEE 1588-2008 Annex J Recommended Default Settings



Transport Protocol	UDP
Sync Interval	1 pkt/1 sec
Delay Mechanism	E2E
Packet TTL	1
E2E Delay Interval	1 pkt/1 sec
P2P Delay Interval	1 pkt/1 sec
Priority 1	128
Priority 2	128
Domain Number	0
Mean Announce Message Transmit Interval	2 sec
Announce Receipt Timeout Multiplier	3

PTP - Slaves

This page will show all the slaves associated with this SyncServer, both active and inactive within the last 14 days. It shows when each slave was last accessed. The range of access recording is from within 10 minutes to 14 days.

This page has a text box to log the slaves. The number of slaves tracked is shown below the text box. For each slave, there are three parameters monitored:

- **Address** shows the IP address of the slave (xxx.xxx.xxx.xxx)
- **Last Access** shows the date and time of the last access, (MM-DD-YYYY HH:MM).

- **Activity** shows an activity message in red text if the slave is inactive, or in blue text if the slave is active. An example of an active message would be "Active within the last 10 minutes" in blue text.

Below the text box logging the slaves are three options to clear slaves from the SyncServer monitoring list:

- Remove ALL Slaves
- Remove ALL Slaves Not accessed for 1 Day
- Remove ALL Slaves Not accessed for 7 Days

After making one of these three selections, click the **APPLY** button to activate the selection, or click the **CANCEL** button to abort the process.

Note: Slaves inactive for 14 days will be automatically removed

PTP - Performance

This page will provide insights into SyncServer PTP Grandmaster operations.

It is set up as a running log, in 15 Minute Performance Intervals for up to 4 days. For each logged interval, you can see the start time in 15 minutes increments, showing:

- How many delay requests were generated.
- How many Sync Messages were sent.
- How full is the queue.
    - For example, if the PTP slave activity is increasing, then the PTP packet queues can start filling up. When the number starts to grow from 0%, this is an indication that the SyncServer is processing packets, the network is busy, and requests are sitting in the queue. If the queue percentage reaches 100%, the queue will be flushed.

An example of the PTP Performance Logged in 15 Minute Intervals

	Delay Requests		Sync Messages		Resets	
Interval Start Time	Count	Queue	Count	Queue	Daemon	Queues
09-05-2010 07:15	1372	0%	899	0%	0	0
09-05-2010 07:30	1481	0%	893	0%	0	0
09-05-2010 07:45	1367	0%	897	0%	0	0
09-05-2010 08:00	1355	0%	896	0%	0	0
09-05-2010 08:15	1355	0%	897	0%	0	0
09-05-2010 08:30	1373	0%	896	0%	0	0

Click the **RESET** button to reset the performance log.

Charting PTP Performance

The PTP Performance chart is handy to show how your network traffic is occurring dynamically. For example, the cause of a spike at traffic occurring at a certain time each day could be investigated, improving the network performance.

To Create a Chart

Click the **CHART** button to view a chart of the PTP packet performance. After several seconds, a chart will appear. The chart will show the selected data set. Delay data sets have a red chart line, and sync data sets have a black or blue chart line. Both data sets are drawn against a timeline of the 15 minute intervals.

To view different data sets, click the **Data Set** button. Available selections are:

- E2E Packets
- P2P Packets
- E2E Packet Errors
- P2P Packet Errors
- E2E Queues
- P2P Queues
- Daemon Resets

PTP - Save-Restore

Use this page to Save or Restore PTP Grandmaster Configuration settings.

The current PTP Configuration is displayed, reflecting values set up on the PTP Master web page. An example of settings is:

Transport Protocol	UDP	Priority 1	128
Sync Interval	1 pkt/1 sec	Priority 2	128
Delay Mechanism	E2E	Domain Number	0
Packet TTL	1	Mean Announce Message Transmit Interval	2 sec
E2E Delay Interval	1 pkt/1 sec	Announce Receipt Timeout Multiplier	3
P2P Delay Interval	1 pkt/1 sec		

To Save Configuration Settings to a File

Click the **Save As...** button.

To Restore Configuration Settings from a File

1. Click the **Browse...** button.
2. Navigate to the file that contains the configuration settings to be restored.
3. Click the **UPLOAD** button

TIMING - Time Zone

Local Time Zone

This setting affects:

- The time shown on the SyncServer front panel display when the user presses the **TIME** button. Also see ***TIME Button*** (on page 101).
- The time output by the *IRIG out* connector if the *Output Type* is set to *Local* on the **REFERENCES - Timecode** page. Also see ***REFERENCES - Timecode*** (on page 71).

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]".

note: The SyncServer S350i does not include a GPS receiver.

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 177) and ***Distributing Non-UTC Time*** (on page 180).

Microsemi recommends using the **Auto** setting.

Also see ***Hardware Clock*** (on page 196).

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**.

Note: On the Sysplex Timer output, if the user sets *Forced Timing Source* to *Free Run*, the Sysplex *Flywheel Quality Character* in effect at that moment remains in effect thereafter. Also see ***TIMING - Sysplex*** (on page 64).

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 178).

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[1]. 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 (e.g., GPS, Timecode).
- 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 202).

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.

[1] The SyncServer S350i does not include a GPS receiver.

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 50).
- With the 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.

TIMING - Sysplex

The Sysplex Timer port outputs serial time strings for IBM mainframe Sysplex systems. The Sysplex Timer provides a common time reference across all the members of an IBM Sysplex. The Sysplex Timer is a key component when systems on multiple CPCs share access to the same data.

See ***Sysplex Out*** (on page 116) for specifications and more information on the format of the Sysplex output string.

Sysplex Output Configuration

The **Sysplex Out** port located on the rear panel outputs the time of day once per second.

Autostart:

- *Yes*: The **Sysplex Out** connector automatically outputs the time of day after system startup. The user cannot stop or restart the output by entering the "C" or "R" commands.
- *No*: The user starts or stops the Sysplex output by sending the following characters to the **Sysplex Out** connector:
    - "C" or "c" to start the output.
    - "R" or "r" to stop the output.

Parity: (Odd, None, Even) The parity setting of the Sysplex Out port (should match that of the receiving device).

Flywheel Quality Character:

The user can set the Flywheel Quality Character to:

- " " (space)
- "X"
- "F" (for **F**lywheel Quality Character)

About Sysplex and the Hardware Clock

To achieve the highest levels of precision and accuracy, the Sysplex Timer port gets its time directly from the Hardware Clock. The Hardware Clock synchronizes with the highest priority Input Reference (e.g. GPS[1], Timecode).

With the S300 and S350, if the Input References become unavailable, and Holdover expires, the Hardware Clock synchronizes to the time the NTP daemon gets from other synchronizing NTP associations (if any are present). The default configuration includes three NTP servers on the Internet. If no synchronizing NTP associations are present, the Hardware Clock is unsynchronized and uses the internal oscillator to keep time.

In the S200, S250, and S250i, if the Input References become unavailable, and Holdover expires, the Hardware Clock is unsynchronized and uses the internal oscillator to keep time.

The time quality character at the end of the Sysplex output string reflects the synchronization state of the Hardware Clock. The user can select the time quality character used after holdover expires and the hardware clock is:

- Synchronized to the NTP daemon, or
- Using the internal oscillator to keep time.

This setting is called the *Flywheel Quality Character*.

About the Flywheel Quality Character

The time quality character at the end of the Sysplex output string has three states:

- The first state is "X", time is invalid. The Hardware Clock has not yet synchronized to an Input Reference.
- The second state is " " (space), time is valid. Hardware Clock has synchronized to an Input Reference, or is in Holdover.

[1] The SyncServer S350i does not include a GPS receiver.

- The third state is "F", the Flywheel Quality Character. The Hardware Clock has no Input References and Holdover has expired. (On the SyncServer S300 and S350, if a synchronizing NTP association is present, the Hardware Clock is synchronized to the NTP daemon.)

The time quality character can progress through a number of states:

1. After the user starts the SyncServer, the Sysplex port starts outputting a time string. Initially, the time quality character is "X" (time invalid).
2. When the Hardware Clock locks to an Input Reference, the time quality character becomes " " (time valid).
3. If the Hardware Clock loses all Input References and enters Holdover, the time quality character remains " " (time valid).
4. If Holdover expires, the time quality character becomes the Flywheel Quality Character, determined by the user.
5. If an Input Reference becomes available again, the Hardware Clock synchronizes with it and the time quality character becomes " " (time valid) again.

Usually there is a short delay between the Hardware Clock changing state and the time quality character changing.

Here are some potential guidelines for configuring the Flywheel Quality Character (FQC):

- The user sets the FQC to " " if one or more of the following are true:
  - The S300 or S350 is configured with two or more synchronizing NTP associations and the user is satisfied with using time from other NTP associations.
  - The SyncServer oscillator type has superior time keeping properties compared to the receiving equipment. This is usually the case since most computer equipment uses uncompensated quartz oscillators.
- The user sets the FQC to "F" if the receiving equipment can handle "F" as a time quality character in some way that is useful and distinct from the " " or "X" time quality characters.
- The user sets the FQC to "X" so that the receiving equipment to handles time from NTP or the Hardware Clock internal oscillator as "X" (time invalid).

Troubleshooting: If the time quality character remains "X" (time invalid) even though Input References are connected to the SyncServer.

- Verify that the physical connection to the input connector is valid and that there are no cable breaks or short circuits.
- On the **TIMING - HW Clock** page, verify that the Input Reference is *Enabled* and that *Forced Timing Source* is set to *Auto*.
- For Timecode, on the **REFERENCES - Timecode** page, check that the *Timecode Input* setting matches the input signal type.
- For GPS, wait for the GPS receiver to complete the GPS acquisition process and achieve "locked" status. Also see ***Operating in "Window Mode"*** (on page 143).

Also see ***TIMING - Holdover*** (on page 63) and ***TIMING - HW Clock*** (on page 61).

Note: If the user sets *Forced Timing Source* on the **TIMING - HW Clock** page to *Free Run*, the *Flywheel Quality Character* in effect at that moment remains in effect thereafter.

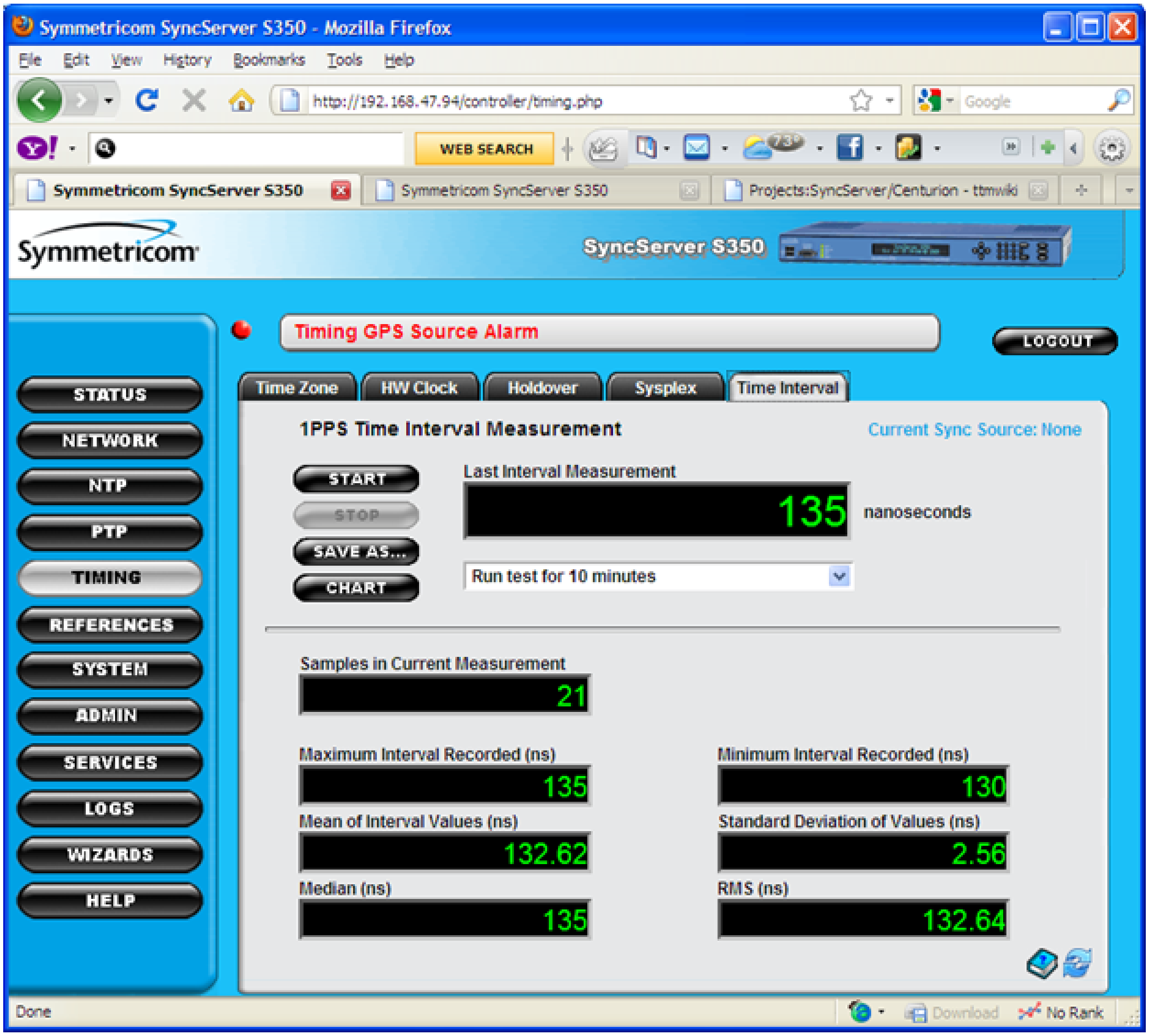
TIMING -Time Interval

You can use the Time Interval only if you have purchased the PTP option. See "How to Activate the PTP Option" on page 53

Time Interval is only available on S350 Syncservers with the PTP option enabled.

The time interval is measured from the **1PPS in** and compared to the top of second of the internal hardware HW Clock. This means that you cannot use the 1PPS input as a reference source and measure Time Interval at the same time. The Web UI will not prevent you from doing this, but the user should disable the **1PPS in** on the **TIMING > HW Clock** page when making a Time Interval measurement.

From the **TIMING, Time Interval** page, press the **CHART** button to access the charting applet.


Symmetricom SyncServer S350 - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://192.168.47.94/controller/timing.php
Google
WEB SEARCH
Symmetricom SyncServer S350
Symmetricom SyncServer S350
Projects:SyncServer/Centurion - ttmwiki
Symmetricom
SyncServer S350
LOGOUT
STATUS
NETWORK
NTP
PTP
TIMING
REFERENCES
SYSTEM
ADMIN
SERVICES
LOGS
WIZARDS
HELP
Time Zone
HW Clock
Holdover
Sysplex
Time Interval
START
STOP
SAVE AS...
CHART
Done
Download
No Rank

Timing GPS Source Alarm

1PPS Time Interval Measurement

Current Sync Source: None

Last Interval Measurement: 135 nanoseconds

Run test for 10 minutes

Samples in Current Measurement: 21

Maximum Interval Recorded (ns): 135

Minimum Interval Recorded (ns): 130

Mean of Interval Values (ns): 132.62

Standard Deviation of Values (ns): 2.56

Median (ns): 135

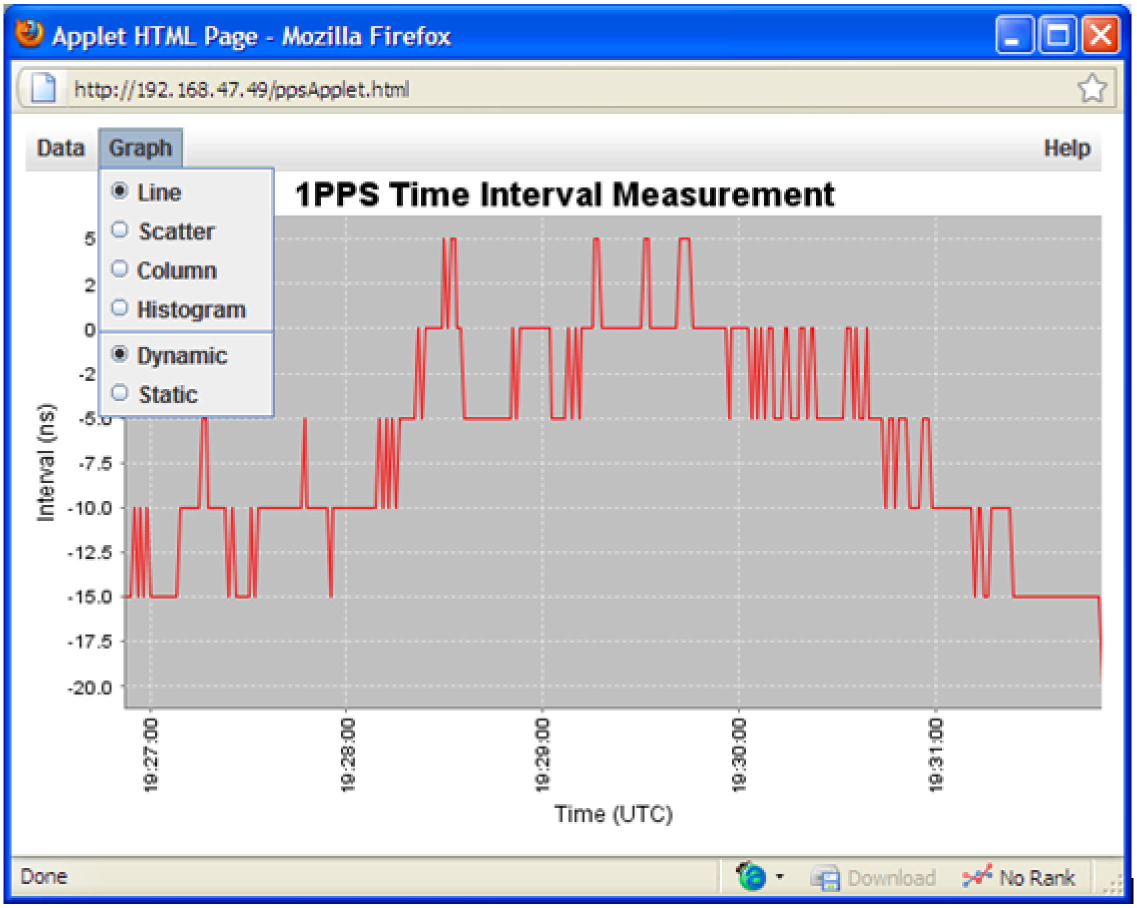
RMS (ns): 132.64

Please Note: It takes a few moments for the charting applet to open in a separate browser window on the host computer. After the charting applet is open, you have access to several options to customize the graph to your liking.

Pressing the **Graph** pull down menu in the upper left of the applet allows you to select among the following chart types to view the Time Interval Measurement data:

- Line
- Scatter
- Column
- Histogram

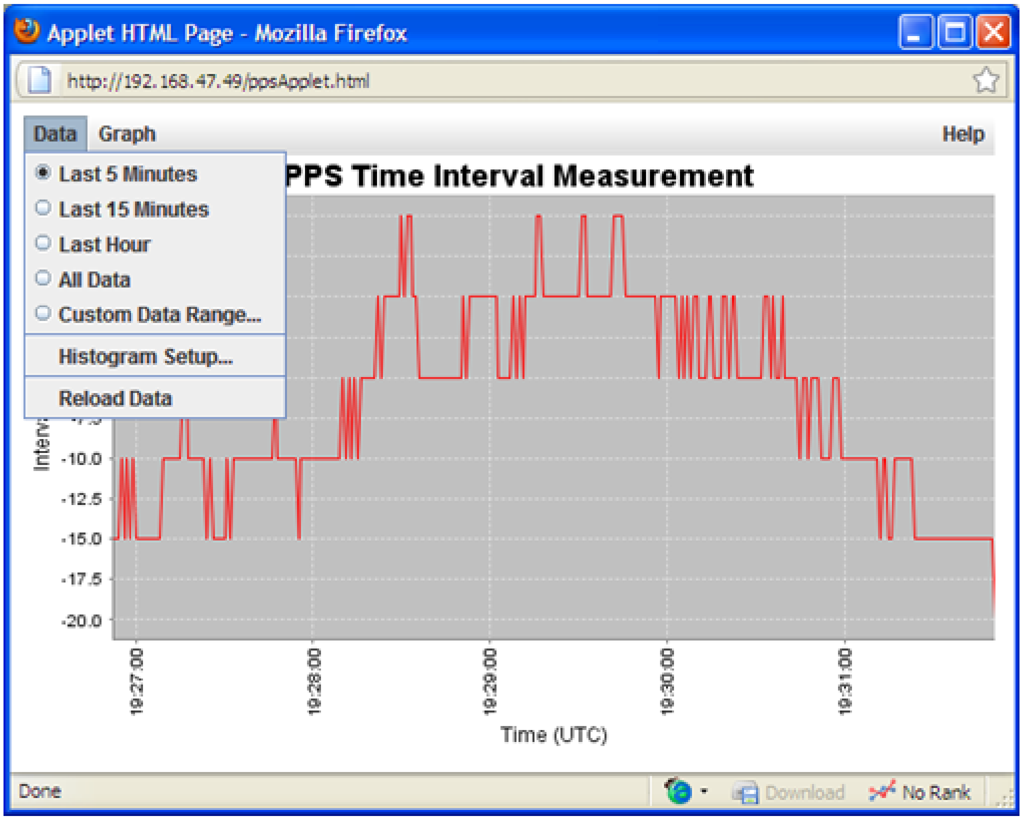
From the **Graph** pull down menu, you can also select between a **Dynamic** or **Static** view of your data. If you are currently running a measurement and would like to view the data as it is being processed, select the **Dynamic** view.



From the **Data** pull down menu, you can view data from the:

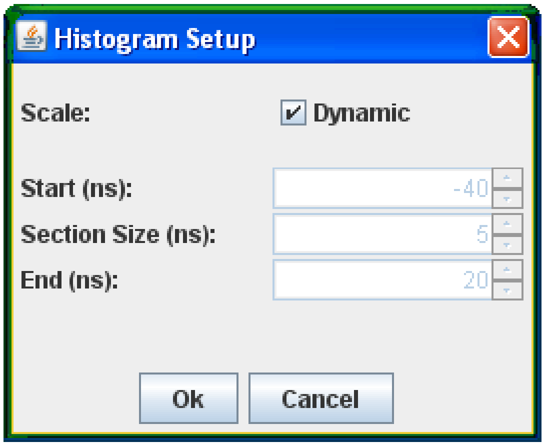
- Last 5 minutes
- Last 15 Minutes
- Last Hour
- All Data
- Custom Data Range…

You can also set up the Histogram chart from the **Data** menu or Reload Data from the database to the chart.



After a test has completed, you can zoom in on portions of the data set by selecting the **Custom Data Range…** and changing the **Start Date to Display** or **Stop Date to Display**.

You can configure the way the Histogram chart is displayed using the **Histogram Setup…** selection in the **Data** menu. When the **Dynamic** Scale checkbox is selected, the Histogram chart sets the first peak of the data in the center and automatically sets the x-axis values appropriately for an equal **Section Size**. If this value does not work for your data, uncheck the **Dynamic Scale** and manually select values for **Start**, **End** and **Section Size**.



Scale: ☑ Dynamic

Start (ns): -40

Section Size (ns): 5

End (ns): 20

If none of the provided charts meets the needs of your data set, please use the **Save AS...** function provided on the **TIMING, Time Interval** page to export your data to the tool of your choice for further analysis.

REFERENCES - GPS

GPS Position and Operating Mode

Note: The SyncServer S350i does not include a GPS receiver.

This page can be used to view or set the GPS receiver's Position and Mode, as well as the GPS Antenna Cable Delay. Note that the SyncServer model 350i does not have a GPS receiver.

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 143).

Antenna Cable Delay:

Use this setting to achieve the highest timing precision and accuracy on the timing outputs such as IRIG Out or 1PPS Out. 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.

Note: Use the *Cable Delay* setting on the **REFERENCES - Timecode** page to compensate for the length of the Timecode Output cable. Avoid using *Antenna Cable Delay* for that purpose.

REFERENCES - Timecode

Use this page to configure the timecode input and output on the SyncServer.

Also see ***IRIG In (Timecode In)*** (on page 118) and ***IRIG Out (Timecode Out)*** (on page 119).

Timecode Configuration

Status: Reports "locked" when the Timecode Input signal and configuration are both valid. Otherwise it reports "unlocked".

Configure the **Timecode Input** setting to match the input signal on the **IRIG In** connector.

- If the Timecode Input is marked "without YR", and there are no other Input References or synchronizing NTP associations (the default NTP servers on **NTP - Assoc** page), verify that the time SyncServer includes the correct year. If needed, manually set the year. See in ***Setting the Time Manually*** (on page 177).

Note: IRIG B 1344 provides a Leap Indicator warning during the minute preceding a leap second insertion/deletion. If a leap second adjustment occurs while the SyncServer is synchronized to IRIG B 1344 *, NTP clients that don't poll the SyncServer during this one-minute warning period may be off by approximately one second until they synchronize to the new time. If the Maximum Poll Interval of the NTP clients is sufficiently shorter than one minute (e.g., 16 or 32 seconds), this scenario is less likely to occur.

*The "SyncServer is locked to IRIG B 1344" when Hardware Clock locked to the 1344 timecode input and the Hardware Clock is the "synchronizing" NTP association for the NTP daemon.

Timecode Output

Use the **Timecode Output** to configure the signal type on the **IRIG Out** connector.

The **Cable Delay** and **Output Type** settings only apply to the *Timecode Output*.

Cable Delay (nS): Compensates for delays caused by the length of the cable on the IRIG Out connector. Use the table below to calculate the Cable Delay by selecting the signal propagation rate for the type of cable and multiplying 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, a 50 foot length of RG-59 cable x 1.24 nS/foot = 62 nS of *Cable Delay*.

Or, using metric units, a 15.24 meter length of RG-59 cable x 4.06 nS/meter = 62 nS of *Cable Delay*.

Output Type: Set the time scale used for the Timecode Output.

- **UTC**: Coordinated Universal Time. This is the factory default setting.
- **Local**: The local time, as configured on the **TIMING - Time Zone** page.

Note: The timecode output can also be affected by the *Ignore UTC Corrections from GPS Reference* setting on the **TIMING - HW Clock** page. Also see ***TIMING - HW Clock*** (on page 61). Note that the **SyncServer model 350i** does not have a GPS receiver.

References

Please consult the Range Commander's Council document *200-04 - IRIG Serial Time Code Formats (TTG)* on the product information CD and at https://ws-mrc2vger.wsmr.army.mil/rcc/manuals/200-04/TT-45.pdf for definitions of the following time-codes:

- IRIG A
- IRIG B
- IRIG E
- IRIG G
- NASA 36
- XR3/2137

Timecode glossary:

- **AM**: Amplitude Modulated
- **B 1344**: Standard IRIG-B with information encoded in the control bits per the IEEE 1344 standard. These include year, daylight saving time, Leap Indicator, time quality, and parity information.
- **BCD**: Binary Coded Decimal encoding of hours, minutes, seconds, and days of year (hh:mm:ss:ddd)
- **CF**: Control Function (elements - various uses depending on the implementation)
- **DC**: TTL Levels
- **DCLS**: Direct Current Level Shift (width coded)
- **Hz**: Hertz
- **kHz**: Kilohertz
- **Legacy TrueTime:** Standard IRIG-B with four time-quality bits and a lock indicator encoded in the control bits
- **SBS**: Straight Binary Second encoding of seconds in the day
- **YR**: Year

REFERENCES - Modem

note: The SyncServer S350i does not include a modem.

Use the **REFERENCES - Modem** page to create an NTP server association for the modem on the **NTP - Config** page. The modem association operates as a backup reference, getting the time from an automated dial-up time service if more accurate NTP associations aren't available (e.g., if the hardware clock or other server associations became unreachable). While the SyncServer's NTP daemon is synchronized to the modem association (*system peer* = modem), the **Sync LED** on the front panel is green and the SyncServer operates as a stratum 1 NTP server.

The **REFERENCES - Modem** page provides the telephone numbers of several established time services. The user can edit or replace these with the number of any compatible dial-up time service (same protocols, time code, and time scale). Microsemi recommends that users outside the United States, Japan, and Germany determine whether a local timekeeping authority offers a compatible dial-up time service.

After the modem association has been created, the user can *influence* how often the modem calls the time service by modifying the **Minimum Poll Interval (default** 00:02:08, in hh/mm/ss format) and Maximum **Poll Interval (default** 18:12:16, in hh/mm/ss format) on the **NTP - Config** page. The interval between calls starts out close to the **Minimum Poll Interval and gradually** increases to the Maximum **Poll Interval over a day or so**. Decreasing the Maximum Poll Interval improves timing accuracy, but also increases the frequency of phone calls.

Note: All communication and service charges are the responsibility of the user.

The user can determine the highest acceptable value for the Maximum Poll Interval by multiplying it with the estimated drift rate of the oscillator (given on the **TIMING - Holdover** page). For example, on a SyncServer equipped with a TCXO oscillator, the default Maximum **Poll Interval,** 18:12:16, translates into approximately 0.76 days or approximately 14 ms of drift between synchronizations. This value may be acceptable for network timing applications, but should be considered if more precise timing is required, particularly from the timing outputs from the rear panel.

Note: The settings on the **TIMING - Holdover** page do not apply to the modem association, they only apply to the Hardware Clock Input References.

Modem Configuration

Dial Configuration:

- **Tone Dial (ATDT):** (Factory Default) Configures the modem for "touch tone" dialing, common throughout the world.
- **Pulse Dial (ATDP):** Configures the modem for pulse "rotary telephone" dialing, still used in selected regions of the world.
- **None (User Dial Command):** Makes AT commands available in the **Dial-Up Time Reference Phone Number(s)** fields. Phone numbers *must* be preceded by a valid AT command. Some potentially useful AT modem commands for getting an outside line from a PBX system:
    - *AT X0* establishes blind dialing and dials 0, common in Japan.
    - *AT X9* establishes blind dialing and dials 9, common in USA.

Note: Leave a space between T and X in the preceding commands.

Modem Pre-Test

The user can test a number by entering a number in the *Test Number* field and clicking the **TEST MODEM** button. If successful, "Modem Connected to Test Number" appears in small text to the right of the CANCEL button. If the user does not supply a phone number, this feature verifies the operation of the modem. Testing a number does not synchronize the NTP daemon to the service.

Preconfigured Phone Numbers

Selecting one of the service providers does two things:

- Enters phone numbers for the dial-up time service in the *Dial-Up Time Reference Phone Number(s)* field(s).
- Sets the protocols, time code, and time scale the modem will use to decode the dial-up time service.

Select one of the following services:

- **ACTS**: NIST Automated Computer Time Service (**ACTS**) in the United States. See ***http://tf.nist.gov/service/acts.htm***.
    - **Disable Echo Delay**: ACTS measures the echo delay to calibrate for the propagation delay of the telephone circuit and equipment in order to achieve accuracies of approximately 1 or 2 milliseconds. Selecting *Disable Echo Delay* disables this feature for ACTS, resulting in lower accuracies.
- **USNO**: An ACTS-like service provided by the US Naval Observatory in the United States. Does not provide delay compensation.
- **JJY**: NICT Dial-up standard time service (Telephone **JJY**) in Japan. See ***http://jjy.nict.go.jp/time/teljjy/teljjy_p1-e.html***.
- **ITU-R**: Selecting ITU-R generates the phone number for **PTB**'s telephone time service in Germany. If needed, please consult the list of other ITU-R service providers below.

Dial-Up Time Reference Phone Number(s)

Selecting an item under *Preconfigured Phone Numbers* populates these fields. The user can also enter phone numbers directly. Use a "." (period) character to insert a pause.

Note: Review this list to ensure that the nearest service, or the service with the lowest charges, is at the top of the list.

Comments

The services and numbers listed below are subject to change. Please consult with your local time-keeping authority for the latest information.

Note: Some ITU-R services charge fees. All tolls and fees are the responsibility of the customer.

ITU-R services: Services that comply with the ITU-R Recommendation (ITU-R TF583.4) are now available from the primary timing centres of: Austria, Belgium, Germany, Italy, The Netherlands, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Turkey, and the United Kingdom.

This is a partial list of those services:

- **Germany**: Physikalisch-Technische Bundesanstalt (PTB)'s timecode service. +49 5 31 51 20 38. ***http://www.ptb.de/en/org/4/44/_index.htm***

- **United Kingdom**: National Physical Laboratory (NPL)'s TRUETIME service. +44 0891 516 333. ***http://www.npl.co.uk/npl/ctm/truetime.html***
- **Italy**: Istituto Elettrotecnico Nazionale "Galileo Ferrais" (IEN)'s CTD service. +39 166 11 46 15. ***http://www.ien.it/ar96/tf.htm***
- **Switzerland**: Swiss Federal Office of Metrology 's timecode service. +41 031 323 32 25. ***http://www.metas.ch/en/labors/official-time/modem/index.html***
- **Sweden**: SP Swedish National Testing and Research Institute 's timecode service. +46 33 41 57 83 ***http://www-v2.sp.se/metrology/timefreq/eng/timesynch_modem.htm***
- **Netherlands**: Swinden Laboratorium (VSL). 09 00 61 71 81 9. ***http://nmi.nl/tijd_service-663.pagina?lg=en***

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.

REFERENCES - LF Radio

The Low Frequency (LF) Radio is an optional Input Reference for the SyncServer S300 and S350 models. The LF radio option operates as an Input Reference.

note: The S350i SyncServer does not include the Low frequency radio.

Also see ***Using LF Radio*** (on page 170).

Low Frequency Radio Configuration

Installed Radio Option: Specify the format of the radio time service for decoding:

- Not Installed (Default): disables the LF radio module.
- WWVB (60 kHz)
- DCF77 (77.5 kHz)
- JJY (40 kHz or 60 kHz) The customer specifies the frequency at the time the LF Radio option is purchased.

Select **Not Installed**:

- If the LF radio option isn't present.

The **72 hour Reachability Chart** shows a series of color-coded vertical bars:

- Green - Time was decoded.
- Red - Time was not decoded.

The height (y-axis) of the bars indicates a figure of merit. For example, the taller the green bar, the better the signal and the more often the signal was decoded during the 15-minute interval.

When choosing a location for the LF Antenna module, seek the one with the shortest red bars during the day, and the tallest green bars at night.

Each tick-mark along the bottom of the graph represents an hour, with extended tick marks for 6 and 24-hour periods.

Each green or red vertical bar represents a 15-minute interval, with four bars per hour. The most recent data is displayed on the right, and the data moves from right to left.

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, LAN1 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", "Write to log", and "Send email notification" when upgrades become available. SNMP and alarm email 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 from workstation, or using the keypad/display interface to upload the new software from a USB flash memory device connected to one of the SyncServer's USB ports. Please consult ***Upgrading System Software*** (on page 152) 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 LAN1 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, IRIG Input and Output, etc.
- All cryptographic materials (NTP keys, sshd keys, SNMP users and communities) deleted.
- Logs are erased.

Also see ***Backing Up/Restoring Configurations*** (on page 165), ***Configuring LAN1*** (on page 148), and ***Logging in to the Web Interface*** (on page 149).

Factory Default Settings

Note: The S350i SyncServer does not include a GPS receiver,LF radio, or modem.

NETWORK – Ethernet

For LAN1:

Connection Mode: Static

IP Version: IPv4

IP Address: 192.168.0.100

Mask255.255.255.0

Gateway: 192.168.0.100

Redundant: 000.000.000.000

Allowed Access: Null

Speed/Duplex: Auto

For LANGBE, LAN2, LAN3:

Connection Mode: Disabled

IP Version: None

IP Address: None

Mask: None

Gateway: None

Redundant: None

Allowed Access: None

Speed/Duplex: None

Mgmt Port User DNS Servers: Null

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 – MD5 Keys, Autokey, Autokey Client

All null.

NTP – Prefs

Leap Indicator Bits/StratumFollow Standard NTP rules (Default)

TIMING – Timezone

Time Zones: UTC

TIMING – HW Clock

Clock Source PrioritiesGPS, Timecode, WWVB, 1PPS, 10MHz, T1E1
Enable: All enabled
Forced Timing Source: Auto
Ignore GPS - UTC Correction: Disabled

TIMING – Holdover

Time Error Limit: 1 ms

TIMING – Sysplex

Autostart: No
Parity: Odd
Flywheel Quality Character: X

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

REFERENCES – IRIG-B

Timecode Input: B 1344 AM
Timecode Output: B 1344 AM
Output Type: UTC
Cable Delay: 0

REFERENCES – Modem

Dial Configuration: Tone Dial (ATDT)
Preconfigured Phone Numbers: None
Dial-Up Time Reference Phone Number(s): None

REFERENCES – LF Radio

Installed Radio Option: WWVB (60 kHz)

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 Addresses for all configured LAN ports: 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 89).

ADMIN – Logs Config

auth.log: Notice

daemon.log: Notice

kern.log: Notice

syslog: Notice

messages: Debug, Info, Notice, Warning

Remote Log System: Null

ADMIN – Relays

Alarm Relay: Off (no activation on any alarm)

System Restart Delay: 60 minutes

ADMIN – RADIUS

RADIUS Authentication: Disabled

ADMIN – TACACS+

TACACS+ Authentication: Disabled

SERVICES – Startup

Web Server: On, Auto

NTP: On, Auto

SNMP: On, Auto

SSH: On, Auto

Sysplex: 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

SERVICES – Email

SMTP Gateway: Null

User1-10: Null

SYSTEM - Options

Use this page to install available options.

See "How to Activate the PTP Option" on page 53 to install the PTP option

This page gives:

- The SyncServer serial number for use in obtaining the option key.
- A text box for entering the option key.
- Two text boxes showing both the available options and installed options.
- Buttons to apply the available options or cancel the process.

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 LAN1 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[1] 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 all Configured LAN Ports**: The MAC, IPv4, and IPv6 addresses of the LAN ports.

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

[1] The SyncServer S350i does not include a GPS receiver.

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 175).

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 167).

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 LAN1 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. However, email addresses for alarm notification are entered on the **SERVICES - Email** page. Email notification of alarms is configured on the **ADMIN - Alarms** page.

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.
- Configuring notification by SNMP traps and email messages.
- 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 86).

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*, *Write Log*, and *Send Email* 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.

Send Email: Generates a descriptive entry in an email message when the alarm occurs and ends. The SyncServer compiles the entries over a 5-minute period and sends email messages at five-minute intervals, so an email alert may contain more than 1 alarm. For Send Email to work, the **SERVICES - Email** page must be configured with a valid SMTP Gateway and email address. If the SMTP gateway is a DNS name, LAN1 on **NETWORK - Ethernet** must be configured with a valid DNS server address.

Note: When *Clear Now* and *Auto Clear* are used to clear an alarm, *Send Trap*, *Write Log*, and *Send Email* 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.

Note: The SyncServer S350i does not include a GPS receiver.

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 a configured port has no connection (network link). Clears if all configured ports have 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* and/or *Send Email* 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 Timecode Source Alarm: The Hardware Clock is not detecting a valid input signal on the IRIG In connector.

Timing PPS Source Alarm: The Hardware Clock is not detecting a valid input signal on the 1PPS In connector.

Timing 10MHz Source Alarm: The Hardware Clock is not detecting a valid input signal on the 10MHz In connector.

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 Rubidium Lock Alarm: The optional Rubidium oscillator, if installed, has not stabilized its frequency output. After power up, this alarm may be raised for up to several minutes until the Rubidium warms up and stabilizes its frequency output.

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 or IRIG 1344 timing references, 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.

Note: IRIG-1344 only provides a Leap Indicator warning during the last minute of the day of the event. In this case, while the SyncServer will propagate that information via NTP, NTP clients may not query the SyncServer in time to be warned of the leap second adjustment.

LAN1 Link Alarm: A network connection is not available on LAN1. Note that if LAN1 is down, SNMP and Email notification do 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).

LAN2 Link Alarm: LAN2 has lost its network connection.

LAN3 Link Alarm: LAN3 has lost its network connection.

LANG Link Alarm: LANGbE has lost its network connection.

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

Timing <LF Radio> Source Alarm: The LF Radio module cannot be decoded by the Hardware Clock. The values for <LF Radio> can be WWVB, DCF77, and JJY.

System RADIUS Server Alarm: This alarm is raised when the system failed to create firewall rules to allow RADIUS packets. Without the proper firewall rules, RADIUS server(s) cannot provide authentication service.

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.

PTP Leap 59: Leap second deletion is pending. The last minute of the day will have 59 seconds.

PTP Leap 61: Leap second insertion is pending. The last minute of the day will have 61 seconds.

PTP Clock Accuracy: The system is not locked to a reference source and is not within the holdover specifications. The PTP Clock Class is 52.

PTP Queue Reset: A PTP queue has filled up and was flushed.

PTP Daemon Reinit: The PTP daemon was overloaded and reinitialized.

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	Y
NTP Leap Change	Y	Notify		Y	
System Network	Y	Notify		Y	
System Upgrade		*Minor*	Y	Y	Y
System Config Change		Notify		Y	
System Health	Y	**Major**	Y	Y	Y
System Up/Down	Y	*Minor*	Y	Y	Y
System Authentication	Y	Notify		Y	
Timing No Source	Y	**Major**	Y	Y	Y
Timing GPS[1] Source	Y	**Major**	Y	Y	Y
Timing Timecode Source	Y	Notify		Y	
Timing PPS Source	Y	Notify		Y	
Timing 10MHz Source	Y	Notify		Y	
Timing GPS Antenna Short	Y	**Major**	Y	Y	Y
Timing GPS Antenna Open	Y	**Major**	Y	Y	Y
Timing Oscillator DAC Range		Notify		Y	
Timing Rubidium Lock		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	

[1] The SyncServer S350i does not include a GPS receiver.

Name	Auto Clear	Severity	Send Trap	Write Log	Send Email
Timing Leap Event	Y	Notify		Y	
LAN1 Link	Y	**Major**		Y	
LAN2 Link	Y	Notify		Y	
LAN3 Link	Y	Notify		Y	
LANG Link	Y	Notify		Y	
Timing NTP Daemon	Y	Notify		Y	
Timing DCF77 Source	Y	Notify		Y	
System RADIUS Server	Y	Notify		Y	
System Reset Default Config		**Major**		Y	
PTP Leap 59	Y	Notify		Y	
PTP Leap 61	Y	Notify		Y	
PTP Clock Accuracy	Y	Notify		Y	
PTP Queue Reset		Major		Y	
PTP Daemon Reinit		Major		Y	

ADMIN - Logs Config

System Log Configuration

Use this page to configure the SyncServers logging subsystem. The SyncServer uses klogd and syslogd, the standard logging facilities. What is logged and where it is logged is based on the options selected in this page. A default set of options is preconfigured that should provide a level of detail sufficient for the majority of applications. Each entry is broken down into facility and priority, where facility is the part of the system such as the kernel or the application daemons and priority indicates the severity of the message. The priority ranges from "Emerg", which represents only very significant events like kernel panics to "Debug", where even debug messages are logged. Messages are generally logged to different files to allow easier parsing. The messages file is unique however in that its default configuration captures all messages flowing through the logging daemons. But, due to the high volume of traffic, it is cleared at each power cycle or reboot.

Note: Most users should leave the logs configured in the default manner unless directed to make changes by Microsemi technical support.

Log Types

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).

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

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.

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.

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.

Log Priorities

In the case of kernel, syslog, auth and daemon logs, the priority specified will cause all messages greater than or equal to the selected priority to be logged. The priorities are defined in ascending order.

In the case of the messages log, only the selected priorities are logged. As such, up to four priority levels are supported.

Debug: This priority level captures debug output from applications designed to produce this type of output. This level generates a large volume of traffic and is not recommended unless it is done under the direction of technical support personnel. An example may be a signal handler called.

Info: This level captures informational output. This level typically provides information regarding successful operations. An example may be a successful file save or a normal application startup.

Notice: This level captures transactional information. An example of this could be a network connection or login.

Warning: This level captures information that is not expected by the application or system. This could be something the system is not configured to handle. An example might be a malformed network packet or a drive change caused by inserting a thumb drive into a USB slot.

Err (deprecated): The use of this level is deprecated.

Crit: This level captures critical information. This data can often be used to debug the failure of a system or application under abnormal conditions. An example of this may be a memory error.

Alert: This level captures information about which the administrator should be made aware. An example of this could be a failed login attempt.

Emerg: This level captures messages of the highest priority. These are typically last resort messages before an abnormal exit of the calling application or the system itself. An example of this would be a hardware error or memory exhausted message.

Remote Log System

It is possible to send a copy of all messages to a remote system running syslogd. This allows centralized management of alarm messages. As the system logs are written to a RAM based volume, messages may be lost if the system is rebooted or power cycled or experiences an unexpected failure. They may also be overwritten if memory is low. Microsemi recommends rotating log files, if needed. Specifying the DNS name or IP address of a remote server will configure the SyncServer to send a copy of each message received by the syslog and kernel log daemons to the remote address, if it is reachable. The remote server can then be configured to filter the messages using its configuration file.

A complete definition of how Syslog is configured may be obtained by consulting the standard syslog.conf man pages that are widely available on the Internet.

ADMIN - Relays

The SyncServer S300/S350 has two alarm output relays located on the rear panel, **Power** and **Alarm**.

Also see ***Power and Alarm Relays*** (on page 114).

Relays Configuration

Loss of Power Alarm Relay

Power: This relay de-energizes when the SyncServer loses power. Its behavior cannot be configured.

Minor/Major Alarm Relay

The user can configure the conditions that de-energize the **Alarm** relay:

- **Any Major Alarm:** Alarms with *Severity* = *Major*.
- **Any Major or Minor Alarm:** Alarms with *Severity* = *Major* or *Minor*.
- **Off (no relay activation on any alarm):** The relay is remains energized except when the SyncServer loses power or is rebooted.

The following pages/actions may de-energize the Alarm relay:

- **SERVICES - Startup**: Using *Halt* or *Reboot*.
- **NETWORK - Ethernet**: Applying changes to the network configuration.
- All **NTP - *** pages: Using *RESTART* on any of the NTP-related pages.
- **SYSTEM - Upgrade:** Upgrading the firmware.
- **SYSTEM - Factory Reset:** Resetting the configuration to factory defaults.
- Using the following **WIZARDS**: **1st Setup**, **NTP**, **Restore**, **Upgrade**.

For more information on major/minor alarm states, see ***ADMIN - Alarms*** (on page 85).

System Restart Delay (Minutes)

Use this setting to prevent the Alarm relay from de-energizing for a user-configured period of time after the SyncServer starts or restarts. The delay can be set to allow enough time for unwanted alarm conditions to clear. The factory default setting is 60 minutes. The range is 1 to 99 minutes. This setting only affects the Alarm relay. It does not affect other aspects of alarm operation.

ADMIN - RADIUS

RADIUS authentication provides a method for users to log into a variety of RADIUS-enabled devices using a centrally managed username and password. The SyncServer implements RADIUS in accordance with portions of RFC 2865 and RFC 2866.

RADIUS authentication on the SyncServer is designed to inter-operate with standard compliant RADIUS servers:

- When RADIUS is enabled and configured a user can log in to the SyncServer using a RADIUS username and password.
- The SyncServer contacts each RADIUS server listed on the **ADMIN - RADIUS** page until it receives authentication from a RADIUS server.
- If RADIUS authentication fails due to AUTHINFO_UNAVAIL reason (in other words, server is not available), the SyncServer attempts to authenticate the user against its own access control list.

The LAN1 port must have access to the authenticating RADIUS servers.

Extended Character Set for RADIUS logins

The following character set is available for RADIUS logins:
~!@#$%^&*()_+|\=-'{}[]:'";<>?/.,

RADIUS Configuration

For each server, set the following values:

RADIUS Server IPv4 Address: The RADIUS server's IPv4 address.

Secret Key: The authentication key shared by the RADIUS server and the SyncServer.

Timeout: The number of seconds to wait for authentication from the RADIUS server before disconnecting and trying the next one.

Enable RADIUS Authentication: Makes RADIUS and then standard SyncServer authentication available.

Disable RADIUS Authentication: Makes RADIUS authentication unavailable. Only standard SyncServer authentication is available.

Note: The RADIUS and TACACS+ authentication is exclusive. When RADIUS authentication is enabled, the TACACS+ authentication is automatically disabled. Vice versa, when TACACS+ authentication is enabled, the RADIUS authentication is disabled. When the SyncServer is started, power on or reboot, if the software detects that both RADIUS and TACACS+ authentication are enabled, the TACACS+ authentication will be disabled and only RADIUS authentication is left enabled.

ADMIN - TACACS+

TACACS+ (Terminal Access Controller Access-Control System Plus) is an access control network protocol for routers, network access servers and other networked computing devices.

Unlike RADIUS and the predecessors of TACACS+ (TACACS and XTACACS), TACACS+ provides separate authentication, authorization and accounting services. Like RADIUS, TACACS and XTACACS, TACACS+ is an open, publicly documented protocol. TACACS+ uses the TCP protocol and encrypts the entire packet (except the header).

TACACS+ authentication on the SyncServer is designed to inter-operate with standard compliant TACACS+ servers:

- When TACACS+ is enabled and configured a user can log in to the SyncServer using a TACACS+ username and password.
- The SyncServer contacts the TACACS+ server listed on the **ADMIN - TACACS+** page until it receives authentication from a TACACS+ server.
- If TACACS+ authentication fails due to AUTHINFO_UNAVAIL reason (in other words, server is not available), the SyncServer attempts to authenticate the user against its own access control list.

The LAN1 port must have access to the authenticating TACACS+ servers.

Extended Character Set for TACACS+ logins

The following character set is available for TACACS+ logins:
~!@#$%^&*()_+|\=-'{}[]:"';<>?/.,

TACACS+ Configuration

For each server, set the following values:

TACACS+ Server IPv4 Address: The TACACS+ server's IPv4 address.

Secret Key: The authentication key shared by the TACACS+ server and the SyncServer.

Enable TACACS+ Authentication: Makes TACACS+ and then standard SyncServer authentication available.

Disable TACACS+ Authentication: Makes TACACS+ authentication unavailable. Only standard SyncServer authentication is available.

Note: The RADIUS and TACACS+ authentication is exclusive. When RADIUS authentication is enabled, the TACACS+ authentication is automatically disabled. Vice versa, when TACACS+ authentication is enabled, the RADIUS authentication is disabled. When the SyncServer is started, power on or reboot, if the software detects that both RADIUS and

TACACS+ authentication are enabled, the TACACS+ authentication will be disabled and only RADIUS authentication is left enabled.

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 LAN1 port. Once logged in, restart the web server by typing "HTTP on".

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

PTP: Precision Time Protocol daemon. Supports all PTP 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 LAN1 port.

Sysplex: Sysplex timing information on the **Sysplex Timer-Out** connector.

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.

Telnet: Telnet protocol service for remote access to the command line interface on LAN1.

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 LAN1 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.

SERVICES - Email

SMTP Gateway and Alarm Email Recipients

This page establishes the SMTP gateway and email addresses used by the SyncServer for email notification of alarms and password recovery emails. This page must be configured correctly for "Send Email" notification on the **ADMIN - Alarms** page to work.

SMTP Gateway: Enter the DNS name or IP address of a SMTP server that's reachable from LAN1.

User 1-10: Enter the email address of the individuals who should receive email notifications of alarms.

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. The logging behavior can be configured using the **ADMIN - Logs Config** page. 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 - 1st Setup

Microsemi strongly recommends using the 1st Setup to perform the initial configuration of the SyncServer, which includes:

- Setting a new password.
- Configuring Password Recovery (optional).
- Configuring the IP address, hostname, and DNS for LAN1 (erases network settings for all other network ports.
- Setting the local time zone (optional).

Also see:

- For *STEP 1: Password Setup* and *STEP 1A: Password Recovery*, also see ***ADMIN - Users*** (on page 84).
- For *STEP 2: LAN1 IP Address, Hostname and DNS Servers*, also see ***NETWORK - Ethernet*** (on page 32).
- For *STEP 2A: Local Time Zone*, also see ***TIMING - Time Zone*** (on page 61).

WIZARDS - NTP

Microsemi recommends using this wizard to perform an *initial* NTP configuration of up to 5 server associations.

To modify an *existing* NTP configuration, use the **NTP - Config** page instead.

Note: This Wizard deletes all NTP associations that are not *server* associations.

Also see: ***NTP - Config*** (on page 43) and ***NTP - MD5 Keys*** (on page 47).

WIZARDS - SNMP

Use the SNMP wizard to add or change the following SNMP v1/v2c settings:

- Set SysLocation, SysContact and SysName
- Set the Read and Write Community Strings
- Add up to four v1/v2c Trap Destinations

Advanced SNMP configuration (e.g., SNMP v3) is performed on the **NETWORK - SNMP** and **NETWORK - Traps** pages. Upon completing the Wizard, the new SNMP settings replace the previous ones and the SNMP daemon restarts.

See also ***NETWORK - SNMP*** (on page 35) and ***NETWORK - SNMP Traps*** (on page 37).

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** 77**).**

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 LAN1 is configured to use DHCP, the DHCP server may assign a new IP address to LAN1. If needed, use the front panel STATUS button to view the new IP address on the LAN1 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.

Keypad/Display Interface

In this SEC ground

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

- Configuring and enabling/disabling the LAN1 network port.
- Setting the time and entering freerun mode.
- Adjusting the brightness.
- Locking the keypad.
- Shutting down the SyncServer.
- Backing up and restoring the configuration from the USB port.
- Upgrading the software from the USB port.

Overview

When the SyncServer starts, the display shows the Symmetricom logo followed by booting messages. After a minute or so, the SyncServer displays the default time screen.

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

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

The following three buttons change the function of the display.

- **TIME:** Changes the format and contents of the time display.
- **STATUS:** Displays status the network ports and aspects of the SyncServer.
- **MENU**: Displays a menu of functions.

The following sections cover these three buttons in more detail.

TIME Button

Pressing the **TIME** button repeatedly changes the format and contents of the time display:

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

- Medium numeric time display on the left, current reference and NTP Stratum on the right
- Small date and time, reference, and NTP stratum.

The time display also indicates a time scale:

- If the time zone setting on **TIMING - Time Zone** page is set to UTC, the time display shows "UTC" as the time scale.
- If the time zone setting on **TIMING - Time Zone** page is set to a non-UTC (local) time zone, the time display leaves the time scale blank, or adds AM/PM if the user selects the 12-hour time scale. (Press the **MENU** button and select **2) Display** > **3) 12/24** > **1) 12 (AM/PM)**.
- If the *Ignore UTC Corrections from GPS Reference* setting on the **TIMING - HW Clock** page is enabled (selected), the time display shows "GPS" as the time scale. Note that the **SyncServer model 350i** does not have a GPS receiver.

Note: The **TIMING - Time Zone** page configures the display for UTC or local time. The **TIMING - HW Clock** can be used to display GPS time (not recommended). Also see ***TIMING - Time Zone*** (on page 61) and ***TIMING - HW Clock*** (on page 61).

STATUS Button

Note: The SyncServer S350i does not include either a GPS receiver or a modem.

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

- NTP
- Alarms
- Network Ports
- Hardware Clock
- GPS Receiver (Note that the SyncServer model 350i does not have a GPS receiver.)
- SyncServer model, serial number, software version, and software upgrade availability.

The upper right corner of each screen displays the user-configured UTC, local, or GPS time. See ***TIME Button*** (on page 101).

NTP Status Screen

Network Time Protocol (NTP) daemon status.

Stratum: The Stratum number of the SyncServer. Stratum 1 means it is locked to a Hardware Clock Input Reference or to dial-up time service from the Modem. Stratum 2-15 means the SyncServer is locked to another NTP time source. Stratum 16 means that the SyncServer is unsynchronized.

REF: This field identifies the "system peer". While stratum is 16, this field shows the progression of the NTP clock PLL. The field starts with a value of "INIT". Once a peer has been selected, the clock may be stepped, in which case the reference ID field changes to "STEP". Once the PLL is locked, the stratum is updated and the reference ID provides information about the selected peer. When the SyncServer is operating at stratum 1, the reference ID displays the name of the Hardware Clock reference input. If the selected peer is another NTP server, the reference ID displays the address of the server.

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

Also see ***STATUS - NTP*** (on page 28).

Alarm Status Screen

Current alarm status.

Current: The total number of active alarms. Use the left/right arrows for search through the list of alarms.

Major: List of current major alarms

Minor: List of current minor alarms

Also see ***ADMIN - Alarms*** (on page 85).

LAN Status Screens

Multiple screens, one for each network port.

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

IPv4 Addr: Shows the address of the port.

SM: Shows the subnet mask (IPv4) or scope (IPv6).

GW: Gateway address.

IPv6 Addr: The IPv6 Link local address for this port.

Also see ***NETWORK - Ethernet*** (on page 32).

Hardware Clock Status Screen

Hardware Clock and Input Reference status.

Source: (2 fields) The first field is the name of the current reference. The second field indicates "Locked" when the Hardware Clock is synchronized to that reference.

HH:MM:SS H/W: The UTC or GPS time from the Hardware Clock, depending on the "Ignore..." setting on the **TIMING - HW Clock** page.

GPS In: Indicates "Locked" if the GPS receiver is a valid source of time.

1PPS In: Indicates "Locked" if 1PPS In is a valid source of phase.

Timecode In: Indicates "Locked" if IRIG In connector has a valid source of time.

10MHz In: Indicates "Locked" if 10MHz In is a valid source of frequency.

Also see ***TIMING - HW Clock*** (on page 61).

GPS Receiver Status Screen

GPS receiver status.

Status: Indicates "Locked" when the receiver has a valid timing solution.

Satellites: The number of satellites the receiver is using.

Antenna: The electrical state of the GPS Antenna. "Good" for a normal antenna load current. "Open" for an open electrical circuit in the antenna. "Short" for an electrical short circuit.

Note: If you use a GPS antenna splitter, the status can become Open while the GPS receiver is still able to operate normally.

Lat: The latitude of the SyncServer.

Mode: The acquisition mode of the receiver: Survey (GPS receiver is determining its position), Dynamic (a user-configured mode for mobile applications) or Hold (the GPS receiver has determined its precise location, or the user has manually entered the location).

Lon: The longitude of the SyncServer.

Also see ***REFERENCES - GPS*** (on page 70).

SyncServer Status Screen

Hardware and software identification. Software upgrade availability.

Model: The model number.

S.N.: The serial number.

Version: The software "Release Version" number.

Upgrade Available: Shows "Yes" if the SyncServer detects that more recent version of software is available at www.symmetricom.com.

Also see ***SYSTEM - General*** (on page 76) and ***SYSTEM - Upgrade*** (on page 77).

MENU Button

Pressing the **MENU** button presents a tree-structured menu of functions:

1) LAN1

  1) Config

    1) IPv4

      1) Static Addr *(Apply a static IP address)*

      2) DHCP *(Automatically get a dynamic IP address)*

    2) IPv6 *(Automatically configure LAN1 with an IPv6 link local address. IPv6-only mode.)*

  2) On/Off

    1) On *(Enable the LAN1 network port)*

    2) Off *(Disable the LAN1 network port - all traffic types)*

2) Display

  1) Time Entry *(Enter the UTC date and time using 24-hour format)*

1) Set HW Clock to Freerun?

1) OK *(i.e., Apply the entered time to the Hardware Clock and don't use references)*

2) Cancel

2) Brightness *(Adjust the brightness of the front panel* display)

1) Low *(Extends display life)*

2) Medium

3) High

3) 12/24 *(Appears if the TIMING - Time Zone page is set to a non-UTC Time Zone. Select a 12 or 24-hour clock format)*

1) 12 (AM/PM)

2) 24 Hour

3) Sys Control *(System Control)*

1) Keypad

1) Set Password *(Sets the password the Lockout function. The *first time* the interface asks for the "Current Password", enter 123. No password recover or reset feature is available for the keypad, except to reset factory defaults using the ADMIN - Factory Reset page.)*

2) Lockout *(Password protects the keypad from changes. Asks for confirmation.)*

2) Shutdown *(Halts the SyncServer. Press the ENTER button to confirm. Notifies the user when "System Stopped. OK to Turn Power Off Now!")*

4) USB *(Backs up or restores the configuration to/from a USB flash drive)*

1) Backup Cfg *(Backs up the current configuration of the SyncServer to the USB drive.)*

2) Restore Cfg *(Applies the SyncServer configuration on the USB drive to the SyncServer.)*

3) Upgrade Software *(Applies the software upgrade file on the USB drive to the SyncServer.)*

Notes:

Using 1) LAN1, 1) Config clears all other network port settings.

The factory default password for the keypad is '123'.

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

When performing the USB upgrade, the interface looks for the first valid SyncServer software upgrade .tar file. If found, it extracts the version information and asks the user for confirmation before upgrading the software.

Command Line Interface

The Command Line Interface (CLI) is available on LAN1 and the Console RS-232 port.

The user can connect to LAN1 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

Note: The SyncServer S350i does not include a GPS receiver.

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 LAN1 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 LAN1 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 LAN1 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 LAN1. Action only command.

IPV6AUTO: Enables the automatically generated IPv6 link local address for LAN1. 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.

NTP_QUERY <enable|disable>: Without input, the command returns the current configuration status of the monlist query response (enabled or disabled). Use input “enable” or “disable” to start or stop response to monlist query. 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:***Keypad/Display Interface*** (on page 101), ***SYSTEM - Upgrade*** (on page 77), ***WIZARDS - Upgrade*** (on page 100), ***WIZARDS - Backup*** (on page 99), ***WIZARDS - Restore*** (on page 100).

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 107)

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[1]. NTP Stratum 1.	Power off.
Network	Link failure on the LAN1.	Link failure on the LAN2, LAN3, or LANGBE.	All configured ports 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 202).

Keypad/Display

The keypad/display displays the time, status information, and provides functions described by ***Keypad/Display Interface*** (on page 101).

Keypad

Description:19-button firm silicone rubber keypad

Functionality:User input device

Arrow keys: Left, Right, Up, Down

Numeric keys: 0 through 9

Command keys:ENTER, CLR, TIME, STATUS, MENU

Display

Description:256 x 32 pixel vacuum fluorescent display (VFD)

Functionality:Displays time, status, and functions. User-configurable brightness levels.

[1] The SyncServer S350i does not include a modem.

Rear Panel

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

Note: The SyncServer S350i does not include a GPS receiver, modem or LF radio.

Radio (LF Radio Module)

Description:The optional LF Radio Module (LFR) can be purchased with the SyncServer or separately. The frequency must be specified at the time of purchase.

Timing Accuracy:Variable, depending on conditions.

Transmitters:

- JJY, 40 kHz,
- JJY, 60 kHz,
- WWVB, 60 kHz
- DCF-77, 77.5 kHz

Option part numbers:

- 1520R-LFR40-KITSyncServer 40 kHz LFR Kit
- 1520R-LFR60-KITSyncServer 60 kHz LFR Kit
- 1520R-LFR77-KITSyncServer 77.5 kHz LFR Kit

Modem

Description:Provides dial-up time service over ordinary telephone lines (POTS). Functions as a stratum 1 NTP server association (not as a Input Reference to the Hardware Clock).

Connector:RJ-11

Services:ACTS, USNO, TJJY, and ITU-R TF583.4 (used by PTB and other European timecode services).

Delay Compensation:ACTS, TJJY

Standards:V.92/56K, V.44 and V.42bis data compression, V.42 error correction

Also see:***REFERENCES - Modem*** (on page 72) and ***Using the Modem for Dial-up Time Service*** (on page 159)

Power and Alarm Relays

Description:Two relays. The Power relay de-energizes when the SyncServer loses or cycles power (non-configurable). The Alarm relay can be configured by the user to de-energize when the SyncServer generates alarms. Also see ***ADMIN - Relays*** (on page 92). Specs given for a resistive load.

Connector:SPDT relays that connect “dry contacts”.

Rated load:0.30 A at 125 VAC, 1 A at 30 VDC

Max. Carry Current:1 A

Max. Operating Voltage:125 VAC, 60 VDC

Max. Operating Current:1 A

Max. Switching Capacity:37.5 VA, 30 W

Min. Permissible Load:10 uA @ 10 mVDC

Relay contacts:

- C is *Common* contact
- NO is *Normally Open* contact.
- NC is the *Normally Closed* contact.

Relay states:

	C and NC (Normally Closed)	C and NO (Normally Open)
Energized	Open	Closed (connected)
De-Energized	Closed (connected)	Open

For example:

- When the power is on, the *Power* relay is energized, providing a closed set of contacts between C and NO.
- When the power is off, the *Power* relay is de-energized, providing a closed set of contacts between C and NC.

Network Ports

Description:Three 10/100 Mbps Ethernet ports (LAN1, LAN2, LAN3). One 10/100/1000 Mbps Ethernet port (LANGBE)

Connector:Four standard RJ-45 8-pin connectors

Frame Format for LAN1, LAN2, LAN3:

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

Frame Format for LANGBE:

- IEEE 802.3z and 802.3ab (1000Base-T Gigabit Ethernet at 1000 Mbps) for LANGBE port

Roles:

- LAN1:
    - Web interface (HTTP), command line interface (TELNET)
    - The default port for most NTP functions.
    - DNS, SMTP, SNMP
- All ports respond to NTP (port 123), TIME (port 37), and DAYTIME (port 13) requests.

Factory default static IPv4 addresses:

- LAN1192.168.0.100
- LAN2192.168.0.101
- LAN3192.168.0.102

- LANGbE192.168.0.103

Note: The SyncServer's network ports require Category 5 (or better) network cable.

Sysplex Out

Summary:The Sysplex Timer port outputs serial time strings for IBM mainframe Sysplex systems. The Sysplex Timer provides a common time reference across all the members of an IBM Sysplex. The Sysplex Timer is a key component when systems on multiple CPCs share access to the same data. Also see ***TIMING - Sysplex*** (on page 64).

Description:**Sysplex Out** is a male 9-pin D connector mounted on the rear chassis that transmits Time of Day (TOD) with carriage return on time to an attached Sysplex-compatible device. Configured as DTE (Data Terminal Equipment). Configurable via the Web interface. Sysplex typically uses a "null-modem" serial cable (not supplied) for interconnection with other Sysplex equipment.

Connector:male 9-pin (Sysplex Out)

Data Rates:9600 bps

Parity:Even, Odd, or None

Data Bits:8

Stop Bits:1

Pin Assignment:

- 1N/C
- 2Rx
- 3Tx
- 4N/C
- 5GND
- 6N/C
- 7RTS
- 8CTS
- 9N/C

Format:IBM 9037 Sysplex Timer (First Protocol)

Level:RS-232

Accuracy:<10 mS RMS

Phasing:Carriage return on-time marker

Control:Manual or Automatic start/stop, parity setting, flywheel quality character

String:<SOH>DDD:HH:MM:SSQ<CR><LF>

Where:

- <SOH>Start of Header
- DDDDay
- :Colon separator
- HHHours
- MMMinutes
- SSSeconds
- QTime Quality

- <CR>Carriage Return (On-time marker)
- <LF>Line Feed

10MHz In

Description:10MHz In, a female BNC connector mounted on the rear chassis, accepts a 10MHz signal from an external frequency reference into the SyncServer's Hardware Clock. For the SyncServer to maintain lock to this signal, the stability of the 10MHz input must be better than the pull-range of the system oscillator.

Connector:BNC female (10MHz In)

Amplitude:1 Vpp to 8 Vpp

Frequency:10MHz

Wave Shape:Sine Wave or Square Wave

Impedance:> 50 k Ohms

Typical system oscillator pull-ranges:

- TCXO 1E-6 (1 ppm)
- OCXO 5E-7 (0.5 ppm)
- Rubidium 1E-9 (1 ppb)

Note: If the 10MHz In signal is too noisy, the Hardware Clock may not be able to lock to it.

10MHz Out

Description:**10MHz Out**, a female BNC connector mounted on the rear chassis, provides a 10MHz signal from the SyncServer's Hardware Clock.

Connector:BNC female (10MHz Out)

Amplitude:> 3 Vpp and < 4 Vpp into 50 Ohms

Frequency:10MHz

Wave Shape:Sine Wave

1PPS In

Description:**1PPS In**, a female BNC connector mounted on the rear chassis, accepts a once per second pulse from an external reference into the SyncServer's Hardware Clock. For the SyncServer to maintain lock to this signal, the stability of the 1PPS input must be better than the pull-range of the system oscillator.

Connector:BNC female (1PPS In)

Amplitude:TTL Levels

Pulse Width100 nS minimum

On Time Edge:Rising

Impedance:270 Ohms

Typical system oscillator pull-ranges:

- TCXO 1E-6 (1 ppm)
- OCXO 5E-7 (0.5 ppm)

- Rubidium 1E-9 (1 ppb)

Note: If the 1PPS In signal is too noisy, the Hardware Clock may not be able to lock to it.

1PPS Out

Description:**1PPS Out**, a female BNC connector mounted on the rear chassis, provides a once per second pulse that is synchronous with the SyncServer's Hardware Clock.

Connector:BNC female (1PPS Out)

Amplitude:TTL Levels into 50 Ohms

Duty Cycle:50% nominal

On Time Edge:Rising

IRIG In (Timecode In)

Description:**IRIG In** accepts a time code for input from an external timing reference into the SyncServer's Hardware Clock. The time code format is selected via the Web interface. Supports both amplitude modulated (AM) and DC level shifted (DCLS) inputs. For the SyncServer to maintain lock to this signal, the stability of the time code input must be better than the pull-range of the system oscillator. Also see ***REFERENCES - Timecode*** (on page 71) and ***IRIG Control Function Bits*** (on page 120).

Connector:**IRIG In**, BNC female

DCLS Amplitude:<1.5 V for logic 0, >2.0 V for logic 1

AM Amplitude:1 to 8 Vpp

AM Ratio:2:1 to 4:1

Impedance:>5k Ohms

Typical system oscillator pull-ranges:

- TCXO 1E-6 (1 ppm)
- OCXO 5E-7 (0.5 ppm)
- Rubidium 1E-9 (1 ppb)

Note: If the inbound signal is too noisy, the Hardware Clock may not lock to it.

Selectable Time Code Input Formats:

- IRIG A
    - IRIG A AM (with year)
    - IRIG A DCLS (with year)
    - IRIG A AM (no year)
    - IRIG A DCLS (no year)
- IRIG B
    - IRIG B AM (with year)
    - IRIG B DCLS (with year)
    - IRIG B AM (no year)
    - IRIG B DCLS (no year)
    - IRIG B 1344 AM

    - IRIG B 1344 DCLS
    - IRIG B AM Legacy TrueTime
    - IRIG B DCLS Legacy TrueTime
- IRIG E
    - IRIG E AM 100Hz (with year)
    - IRIG E AM 1KHz (with year)
    - IRIG E DCLS (with year)
    - IRIG E AM 100Hz (no year)
    - IRIG E AM 1KHz (no year)
    - IRIG E DCLS (no year)
- IRIG G
    - IRIG G AM (with year)
    - IRIG G DCLS (with year)
    - IRIG G AM (no year)
    - IRIG G DCLS (no year)
- NASA36
    - NASA36 AM
    - NASA36 DC
- XR3/2137
    - XR3 250Hz
    - 2137 1kHz
    - XR3 DC

IRIG Out (Timecode Out)

Description:**IRIG Out**, provides a selected time code from the SyncServer's Hardware Clock. The time code format is selected via the Web interface. Amplitude Modulated (AM) and DC Level Shifted (DCLS) outputs are supported from the IRIG Out BNC. Also see ***REFERENCES - Timecode*** (on page 71) and ***IRIG Control Function Bits*** (on page 120).

Connector:**IRIG Out**, BNC female

DCLS Amplitude: TTL into 50 ohms

AM Amplitude:3.5 ±0.5 Vpp into 50 Ohms

AM Ratio:3:1 ±10%

Selectable Time Code Output Formats:

IRIG A	IRIG B	IRIG E
A000 (DCLS, CF, SBS)	B000 (DCLS ,CF, SBS)	E001 (DCLS, CF)
A001 (DCLS, CF)	B001 (DCLS ,CF)	E002 (DCLS)
A002 (DCLS)	B002 (DCLS)	E005 (DCLS, YR, CF)
A003 (DCLS, SBS)	B003 (DCLS ,SBS)	E006 (DCLS, YR)
A004 (DCLS, YR, CF, SBS)	B004 (DCLS ,YR, CF, SBS)	E111 (100 Hz, CF)

IRIG A	IRIG B	IRIG E
A005 (DCLS, YR, CF)	B005 (DCLS ,YR, CF)	E112 (100 Hz)
A006 (DCLS, YR)	B006 (DCLS ,YR)	E115 (100 Hz, YR, CF)
A007 (DCLS, YR, SBS)	B007 (DCLS ,YR, SBS)	E116 (100 Hz, YR)
A130 (10 kHz, CF, SBS)	B120 (1 kHz, CF, SBS)	E121 (1 kHz, CF)
A131 (10 kHz, CF)	B121 (1 kHz, CF)	E122 (1 kHz)
A132 (10 kHz)	B122 (1 kHz)	E125 (1 kHz, YR, CF)
A133 (10 kHz, SBS)	B123 (1 kHz, SBS)	E126 (1 kHz, YR)
A134 (10 kHz, YR, CF, SBS)	B124 (1 kHz, YR, CF, SBS)	
A135 (10 kHz, YR, CF)	B125 (1kHz, YR, CF)	
A136 (10 kHz, YR)	B126 (1kHz, YR)	
A137 (10 kHz, YR, SBS)	B127 (1kHz, YR, SBS)	
	B 1344 AM	
	B 1344 DCLS	

IRIG G	Legacy TrueTime	NASA 36	XR3/2137
G005 (DCLS, YR, CF)	Legacy TrueTime AM	NASA 36 AM	XR 3 (250 Hz)
G145 (100 kHz, YR, CF)	Legacy TrueTime DCLS	NASA 36 DCLS	2137 (1 kHz) DCLS

IRIG Control Function Bits

In the following tables, tq1 through tq4 are the time quality bits.

For the time quality bits and the unlock bits, "1" means active.

For **IRIG output codes A, B, or E with CF** (control functions), the following CF bits are encoded:

IndexBit

countname

----- -----

70 (bit = 0)

71 (bit = 0)

72 (bit = 0)

73 unlock (1 = unit is not locked to a reference)

74 (bit = 0)

75 tq1(1 = timing error estimate > 1us)

76 tq2 (1 = timing error estimate > 10us)

77 tq3 (1 = timing error estimate > 100us)

78 tq4 (1 = timing error estimate > 1ms)

For **IRIG output code G**, the following CF bits are encoded:

Index Bit

countname

----- -----

70 (bit = 0)

71 (bit = 0)

72 (bit = 0)

73 unlock (1 = unit is not locked to a reference)

74 (bit = 0)

75 tq1(1 = timing error estimate > 1us)

76 tq2 (1 = timing error estimate > 10us)

77 tq3 (1 = timing error estimate > 100us)

78 tq4 (1 = timing error estimate > 1ms)

For **Legacy TrueTime IRIG B**, the following CF bits are encoded:

Index Bit

countname

----- -----

50 (bit = 0)

51 (bit = 0)

52 (bit = 0)

53 unlock (1 = unit is not locked to a reference)

54 (bit = 0)

55 tq1(1 = timing error estimate > 1us)

56 tq2 (1 = timing error estimate > 10us)

57 tq3 (1 = timing error estimate > 100us)

58 tq4 (1 = timing error estimate > 1ms)

When **Legacy TrueTime IRIG B input** is selected, the SyncServer will not lock to the incoming code if the unlock bit = 1.

GPS Receiver

Note that the **SyncServer model 350i** does not have a 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:

- ***GPS Antenna*** (on page 125)
- ***GPS Cable Configurations/Options*** (on page 145)

Chassis Grounding Screw

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

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

Also see:***WARNING: Grounding*** (on page 122)

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.

VDC Power Supply

This topic applies to the 48 VDC Operation Model only.

Description:VDC Power Supply

Connector:Two three-position screw terminal blocks

Input Voltage Range:40-60 VDC, 50 watts maximum, 1.5 amps

Isolation, Ground:Input is fully floating. Either input polarity may be strapped to chassis ground at the input terminal block.

Isolation:Input to output 1,000 VAC minimum

Also see:***WARNING: VDC Power*** (on page 123)

WARNING: VDC Power

For the 48 VDC model of the SyncServer:

- Use a disconnect device, such as a switch, with the appropriate voltage/current rating when connecting a VDC Power source.
- Only use the unit in an restricted area.
- The screw torque on the Power Terminal Block is 4.5 to 5.3 inch pounds.
- The unit chassis must be grounded for proper safety.

AVERTISSEMENT :

Sur le 48 VDC modèle du SyncServer:

- Utilisez un dispositif de débranchement, tel qu'un commutateur, avec le classement de tension/courant approprié en connectant une source de pouvoir de DC.
- Employez seulement l'unité dans un secteur avec l'accès limité.
- Le couple de vis sur le TB de puissance est livres de 4.5 à 5.3 pouces.
- Le châssis d'unité doit être fondu pour la sûreté appropriée

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 123)

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 15)

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:8 lbs., 3.7 kg w. standard oscillator or optional OCXO

9 lbs., 4.1 kg w. 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

Note: The SyncServer S350i does not include a GPS receiver or a modem.

Synchronization Source	Timing Accuracy to Reference	Comments
GPS, >= 4 Satellites tracked	150 nS peak; 50 nS RMS to UTC(USNO)	Highest Performance Mode

Synchronization Source	Timing Accuracy to Reference	Comments
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
IRIG AM		
A13x	±5 uS relative to 1PPS output	10kHz
B12x	±10 uS relative to 1PPS output	1kHz
E11x	±100 uS relative to 1PPS output	100Hz
E12x	±10 uS relative to 1PPS output	1kHz
G14x	±5 uS relative to 1PPS output	100kHz
NASA 36 AM	±10 uS relative to 1PPS output	1kHz
XR3 AM	±10 uS relative to 1PPS output	250Hz
2137 AM	±10 uS relative to 1PPS output	1kHz
IRIG DCLS		
A00x	±500 nS relative to 1PPS output	
B00x	±500 nS relative to 1PPS output	
E00x	±500 nS relative to 1PPS output	
G00x	±500 nS relative to 1PPS output	
NASA 36	±500 nS relative to 1PPS output	
XR3	±500 nS relative to 1PPS output	
2137	±500 nS relative to 1PPS output	
1PPS	±100 nS	
Ext. 10MHz	Coherent with 1PPS	
ACTS Modem[1]	±100 mS	< ±50 mS typical
LFR	±50 mS	< ±20 mS typical
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

[1] Accuracy with default polling intervals. Can be degraded with longer polling interval.

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)

Note that the **SyncServer model 350i** does not have a GPS receiver.

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:3 microseconds/day typical for a Model S350 and 6 microseconds/day typical for a Model S300 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 7000 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 and Autokey Authentication

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

Also see: ***STATUS - NTP*** (on page 28), ***NTP - Sysinfo*** (on page 39), ***NTP - Assoc*** (on page 42), ***NTP - Config*** (on page 43), ***NTP - MD5 Keys*** (on page 47), ***NTP - Autokey*** (on page 48), ***NTP - Autokey Client*** (on page 49), ***NTP - Prefs*** (on page 50), ***WIZARDS - NTP*** (on page 99), ***ADMIN - Alarms*** (on page 85), 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-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

- 73/23/EEC Low Voltage Safety as amended by 93/68/EEC
- IEC 60950-1:2001 (1st Edition)
- EN 60950-1:2001

Electromagnetic Compatibility

- 2004/108/EC Electromagnetic Compatibility
- EN55022 (1998) EMC Emissions for ITE, Class A
- EN55024 (1998) EMC Immunity for ITE
- EN61000-3-2 (2000) 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:

- 73/23 EEC CE Low Voltage Safety Directive
- EN 60950-1:2001
- UL 60950-1:2003
- CSA 22.2 60950-1:2003
- IEC 60950-1:2001

- AS/NZ 60950-1:2003
- PSE Japan

EMC Standards

Meets the following EMC standards:

- FCC Part 15 Subpart B
- 2004/108/ECCE EMC Directive
- EN61000-3-2:2000Harmonic Current
- EN61000-3-3:1995Voltage Fluctuations and Flicker
- EN55022:1998Conducted and Radiated Emissions Standard
- EN55024:1998Immunity Standard
- VCCI: April 2000Japan EMC Standard
- ICES-003Canada EMC Standard
- AS/NZS CISPR 22:2002Australia/New Zealand EMC Standard

Note: In some cases, for FCC and CE EMC Radiated Emission Compliance, a ferrite EMI suppressor (Fair Rite P/N 0444164951 or equivalent) may need to be placed on the unit end of cables connected to the BNC Connectors. Please contact ***Microsemi Customer Assistance*** (on page 5) for additional information.

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.

86-611x PCB

- 512MB CompactFlash Primary (J3). The 512MB CompactFlash device is installed on the 86-611x PCB. 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 86-611x PCB. 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 (J4).
- 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 Intel 82551ER Fast Ethernet Controller configuration (U34). This non-volatile part is used at power-on to initialize registers in the Intel Fast Ethernet Controller. This part is not reprogrammed in normal operation. This part is a DIP that is mounted in an 8-pin socket.
- M93C46 1Kb Serial Microwire EEPROM for Intel 82541ER Gigabit Ethernet Controller configuration (U36). This non-volatile part is used at power-on to initialize registers in the Intel Gigabit Ethernet Controller. This part is not reprogrammed in normal operation. This part is a DIP that is mounted in an 8-pin socket.
- 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.

Line Replaceable Units (LRUs).

Web Interface

The S300 and S350 web interface is compatible with:

- Internet Explorer 7 and 8
- Firefox 3.x

Software

Upgrades

Microsemi (formerly Symmetricom) makes software updates available as downloads on the Internet.

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: VDC Power

For the 48 VDC model of the SyncServer:

- Use a disconnect device, such as a switch, with the appropriate voltage/current rating when connecting a VDC Power source.
- Only use the unit in an restricted area.
- The screw torque on the Power Terminal Block is 4.5 to 5.3 inch pounds.
- The unit chassis must be grounded for proper safety.

AVERTISSEMENT :

Sur le 48 VDC modèle du SyncServer:

- Utilisez un dispositif de débranchement, tel qu'un commutateur, avec le classement de tension/courant approprié en connectant une source de pouvoir de DC.
- Employez seulement l'unité dans un secteur avec l'accès limité.
- Le couple de vis sur le TB de puissance est livres de 4.5 à 5.3 pouces.
- Le châssis d'unité doit être fondu pour la sûreté appropriée

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.

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 13).

Note that the **SyncServer model 350i** does not have a GPS receiver, modem or LF radio installed.

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 (unless 48VDC option is ordered)
- 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.

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.

Connecting VDC Power

For units equipped with the optional 48 VDC power supply:

- Use a 14 amp DC circuit breaker in series with the DC power source. Do not connect the unit directly to a DC power source without the breaker.

- Provide a circuit disconnect in series with the VDC Power input. The SyncServer DC option does not include a power switch
- The minimum recommended wire size is 14 AWG (1.5mm2) for DC power source hook up. Don't forget to tighten the terminal screws on the input power block.
- The VDC Power supply in the SyncServer is DC isolated. The VDC Power inputs are polarity protected so reversed DC connections will not power the unit but will also not harm the unit.
- Connect VDC Power to the PRI or optionally the SEC set of terminals observing correct polarity (+, -). The SEC set of terminals has been provided for connections to a secondary power source. Note that the PRI and SEC power connections are simply diode OR'ed, so the highest voltage source will be powering the unit.

The PRI and SEC ground terminals on the VDC Power input block are connected to the chassis. These terminals are normally used to connect to the VDC Power return line.

Note: The 48 VDC Operation Model is supplied with two 48 VDC inputs to accommodate input from an alternate VDC Power Source. Because of diode switching, the polarity can be plus-plus, plus-minus, minus-plus, or minus-minus.

WARNING: VDC Power

For the 48 VDC model of the SyncServer:

- Use a disconnect device, such as a switch, with the appropriate voltage/current rating when connecting a VDC Power source.
- Only use the unit in an restricted area.
- The screw torque on the Power Terminal Block is 4.5 to 5.3 inch pounds.
- The unit chassis must be grounded for proper safety.

AVERTISSEMENT :

Sur le 48 VDC modèle du SyncServer:

- Utilisez un dispositif de débranchement, tel qu'un commutateur, avec le classement de tension/courant approprié en connectant une source de pouvoir de DC.
- Employez seulement l'unité dans un secteur avec l'accès limité.
- Le couple de vis sur le TB de puissance est livres de 4.5 à 5.3 pouces.
- Le châssis d'unité doit être fondu pour la sûreté appropriée

Telecommunications (Modem) Interfaces

Caution: To reduce risk of fire use only No.26 AWG (0.128mm2) or larger telecommunications (modem) line cord if the cord supplied is not used with the apparatus.

Attention : Pour réduire le risque d'A.W.G. No.26 d'utilisation du feu seulement (0.128mm2) ou de plus grande ligne corde de télécommunications (modem) si la corde fournie n'est pas employée avec l'appareil.

IMPORTANT SAFETY INSTRUCTIONS

When using your telephone (modem) equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons, including the following:

1. Do not install modem during a storm.
2. Do not use this product near water or in a damp location.
3. Avoid routing telephone cords with power cords.

Save These Instructions

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 isn't 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 :

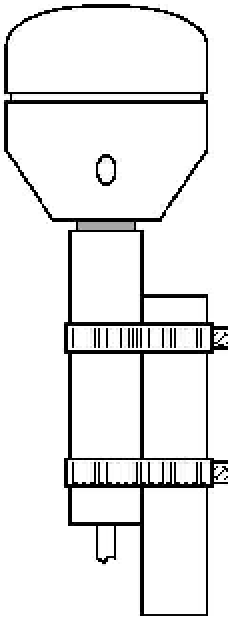
- Evitez et les dangers de sûreté électriques et RF, tels que les lignes à haute tension et les antennes de transmission de radio de haute énergie.
- Où les dangers potentiels existent, ayez un technicien qualifié exécute l'installation.
- Observez des codes et des règlements locaux.

- 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 143).

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. 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. (Avoid unscrewing the PVC mounting mast from the base of the GPS antenna as this may require a vice and lots of torque.)
- When extending the length of the cable, observe the recommended configurations in ***GPS Cable Configurations/Options*** (on page 145). Avoid exceeding the recommended lengths by combining the standard 50 foot (15.24 m) cable with the extended-length cable.

Operating in "Window Mode"

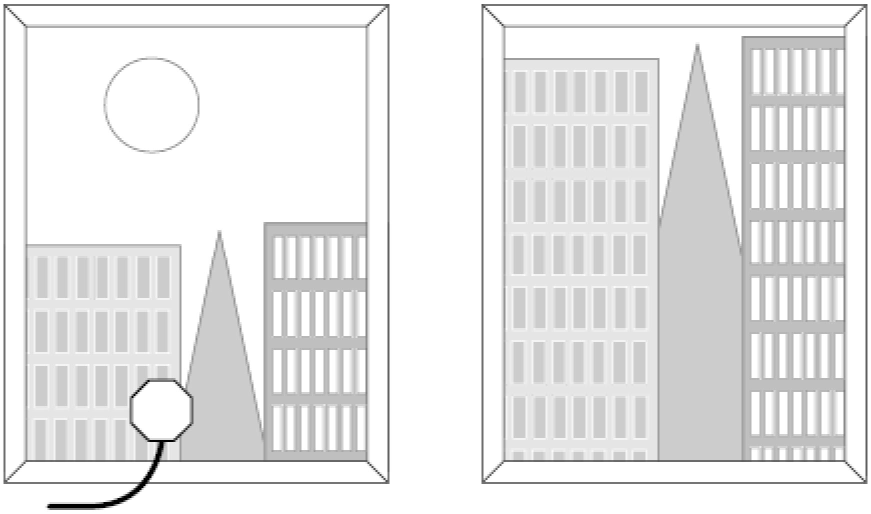
The SyncServer can provide can provide excellent synchronization to UTC if the GPS receiver has an accurate fix on its position and one *current* GPS satellite most of the time. This capability is known as *Window Mode*.

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 126).

Verifying the GPS Installation

Verify the GPS antenna installation:

1. Press the **STATUS** button on the front panel.
2. Press the up arrow button to display the **GPS STATUS** screen.
3. When the number of **Satellites** is equal or greater than "4", **Status** should be *Locked*.
4. With GPS locked, the **SYNC** LED on the front panel should be green within approximately 15 minutes.

This 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 (email, 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:

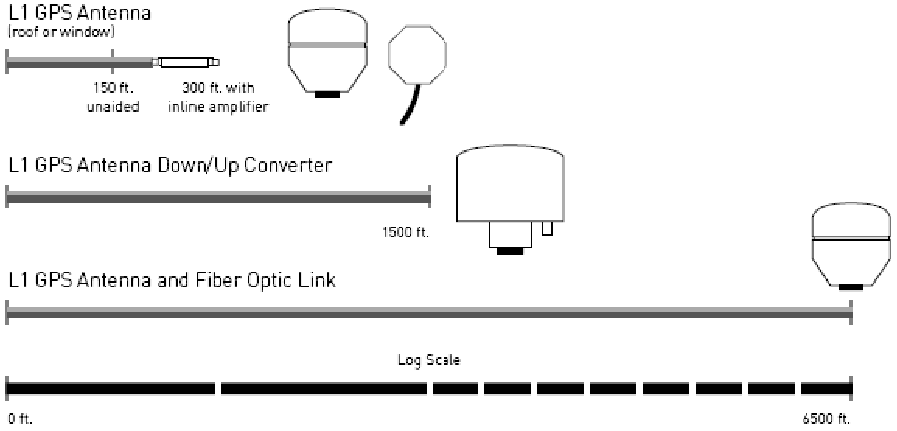
- Review the GPS topics in this user guide
- Troubleshoot for issues with the GPS antenna and cable.
- Contact ***Microsemi Customer Assistance*** (on page 5).

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.

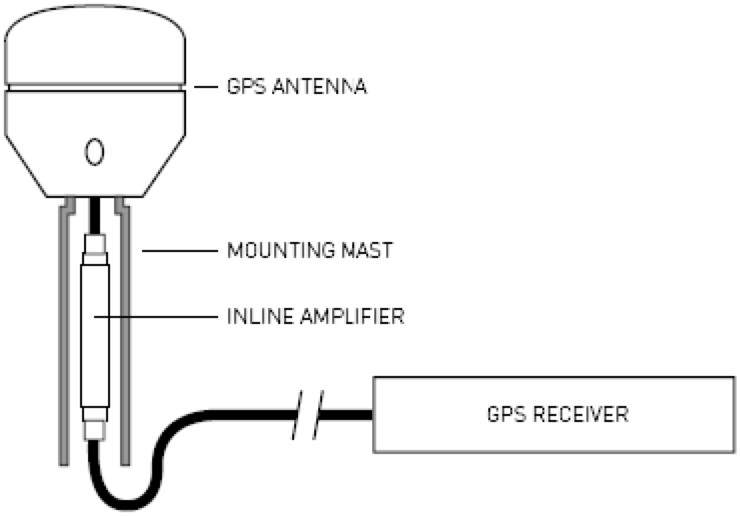
Since the GPS signal is very weak, the antenna amplifies the signal to drive it through the cable to the receiver. Antenna cable however offers some resistance and the GPS signal strength will attenuate as it travels down the cable. GPS receiver sensitivity is finite so if the cable length is too long 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:



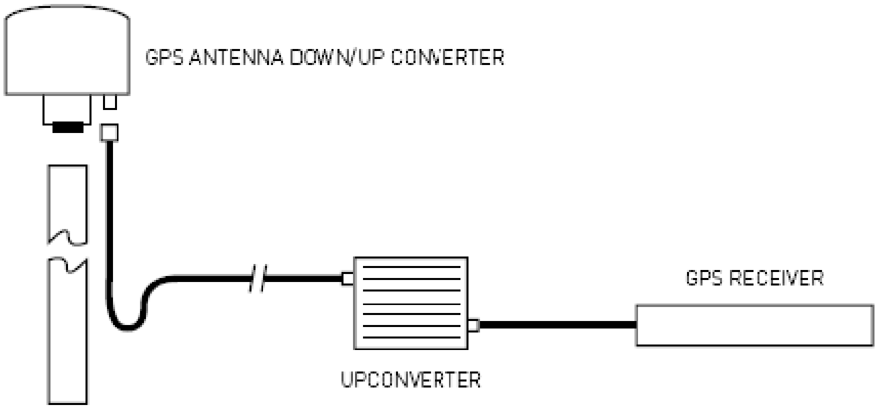
Cable lengths and antenna solutions

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

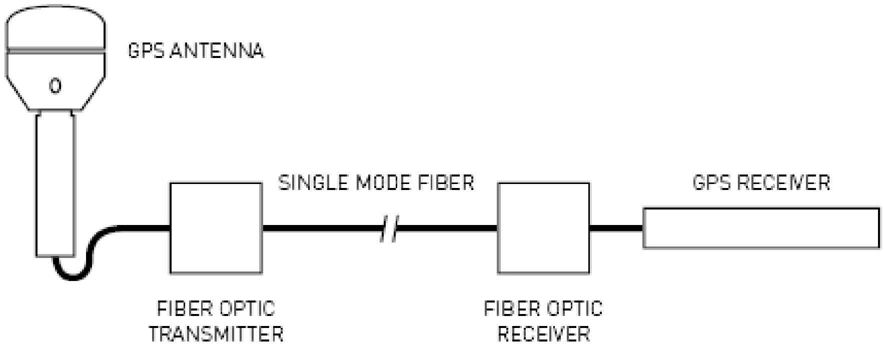
GPS Down/Up converter: The GPS Down/Up converter makes cable runs of 250 to 1500 feet (75 m to 457 m) possible. GPS signal down conversion requires a special GPS antenna and corresponding signal up-converter. The antenna module converts the signal down to a lower frequency that has less attenuation, 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 LAN1

During installation, the user configures LAN1 to gain access to the web interface. After logging in to the web interface, the user can configure the remaining ports on the **NETWORK - Ethernet** page.

The factory default settings for the LAN1 network port are as follows:

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

Configure new network settings using the keypad on the front panel:

1. Press the **MENU** button on the front panel.
2. Using the number buttons, select **1) LAN1**, then **1) Config**, and configure the port as needed.
3. Check the new LAN1 settings by pressing the **STATUS** button repeatedly until "LAN1 STATUS" is shown.

Note: Using the keypad/display interface to configure LAN1, erases the previous settings for all of the network ports.

Also see ***MENU Button*** (on page 104).

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. Get the LAN1 IP address by pressing the **STATUS** button repeatedly until the **LAN1 STATUS** screen is visible on the display.
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.

Using the 1st Setup Wizard

Select the **WIZARDS** button and complete the **1st Setup** wizard.

1. Configure the SyncServer using **WIZARDS - 1st Setup**. Select the following options:
    - "Configure Password Recovery" (Ask the IT department for the IP address of the SMTP server).
    - "Send test mail when finished"
    - "Set Local Time Zone"

Note: Reconfiguring LAN1 in the **1st Setup** wizard erases the previous network settings for all Ethernet ports.

Also see ***WIZARDS - 1st Setup*** (on page 99).

Configuring the Network Ports

Configure the remaining network ports using **NETWORK - Ethernet**.

Microsemi Recommends:

- Using static IP addresses. (See explanation below.)
- Using **Allowed Access** to protect the network ports 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 32).

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 155).

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 43).
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 158).

Using the Other Input References

(Optional) Connect any additional Input References to the back panel and configure them, if needed:

- For **IRIG In**, see ***REFERENCES - Timecode*** (on page 71).
- **1PPS In, 10MHz In** don't require any configuration.
- For **LF Radio**, see ***REFERENCES - LF Radio*** (on page 75) and ***Using LF Radio*** (on page 170).

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 167).

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

Alarms and Notification

You're not receiving alarm notifications by email or snmp.

- Check that the alarm notification settings are enabled, as shown in the ***Factory Default Settings for Alarms*** (on page 89) topic.
- To receive SNMP traps, verify that the **NETWORK - SNMP** and **NETWORK - SNMP Traps** pages are configured correctly.
- To receive email notification, verify that the **SERVICES - Email** page is configured correctly.
- Verify that LAN1 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 ports on the **NETWORK - Ethernet** page, described in ***Configuring the Network Ports*** (on page 149).
- 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 and/or NTP server/peer associations. Also see ***Using GPS*** (on page 140), ***Using the Other Input References*** (on page 150), and ***Adding Server Associations*** (on page 150).

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 LAN1 port is configured correctly and has a DNS server on the **NETWORK - Ethernet** page (typically configured during installation).
- The LAN1 port can reach 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: email, Alarm LED, SNMP (typically configured during installation).

See also:

- ***WIZARDS - Backup*** (on page 99)
- ***SYSTEM - Upgrade*** (on page 77)
- ***ADMIN - Alarms*** (on page 85)

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 at 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 166).

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 **4) USB** function on the keypad/display interface:

1. Insert the USB flash drive in either USB port on the front panel.
2. Press the **MENU** button.
3. Select **4) USB**.
4. Select **3) Upgrade Software**.
5. Select **1) Yes**.

Method 2: 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 3: 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, while the Front Panel Display shows the model, time and date.

- 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 LAN1 is physically connected to the network.
- Ping the IP Address of LAN1.
- Check that the LAN1 IP Address, Mask, and Gateway are valid using the **STATUS** button to display **LAN1 STATUS**.
- LAN1 may be disabled. If needed, turn it on using the Keypad/Display as follows:
    1. Press **MENU**.
    2. Select **1) LAN1**.
    3. Select **2) On/Off**.
    4. Select **1) On**.
- 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 15).
    - Otherwise, log into the command line interface and turn the web server on using the *HTTP on* command. See ***Command Line Interface*** (on page 107).
    - 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 155).

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 43).
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 158).

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 43).
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 (LAN1) 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 43).

Creating a broadcast association

To configure the SyncServer as a broadcast server:

1. Configure authentication as described in ***Using NTP Authentication*** (on page 160). 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 160)
- ***Using MD5 Keys on a SyncServer*** (on page 161)
- ***Using NTP Authentication*** (on page 160)

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 156) and ***NTP - Config*** (on page 43).

Configuring the multicast server

To configure a SyncServer as a multicast server:

1. Configure authentication as described in ***Using NTP Authentication*** (on page 160). 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 160)
- ***Using MD5 Keys on a SyncServer*** (on page 161)
- ***Using NTP Authentication*** (on page 160)

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 160).

Using the Modem for Dial-up Time Service

The SyncServer S350i does not include a modem.

The modem provides dial-up time service over ordinary telephone lines (POTS). It functions as a stratum 1 NTP server association, not as a Input Reference to the Hardware Clock. The SyncServer typically uses the modem as a backup NTP reference if no other NTP references are available (no Input References, or reachable NTP servers and peers).

To configure the modem for dial-up time service:

1. Connect **Modem** to a standard telephone line (POTS) using a RJ-11 telephone cable.
2. On the **REFERENCES - Modem** page, select one of the services under **Preconfigured Phone Numbers**. This populates the **Dial-Up Time Reference Phone Number(s)** field(s) with established phone numbers for that service.
3. (Optional) Manually enter the phone number of a compatible dial-up service under **Dial-Up Time Reference Phone Number(s)**.
4. (Optional) Use the *Modem Pre-Test* and the **TEST MODEM** button to verify any particular number is reachable. A small status message to the right of the **CANCEL** button indicates whether the call was successful.
5. Click the **APPLY** button. This creates an NTP server association for the modem.
6. On the **NTP - Sysinfo** page click the **RESTART** button at the bottom of the page.

The user can edit and delete the modem association on the **NTP - Config** page, if needed.

The timing accuracy of the modem is a function of the *Minimum Poll Interval* and *Maximum Poll Interval* settings on the **NTP - Config** page. A smaller maxpoll causes the modem to call the time service more frequently, yielding better synchronization.

Note: The jitter on a voice over IP (VoIP) digital line may be too high, seriously degrading performance.

Delay Compensation

For NIST Automated Computer Time Service (ACTS), the typical maximum time offset is 50 milliseconds to UTC (NIST). The typical time offset is < 20 milliseconds to UTC (NIST).

When the SyncServer dials ACTS, the on time mark (OTM) is delayed as it travels from NIST back to the SyncServer. Software in the SyncServer returns the OTM to ACTS after it is received. Each time the OTM is returned, ACTS measures the amount of time it took for the OTM to go from ACTS to the SyncServer and back to ACTS. Software at ACTS divides the round-trip path delay by two to get the one-way path delay. ACTS then advances the OTM by the one-way path delay and the resulting time code can be synchronized within a few milliseconds of UTC(NIST).

Telephone JJY in Japan offers automatic delay compensation similar to that of ACTS.

The time services run by USNO in the US and the PTB in Germany do not offer delay compensation.

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 164).

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 162) 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 164).

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.

Using Autokey

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 164).

Generating and downloading autokeys

1. Log in to the SyncServer securely and go to the **NTP - Autokey** page.
2. Select an **Identity Scheme**.
3. (Optional) Create a peer, broadcast, or multicast association using the **Server Role** and **Server Address** fields.
4. Enter an alphanumeric **Server Password**.
5. If the Identity Scheme is IFF, enter an alphanumeric **Client Password**.
6. Click the **GENERATE** button.
7. Download the keys or certificates:
   - If the Identity Scheme is PC, use **SAVE AS** to download the *Server Host Key* and *Server Certificate* to your workstation one at a time.
   - If the Identity Scheme is IFF or GQ, use **SAVE AS** to download the *Client Group Key* to your workstation.
8. Click the **RESTART** button.

Enabling autokey for a particular NTP association

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

1. After generating the keys or certificates on the SyncServer.
2. If needed, log in to the SyncServer securely.
3. Go to the **NTP - Config** page.
4. Create or edit an NTP association.
5. Set **MD5 Key** to **Auto**.
6. Click the **SAVE** button.
7. 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 autokey keys and certificates to another SyncServer

1. Log in to the other SyncServer securely.
2. On the **NTP - Autokey Client** page, select the **Identity Scheme** that was used to generate the keys.
3. Enter the **Server Password** or **Client Password** used at the time the user generated the certificates and keys:
   - If the Identity Scheme is PC or GQ, enter the Server Password.
   - If the Identity Scheme is IFF, enter the Client Password used at the time the user generated the certificates and keys.
4. Use the **BROWSE** buttons to locate and upload the key or certificate files:
   - If the Identity Scheme is PC, upload the *Server Host Key File* and *Server Certificate File*.
   - If the Identity Scheme is IFF or GQ, upload the *Client Group Key File*.
5. Click the **INSTALL** button. This copies the files to the SyncServer.
6. Click the **RESTART** button. This restarts the NTP daemon, putting all of the keys into effect.

Using Autokey on a generic NTP device

Consult the manufacturer's documentation, if available, or consult ***http://support.ntp.org/bin/view/Support/ConfiguringAutokey***.

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** or **WIZARD-1st Setup** pages

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 167).

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 keypad/display interface:

1. Press the **MENU** button.
2. Select **3) Sys Control**.
3. Select **2) Shutdown**.
4. Press the **ENTER** button.
5. When the display shows "System Stopped - OK to Turn Power Off Now!" turn the power off.

Or, 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.
- From the front panel keypad, using the **MENU** button and the **4) USB** menu item.

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 ports have static IP addresses, avoid IP address conflicts by changing these addresses.

- 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 167) topic.

Creating a Backup File

From the front panel keypad

1. Plug a compatible USB flash drive into either USB port.
2. Wait 10 seconds.
3. Press the **MENU** button.
4. Select **4) USB**.
5. Select **1) Backup Cfg**.
6. When the SyncServer finishes "Saving to USB Drive", remove the USB flash drive.

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 front panel keypad

1. Plug the USB flash drive into the 'target' SyncServer.
2. Wait 10 seconds.
3. Press the **MENU** button, select **4) USB**, and select **1) Restore Cfg**.
4. The SyncServer reports "Restoring from USB Drive" and "Shutting down, please wait..."
5. When the SyncServer finishes rebooting, remove the USB flash drive.

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 167).
- Restore last backup from SyncServer.
- Restore backup from USB flash drive.
- Restore backup from a workstation hard-drive or network directory.

Transferring Configurations

The user can transfer a configuration across multiple SyncServers to save time and effort, provided they are running the same *Software Version* (displayed on the **STATUS - General** page.

If you have physical access to the SyncServer, the easiest method for transferring the configuration is to use a USB flash drive and the front panel keypad.

1. Create a backup file on a configured SyncServer, as described in ***Creating a Backup File*** (on page 166).
2. Restore that backup file to another SyncServer as described in ***Restoring from a Backup File*** (on page 167).
3. **IMPORTANT:** When the SyncServer reboots, immediately change the IP address of LAN1 using the front panel **MENU** button as described in ***Configuring LAN1*** (on page 148). This step resets all of the network port addresses and prevents network address collisions with the previous SyncServer.
4. Log in and use the **NETWORK - Ethernet** page to configure the network ports.
5. On the **SYSTEM - General** page, update the **Hostname**.

Restoring the Factory Default Configuration

Note: The SyncServer S350i does not include a GPS receiver.

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 166).

Restoring the default factory configuration removes the current network settings. Afterwards, the user may need to configure the LAN1 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 15).
2. **VERY IMPORTANT**: Remove the top cover as described in ***Removing the Top Cover*** (on page 169).
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 15):

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 169).
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.

Using LF Radio

Introduction

Note: the SyncServer model 350i does not include the LF Radio or GPS receiver.

The Low Frequency Radio (LFR) option gets time from a radio time service and makes it available as an Input Reference. The LF radio option can be used alone, or as a backup to other Input References, such as GPS and Timecode. Depending on conditions, the LF radio option may be able to operate indoors.

Please note that the LFR option provides the least accurate timing reference to the SyncServer's hardware clock (in the milliseconds range). This option is intended for use as a backup to more accurate Input References.

Please feel free to contact ***Microsemi Worldwide Sales***http://www.microsemi.com/sales-contacts/0 online to borrow a stand-alone kit for evaluating LF Radio reception in a variety of locations.

Purchasing:

- The LF radio option is available only for the S300 and S350.
- It can be purchased with the SyncServer, or separately.
- At the time of purchase, the user specifies the frequency of the radio time service.

The four radio time services are:

- WWVB, transmitting at 60 kHz, located near Fort Collins, Colorado, USA, at coordinates: 40°40' north, 105°2' west.
- DCF77, transmitting at 77.5 kHz, located near Mainflingen and Frankfurt, Hesse, Germany, at coordinates: 50°01' north, 09°00' east.
- JJY, transmitting at 60 kHz, located on Hagane-yama, Saga prefecture, Kyushu Island, Japan, at coordinates: 33°28' north 130°11' east.
- JJY, transmitting at 40 kHz, located on Ohtakadoya-yama, Fukushima prefecture, Japan, at coordinates: 37°22' north 140°51' east.

The LF radio option derives UTC from all of these services (JJY transmits Japan Standard Time).

The low frequency (long wavelength) signals from these transmitters:

- Propagate over long distances as ground waves, following the curvature of the Earth.
- Have significantly greater range at night than at day.
- Penetrate structures and obstacles better than higher frequencies, such as those used by GPS.

LF Radio receiver operation therefore depends on the following factors:

- The distance from transmitter to receiver.
- The orientation of the receiving antenna relative to the transmitter.
- The orientation of the receiving antenna relative to the vertically polarized radio waves.
- The time of day.

- Local electromagnetic conditions such as shielding and sources of radio frequency noise.

The best conditions are therefore:

- Areas closer to transmitters.
- Antenna perpendicular to transmitter.
- Antenna horizontal to ground.
- Night time.
- Low RFI noise.

If LF radio is being considered as the primary reference for the SyncServer, the Rubidium oscillator option can be employed to provide long term holdover when the LFR signal is impaired to the point where the SyncServer cannot lock to it.

Unpacking

1. Verify that the part number (on the label of the large pink anti-static bag) matches the radio time service specified at the time of purchase:
    - 1520R-LFR60-KIT for WWVB, 60 kHz, Colorado, USA
    - 1520R-LFR77-KIT for DCF77, 77.5 kHz, Hesse, Germany
    - 1520R-LFR60-KIT for JJY, 60 kHz, Kyushu, Japan
    - 1520R-LFR40-KIT for JJY, 40 kHz, Fukushima, Japan
2. Verify that the following items are present:
    - RG-59 coaxial cable (50 ft, 15 m)
    - LFR module (Disk-shaped)
    - Mounting bracket (part #4186-8P) and a bag of 4 mounting screws
    - 9 volt battery holder with TNC connector (part #110-6210)

Please contact ***Microsemi Customer Assistance*** (on page 5) if any items are missing or damaged.

Connecting and Finding a Signal

Choosing a Site

- LF signals can penetrate structures and are often available indoors, particularly at night when LF signal strength and range are highest.
- To avoid the cost and effort of running a cable through the building, the user should test signal quality at indoor sites close to the SyncServer.
- If the structure limits LF signal quality and/or longer signal availability is important, the user should test signal quality nearer to the exterior of the building, or outdoors.
- Place the LFR outside RF shielded structures and away from strong RF emitters.
- Avoid mounting the antenna on or near metallic objects.

Applying Power

Use battery power to test signal quality easily over a variety of locations:

1. Connect a 9-volt battery (not supplied) to the battery holder/TNC cable.

2. Connect the battery holder/TNC cable to the LFR.

Use power from the SyncServer to test signal strength nearby while graphing signal strength over several days:

1. Connect the supplied 50 foot (15.24 m) RG-59 cable to the TNC connector on the LFR.
2. Connect the RG-59 cable to the **Radio** connector on the rear panel of the SyncServer.

Signal Quality

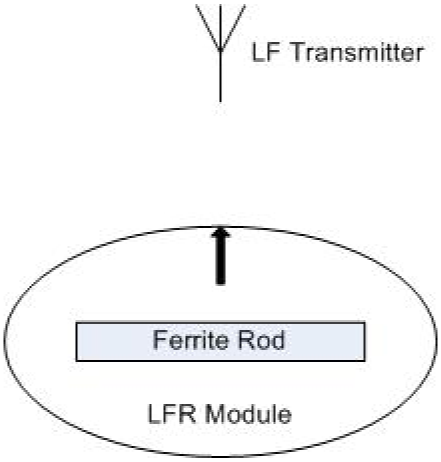
The Signal Quality LED (located on the underside of the LFR) indicates:

- **Once per second on/off**: Good position, strong signal
- **Irregular/intermittent/flicker**: Poor position, weak signal
- **Solid On**: No signal

Positioning the Antenna

The LFR contains a ferrite rod antenna that isn't visible from the outside. The orientation of the ferrite rod antenna has a significant effect on performance. The ferrite rod is in the optimal position when:

- The black arrow on the top of the LFR is pointing toward the LF radio transmitter.
- The ferrite rod is horizontal.



Finding the Direction of the LF Radio Transmitter

Keeping the ferrite rod horizontal:

1. Hold the LFR near its intended location.
2. Find the weakest reception by rotating the LFR Antenna so the Signal Quality LED shows "Solid On" or "Intermittent".
3. Rotate the LFR Antenna 90 degrees to the "best position". The signal quality LED should show "Once per second on/off".
4. Temporarily mount the LFR antenna in this location, preserving the orientation of the ferrite rod.

Note: LF radio signals have the greatest range at night, peaking around 1 AM local time. It may be necessary to perform this procedure after dark.

Configuring the SyncServer

1. On the **REFERENCES - LF Radio** page, select the appropriate radio time service and click **APPLY**.
2. On the **TIMING - HW Clock** page, enable the LFR reference (shown as *DCF77*, *JJY*, or *WWVB*) and click **APPLY**.
3. Monitor the *Signal Quality* on the **REFERENCES - LF Radio** page for several days. At a minimum, there should be blocks of vertical green bars for each night. If not, the user should re-evaluate the location of the LFR's location.

Troubleshooting Antenna Locations

If the LFR's LED indicates no signal (Solid On) or weak signal (Intermittent Flashing):

- Test LFR reception at night time. Use the battery holder/TNC cable.
- Move the LFR away from sources of radio frequency interference (RFI), such as switching power supplies, transmitting antennas, computers, transformers, HVAC, and other electrical equipment or motors.
- Reposition the antenna away from or outside any shielding structures, such as metallic enclosures.
- If a structure has too much RFI or shielding, it may be necessary to position the antenna outdoors.
- Check that your location is within reasonable range of an LF transmitter.

Mounting Outdoors

When mounting the LFR outdoors:

- Observe all local codes and regulations.
- It may be necessary to use a lightning/surge suppressor.
- Position the antenna away from sources of radio frequency noise.

Additional Resources

Online References

- ***NIST Radio Station WWVB*** http://tf.nist.gov/stations/wwvb.htm
- ***PTB Website for DCF-77*** http://www.ptb.de/en/org/4/44/442/dcf77_1_e.htm
- ***Japan Standard Time Project - JJY*** http://jjy.nict.go.jp/jjy/index-e.html

Microsemi Worldwide Sales

Note: Please feel free to contact ***Microsemi Worldwide Sales***http://www.-microsemi.com/sales-contacts/0 online about borrowing a kit for testing Low Frequency

Radio (LFR) reception prior to purchasing the LFR option.

Using Redundant Ethernet Ports

About Redundant Ethernet Ports

The SyncServer's LAN2 and LAN3 network ports can be bonded together as a single, physically redundant, Ethernet connection with a single IP address. Bonding can be used to reduce the Ethernet connection's susceptibility to a single-point failure. For example:

- Having connected LAN2 and LAN3 to separate hubs, the admin bonds the two ports into a single Ethernet connection.
- LAN2 handles all NTP exchanges (active), while LAN3 remains inactive (backup).
- The device connected to LAN2 goes off-line and LAN2 becomes inactive (backup).
- LAN3 becomes active, handling all NTP exchanges for the Ethernet connection.
- After fixing the problem, the admin logs in to the SyncServer and restores the redundant Ethernet ports.

Requirements:

- The IP address of the virtual Ethernet port must be valid on the network(s) to which it is connected.
- The devices to which LAN2 and LAN3 are connected must be able to handle the switchover correctly. Typically hubs and non-managed switches do just fine, while some managed/smart switches may need to be configured.

Configuring Redundant Ethernet Ports

1. Connect LAN2 and LAN3 to the network.
2. On the **NETWORK - Ethernet** page, click the **EDIT** button for LAN2. This displays the *LAN2 Configuration* window.
3. For *Connection Mode*, select **Static** and complete the IP address related fields.
4. Select the **Redundant** checkbox.
5. Verify that **Active** is selected.
6. Click the **APPLY** button. The *LAN2 Configuration* window closes. On the **NETWORK - Ethernet** page, observe the status icons for LAN2 and LAN3, which may include pending changes (check mark), status unknown (question mark), and bonding (letter "B").
7. Click the **APPLY** button at the bottom of the **NETWORK - Ethernet** page. The status icons show LAN2 is up and bonded, and LAN3 is bonded.

Verifying Redundancy

1. ***PING*** (on page 201) the IP Address of the bonded ports. The PING statistics should show 0% lost. *This confirms that the IP address exists on the network.*
2. Disconnect LAN3 from the network.
3. PING the IP Address of the bonded ports. The PING statistics should show 0% lost. *This confirms that LAN2 is active.*

4. Reconnect LAN3 to the network.
5. Disconnect LAN2 from the network. LAN2 becomes backup and LAN3 becomes active.
6. PING the IP Address of the bonded ports. The PING statistics should show 0% lost. *This confirms that LAN3 is active.*
7. Reconnect LAN3 to the network and perform the steps in ***Restoring Redundant Ethernet Ports*** (on page 175).

If the PING statistics don't show 0% lost, there is a problem with connectivity to, or configuration of, LAN2 and/or LAN3.

IMPORTANT: After verifying redundancy, perform the steps in ***Restoring Redundant Ethernet Ports*** (on page 175).

Note: The **NETWORK - Ethernet** page and **LAN2 Configuration** window *do not* indicate which port is currently active. The **LAN2 Configuration** page only shows *the initial configuration* for Redundancy.

Restoring Redundant Ethernet Ports

1. On the **NETWORK - Ethernet** page, click the **EDIT** button for LAN2.
2. For **Redundant**, select **Backup**.
3. Click the **APPLY** button and then click the **APPLY** button on the **NETWORK - Ethernet** page.
4. Click the **EDIT** button for LAN2.
5. For **Redundant**, select **Active**.
6. Click the **APPLY** button and then click the **APPLY** button on the **NETWORK - Ethernet** page.

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 175).
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 LAN1 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

Note: the **SyncServer model 350i** does not have a GPS receiver.

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 180) and ***TIMING - HW Clock*** (on page 61).

In most cases, the user sets the time manually when:

- The Hardware Clock's Input References aren't available, or don't provide time (10MHz, 1PPS).
- 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 keypad/display

1. Press the **MENU** button.
2. Use the number buttons to select **2) Display** and **1) Time Entry.**
3. Enter the UTC date and time.
4. For **Set HW Clock to FreeRun?**, select **1) OK**.

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

Note: the **SyncServer model 350i** does not have a GPS receiver.

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 seconds on the front panel time display 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 IRIG output
- The Sysplex output
- The NTP, SNTP, Time, and DAYTIME protocol outputs on the network ports
- The web user interface
- The front panel time display

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

Note: the **SyncServer model 350i** does not have a GPS receiver.

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.
- Inserting non-UTC Timecode.
- 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 178).

Inserting non-UTC Timecode

1. Connect the non-UTC Timecode signal to the **IRIG In** connector.
2. On the **TIMING - HW Clock** page, enable *Timecode*, disable all of the other references, and click the **APPLY** button.
3. On the **NTP - Config** page, delete UTC-based NTP associations that have the following roles: *server*, *peer*, *broadcastclient*, and *multicastclient*.
4. Click the **RESTART** button.
5. When the NTP daemon finishes restarting, the SyncServer will be distributing non-UTC time.

Manually Setting the Time to non-UTC Time

See the ***Setting the Time Manually*** (on page 177) 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 154).

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 LAN1 network port (TELNET must be enabled on the SERVICES - . Consult the ***Command Line Interface*** (on page 107) for more detail.

GPS

Introduction

The Global Positioning System (GPS)[1] 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."

[1] The SyncServer S350i does not include a GPS receiver.

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[1].
- 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 43), and ***Input References*** (on page 196).

[1] The SyncServer S350i does not include a GPS receiver.

Input References

The SyncServer S350i does not include a GPS receiver,or LF radio.

Input References are timing inputs with connectors on the rear panel of the SyncServer. These vary by model and include:

- GPS
- Timecode (IRIG In)
- 1PPS
- 10MHz
- LF Radio (Optional)

The GPS, Timecode, and LF Radio reference inputs provide time and phase, while the 1PPS, and 10MHz inputs provide phase only.

The modem, which provides dial-up time service, is not an Input Reference; it is a server association on the NTP daemon.

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 50) 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[1] (on the S300 and S350) 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.

[1] The SyncServer S350i does not include a modem.

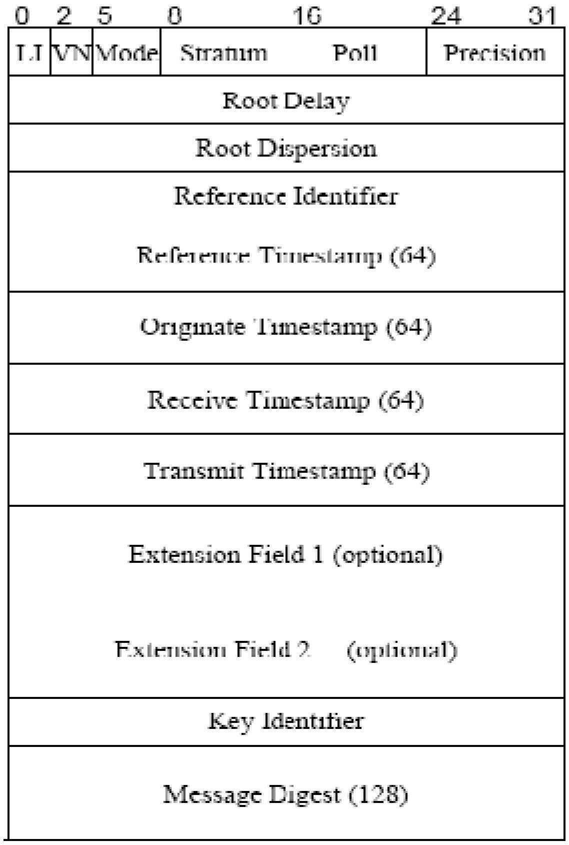
NTP Daemon

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

See the ***NTP - Config*** (on page 43) 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 50) 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.

Stratum	Definition
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 50) 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".

PTP (Precision Time Protocol

The Precision Time Protocol as defined in IEEE Std 1588-2008: IEEE Standard for a Precision

Clock Synchronization Protocol for Networked Measurement and Control Systems.

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
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- 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 50) 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.

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