VERY IMPORTANT: Please see Pg. 5 before attempting Network Addressing.

XLi IEEE 1588 Clock – Quick Start Guide

The *IEEE 1588 standard* defines *Precision Time Protocol* (PTP). For general information about IEEE 1588 and PTP, please consult the white paper "wp_IEEE_1588.pdf", located on the Product Information CD (998-01510-03).

This Quick Start guides the user through procedures for setting up a factory-configured *XLi IEEE 1588 Clock* and standard *IEEE 1588 card* to function as a PTP grandmaster or PTP slave. For brevity, this guide omits information that may be useful to some users. For more information, please consult the *XLi IEEE 1588 Clock User Guide* (997-01510-03_User_Guide.pdf), located on the Product Information CD.

The contents of this guide are as follows:

Two versions of the XLi IEEE 1588 clock are currently available:

- *The first version has:*

    - *An IEEE 1588 card configured as a PTP master in Option Bay 4*
    - *A GPS receiver in Option Bay 1*

- *The second version has:*

    - *An IEEE 1588 card configured as a PTP master in Option Bay 4*
    - *An IEEE 1588 card configured as a PTP slave in Option Bay 2*
    - *A GPS receiver in Option Bay 1*

This Quick Start guide is based on the first version. Users with the second version should take care to select the correct Option Bay when configuring the IEEE 1588 cards.

Unpacking

While unpacking, please verify that the following items are included with the XLi IEEE 1588 Clock:

Item Description	Part Number
▪ Yellow Cat 5 Crossover/Patch Cable	161-20007-00-0
▪ Gray Cat 5 Network Cable	392-732
▪ RG58 Cable with BNC connectors	338-001
▪ AC Power Cord	332-002
▪ Null Modem Cable DB9/DB9 F/F	392-756
▪ Adapter for RS-232 Port	391-004
▪ CD, XLi IEEE 1588 User Guide	998-01510-03
▪ CD, XLi User Guide	XLi-MAN-CD
▪ $1^3/_4$ inch Rack Mounting Brackets	206-800
▪ Tach-it Loops DBL HDR 5in	232-007
▪ Screw FH SS 8-32X 5/8	241-008-005
▪ L1 GPS Antenna Assembly w. RG-59 Cable, Hose Clamps and misc. other hardware	142-614-50

PTP Grandmaster

Apply the following procedures to operate an IEEE 1588 card as a PTP grandmaster.

Setting up GPS as a Reference Source

Symmetricom strongly recommends using the GPS antenna/receiver to synchronize the PTP grandmaster with TAI (Temps Atomique International), the standard time scale for PTP.

1. Select a GPS antenna site outdoors that provides a good view of the sky:

    *   The ideal site provides an unobstructed 360-degree view of the horizon and sky.
    *   A stayed antenna mast on a building rooftop typically provides the best views.
    *   The site must be within cabling distance of the XLi IEEE 1588 Clock. The standard coaxial cable supplied with the instrument is 50 ft (15.24 m) long. Consider additional equipment, such as lightening arrestors, when calculating this distance.

2. Temporarily fasten the standard GPS antenna (supplied) in place until you've verified GPS signal strength. (See Verifying GPS Signal Strength on page 6.)

3. Run the antenna cable to the XLi IEEE 1588 Clock. Observe applicable codes and regulations.

4. Connect the GPS antenna cable to the ANTENNA connector on the GPS receiver card (87-8028-2).

Note: GPS antennas that are not 12-volt capable may be permanently damaged if connected to the XLi IEEE 1588 Clock.

Making Additional Connections

1. Connect the **NET** network port on the main CPU card to the network.

2. Connect the **1588** network port on the 1588 card to the network.

Note: The XLi IEEE 1588 Clock is supplied with one standard and one crossover network cable. The crossover cable can be used for synchronizing a PTP slave directly to a PTP master without using a network device such as a hub or switch in between. Use standard network cables when connecting the NET and 1588 network ports to network devices.
Note: the AC power should be off for at least 3 minutes before repowering the unit.

3. Connect the power supply to AC power. The XLi IEEE 1588 Clock starts.

Manually Setting the Time

*If the GPS antenna/receiver **is not** being used as a timing reference source, manually set the time using function F3.*

*If GPS **is** being used, skip to "Configuring the NET Network Port" on page 4.*

To set the time using function F3, press the following buttons on the keypad display interface:

Press button or enter:	The display responds:
MENU	
Up-arrow, twice.	**F3 TIME DATE**
ENTER	**TIME MODE – LOCAL**
Up-arrow, once.	**TIME MODE – UTC**
ENTER	**DATE-TIME**
Enter the UTC date.	
ENTER	**DATE-TIME**
Enter the UTC time.	
ENTER	**SAVE CHANGES? YES**
ENTER	

Upon setting the time with F3, the IEEE 1588 card starts operating as a PTP grandmaster. Otherwise, the IEEE 1588 card waits until the XLi IEEE 1588 Clock is locked to GPS before it starts operating as a PTP grandmaster.

*Caution: Setting the time manually **and** using GPS as the reference source causes a discontinuity when the XLi IEEE 1588 Clock locks to GPS.*

Configuring the NET Network Port

To access the command line interface using Telnet and the web interface using a browser, configure the NET network port, located on the rear of the main CPU card.

Using function F100 on the keypad display interface, make the following entries:

Press button or enter:	*The display responds:*
ENTER 100 ENTER	**COMPANY/UNIT…**
ENTER	**IP ADDRESS**
Enter a valid IP address.	
ENTER	**SUBNET MASK**
Enter a valid subnet mask.	
ENTER	**DEFAULT GATEWAY**
Enter a valid default gateway.	
ENTER, multiple times.	**SAVE CHANGES? YES**
ENTER	Saves and applies the changes.

Configuring the IEEE 1588 Card

The IEEE 1588 card *located in Option Bay 4* is factory configured as a PTP master with the following settings:

- PTP AVAILABILITY   OPTION BAY 4
- PTP IP ADDRESS (STATIC)   010.048.000.103
- PTP SUBNET MASK (STATIC)   255.255.000.000
- PTP DEFAULT GATEWAY (STATIC)   010.048.000.001
- PTP DHCP   ENABLE
- PTP SYNC INTERVAL   2 SECONDS
- PTP BURST MODE   DISABLE
- PTP PORT STATE   ENABLE
- PTP SUBDOMAIN NAME   _DFLT
- PTP RESET TO FACTORY DFLT?   NO
- PTP INIT TO USER SETTINGS?   NO
- PTP CLOCK CONFIG, BAY 1   MASTER
- SLAVE SYNC THRESHOLD   5 microsec
- PTP PREFERRED MASTER   DISABLE

Note: The IEEE 1588 card requires 5 minutes from power up to initialize. Until then, the card does not appear in the user interfaces, or is reported as "NOT AVAILABLE".

Symmetricom strongly recommends that customers let their IEEE 1588 cards use DHCP[1] to obtain network address settings (*IP Address, Subnet Mask, Default Gateway*). In the factory default configuration of function F131, DHCP is enabled.[2]

If the user configures the IEEE 1588 card with *static network address settings*, it is very important to observe the following guidelines.

Configuring the IEEE 1588 card with static network address settings THAT ARE NOT VALID causes the card to stop communicating with the network and the main XLi.

To operate correctly, the static network address settings MUST be valid:
- **The *IP Address* must be unique and valid.[3]**
- **The *Subnet Mask* must be appropriate for the structure of the network.**
- **The *Default Gateway* must be on the same subnet as the IP address.**

NOTE :   If power is removed from unit, it must remain off for at least 3 minutes.

Here is an example of settings that **meet** this requirement (valid):
- IP Address: 192.168.31.125
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.31.1

Here is an example of settings that **do not meet** this requirement (not-valid):
- IP Address: 192.168.31.125
- Subnet Mask: 255.255.255.0
- Default Gateway: 10.24.0.1

Stated another way: In a valid configuration, portions of the *IP Address* and *Default Gateway* are the same. For example, for each *225* in the *Subnet Mask*, the *IP Address* and *Default Gateway* match, as shown in **bold** below:

Parameter	*Octet 1*	*Octet 2*	*Octet 3*	*Octet 4*
IP Address	**192**	**168**	**31**	125
Subnet Mask	**255**	**255**	**255**	0
Default Gateway	**192**	**168**	**31**	1

The *Subnet Mask* is determined by the structure of the network and may not match the examples above. For more information and assistance on configuring valid static network address settings for your network, consult with your IT Department or Network Administrator.

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1 Dynamic Host Configuration Protocol server.

2 To query this setting, enter the following at the command line: **F131 B<N> DHCP**.(replacing <N> with the option bay). Or simply use the MENU button to find and select F131on the front panel keypad/display.

3 While IEEE 1588 protocol does not use the *IP Address* and *Default Gateway*, the underlying protocols in the card require a unique address to build internal addressing tables and operate correctly with other devices on the network.

Note: *For units with the optional IEEE 1588 card in Option Bay 2, be sure to select the PTP master in Option Bay 4 (using the up/down arrows) before making changes.*

Using the familiar keypad display interface, modify the following settings using F131:

- Configure the following settings *so that they have the same value on the PTP master and PTP slaves*:

  - PTP SYNC INTERVAL – The rate at which synchronization packets are sent out. The recommended setting is **2 seconds**.[1]

  - PTP BURST MODE – Enhances synchronization speed and accuracy. Increases network traffic.

  - PTP SUBDOMAIN – Defines the PTP master and slaves as members of a logical timing network.[2]

- (*Recommended*) Enable PTP PREFERRED MASTER to have PTP slaves on the timing network favor the IEEE 1588 card over other potential masters.

Note: *The factory configuration has PTP DHCP for the 1588 port* **enabled**. *If a DHCP server is present on the network connected to the 1588 port, the user does not need to configure the static IP address, subnet mask, and default gateway. The DHCP-assigned settings will supersede the static ones. If a DHCP server* **is not** *present, disable PTP DHCP and configure the static IP address, subnet mask, and default gateway.*

Logging into the Web Interface

1. Using a web browser, **enter the IP address of the NET port** as the URL.

2. At the XLi Home Page, click the **Login** button.
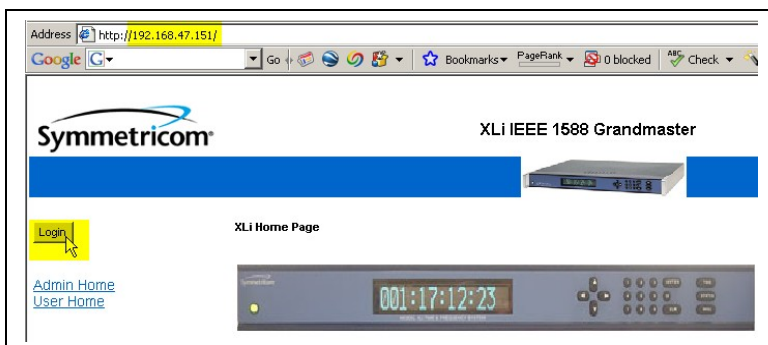
3. At the Login Page, enter user name, "**operator1**", and the password, "**zeus**".

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[1] If one of the PTP slaves on the timing network is a Symmetricom IEEE 1588 card, the interval for all PTP masters and PTP slaves **must** be set to 2 SECONDS.

[2] Multiple logical timing networks are possible on a single physical network.

*Note: Avoid logging onto web interface and the command line through the serial port at the same time.*

Verifying GPS Signal Strength

Press **STATUS** on the keypad display. If the display shows "**LOCKED   GPS PRI**":

- The XLi IEEE 1588 Clock is locked to GPS as the reference source.
- The IEEE 1588 card is operating as PTP master.
- *Completing the steps in this section is optional.*
- The GPS antenna site is good. The user can permanently secure the GPS antenna.

1. Having logged in to the web interface, click the link for the **GPS M12 Receiver** on the Admin Home page.
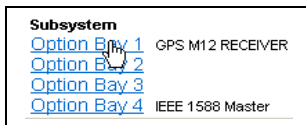
2. Verify the settings shown below, especially *Time Reference = Primary*.
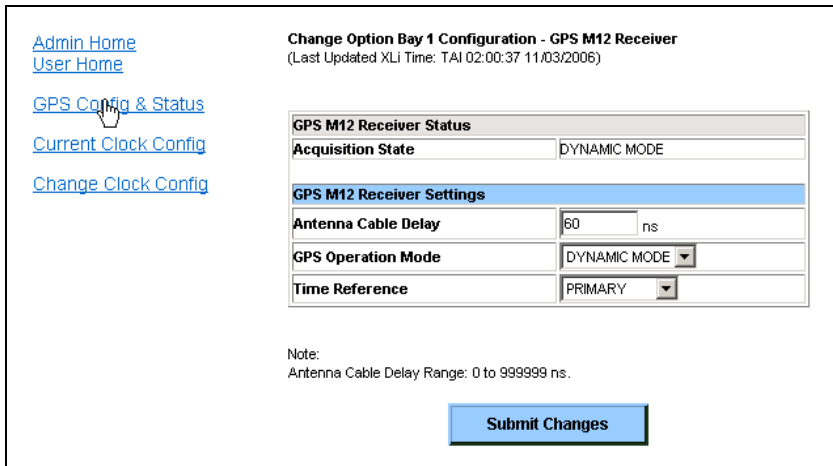
3. Click the link for **GPS Config & Status**.

4. On the next page, if *GPS Status = Locked*, the site for the GPS antenna is good and the IEEE port is operating as a PTP grandmaster. You can permanently fasten the GPS antenna.

Otherwise, if *GPS Status = Unlocked*, check that *GPS Antenna Status = OK*. Allow approximately 20 minutes from startup to elapse before checking *GPS Status* again or trying a new site for the GPS antenna.

Option Bay 1 Configuration & Status - GPS M12 Receiver
(Last Updated XLi Time: TAI 02:06:41 11/03/2006)

Admin Home
User Home

GPS Satellite List

Change GPS Settings

GPS Board Configuration	
Part Number	87-8028-02
Software Version	230-01510-04v1.18
FPGA Version	184-8024v1

GPS Receiver Status	
GPS Status	LOCKED
GPS Antenna Status	OK
Acquisition State	DYNAMIC MODE

GPS Position - LLA	
Latitude	N 38d30'37.0"
Longitude	W 122d47'43.0"
Altitude	35m

GPS Position - XYZ	
X Position	-2706779m
Y Position	-4200859m
Z Position	3949943m

Admin Configurable Settings	
Antenna Cable Delay	60 ns
Time Reference	PRIMARY

5. (Optional) While waiting for *GPS Status = Locked*, click the link for **GPS Satellite List**. The *Tracked Satellite List* must show at least four "Current" satellites for the GPS receiver to initially lock. A low number (<4) of GPS satellites indicates a potential problem with GPS signal strength or visibility at the current site.

Tracked Satellite List			
PRN	Status	Utilization	Level (dBW)
2	Good	Current	-156dBW
5	Good	Current	-156dBW
6	Good	Current	-150dBW
10	Good	Current	-147dBW
21	Good	Current	-163dBW
30	Good	Current	-151dBW
31	Good	Current	-160dBW
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

*Note: If needed, contact Symmetricom Customer Assistance. See page 9.*

PTP Slave

To reconfigure the IEEE 1588 card in Option Bay 4 from as a PTP slave, complete the following steps:

1. Having logged in to the web interface, from the Admin Homepage, click the link **Option Bay 4   IEEE 1588 Master**. The new 1588 web page takes approximately 5 seconds to load.
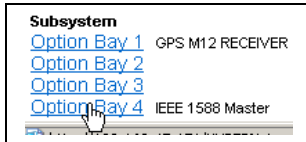
2. Set *Clock Configuration* to **Slave Primary**.
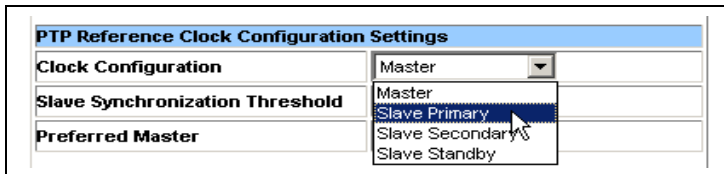
3. Try operating with *Slave Synchronization Threshold* at *five microseconds*. Timing networks with bursty or heavy traffic, routers, or many layers of hubs and switches may need the higher *1000 microsecond* setting.

4. Click the **Submit Changes** button.

5. The front panel display should show "**LOCKED   PTP PRI**" soon after.

The IEEE 1588 card is now operating as a PTP slave and as the primary reference source to the PTP master. The GPS receiver, which was previously operating as the primary reference source to the IEEE 1588 clock, is now a standby reference source.

Note: When reconfiguring the IEEE 1588 card as a PTP master later on, reconfigure the GPS receiver as the primary reference source (In F119, set GPS TIME REFERENCE, BAY 1 back to PRIMARY).

*Note: For the optional IEEE 1588 card in **Option Bay 2**, already configured as a PTP slave, configure the network settings, PTP SYNC INTERVAL, PTP BURST MODE, and PTP SUBDOMAIN. See "Configuring the NET Network Port" on page 4 and "Configuring the IEEE 1588 Card" on page 4. The factory settings are the same as for the PTP master, except the static IP Address is 010.048.000.105 and Clock Configuration is Slave Primary.*

Symmetricom Customer Assistance

Symmetricom's Customer Assistance Centers are a centralized resource to handle your customer needs.

Telephone Support

- Worldwide (Main Number): 1-408-428-7907

- USA, Canada, Latin America including Caribbean, Pacific Rim including Asia, Australia and New Zealand: 1-408-428-7907

- USA toll-free: 1-888-367-7966 (1-888-FOR-SYMM)

Europe, Middle East & Africa: 49 700 32886435

Technical Support can be obtained by calling one of the Customer Assistance Center numbers above, or from the Online Support area at www.symmetricom.com.

When calling the Worldwide or USA telephone number:

- Select Option 1 at the first prompt.

- Select Option 2 for Timing, Test and Measurement Division products.

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

Email Support

Customers who have purchased Technical Support Contracts can e-mail support requests to:

support@symmetricom.com (Americas, Asia, Pacific Rim)

emeasupport@symmetricom.com (Europe, Middle East, Africa)