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XL-GPS Time & Frequency System



User Guide

997-01530-01, Rev. C, January 2008

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The manual's contents do not apply to previously released versions of XL-GPS hardware or software.

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Preface

Limited Warranty

Each new product manufactured by Symmetricom is warranted for defects in material or workmanship for a period of one year from date of shipment (“Limited Warranty”). Defects in material or workmanship found within that period will be replaced or repaired, at Symmetricom’s option, without charge for material or labor, provided the customer returns the equipment, freight prepaid, to the Symmetricom factory under this limited warranty. Symmetricom will return the repaired equipment, freight prepaid, to the customer’s facility. This one year Limited Warranty does not apply to any software or to any product not manufactured by Symmetricom.

If on-site warranty repair or replacement is required, the customer will be charged the then current field service rate for portal-to-portal travel time plus actual portal-to-portal travel charges. There is no charge for on-site warranty repair labor.

Products not manufactured by Symmetricom, but included as integral part of a system (e.g., peripherals, options), are warranted for 90 days, or longer as provided by the original equipment manufacturer, from date of shipment.

Aside from the Limited Warranty set forth above, Symmetricom makes no other warranties, express or implied, of merchantability, fitness for purpose or of any other kind or description whatsoever.

By purchasing any product manufactured by Symmetricom, the buyer consents to and agrees with Symmetricom that as a result of the exclusion of all warranties, expressed or implied, of merchantability, fitness for purpose, or otherwise, except for the limited one-year warranty for defects in material and workmanship for products manufactured by Symmetricom, that the Buyer has the sole responsibility to assess and bear all losses relating to (1) the ability of the product or products purchased to pass without objection under the contract description among merchants and buyers in the trade; (2) the conformity of the product or products to fair average quality within its contract description; (3) the fitness of the product for the ordinary purposes for which such product is used; (4) the consistency of quality and quantity within each unit of product or products and among all units involved; (5) the adequacy of containers, packaging and labeling of the product or products; (6) the conformity of the product, promises or affirmations of fact (if any) made on its label or container; and (7) the conformity of the product to standards of quality observed by other merchants in the trade with respect to products of similar description.

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Abut this Manual

This manual is subject to change without notice. Symmetricom can not be held responsible for any errors or inaccuracies in this manual. Please notify the Customer Assistance team of any suggested improvements or corrections.

Finding Answers to Product Questions

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

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1: Overview of the XL-GPS Time and Frequency Receiver

Product Description and Features

The XL-GPS Time and Frequency Receiver is high-precision time and frequency system that generates time and frequency outputs from its GPS-disciplined system clock. When locked to Symmetricom's timing-optimized GPS receiver, the XL-GPS provides $1x10^{-12}$ frequency output accuracy, and better than 30 nS RMS accuracy to UTC.

Two user interfaces are available for managing the XL-GPS:

- *command line interface*, available from the serial and network ports (using TELNET)
- *keypad interface*, available on the front panel of the XL-GPS

The standard configuration includes:

- 1U chassis
- GPS receiver
- Vacuum fluorescent display and a 19-button keypad
- 1 pulse/sec out (via rear panel BNC)
- RS-232 or RS-422 (via rear panel 9P D Male)
- Network Port 10/100 Base-T for TELNET and SNMP
- Rate Out 1/10/100 PPS, 1/10/100 kPPS, 1/5/10 MPPS (1 output via a rear panel BNC)
- IRIG B Time Code Out (AM or DC) (via a rear panel BNC)
- Alarm Open Collector (via a rear panel BNC)
- 90-264 VAC

An optional Expansion Module provides four female BNC connectors that are factory-configurable per the sales order. The output configurations include:

- IRIG B AM
- IRIG B DC
- Alarm
- 1 PPS
- 1 kPPS
- 10 kPPS
- 100 kPPS

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- 1 MPPS
- 5 MPPS
- 10 MPPS
- Optional Programmable Pulse
- Optional Alarm Relay

In addition, the following software-enabled optional features can be purchased and enabled using a software key at any time:

- Network Time Server (NTS)
- Programmable Pulse Output (PPO)
- Time Interval, Event Time (TI/ET)
- Frequency Measurement (FREQ MEAS)

The optional OCXO oscillator upgrade provides enhanced short-term stability while locked to GPS, and improved holdover ‘flywheeling’ when GPS is unavailable.

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2: System Specifications

Chassis

The chassis is a 19-inch rack-mounted 1U chassis.

Size:	1.75 in. x 17.1 in. x 14. in.
Weight:	8 lbs
Standard Hardware:	Standard 19" EIA rack system
Optional Hardware:	Slide rack hardware

Environmental

Operating Temperature:	0° to +50 °C (+32° to +122 °F)
Storage Temperature:	55° to +85 °C (67° to +185 °F)
Humidity:	95%, non-condensing
Vibration - Operating:	GR-CORE-63, 4.5.2/4, locked to 1.0 g
Vibration - Storage Transport:	GR-CORE-63.4.4.1 to 1.5g

Time and Frequency Accuracy

GPS Reference

Time and frequency accuracy/stability while locked to a GPS timing reference:

1 PPS Output	+/-30 nS RMS
Frequency Output Accuracy:	< 1×10^{-12} @1 day
Frequency/Timing Allan Deviation Stability:	1×10^{-9} @ 1 sec 3×10^{-10} @ 10 sec 3×10^{-10} @ 100 sec 2×10^{-10} @ 1000 sec 1×10^{-12} @ 1 day
AM Code Output Accuracy:	10 μS
DC Level Shift Code Output Accuracy:	1 μS to the 1 PPS

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AC Power Supply

Input

Input connector	IEC 320 type
Input voltage range	Universal, 90 - 260 VAC / 110-300 VDC
Input frequency range	47 Hz - 63 Hz

Standard I/O

The following specifications apply to the connectors on the Main CPU card.

RS-232/RS-422 Interface

The standard serial data port is a bi-directional EIA standard RS 232C interface. The serial data port is configurable via the Keypad and Network Port.

Interface:	RS-232, RS-422
Data Rates:	1200, 2400, 4800, 9600 and 19200 bps
Data Bits:	7 or 8
Parity:	even, odd or none for Data Bits 8, even or odd for Data Bits 7
Stop Bits:	1 or 2
Connector:	Male 9 pin D subminiature
Pin Assignment:	1------N/C
	2------Rx (RS-232)
	3------Tx (RS-232)
	4------N/C
	5------GND
	6------Rx- (RS-422)
	7------Rx+ (RS-422)
	8------Tx- (RS-422)
	9------Tx+ (RS-422)

Factory settings for RS-232 9600,N,8,1

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Network Port 10/100

The Ethernet port interface is:

Type:	Standard RJ-45 8 pin connector, 10 Base-T and 100 Base-T standards.
Frame format:	IEEE 802.3

J1 - Optional TI/ET

The TI/ET configuration is via the Keypad, Serial I/O, and Network port. J1 accepts an external 1 PPS or Event input signal and measures it against the system-derived time. The a minimum pulse width of the input signal is 100 nS. The input impedance is selectable at 100 kΩ or 50 Ω. The rising edge of the pulse is measured with 5 nS resolution relative to the system clock time.

Pulse width:	100 nS, min.
Active Edge:	Rising
High Level:	Logic Hi >1.25 V < 10V
Low Level:	Logic Low < 1.25 V >0V
Impedance:	100 kΩ or 50 Ω
Resolution:	5 nS, single shot
Accuracy:	Refer to “Time and Frequency Accuracy” on page 3
Qty:	1
Connector:	BNC female

J2 - Rate Out

The Rate output is default 10 MPPS and configuration is via the Keypad, Serial I/O, and Network port.

Rate:	1 PPS, 10 PPS, 100 PPS, 1 kPPS, 10 kPPS, 100 kPPS, 1 MPPS, 5 MPPS, 10 MPPS
Accuracy:	Refer to “Time and Frequency Accuracy” on page 3
Duty cycle:	60/40%+/-10%
Amplitude (TTL):	TTL Levels into 50Ω
Qty:	1
Connector:	BNC female

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J2 - Optional Programmable Pulse Out (PPO)

The PPO allows generation of a precisely synchronized trigger pulse at an arbitrary time and with arbitrary pulse width in integer multiples of 1 μS. The rising edge of the trigger output can be programmed to occur with 1 us resolution.

Pulse width:	Programmable in 1 μS steps
On time edge:	Rising
Amplitude:	TTL Levels into 50 Ω

J3 – Optional Frequency Measurement

The Frequency Measurement (Freq Meas) option: measures an external frequency applied to the J3 input relative to the XL-GPS' disciplined frequency.

Frequency:	1, 5, 10 MHz
Resolution	120 x 10-12@ 1 Second Interval 12 x 10-12@ 10 Second Interval 1 x 10-12@ 100 Second Interval
Range	1000 x10-6
Impedance:	1 kΩ, 50 Ω
Factory Configuration:	Disabled
Accuracy	Refer to "Time and Frequency Accuracy" on page 3

1 PPS Out

A time-stable 1 PPS (one pulse per second) output is provided. If no reference is available, the 1 PPS pulse will be as stable as the internal oscillator.

Pulse width:	20 μS +/-1 μS
On time edge:	Rising
Accuracy:	Refer to "Time and Frequency Accuracy" on page 3
Amplitude:	TTL Levels into 50 Ω
Qty:	1
Connector:	BNC female

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Code Out

The default output is IRIG-B-120 AM. Configuration is via the Keypad, Serial I/O, and Network port.

Format:	IRIG B-120 1 kHz AM -000 DC
Amplitude (AM):	3 Vp-p, into 50 Ω +/-10%
Ratio (AM):	3:1 +/-10%
Amplitude (DC):	TTL into 50 Ω
Qty:	1
Connector:	BNC female
Phasing:	In phase with carrier ± 10 μS
Accuracy:	Refer to "Time and Frequency Accuracy" on page 3

Five flags are encoded in the control function segment of the IRIG B code. The first flag encoded at element P5+40ms is the LOCK indicator. It is a binary 1 when the reference source has become unlocked. The second flag encoded at element P5+60ms is a binary 1 when the worst case time error exceeds threshold 1 element P5+70ms is a binary 1 when the worst case time error exceeds threshold 2. Element P5+80ms encodes a binary 1 when the error exceeds threshold 3 and P5+90ms when the error exceeds threshold 4.

The time code resets as follows:

Days Reset:	Resets to day 1 after day 365
Leap Year:	Resets to day 1 after day 366

Alarm

Drive:	Open Collector
Max. Voltage:	25 VDC
Max. Current:	50 mA
Qty:	1
Connector:	BNC female

The open collector alarm output has the following states:

Off	(High Z) Power off
Off	(High Z) Error, major or minor enabled alarm fault.
On	(Low Z) Normal, no major or minor enabled alarm faults.

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GPS Time and Frequency Reference

GPS Time and Frequency reference configuration is via the Keypad, Serial I/O, and Network port.

Frequency:	1575.42 MHz (L1 signal).
Code:	Coarse Acquisition (C/A) code.
Tracking:	Up to 12 satellites.
Position Accuracy	within 10 meters when tracking four (4) satellites.
1 PPS Accuracy:	UTC(USNO) 30 nanoseconds RMS
Time standard:	UTC
Antenna input:	BNC female
Antenna power:	+12 VDC

Options

Expansion Module (87-8034)

The expansion module provides four independently-configurable outputs. The outputs are configured using jumper/switch settings on the Expansion Module. These are configured at the factory per the sales order, and can also be configured by the user in the field.

The available output types are as follows:

- IRIG B AM
- IRIG B DC
- Alarm
- 1 PPS
- 1 kPPS
- 10 kPPS
- 100 kPPS
- 1 MPPS
- 5 MPPS
- 10 MPPS
- Optional Programmable Pulse
- Optional Alarm Relay

Connector Quantity and Type: Four female BNC

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IRIG Code Out

Format:	IRIG B-120 1 kHz AM, or IRIG B-000 DC
Amplitude (AM):	3.0 Vp-p +/-1V, into 50 Ω
Ratio (AM):	3:1 +/- 10%
Amplitude (DC):	TTL into 50 Ω
Phasing:	In phase with carrier ± 10 μS

Alarm

Off	(High Z) Power off
Off	(High Z) Error, major or minor enabled alarm fault.
On	(Low Z) Normal, no major or minor enabled alarm faults.
Drive:	Open Collector
Max. Voltage:	25 VDC
Max. Current:	50 mA

Rates

Rate:	1 PPS, 1 kPPS, 10 kPPS, 100 kPPS, 1 MPPS, 5 MPPS, 10 MPPS
Duty cycle:	60/40% +/- 10%
Amplitude (TTL):	TTL Levels into 50 Ω

Optional Programmable Pulse

On time edge:	Rising
Amplitude:	TTL Levels into 50 Ω

Optional Alarm Relay

Connection:	Terminal strip, COM, NO, NC
Max Voltage:	48 VAC/VDC
Max Current:	2 A @ 24 VDC

NTP

The standard network interface of the XL-GPS can be optionally enabled at the factory, or by the user in the field, to become a Network Time Server (NTS) to client clocks over a network. Time is acquired from the host clock and distributed over the network using the Network Time Protocol (NTP). Initialization of the NTS option is done via the Serial I/O port, Network Port, or via the front panel keypad.

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Support for version 3.0 of the NTP, RFC 1305 as well as the Simple Network Time Protocol (SNTP), RFC1361 is available. In addition, the NTS will respond to TIME protocol requests, RFC868.

The NTS will respond to time synchronization requests from hosts using these User Datagram Protocol/ Internet Protocols (UDP/IP):

NTP ver. 3.0	UDP Port 123 - RFC1305 (Transmitted Timestamp Accuracy ±10 µS)
SNTP	UDP Port 123 - RFC1361
TIME	UDP Port 37 - RFC868

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Oscillators

Standard TCVCXO

Accuracy:	< 1 x 10^{-12} @ 1 day when locked to GPS
Frequency/Timing Stability (Allan Deviation)	1 x 10^{-9} @ 1 sec 3 x 10^{-10} @ 10 sec 3 x 10^{-10} @ 100 sec 2 x 10^{-10} @ 1000 sec 1 x 10^{-12} @ 1 day
Temp	5x10^{-7}, over 0°C to 50°C when not locked to GPS

Optional OCXO

Accuracy:	< 1 x 10^{-12} @ 1 day when locked to GPS
Frequency/Timing Stability (Allan Deviation)	1 x 10^{-10} @ 1 sec 1 x 10^{-10} @ 1000 sec 1 x 10^{-12} @ 1 day
Temp	1 x 10^{-8}, over 0°C to 50°C when not locked to GPS
Drift rate	5 x 10^{-9} / Day

Certification

UL	UL 60950:2000
C-UL	CAN/CSA-C22.2 No. 60950-00:2000
FCC	FCC Part 15, Subpart B
CE	89/336/EEC EMC Directive EN55022:1998 EN55024:1998 EN61000-3-2:2000 EN61000-3-3:1995 73/23/EEC Low Voltage Safety Directive EN 60950-1:2001
IEC	IEC 60950-1:2001 Safety of Information Technology Equipment (ITE)

Calibration Statement

This unit does not contain user-serviceable parts and does not require calibration.

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Volatility Statement

Statement of Volatility for the XL-GPS Model 1530-602.

Memory Size	Memory Type	Volatile/Non-Volatile	User Data	IC Location
16 Mb	SRAM	Non-Volatile	No	U25
8 Mb	EEROM	Volatile	Yes	U39

This document only pertains to the XL-GPS main processor board, the 86-8000.

Default parameters are stored one at a time through the function commands. There is no global clear command to restore default conditions.

Default conditions are listed in the XL-GPS user manual.

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3: Installation/Configuration

Installing the GPS Antenna

For XL-GPS units include a standard GPS receiver, antenna, and antenna cable. Install as described below.

Selecting a GPS Antenna Site Outdoors

Select a site that...

- Is the highest point available
- Offers a full 360° view horizontally, to within 10° vertically of the horizon
- Is higher than neighboring buildings/obstructions
- Is protected from strong radio frequency (RF) and microwave transmissions
- Is set away from RF-reflective surfaces that cause multipath interference
- Is set 3 ft. (1 m) away from other GPS antennas

Avoid...

- Mounting the antenna between tall buildings or next to walls and equipment
- Cable runs from the antenna to the receiver that exceed the specified length
- Patching multiple cables together to make a single cable run
- Running the cable through bulkheads and along side high-energy cables
- Crimping or damaging the cable

For test situations, a GPS antenna can be placed in a window. Equatorial-facing (e.g., south-facing for users in the northern hemisphere) windows provide the best visibility of satellites. However, if the equatorial-facing window has large obstructions such as trees or buildings, a window facing another direction with fewer obstructions may be better. Metal window shades and special metallic window coatings may block GPS signals entirely.

Blocked signals and multipath cancellation significantly increase GPS acquisition time. Multipath cancellation is caused by reflected signals that reach the antenna out of phase with the direct signal. Multipath cancellation and blocked signals are typically caused by vertical reflective objects positioned to the side and above the antenna. To solve these problems, mast mount the antenna at least 1 meter away from and above the reflecting surface.

Mounting the GPS Antenna

Mount the GPS antenna on an antenna mast (recommended) or on the peak of a building. The GPS antenna kit includes special mounting brackets. For the mast, use 2-inch (5.08-cm) diameter water pipe

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or conduit that is rigid enough to withstand high winds without flexing. Use guy wires to stabilize masts longer than 10 ft. (3.048 m).

Notes:

- The XL-GPS requires a 12 Volt-compatible antenna. Antennas not rated for 12 V will be damaged.
- Use an antenna splitter to connect a single antenna to multiple receivers. Don't use a BNC "T" connector.
- The L1 GPS antenna is designed to operate with up to 150 ft. (60.96 m) of RG-59 coax cable. An optional Down Converter can be used for cable runs of 1,500 ft. (457.2 m) using RG-58 coaxial cable.

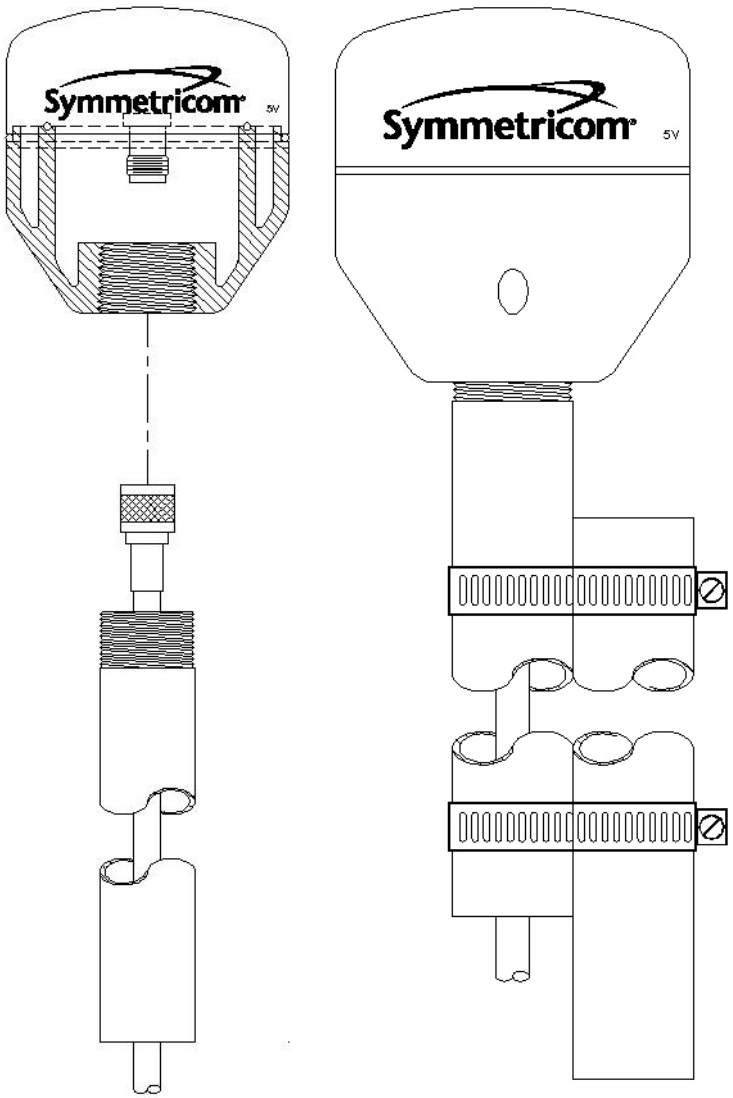


Figure 1: L1 GPS Antenna - methods for cabling and mounting

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GPS Signal Strength Requirements

Refer to Figure 2:The required gain at the GPS receiver's ANTENNA connector is greater than 20 dB and less than 36 dB. A standard 150 foot length of RG-59 coax cable of has a loss of 16-21 dB, which meets this requirement. Abide by the minimum input gain requirements if using other cable types. Additionally, if changing the antenna, abide by the 41 dB gain requirement. Other factors, such as radiation, coverage, VSWR, and input impedance also affect system performance. Symmetricom recommends using the standard antenna and cable provided with the GPS receiver.

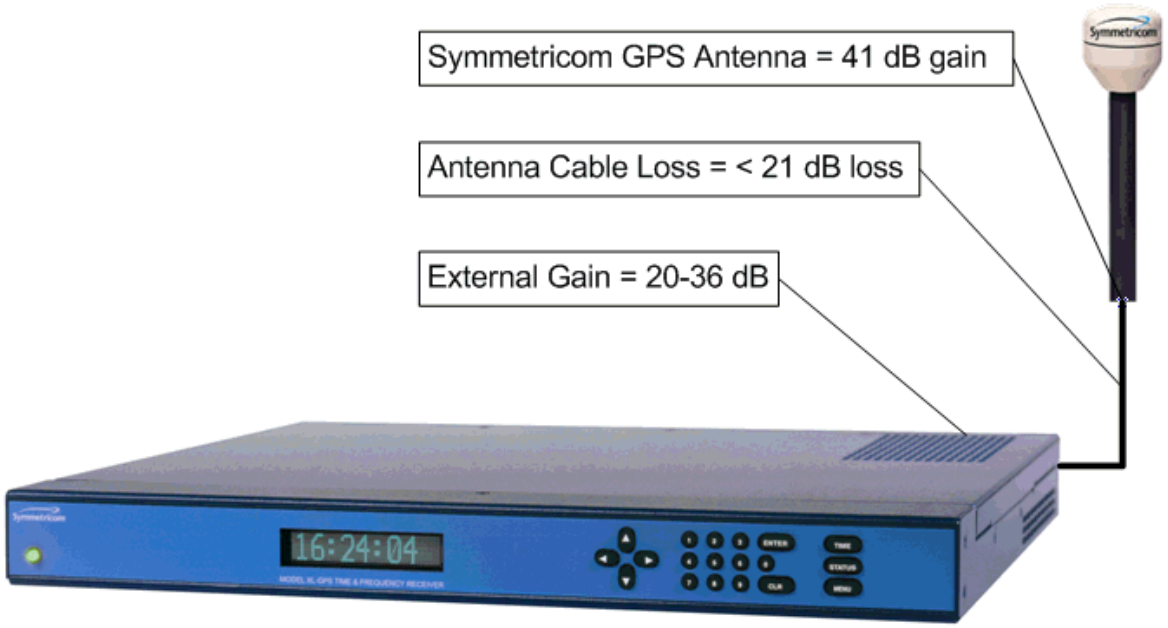


Figure 2: GPS Signal Strength Requirements

Making Additional Connections

Make the following optional connections:

- **ANTENNA:** GPS receiver antenna connector with **GPS antenna cable**. See "GPS Receiver" on page 133 for more information.

Warning: **Use a 12-volt capable GPS antenna.**

- **NET:** network port with the **Cat-5 network cable** (supplied) to an Ethernet network. (Needed to manage the XL-GPS remotely by network, or optionally to distribute NTP time information)
- **SERIAL I/O:** with **RS-232 null modem cable** (supplied) to the serial port on a PC.
- For **J1**, **J2**, **J3**, and any other **option cards**: See also "F110 – J1 Input (TIET)" on page 93, "F111

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– J2 Output (Rate, PPO)" on page 96, "F113 – J3 Input (Freq Meas)" on page 100.

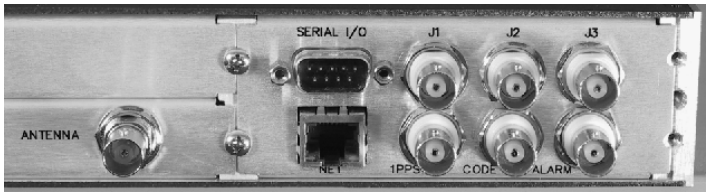


Figure 3: Connectors: ANTENNA, SERIAL I/O, J1, J2, J3, NET, 1 PPS, CODE, ALARM

Connecting the Power Supply

Warning: **Ensure that a disconnect device, such as a switch, with the appropriate voltage/ current rating is provided when operating/installing the XL-GPS.**

Connect the Power Supply it to a power source. The green STATUS light indicates that the XL-GPS is receiving power.

Notes for optional DC power supplies:

- Use a 15 amp circuit breaker in series with the DC power source; don't connect directly to a DC power source without the breaker.
- 14 gage wire is the minimum recommended for DC power source hookup.
- DC Power Supply Only to be used in a restricted access area.
- The screw torque range on the Power Terminal Block is 5 to 8 inch pounds.
- When connecting to a DC power source, first connect the positive power cable to "+" on the power supply, then connect the negative power supply cable to "–".

Upon receiving power, the XL-GPS goes through its startup sequence; displaying "Booting", Loading", and "Starting". After approximately 40 seconds, the XL-GPS displays the clock status, and user interfaces (front panel/command line) become available.

Configuring the Network Port

The following additional steps are required to make the XL-GPS operational on a network. Make the XL-GPS operational on a network if you plan on:

- Managing the XL-GPS remotely over the network
- Distributing timing information from the XL-GPS over the network

Press	**Result**
ENTER	Displays "FUNCTION"
100	Enters 100 as the function number

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ENTER	Displays Function 100's first screen: "COMPANY 00-A0-69…"
ENTER	Displays "IP ADDRESS…"
1-9…	Enter the unit's IP Address (e.g., 192.168.0.11
ENTER	Displays "SUBNET MASK…"
1-9…	Enter the Subnet Mask (e.g., 255.255.255.000)
ENTER	Displays "DEFAULT GATEWAY…"
1-9…	Enter the Default Gateway's IP address (e.g., 192.168.0.1)
ENTER	Displays "10 100 BASE-T – 10"
ENTER	Displays "REMOTE LOCKOUT – UNLOCK" (Leave unchanged)
ENTER (5 times)	Displays "SAVE CHANGES – YES"
ENTER	Saves the new network parameters, and reboots the XL-GPS

Notes:

- To prevent remote network access to the XL-GPS, change Remote Lockout to LOCK. Doing this shuts down remote access through the XL-GPS's network port so that the XL-GPS's functions are available only through the keypad interface, and through the serial port's command line interface.
- For additional information, consult the relevant topics covering the F100 commands in the XL-GPS User's Guide and Reference Manual.

Configuring the Time Display

Configure the XL-GPS to display time correctly. Use the menu-driven keypad interface, to enter the functions and select the desired settings, as follows:

- **F1 – Time Zone Offset**: ("F: World Map of Time Zones:" on page 141) Set the number of hours difference between your time zone and UTC. For example:
  - Pacific Standard Time is UTC -08:00
  - Mountain Standard Time is UTC -07:00
  - Central Standard Time is UTC -06:00
  - Eastern Standard Time is UTC -05:00
- **F2 – 12/24-Hour Format**: ("F2 – 12/24 Hour Format" on page 35) Select a 12 or 24-hour display format. By default, the XL-GPS is set to the 24-hour display format (e.g., 6 PM is displayed as 18:00).
- **F66 – Daylight Saving Time (DST)**: ("F66 – Daylight Saving Time (DST) Mode" on page 58) If needed, set when Local time enters and leaves DST.
  - The factory settings for F66 apply to most users in the continental US: DST begins at 2 am on the first Sunday of April, and ends at 2 am on the last Sunday of October.
  - DST is NOT observed in Hawaii, American Samoa, Guam, Puerto Rico, the Virgin Islands,

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the Eastern Time Zone portion of the State of Indiana, and most of Arizona (Navajo Indian Reservation in observes DST).

- Throughout the European Union (EU), Summer Time begins and ends at 1 am UTC. It starts the last Sunday in March, and ends the last Sunday in October. In the EU, all time zones change at the same moment.

- **F69 – Time Mode**: ("F69 – Time Mode" on page 61) Select the type of time output on the front panel display, F8, F9, and F90. The four choices are as follows:
  - **UTC** (Universal Coordinated Time) differs from GPS Time by the addition of leap-second corrections to compensate for variations in the earth's rotation.
  - **GPS** time is derived directly from the GPS constellation and doesn't contain any leap-second adjustments or other GPS-to-UTC corrections.
  - **Standard Time** is UTC plus a time zone offset. For example, Pacific Standard Time is UTC minus 8 hours.
  - **Local Time** is UTC with a time zone adjustment and a daylight saving time adjustment.

Using the Command Line Interface

The next two sections show how to connect to the XL-GPS using the serial and network ports. Both Serial I/O and the network port give the user access to the command line interface. While the keypad interface provides a simple menu-driven user interface, the command line interface features:

- Additional functions that aren't available through the keypad
- Remote accessibility over a network through the standard network port

To use the command line interface, refer to the explanations and examples in the 'Command Line' subsections for each function in the XL-GPS User's Guide and Reference Manual.

Connecting to the Serial Port

Complete the following steps to set up and use the Serial Port to communicate with the XL-GPS.

Verify that the XL-GPS's serial port settings are as follows: (Keypad: **ENTER–4–ENTER.** Use the UP/DOWN ARROWs.)

- Serial Port – RS232
- Baud rate – 9600
- Data bits – 8
- Parity – NONE
- Stop bits – 1

Note: Parity set to NONE is only valid when Data Bits is set to 8.

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Connect a null-modem cable from the PC's serial port to the XL-GPS's "SERIAL I/O" port.

If needed, configure your PC's terminal emulation program to match the serial port settings above (9600, 8, N, 1). Set Flow Control to "None".

One terminal emulation program, HyperTerminal, is usually found in Microsoft Windows under **Programs – Accessories** or **Programs – Accessories – Communications**.

Initiate a serial port connection between the terminal emulation program and the XL-GPS. (The Serial Port connection does not require you to log in.)

Once connected, press the **Enter** key on your keyboard to get a command prompt.

From the command prompt, ">", you can use the functions described in the "Function Reference" section of the XL-GPS User's Guide and Reference Manual. The 'Command Line' sub-sections provide instructions and examples.

Troubleshooting Tip: If the terminal emulation software has trouble displaying XL-GPS responses (looks like the unit doesn't respond to inputs), add a 1 ms/character delay to the software's serial port settings.

Connecting to the Network Port

The network port provides remote access to the XL-GPS's command line interface. Complete the following steps to connect to the network port.

1. Use function F100 – Network Port Configuration & XL-GPS Firmware (page 74), or F100 IP – IP Address (page 76), to obtain the XL-GPS's IP address.

2. Open a telnet session from your PC to the XL-GPS.
   - In Windows, click **Start** – **Run**, enter **`telnet ###.###.###.###`** (where the #s are the XL-GPS's IP address), and click OK.
   - Open a telnet session using a program such as HyperTerminal, TeraTerm Pro, or Minicom. Consult the program's documentation for instructions.

3. Log in as user name "**operator**" and password, "**janus**". Press **Enter** on your keyboard to get a command prompt.

From the command prompt, ">", you can use the functions described in the "Function Reference" section of the XL-GPS User's Guide and Reference Manual. The 'Command Line' sub-sections provide instructions and examples.

Related topics:

- "Configuring the Network Port" on page 16
- "F100 – Network Port Configuration & XL-GPS Firmware" on page 74
- "F100 L/LOCK/UNLOCK – Remote Lockout" on page 80

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Installing the Expansion Module

Warning: **Installing and removing the expansion module can expose dangerous voltages that can cause electric shock resulting in injury or death. Disconnect all power before installing or removing the option card. Dangerous voltages may be present in the expansion module and in the unit even when the power is disconnected.**

To install the optional Expansion Module:

1. Set the unit up on a clean, safe, stable work surface that provides good visibility and maneuverability to work with screwdriver.

2. On the back panel, select an option bay and unscrew the retaining screws and remove the small aluminum panel from the bay.

3. Line up the edges of the module with the guide grooves in the option bay and slide it in.

4. When the card is in almost all the way, push it firmly the rest of the way in until the faceplate of the option card is flush with the back panel.

5. Insert and tighten the retaining screws so the expansion module is secured in place.

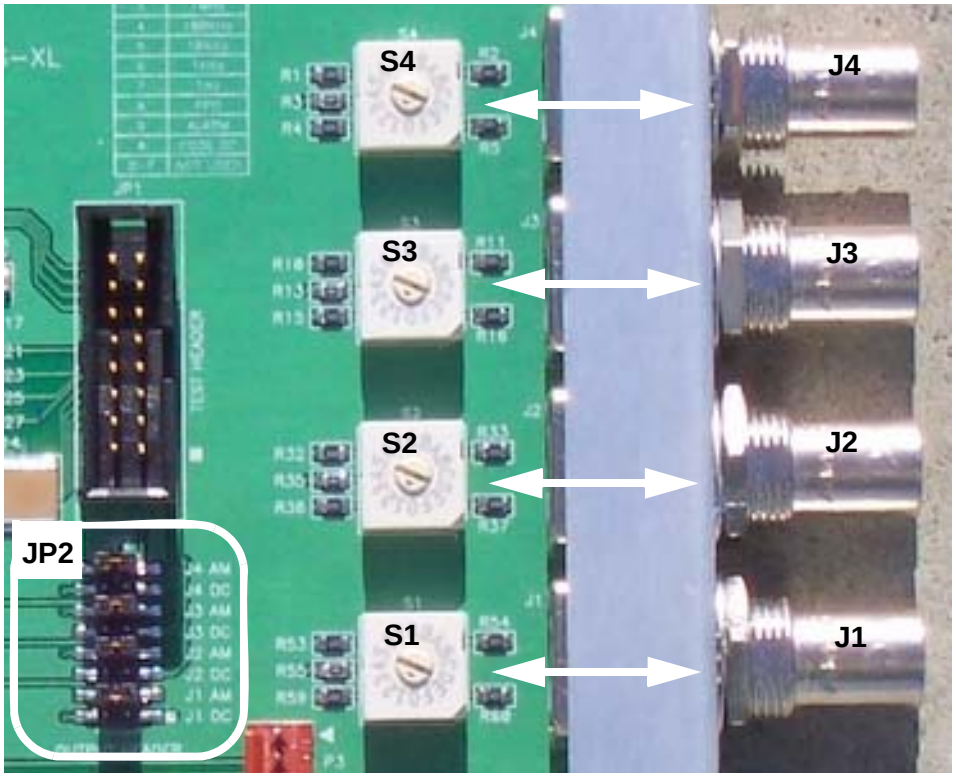
To remove the expansion module, remove the screws, pull the card out, and secure the small aluminum panel in its place with the screws.

Configuring the Expansion Module

Each of the Expansion Module's outputs can be independently configured to generate a signal type. This is done using jumpers and switches located on the module. Symmetricom configures the output signals

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at the factory per the customer sales order.



To change the configuration, identify the jumper at JP2 that corresponds to the output you are configuring. For example, jumper J4 AM corresponds to the J4 output.

To generate *IRIG-B AM time code*, move the plug in JP2 to the AM jumper. For example, to generate IRIG-B AM on the J4 output, move the plug from J4 DC to J4 AM. At this point the configuration procedure would be complete.

To generate *any other signal type*, three steps are required. First, move the plug in JP2 to the DC jumper (e.g., J4 DC). Second, select a signal type from the following table and note the corresponding switch position (e.g., 10 MPPS = position 1). Finally, using a small flat-head screwdriver, turn the rotary switch (e.g., S4) to the appropriate switch position (e.g., 1). In this example, the J4 output would be set to

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generate 10 MPPS and the procedure would be complete. The same method can be used to configure any of the outputs.

Switch Position	Signal Type
0	Off
1	10 MPPS
2	5 MPPS
3	1 MPPS
4	100 kPPS
5	10 kPPS
6	1 kPPS
7	1 PPS
8	Code DC (IRIG-B DC Time Code)
9	PPO
A	Alarm
B-F	Not Used

Note: PPO and Alarm are only available if those options have been purchased and are enabled using F126 – Options Key Entry (page 108).

Note: F90 – Code Output Configuration **does not** control the IRIG signals on the Expansion Module.

Verifying Antenna Installation

After completing the above steps, use the keypad to verify the following:

- In F119 – GPS Receiver Configuration (page 104), after approximately 20 minutes of operation, check that GPS STATUS is LOCKED and GPS ANTENNA is OK.
- In F73 – Alarm Control / Status (page 64), check that the GPS PRI is OK and is ALARM ENABLED (the same for GPS SEC, if two GPS receivers are present). Clear any alarm latches if present.
- Press the STATUS key. “LOCKED GPS PRI” should appear on the front panel display ***without an asterisk***. If an asterisk appears, it means that a reference source is not available.

To troubleshoot a problematic Antenna installation, recheck the physical location of the antenna, the cabling, and the configuration settings described in this manual.

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Rack Mounting the XL-GPS

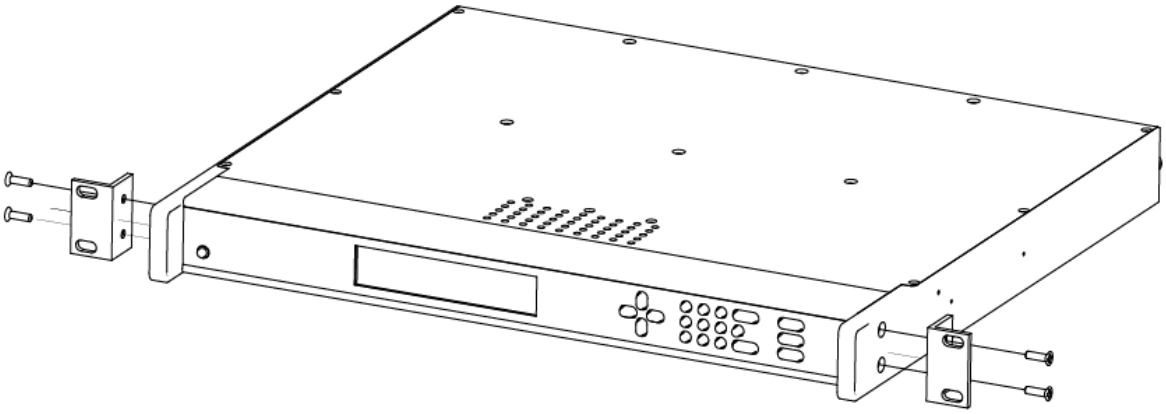
The XL-GPS comes with the following parts needed to mount the XL-GPS securely in any EIA standard 19-inch (48.26-cm) rack:

- 2 mounting brackets
- 4 flat-head, Phillips screws

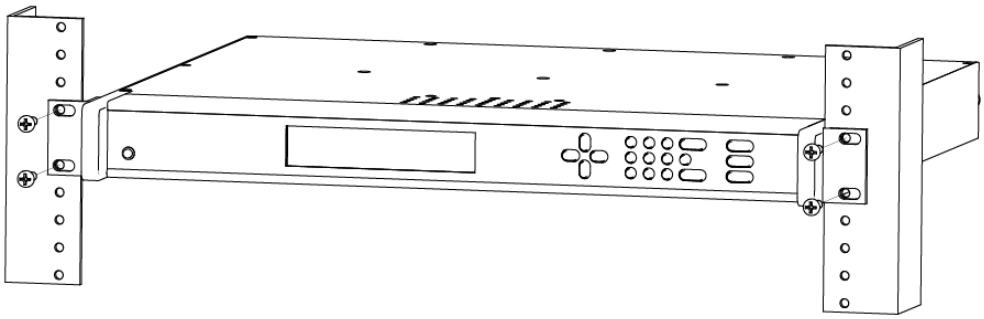
Have the following items ready and available:

- The appropriate AC or DC power source to connect to the XL-GPS's power supply.
- A #2 size Phillips bit screwdriver

To rack mount the XL-GPS:



- Unscrew the four phillips-head screws from the front end of the side panels.
- Use the same screws to attach the rack mount brackets, as shown.
- Tighten the screws using a #2 size Phillips screwdriver.
- Position the XL-GPS in any EIA Standard 19-inch (48.26 cm) rack system, and line up holes in the brackets with the holes in the rack.
- Secure the brackets to the rack using rack mount screws.



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Note: Ensure that the ambient operating temperature does not exceed +50° C. Install the XL-GPS chassis so that the top and bottom holes are unobstructed and have sufficient clearance to allow 6 cfm of air to pass through the chassis. To maintain recommended operating temperatures, install a rack-cooling fan capable of 100 cfm in heavily loaded racks.

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4: User Interfaces

The XL-GPS features two user interfaces for controlling the XL-GPS's functions:

- A keypad interface on the front panel of the XL-GPS
- A command line interface available through the serial and network ports

There is also an Alarm Status LED on the front panel.

Alarm Status LED

The Alarm Status LED, located on the front panel, displays the alarm-state of the XL-GPS unit.

The LED has four states:

Dark	=	Power is off.
Green	=	No F73-related alarms. The current reference source input is locked.
Amber	=	No F73 Alarms. Timeout Delay is counting down, but hasn't elapsed. The current reference source input is unlocked (e.g. broken antenna cable or no GPS signal)
Red	=	An indicator in F73 has triggered an alarm. Check F73 to find out what the fault/unlock condition is and take appropriate action.

Notes:

- The amber LED can turn green again while the reference source input remains unlocked. This is because:
  - F119's 'GPS Status' controls whether the LED turns amber.
  - F73's 'Timeout Delay' controls how long the LED remains amber.
- The blinking of the LED has no meaning. It is a user preference that can be enabled or disabled using the F73's 'LED Blink' setting. If enabled, the LED blinks when it is green and yellow, but stays unblinking when it is red. If disabled, the LED doesn't blink.

keypad Interface

Time Display

Press the TIME button on the keypad to display the time only. Use the TIME button to exit the STATUS, MENU, or function displays. The default time format is HH:MM:SS.

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Time Display related functions:

- Select between the 12 or 24 hour format displayed: “F2 – 12/24 Hour Format” on page 35.
- Select between Local, Standard, UTC, and GPS time: “F69 – Time Mode” on page 61.

Time related functions:

- “F1 – Time Zone Offset” on page 34
- “F3 – Time & Date” on page 37
- “F66 – Daylight Saving Time (DST) Mode” on page 58

Status Display

The Status Display comes up automatically when the XL-GPS is rebooted. To manually switch from another display to the Status Display, press STATUS button on the keypad. The keypad appears as follows:

```
LOCKED    * GPS
UTC     200:21:24:09 2002
```

where:

LOCKED	=	System Clock Status is Locked or Unlocked to the current reference source. See Clock Status in “F73 – Alarm Control / Status” on page 64
*	=	A reference source input has been configured, but is not available. (Note: When using GPS, “*” may remain visible for up to 13 minutes) See “F119 – GPS Receiver Configuration” on page 104
GPS	=	Shows that the clock is locked to GPS.
UTC	=	Time display mode: GPS, UTC, Standard, or Local (“F69 – Time Mode” on page 61)
200:21:24:09 2002	=	The time, in DDD:HH:MM:SS YYYY format (See “Time Display” on page 25.)

Menu Display

To use the XL-GPS functions that are available from the keypad, press the MENU button on the keypad. “Function Summary” on page 32 lists which functions are available from the Menu Display.

Pressing the MENU key on the front of the XL-GPS displays the first function, F1: TIME ZONE OFFSET:

```
F1:
TIME ZONE OFFSET
```

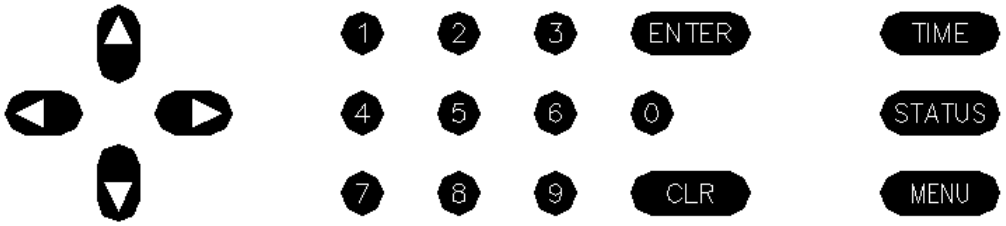

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Pressing the UP ARROW key increments to the next function, F2 - 12/24 HOUR FORMAT, and so on. Pressing the DOWN ARROW key skips to the highest available function, F126 OPTIONS KEY ENTRY, and, from there, decrements through the functions.

The section, “5: Function Reference” on page 32, provides detailed information on all of the XL-GPS’s functions.

Keypad Operation

Use XL-GPS’s front panel keypad to operate the menu-driven keypad interface.



The following table explains how the individual keys work:

UP ARROW	Increase value/Display next choice above
DOWN ARROW	Decrease value/Display next choice below
RIGHT ARROW	Move cursor right
LEFT ARROW	Move cursor left
0-9	Enter numeric values
ENTER	Enters currently displayed choice, e.g., a function or yes/confirmation to save changes
CLR	Clears the current selection/choice and returns to the last saved value
TIME	Displays the current time. Can also be used to exit a function without saving changes.
STATUS	Displays the clock status and time. Can be used to exit a function without saving changes.
MENU	Displays first item in function menu. Use UP/DOWN ARROWs to display other functions.

Keypad Examples

The following examples show how to use the keypad effectively.

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To open a function using ENTER:

Press	Result
ENTER	Displays the "FUNCTION" prompt
2	Enter the function's number ("2" in this example)
ENTER	Displays F2's first screen, "DISPLAY HOUR FORMAT: 24 HOUR"

To open a function using MENU:

Press	Result
MENU	Displays F1 on the front panel display
UP/DOWN ARROW	Scrolls through the list of functions
ENTER	Opens the function and displays its first screen

To change the settings in a function, and not save them:

Press	Result
MENU	Displays "F1: TIME ZONE OFFSET"
ENTER	Displays "TIME ZONE OFFSET –08:00"
UP ARROW	Changes the minus sign in "– 08:00" to a plus in "+08:00"
RIGHT ARROW	Moves the cursor to the right, under "0".
UP ARROW	Changes "0" to "1", making "+18:00"
ENTER	XL-GPS asks "SAVE CHANGES? YES"
UP ARROW	Changes "YES" to "NO"
ENTER	Abandons the changes and displays the Status Display

Other ways to abandon new settings in a function:

Press	Result
CLR	Abandons all changes and displays to the first screen in the function
TIME	Abandons all changes, exits the function, and displays the Time Display
STATUS	Abandons all changes, exits the function, and displays the Status Display

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To enter numeric values in a function:

Press	Result
ENTER	Displays the "FUNCTION" prompt
3	Enters "3" as the function number
ENTER	Opens Function 3, displays the first screen, "TIME MODE – LOCAL"
ENTER	Displays the second parameter, "DATE-TIME…<mm>/<dd>/<yyyy>"
05152002	Enters May 15, 2002 as today's date. (replace)
ENTER	Displays "DATE-TIME"
ENTER	XL-GPS asks "SAVE CHANGES? YES"
ENTER	Selects "YES", saves the changes, and displays the Status Display

Command Line Interface

To open a command line session, connect to the serial or network port using a terminal or a terminal emulation program on a PC.

Consult "5: Function Reference" on page 32 for information on the function commands.

Logging In

Two user names are available for logging in to the network port's command line interface: "operator" and "guest". The serial port's command line interface does not require the user to log in.

Operator Login

The Operator has full privileges to change the settings in all the XL-GPS's functions and to perform firmware updates. As shipped, you can log in as Operator using:

```
User Name: operator
Password: janus
```

To maintain security, change the Operator password at installation.

If you are logged in as "operator", the only command line interface function you cannot perform is changing the Guest password.

Guest Login

Use the guest login to view function settings. As shipped, you can log in as guest using:

```
User Name: guest
Password: ttm
```

To maintain security, change the Guest password at installation.

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If you try to use a function that is not accessible from the guest login, you will see a message such as “Access denied” or “Command canceled”.

Logging Out

You can log out using the following commands:

```
logout
logoff
exit
quit
```

Changing Username and Password

To change the user name and password, use the following commands:

- “F100 P – Change User Password” on page 90
- “F100 PN – Change User Name” on page 91

To reset a lost or forgotten operator username/password, use F100 P and F100 PN commands from the command line interface ***on the serial port***.

Session Timeout and Priority

The XL-GPS’s system firmware has session timers that will terminate an inactive command line session on the *network port* after 15 minutes. The XL-GPS does not terminate inactive command line sessions on the *serial port*.

The user can open a network port session and a serial ports session concurrently, provided the other session is inactive (i.e., not actively performing a function such as F8 – Continuous Time Once-per-Second). The XL-GPS does not allow two or more concurrent network port sessions.

A network port session can be used while a serial port session is open. However, if the serial port session receives user input at this point, it takes control away from the network port and does not yield control to the network port again. The network port will show a prompt, but will not accept additional commands after the serial port has taken control back. At this point, closing the network port connection and opening a new one will also fail; a network port connection cannot be re-established until the serial port has been closed. The following transcripts show the results of a ‘contest’ between a serial and a network port session:

Serial port session:

```
>f100 ic
f100 IP:192.168.46.150 SM:255.255.255.0 G:192.168.46.1

>NOTICE: A NEW TELNET SESSION HAS BEEN STARTED ON THE INTERNET PORT!

>f100 ic
NOTICE: THERE IS ALREADY A TELNET SESSION ON THE INTERNET PORT!
NOTICE: YOU HAVE TAKEN CONTROL AWAY FROM THE TELNET SESSION!
```


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```
f100 IP:192.168.46.150 SM:255.255.255.0 G:192.168.46.1

>f100 ic
f100 IP:192.168.46.150 SM:255.255.255.0 G:192.168.46.1

>
```

Network port session:

```
WELCOME TO SYMMETRICOM NETWORK INTERFACE!
USER NAME: operator
PASSWORD: *****
NETWORK INTERFACE 192-8001      (c) 1998 - 2003 SYMMETRICOM
ALL RIGHTS RESERVED
LOGIN SUCCESSFUL!

>f100 ic
f100 IP:192.168.46.150 SM:255.255.255.0 G:192.168.46.1

>NOTICE: UTILITY MONITOR SESSION HAS TAKEN PRIORITY FROM THIS TELNET SESSION!

>f100 ic
NOTICE: CANNOT RESPOND TO COMMAND BECAUSE UTILITY PORT SESSION HAS PRIORITY!
```


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5: Function Reference

Function Summary

The following summary lists all the XL-GPS functions, identifies the user interfaces from which each one is available, and provides a brief description of the function.

Available from: K = keypad, N = Network Port (Telnet), S = Serial Port

Function	Available From	Description
F1 – Time Zone Offset	K, N, S	Set the time offset for Standard and Local time
F2 – 12/24 Hour Format	K, N, S	Apply a 12 or 24-hour format to the Front Panel Display, to F8, F9, and F90.
F3 – Time & Date	K, N, S	Set the time and date (when not already provided by a reference source)
F4 – Serial Port Configuration	K, N	Configure the main serial port settings
F5 – Time-Quality Setup	K, N, S	Set the thresholds for each of the four time quality flags
F6 – Keypad Lock	K*, N, S	Lock keypad access to the XL-GPS's functions. (When locked, F6 is the only function available from the keypad.)
F8 – Continuous Time Once-per-Second	N, S	Output the time once-per-second (to the command line)
F9 – Time On Request	N, S	Output the time when triggered (to the command line)
F11 – Time Output Format	N, S	Change the format of the time output by F8 and F9
F13 – Time Error	K, N, S	View the current estimated worst case time error
F18 – Software Version Request	K, N, S	View the XL-GPS's software version information
F50 – GPS Receiver LLA/XYZ Position	K, N, S	View the Latitude/Longitude/Altitude or geocentric X/Y/Z coordinates of one or more GPS antennas.
F51 – GPS Antenna Cable Delay	K, N, S	Compensate for the delay caused by the length of the GPS antenna cable. (Use F52 to adjust timing *outputs*.)
F52 – Distribution Cable Delay	K, N, S	Compensate for the length of the distribution cable on J2.
F53 – GPS Operation Mode	K, N, S	Operate the GPS M12 Receiver in Time Mode in static applications, or in Dynamic Mode for mobile applications.
F60 – GPS Receiver Satellite List	K, N, S	View a list of current and tracked satellites.
F66 – Daylight Saving Time (DST) Mode	K, N, S	Schedule when DST starts and ends (Local time only)
F69 – Time Mode	K, N, S	Set the type of time (GPS, UTC, Standard, Local) displayed on the front panel of the XL-GPS

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F71 – Oscillator Statistics	K, N, S	Display the XL-GPS oscillator's phase, offset, drift, and DAC values
F72 – Fault Status	K, N, S	View clock and power supply fault status
F73 – Alarm Control / Status	K, N, S	View the status of all the alarm indicators. Enable/disable alarms for each indicator. Set alarm thresholds. Enable or disable LED blink
F90 – Code Output Configuration	K, N, S	Configure settings for CODE – time code output
F100 – Network Port Configuration & XL-GPS Firmware	K, N, S	Configure the standard network port settings
F100 EA – Ethernet Address	K, N, S	Display the Ethernet (MAC) address
F100 IP – IP Address	K, N, S	Configure the IP address
F100 SM – Subnet Mask	K, N, S	Configure the subnet mask
F100 G – Gateway	K, N, S	Configure the default gateway
F100 IC – Network Port Settings	K, N, S	Display all the standard network port's settings
F100 L/LOCK/UNLOCK – Remote Lockout	K, N, S	Lock remote access to the XL-GPS's standard network port
F100 L – Remote Lockout Status	K, N*, S	Display the status of F100 LOCK *Locked through the network port, serial port, and keypad. Can be unlocked only through the keypad or serial port.
F100 ST – Self Test Status	K, N, S	Display the XL-GPS's self test results for Flash CRC, RAM, Serial Port, and NVRAM
F100 BH – Burn Host	N, S	Upgrading system firmware: select the FTP host, path, and filename of the system firmware
F100 BUB – Burn BootLoader	N, S	Upgrading system firmware: 'burn' the bootloader file (*.bt) selected using F100 BH to flash memory
F100 BU – Burn	N, S	Upgrading system firmware: 'burn' the system firmware file (*.bin) selected using F100 BH to flash memory
F100 BF – Burn File System	N, S	Upgrading system firmware: 'burn' the file system file (*.fs) selected using F100 BH to flash memory
F100 BUFP – Burn FPGA Firmware	N, S	Upgrading system firmware: burn the FPGA program file (*.bin) selected using F100 BH to the flash memory
F100 CONFIG – Configure NTP & SNMP	N, S	Transfer the NTP and SNMP configuration files between the XL-GPS and an FTP server for editing
F100 J – Factory Mode Jumper	N, S	View the status of the factory mode jumper, which is used by factory technicians. Not of interest to most end users.
F100 K I L L – Reboot	N, S	Reboot the XL-GPS
F100 P – Change User Password	N, S	Change the XL-GPS password
F100 PI – PING	N, S	Ping from the XL-GPS to another host on the network
F100 PN – Change User Name	N, S	Change the User Name

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F108 – Oscillator Configuration	K, N, S	View the oscillator type
F110 – J1 Input (TIET)	K, N, S	Configure the J1 input connector
F111 – J2 Output (Rate, PPO)	K, N, S	Configure the J2 output connector
F113 – J3 Input (Freq Meas)	K, N, S	Configure the J3 input connector
F117 – Factory Configuration	K	Set the brightness of the display on the XL-GPS's front panel
F117 – Factory Configuration	K, N, S	View some of the factory settings such as the serial number or NTP state
F119 – GPS Receiver Configuration	K, N, S	Configure and display status for the GPS M12 Receiver card (87-8028-2)
F126 – Options Key Entry	K, N, S	Enable an XL-GPS option by entering a software key

F1 – Time Zone Offset

Use function F1 to display and set the time zone offset between your Standard Time zone and Universal Time Coordinated (UTC). Refer to "F: World Map of Time Zones:" on page 141. F1 is the basis for Standard Time and Local Time used by F69. For an expanded explanation of Local, Standard, UTC, and GPS time, see "F69 – Time Mode" on page 61.

For example, to set the time zone for Pacific Standard Time (UTC –8 hours), set the value in F1 to –08:00. *Do not include the 1-hour Daylight Saving Time (DST) offset in this value*. DST is handled separately by "F66 – Daylight Saving Time (DST) Mode" on page 58.

Because the front panel display can be configured to display/distribute Local or Standard time, we recommend configuring F1 as described in the "3: Installation/Configuration" on page 13.

The factory setting for F1 is UTC –8:00 hours (Pacific Standard Time).

Related topics:

- "F2 – 12/24 Hour Format" on page 35
- "F11 – Time Output Format" on page 46

Command Line

To display the time zone offset, send:

```
F1<CR>
```

XL-GPS responds:

```
F1<S><SIGN><HH>:<MM><CR><LF>
```


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where:

F	=	ASCII character F
01	=	function number
<S>	=	ASCII space character (one or more)
<SIGN>	=	either no character or + for positive offsets or – for negative offsets
<HH>	=	one – or two-digit hours offset from 00 to12 hours
:	=	ASCII character for a colon
<MM>	=	two-digit minutes offset
<CR>	=	carriage return character
<LF>	=	line feed character

For example, to set the time zone offset, enter:

F1 -8:00<CR>

XL-GPS responds:

OK<CR><LF>

To verify the change, enter:

F1<CR>

XL-GPS Responds:

F1 -8:00<CR><LF>

F2 – 12/24 Hour Format

Use function F2 to apply a 12 or 24-hour format to the time output by:

- “keypad Interface” on page 25
- “F8 – Continuous Time Once-per-Second” on page 42
- “F9 – Time On Request” on page 44
- “F90 – Code Output Configuration” on page 72

F2 affects how all four types of time (Local, Standard, UTC, GPS) appear when displayed or output.

The 12-hour format counts hours from 1 to 12 twice per day, like a conventional wall clock. The 24-hour format counts hours from 1 to 24 once per day. For example, in the 24 hour format, 18:00 is equivalent to 6:00 PM in the 12-hour format (i.e., 18:00 – 12:00 = 6:00 PM).

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Note: Local time is commonly displayed in both 12 and 24 formats. The specifications for Standard, UTC, and GPS call for using the 24-hour format. Applying the 12-hour format to any time type leads to ambiguous time notation. For example, if the 12-hour format is applied to UTC, the clock will display “249:10:21:34” once in the morning, and once at night.

The factory settings for F2 are 24-hour format for the display and 24-hour format for IRIG (F90)

Command Line

To display the current hour format, send:

F2<CR>

XL-GPS responds:

F2<S>D<HH><SEP>I<HH><CR><LF>

where:

F	=	ASCII character F.
02	=	Function number.
<S>	=	ASCII space character (one or more).
D	=	ASCII character for Display format.
<HH>	=	12 or 24.
I	=	ASCII character for IRIG format
<CR>	=	Carriage return character.
<LF>	=	Line feed character.

For example, to display the current hour format, send:

F2<CR>

XL-GPS responds:

F2 D24 I24<CR><LF>

To set the hour format, send:

F2 D12 I24<CR>

XL-GPS responds:

OK<CR><LF>

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F3 – Time & Date

When an optional oscillator is used because a GPS signal is unavailable, use function F3 to manually set the XL-GPS system clock's time and date. When the XL-GPS is using GPS as timing reference, setting F3 manually is unnecessary. At startup, the XL-GPS synchronizes its time and date to GPS.

F3 prompts the user for the Time Mode, the Date in `mm/dd/yyyy` format, and the Time in `hh:mm:ss` format. The hours in `hh:mm:ss` should be given using 24-hour notation (e.g., 6 pm = 18:00).

TIME MODE selects which type of time (Local/Standard/GPS/UTC) is being entered by the user. The XL-GPS, translates the user entry into its equivalents in other types of time. For example, entering LOCAL - 07/14/2002 - 15:47:10 in F3 shows up on the front keypad display as UTC 198:10:47:10, with F1 set to –8:00. TIME MODE in F3 defines only the entry of time in F3; it does not control the type of time displayed or output by the XL-GPS. F3's Time Mode should not be confused with F69 (see "F69 – Time Mode" on page 61). F69 controls the type of time displayed/output on the front panel display, F8 – Continuous Time Once-per-Second, F9 – Time On Request, and F90 – Code Output Configuration.

Notes:

- Don't manually set the time using F3 settings while the XL-GPS is locked to a reference source and distributing time information. Doing so allows the XL-GPS to distribute the potentially incorrect time set by F3 for up to 8 seconds until the XL-GPS re-synchronizes to the reference source's time. The XL-GPS will make this switch to and from F3's time without generating an alarm. In NTP, for example, this means that incorrect time information could be distributed in NTP packets that are marked as having the valid time.

Command Line

To display the time and date, send:

F3<CR>

XL-GPS responds:

`F3<S><MM>/<DD>/<YYYY><SEP><hh>:<mm>:<ss><CR><LF>`

where:

`F3`	=	ASCII string for function F3.
`<S>`	=	ASCII space character (one or more).
`<TIME MODE>`	=	the time mode the entered time refers to; LOCAL/STANDARD/GPS/UTC
`<SEP>`	=	one or more separator characters: either space, comma or tab
`<MM>`	=	two-digit month
`<DD>`	=	two-digit day of month
`<YYYY>`	=	four-digit year
`/`	=	ASCII character for slash delimiter

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:	=	ASCII character for a colon delimiter.
<hh>	=	one- or two-digit hours.
<mm>	=	two-digit minutes.
<ss>	=	two-digit seconds.
<CR>	=	carriage return character.
<LF>	=	line feed character.

For example, to display the date and time, send:

F3<CR>

XL-GPS responds:

F3 UTC 01/01/2002 00:05:34<CR><LF>

To set the time and date, send:

F3 UTC 07/14/2002 18:20:30<CR>

Note: Only valid times and dates are accepted.

XL-GPS responds:

OK<CR><LF>

F4 – Serial Port Configuration

Use function F4 to change or display the serial port settings. The factory settings are:

- Interface – RS-232
- Baud rate – 9600
- Data bits – 8
- Parity – NONE (only available/valid when Data Bits is set to 8)
- Stop bits – 1

Command Line

To display the Serial Port settings, send:

F4<CR>

XL-GPS responds:

F4<S><RS><SEP>
<SEP><DB><SEP><P><SEP><SB><CR><LF>

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where:

F	=	ASCII character F.
04	=	function number.
<S>	=	ASCII space character (one or more).
<SEP>	=	One or more separator characters: either space, comma or tab.
<RS>	=	Interface type, RS-232 or RS-422
 	=	Baud Rate, with possible values 1200, 2400, 4800, 9600, or 19200
<DB>	=	Data Bits, with possible values 7 or 8
<P>	=	Parity, with possible values “even” or “odd” or “none”
<SB>	=	Stop Bits, with possible values 1 or 2.
<CR>	=	Carriage return character.
<LF>	=	Line feed character.

Note: Parity - NONE is only available/valid when Data Bits is set to 8.

For example, to display the serial port settings, send:

F4<CR>

XL-GPS responds:

F4 232 9600 8 none 1<CR><LF>

To set the serial port settings, send:

F4 422 9600 7 even 1<CR>

XL-GPS responds:

OK<CR><LF>

F5 – Time-Quality Setup

Use function F5 to enable/disable time quality reporting, and to set the thresholds of the four time-quality flags.

How time quality reporting works: If the GPS timing reference becomes unavailable to discipline or steer the oscillator, the oscillator begins to drift and gradually accumulates time error. The XL-GPS estimates time error based on the oscillator-type and on the degree of steering (the DAC value) that was being applied to the oscillator before the timing reference became unavailable. As the estimated time error grows, exceeding the threshold of the four *Time Quality Flags* set in F5, the XL-GPS outputs four

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corresponding *time quality characters* in text outputs of F8 and F9. (See “F8 – Continuous Time Once-per-Second” on page 42 and “F9 – Time On Request” on page 44)

In addition, a time quality indicator is encoded in outputs of the IRIG-B AM or DC Expansion module (see “F90 – Code Output Configuration” on page 72).

For more information on time quality indicators, see “IRIG Standard Format A” on page 140.

The XL-GPS accepts threshold values from 200 nS to 40000000000 nS.

The factory settings for F5 are as follows:

- Time quality reporting - enabled
- First time quality flag 1,000 ns
- Second time quality flag 10,000 ns
- Third time quality flag 100,000 ns
- Fourth time quality flag 1,000,000 ns

Related topics (Time Error):

- “F13 – Time Error” on page 48 displays the current time error
- “F71 – Oscillator Statistics” on page 62 provides the DAC value

Command Line

To determine if the time quality characters are enabled and what the thresholds are, enter:

F5<CR>

XL-GPS responds:

F5<S><STATE><SEP><FLAG><SEP><FLAG><SEP><FLAG><SEP><FLAG><CR><LF>

where:

F	=	ASCII character F
05	=	function number
<S>	=	ASCII space character (one or more)
<SEP>	=	one or more separator characters; either space, comma or tab
<STATE>	=	ENABLE or DISABLE
<FLAG>	=	one error threshold in nanoseconds, 1 to 11 digits with or without leading zeros
<CR>	=	carriage return character
<LF>	=	line feed character

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For example, to display the time quality status and flags, enter:

F5<CR>

If F5 is enabled, XL-GPS responds (example):

F5 ENABLE 00000001000 00000010000 00000100000 00001000000<CR><LF>

If F5 is disabled, XL-GPS responds:

F5 DISABLE<CR><LF>

To enable time quality reporting, and change the thresholds of the time quality flags, enter:

F5 ENABLE 2000 20000 200000 2000000<CR>

XL-GPS responds:

OK<CR><LF>

Note: Leading zeros aren't required when entering new settings. They are displayed in the readouts.

To disable time quality reporting:

F5 DISABLE<CR>

XL-GPS responds:

OK<CR><LF>

F6 – Keypad Lock

F6 – Keypad Lock enables or disables the keypad, preventing accidental changes to the XL-GPS's settings. When enabled, the display responds 'KEYPAD LOCKOUT BY FUNC 6' when the user attempts to access any function other than F6. F6 remains available through the keypad at all times. The factory setting for F6 – Keypad Lock is disabled.

Command Line

To display the Keypad Lock status, send:

F6<CR>

XL-GPS responds:

F6<S><STATE><CR><LF>

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where:

F	=	ASCII character F
6	=	function number
<S>	=	ASCII space character (one or more)
<STATE>	=	ENABLE or DISABLE
<CR>	=	carriage return character
<LF>	=	line feed character

For example, to display the Keypad Lock status, send:

F6<CR>

XL-GPS responds:

F6 DISABLE<CR><LF>

To enable Keypad Lock, send the following string:

F6 ENABLE<CR>

XL-GPS responds:

OK<CR><LF>

To disable Keypad Lock, send the following string:

F6 DISABLE<CR>

XL-GPS responds:

OK<CR><LF>

F8 – Continuous Time Once-per-Second

Note: This function is available through the command line interface only – it is not available through the keypad.

F8 generates time-of-year information (e.g., 199:10:41:08) once-per-second over the XL-GPS's command line interface, which is available from the standard network port or the serial port. The format and type of time can be modified using F2, F11, and F69.

If F8 is used following startup, while the XL-GPS is acquiring a reference source, F8's displays time-of-year information from the XL-GPS's *unsynchronized* system clock. When the system clock acquires a

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reference source and synchronizes with it, F8 displays the new time-of-year information. The transition looks like this:

```
365:16:00:14?
365:16:00:15?
365:16:00:16
365:16:00:17
199:13:56:03
199:13:56:04
```

In the first two lines above, the unsynchronized time is followed by a “?” time quality character. In this case, the “?” indicates that the XL-GPS is unlocked to a reference source. As the XL-GPS locks to the reference source, the “?” disappears, and after a couple seconds, the new synchronized time-of-year information appears.

If the reference source becomes unavailable again, F8 continues generating time-of-year information based on the synchronized time, and the unlock “?” appears.

```
199:11:19:31
199:11:19:32
199:11:19:33?
199:11:19:34?
```

The format of time output can be changed using “F11 – Time Output Format” on page 46. The default output string format is:

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

where:

<SOH>	=	ASCII Start-of-Heading character (e.g., in decimal ASCII code: 001)
<CR>	=	ASCII Carriage Return character; is output at the 1 PPS mark +/- 1 mS
<LF>	=	ASCII Line Feed character
DDD	=	day-of-year
HH	=	hours
MM	=	minutes
SS	=	seconds
:	=	colon separator.
Q	=	time quality character (see the following table)

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The time quality character, “Q”, is one of the following characters:

SPACE	=	Time error is less than time quality flag 1’s threshold
.	=	Time error has exceeded time quality flag 1’s threshold
*	=	Time error has exceeded time quality flag 2’s threshold
#	=	Time error has exceeded time quality flag 3’s threshold
?	=	Time error has exceeded time quality flag 4’s threshold Or A reference source is unavailable

The four time quality thresholds are set by F5 – Time-Quality Setup.

See “F13 – Time Error” on page 48 for more information.

Command Line

For example, to initiate Continuous Time once-per-second, enter

F8<CR>

The XL-GPS replies:

```
199:11:19:30<CR><LF>
199:11:19:31<CR><LF>
199:11:19:32<CR><LF>
```

To stop Continuous Time Once-Per-Second, press Ctrl-C on your keyboard to stop it.

F9 – Time On Request

Note: This function is available through the command line interface only – it is not available through the keypad.

Use function F9 to record the exact time the XL-GPS receives a request from the user.

Enter the command “**F9<CR>”** to prepare the XL-GPS for the user’s request. At the desired moment, send the request to the XL-GPS by entering an upper case “**T**”. The XL-GPS saves the current time-of-day, accurate to within 1ms, to a buffer, and then outputs it to the command line interface. The XL-GPS will continue to provide the time-of-day each time it receives a “T” until F9 is cancelled. To cancel this function, enter Ctrl-C on your keyboard. The command line disregards any input other than SHIFT-T until it receives a Ctrl-C command.

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

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The default output string is as follows:

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

where:

<SOH>	=	ASCII Start-of-Heading character
<CR>	=	ASCII Carriage Return character
<LF>	=	ASCII Line Feed character
DDD	=	day-of-year.
HH	=	hours.
MM	=	minutes.
SS	=	seconds.
mmm	=	milliseconds.
:	=	colon separator.
Q	=	time quality character (see the following table)

The time quality character, “Q”, is one of the following characters:

SPACE	=	Time error is less than time quality flag 1’s threshold
.	=	Time error has exceeded time quality flag 1’s threshold
*	=	Time error has exceeded time quality flag 2’s threshold
#	=	Time error has exceeded time quality flag 3’s threshold
?	=	Time error has exceeded time quality flag 4’s threshold, or a reference source is unavailable

For example, to prepare Time on Request, enter:

```
F9<CR>
```

Then, to request the current time, enter SHIFT-T on your keyboard. (“T” does not appear on the command line). XL-GPS responds:

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

To exit F9 press Ctrl-C on your keyboard.

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F11 – Time Output Format

Use function F11 to review or change the format of the time output string used in F8 and F9. The as-shipped factory setting for F11 format is null, which enables F8's and F9's default time output formats. The default format for F8 – Continuous Time Once-per-Second is:

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

Note: F8 does not display milliseconds, regardless of the format defined in F11.

The default format for F9 – Time On Request is:

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

where:

<SOH>	=	ASCII Start-of-Heading character.
<CR>	=	ASCII Carriage Return character.
<LF>	=	ASCII Line Feed character.
DDD	=	Day-of-year.
HH	=	Hours.
MM	=	Minutes.
SS	=	Seconds.
.	=	ASCII decimal point.
mmm	=	Milliseconds.
:	=	Colon separator.
Q	=	Time quality character table below.

The time quality character, "Q", is one of the following characters:

SPACE	=	Time error is less than time quality flag 1's threshold
.	=	Time error has exceeded time quality flag 1's threshold
*	=	Time error has exceeded time quality flag 2's threshold
#	=	Time error has exceeded time quality flag 3's threshold
?	=	Time error has exceeded time quality flag 4's threshold Or A reference source is unavailable

See "F5 – Time-Quality Setup" on page 39 and "F13 – Time Error" on page 48 for more information.

When the unit responds to "F11<CR>" with the current format string (as shown in the following example), the first character after the "F11" is a blank separator; it is not part of the format string.

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To see the Time Output Format, enter:

F11<CR>

XL-GPS responds:

F11 DDD:HH:MM:SS.mmmQ<CR><LF>

To remove the day, hour, minute, second, microsecond, or a character from the time output format (other than the ASCII <SOH> <CR> or <LF> characters), enter the following string replacing the character you want to remove with an "**X**":

F11<SEP>DDD:HH:MM:SS.mmmQ<CR>

F11 does not control the <SOH>, <CR>, or <LF> in the F8 and F9 output strings. <SEP> is only one character wide, either a space, comma or tab. Any character other than an upper case "X" in a numeric position does not affect the output of that position. The colons (:) or decimal point (.), however, may be replaced with any single ASCII character except null (Hex 00), carriage return, or line feed.

For example, to check the current F11 settings, enter:

F11<CR>

XL-GPS replies:

F11 DDD:HH:MM:SS.mmmQ<CR><LF>

Then apply a new time output format by entering, for example:

F11 XXXXXXXMMMSSS.mmmX<CR>

XL-GPS responds:

OK<CR><LF>

With the above settings, F8 displays:

<SOH>12M34S<CR><LF>

With the above settings, F9 displays:

<SOH>12M34S.567<CR><LF>

The new time format above suppresses the days, the first colon, and hours. It replaces the second and third colons with "M" and "S", respectively. And it suppresses the time quality character.

If you end the first part of a format string early with a carriage return, the remaining un-typed characters are enabled and assume their default values. For example, if you enter:

F11<TAB>XXX|<CR>

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XL-GPS responds:

```
OK<CR>
```

With the above settings, F8 displays:

```
<SOH>|10:45:01*<CR><LF>
```

With the above settings, F9 displays:

```
<SOH>|10:45:01.234*<CR><LF>
```

The new time format above suppresses days, and replaces the first colon (:) separator with a vertical bar. This enables the remaining characters, which assume their default values.

F13 – Time Error

Use function F13 to request the estimated worst-case time error due to oscillator drift during periods of unlock from a reference source. See "Time and Frequency Accuracy" on page 3 for more information on time error for different reference sources. Time error begins to accumulate when the receiver loses lock to a reference source. The XL-GPS calculates the worst-case time error based on the stability of system clock's oscillator type, and the time elapsed since loss of lock.

Command Line

The Command line interface will report time error when it receives the following string:

```
F13<CR>
```

XL-GPS responds:

```
F13<S><ERROR><CR><LF>
```

where:

F13	=	ASCII string for function F13
<S>	=	ASCII space character
<ERROR>	=	calculated worst-case error in seconds
<CR>	=	carriage return character
<LF>	=	line feed

For example, to display the time error, enter:

```
F13<CR>
```


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XL-GPS responds (example):

```
F13 TIME ERROR -0.002932863<CR><LF>
```

F18 – Software Version Request

Use function F18 to display the current firmware version numbers of the firmware in the XL-GPS:

- Bootloader
- Software (firmware)
- File System
- Project Rev #
- FPGA

Command Line

Use Command Line Function F18 to obtain the system's firmware version information.For example, enter:

```
F18<CR>
```

XL-GPS responds:

```
F18 BOOTLOADER  192-8000
    SOFTWARE    192-8001
    FILE SYSTEM 192-8002v1.80
    PROJ REV #  1.80
    FPGA #      184-8000V50
```

F50 – GPS Receiver LLA/XYZ Position

Use function F50 to display the current GPS position. Specifically, Use function F50 to:

- Select the positional coordinate system, Latitude Longitude Altitude (LLA) or XYZ (Earth-Centered, Earth-Fixed XYZ coordinates based on WGS 84).
- If LLA is selected, Altitude Mode shows the elevation in meters (WGS 84).

Warning: **This GPS receiver is optimized for timing versus position accuracy. Therefore, position information on this unit is not valid for navigation and other critical applications.**

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Keypad

When Position Mode is “LLA”, the position of the antenna is displayed in degrees, minutes, and seconds using the following format:

```
<SIGN><DEG><°><MIN>'<SEC>"
```

where:

<SIGN>	=	N or S for latitude; E or W for longitude; – for negative altitude and <S> or + for positive altitude.
<DEG>	=	two-digit degrees for latitude or three-digit degrees for longitude.
<MIN>	=	two-digit minutes.
'	=	ASCII character '
<SEC>	=	two-digit seconds plus one-digit 10ths of seconds.
"	=	ASCII character "

For example:

```
LATITUDE
N38°23’53.2”
```

or

```
LONGITUDE
W122°42’53.0”
```

Altitude Mode is available in Meters only.

Altitude is displayed in meters above (“+”) or below (“-”) the WGS 84 ellipsoid.

Command Line

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

```
F50<S>LLA<CR>
```

XL-GPS responds with the coordinate information in the following format:

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


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where:

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

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

F50 LLA<CR>

XL-GPS responds (example):

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

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

F50<S>XYZ<CR>

XL-GPS responds using the following format:

F50<S><SIGN><S><MX>m<S><SIGN><S><MY>m<S><SIGN><MZ>m<CR><LF>

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where:

F	=	ASCII character F
50	=	function number
<S>	=	ASCII space character
<SIGN>	=	Either + or - for the position of the ECEF XYZ coordinates
<MX>	=	Antenna X-position in meters to tenths of a meter
<MY>	=	Antenna Y-position in meters to tenths of a meter
<MZ>	=	Antenna Z-position in meters to tenths of a meter
m	=	ASCII character m for Meters
<ALT>	=	altitude in meters
<CR>	=	carriage return character
<LF>	=	line feed character

For example:

```
F50 XYZ<CR>
```

XL-GPS responds (example):

```
F50   X –4474331m Y 2668899m Z –3668099m<CR><LF>
```

F51 – GPS Antenna Cable Delay

Use function F51 to display or configure the GPS antenna cable delay. Setting a positive value for F51 compensates for the time the signal takes to travel the length of the cable from the GPS antenna to the receiver. The factory setting for F51 is +60 nS (50 feet of RG-59). If using an optional Down/Up Converter, consult that product's documentation for directions on setting the correct cable delay.

F51 Guidelines:

- For RG-59: multiply the cable length by 1.24 ns/ft. to get the value for F51.
- For RG-58: multiply the cable length by 1.4 ns/ft. to get the value for F51.
- Don't use function F51 to adjust the XL-GPS's *timing outputs*; use F52 Distribution Cable Delay instead.

Command Line

Use the following format to display the current Antenna Cable Delay setting:

```
F51<CR>
```


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The XL-GPS responds using the following format:

```
F51<S><+><DELAY>ns<CR><LF>
```

where:

F	=	ASCII character F (f or F for input string).
51	=	the function number.
<S>	=	ASCII space character one or more.
<CR>	=	carriage return character.
<SEP>	=	one or more space characters.
<DELAY>	=	1 to 6 digit delay from 0 nS to 999999 nS.
ns	=	nanoseconds (ns or NS for input string).
<LF>	=	line feed character.

Note: Only positive delays are valid.

For example, to see the antenna cable delay, enter:

```
F51<CR>
```

XL-GPS responds:

```
F51 +000060ns<CR><LF>
```

To set the antenna cable delay, use the following format:

```
F51<S><DELAY>NS<CR>
```

For example, to set the antenna cable delay to 100 nS, enter:

```
F51 100NS<CR>
```

XL-GPS responds:

```
OK<CR><LF>
```

F52 – Distribution Cable Delay

Use function F52 to display or set the distribution cable delay for the standard CODE (time code) and 1 PPS outputs. F52 compensates for the signal's travel time from the XL-GPS to its point of use. The distribution cable delay applies uniformly to all output ports. The as-shipped factory setting is +0 ns. The range of possible values is +999,999 ns to –999,999 ns. Positive values advance the timing signals, while negative values retard them.

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To calculate what the setting should be, multiply the delay/foot by the length of the cable in feet. The typical delays for the following cable types are:

- RG-58 – approximately 1.4 ns/foot
- RG-59 – approximately 1.24 ns/foot

Command Line

To display the current distribution cable delay, enter:

F52<CR>

The XL-GPS responds using the following format:

F52<SEP><SIGN><DELAY>ns<CR><LF>

where:

F	=	ASCII character F (f or F for input string).
52	=	the function number.
<S>	=	one or more space characters.
<SIGN>	=	either + or –
<D>	=	1 to 9 digit delay from +999999 nS to –999999 nS
ns	=	nanoseconds (ns or NS for input string)
<CR>	=	carriage return character
<LF>	=	line feed character

For example, to display the current distribution cable delay, enter:

F52<CR>

XL-GPS responds:

F52 +000000ns<CR><LF>

To set the distribution cable delay to 60 nS, enter:

F52 +000060nS<CR>

XL-GPS responds:

OK<CR><LF>

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F53 – GPS Operation Mode

Use function F53 to set the GPS M12 Receiver in *Time Mode* or *Dynamic Mode*.

Select “Dynamic Mode” if the position of the receiver is subject to frequent change, or if it is in continuous motion. For example, use Dynamic Mode when the XL-GPS is used in mobile vehicles such as ships, land vehicles, or aircraft. With Dynamic Mode selected, the receiver updates the position information repeatedly to arrive at the best time calculations for a mobile environment.

Select “Time Mode” if the receiver used in a static environment such as a server room. With Time Mode, the receiver averages the position data over time to determine the antenna position and calculate the time precisely and accurately.

Keypad

While viewing the Status screen on the XL-GPS front panel display, press the following keypad buttons:

ENTER 53 ENTER

If a GPS M12 Receiver is *not* available, F53 displays:

```
GPS M12 AVAILABILITY
NOT AVAILABLE
```

Note: If F53 indicates that M12 is not available, reset M12. If availability is still an issue, call customer service.

If a GPS M12 Receiver is available, F53 displays:

```
GPS MODE SELECT
TIME MODE (or DYNAMIC MODE)
```

To change the mode, use the **UP/DOWN ARROW** buttons and press **ENTER**. F53 asks:

```
SAVE CHANGES?
YES
```

To save changes, press **ENTER**.

Command Line

To request the GPS operation mode of an GPS M12 Receiver (87-8028-2), enter:

F53<CR>

F53 responds using the following format:

F53<SP><SEP><STATUS><CR><LF>

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where:

F	=	ASCII character F (f or F for input string).
53	=	the function number.
<SP>	=	ASCII space character one or more.
<SEP>	=	one or more space characters.
<STATUS>	=	DYNAMIC MODE or TIME MODE
<CR>	=	carriage return character.
<LF>	=	line feed character.

For example, enter:

F53<CR>

Example response:

```
F53 TIME MODE    (or DYNAMIC MODE)<CR><LF>
```

To set the GPS Operation Mode, enter a command using the following format:

F53<SP><MODE><CR>

where <MODE> equals “DYNAMIC MODE” or “TIME MODE”.

For example, enter:

F53 TIME MODE<CR>

Or:

F53 DYNAMIC MODE<CR>

F53 responds:

```
OK<CR><LF>
```

F60 – GPS Receiver Satellite List

Use function F60 to display the identification number and signal strength of tracked or current satellites. ‘Tracked’ means a satellite’s signal is being received and interpreted by the receiver (or that the XL-GPS has GPS data that suggests this satellite should be visible to the antenna).

GPS satellite are grouped into the following categories:

- Tracked: the XL-GPS is receiving the GPS signal, but isn’t using it to calculate time and position.

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- Current: the XL-GPS is using the satellite's GPS signal to calculate time and position.
- Bad: the GPS satellite is transmitting information that it has been removed from service.
- Rejected: the XL-GPS M12 receiver's TRAIM feature has detected anomalous signals from this satellite and has quarantined it from the timing solution for 12 hours.

GPS satellite signal strengths are reported in units of dBW. Signals below -170 dBW (e.g., -171 dBW) are not usable by the GPS receiver. See "GPS Signal Strength Requirements" on page 15.

If you're using the keypad interface, use the UP/DOWN ARROWs to scroll through the list of satellites.

Command Line

Use Serial Function F60 to request a list of all, current, and tracked satellites. To display the list, enter a string using the following format:

F60<S><TYPE><CR>

XL-GPS responds with approximately 32 lines that use the following format:

F60<S>prn<NN><S><STATE> tracked current<LEVEL><CR><LF>

where:

F60	=	ASCII string indicating function F60.
<S>	=	ASCII space character one or more.
B	=	ASCII letter to denote Option Bay number follows
<N>	=	Option Bay Number, 1 through 10.
<SEP>	=	One or more separator characters; either space, comma or tab.
<TYPE>	=	ALL, CURRENT, TRACKED, BAD, or REJECTED.
<CR>	=	Carriage return character.
prn	=	Pseudo Random Number
<NN>	=	1 through 32 (prn<NN> identifies specific GPS satellites)
<STATE>	=	Good, Bad, or Unknown
tracked	=	Either "tracked" or blank
current	=	Either "current" or blank
<LEVEL>	=	Satellite signal strength in dBW
<LF>	=	Line feed character

For example, to display the complete GPS satellite list, enter:

F60 ALL<CR>

F60 responds:

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```
F60 prn1 good current  -159dBW
F60 prn2 good current  -162dBW
F60 prn3 good current  -163dBW
F60 prn4 unknown
F60 prn5 unknown
F60 prn6 unknown
F60 prn7 unknown
F60 prn8 good current  -161dBW
F60 prn9 unknown
F60 prn10 unknown
F60 prn11 unknown
F60 prn12 unknown
F60 prn13 good current  -159dBW
F60 prn14 unknown
F60 prn15 unknown
F60 prn16 unknown
F60 prn17 unknown
F60 prn18 unknown
F60 prn19 unknown
F60 prn20 unknown
F60 prn21 unknown
F60 prn22 bad tracked -164dBW
F60 prn23 unknown
F60 prn24 unknown
F60 prn25 unknown
F60 prn26 unknown
F60 prn27 rejected tracked -156dBW
F60 prn28 unknown
F60 prn29 unknown
F60 prn30 unknown
F60 prn31 unknown
F60 prn32 unknown
```

Similarly, to display a list of the current, tracked, bad or rejected satellites, enter:

```
F60 CURRENT<CR>
```

Or

```
F60 TRACKED<CR>
```

F66 – Daylight Saving Time (DST) Mode

Use function F66 to enable or disable Daylight Saving Time (DST), and to schedule when *Local time* enters and leaves DST. The factory setting for F66 is Manual (i.e., DST On). The hour for entering/leaving DST is given in the 24-hour format. Entering/leaving DST can be scheduled for any hour of the day, any day of the year. However, transitions scheduled within 24 hours of the beginning/end of the year may not occur at the desired time. This function also works for locations in the southern hemisphere, where DST spans the new year.

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Command Line

To display the current status of F66, enter a command using the following format:

F66<CR>

F66 responds using the following format:

F66<S><STATE><ENTER/EXIT><CR>

where:

F	=	ASCII character F
66	=	function number
<S>	=	ASCII space character one or more.
<STATE>	=	Off or Manual.
<ENTER/EXIT>	=	If <STATE> is Manual, <ENTER/EXIT> are the dates it enters and exits DST.
<CR>	=	carriage return character.
<LF>	=	line feed character.

For example, to disable DST, enter:

F66 Off<CR>

F66 responds:

OK<CR><LF>

To enable DST and set the DST entry and exit times, use the following format:

F66 MANUAL<INHOUR><SEP><INWEEK><SEP><INDAY><SEP><INMONTH><SEP><OUTHOUR>
<OUTWEEK><SEP><OUTDAY><SEP><OUTMONTH><CR>

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where:

<INHOUR>	=	time to enter DST in 24-hour format.
<SEP>	=	one or more separator characters, either space comma or tab characters. For output strings this will be a single space character.
<INWEEK>	=	which week to enter DST, 1, 2, 3, 4 or 0 (for last).
<INDAY>	=	day of week to enter DST, 1 through 7 where Sunday is 1.
<INMONTH>	=	month to enter DST, 1 through 12 where 1 is January.
<OUTHOUR>	=	hour to exit DST, in 24 hour format.
<OUTWEEK>	=	which week to exit DST, 1, 2, 3, 4 or 0 (for last).
<OUTDAY>	=	day in to exit DST, 1 through 7 where Sunday is 1.
<OUTMONTH>	=	month to exit DST, 1 through 12 where 1 is January
<CR>	=	carriage return character.
<LF>	=	line feed character.

For example, enter:

F66 MANUAL 02 1 1 04 02 0 1 10

Meaning:

- Manual settings are in effect.
- The entry time is 02 a.m., week 1 (first), day 1 (Sunday), month 4 (April)
- The exit time is 02 a.m., week 0 (last), day 1 (Sunday), month 10 (October).

To leave the value of any item unchanged, insert a semicolon in its place. For example, to change the week DST begins, enter:

F66 MANUAL ; 0 ; ; ; ; ; ;<CR>

F66 responds to all changes with:

OK<CR><LF>

Meaning that Local time will enter DST on the last week of the month. All other parameters remain unchanged.

The XL-GPS automatically reboots when the user changes the DST entry/exit times in F66.

If any of the items in an input string are invalid, an error message will be returned.

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F69 – Time Mode

Use function F69 to select the time type displayed by:

- The XL-GPS's front panel display
- "F8 – Continuous Time Once-per-Second" on page 42
- "F9 – Time On Request" on page 44
- "F90 – Code Output Configuration" on page 72

Select between the following types of time:

- **UTC (Universal Coordinated Time)** differs from GPS Time by the addition of leap-second corrections to compensate for variations in the earth's rotation.
- **GPS Time** is derived directly from the GPS constellation and doesn't contain any leap-second adjustments or other GPS-to-UTC corrections.
- **Standard Time** is UTC plus a time zone adjustment. For example, Pacific Standard Time is UTC minus 8 hours
- **Local Time** is UTC plus a time zone and a daylight saving time adjustment.

The factory setting is UTC. Local Time modifies UTC time to include the Time Zone and Daylight Saving Time adjustments, if enabled by the user.

Related functions:

- "F1 – Time Zone Offset" on page 34
- "F66 – Daylight Saving Time (DST) Mode" on page 58

Command Line

Use the following format to display the time mode currently used:

F69<CR>

F69 responds using the following format:

F69<S><TT><CR><LF>

where:

F69	=	Function number 69
<S>	=	ASCII space character.
<TT>	=	Time Type. Either GPS, UTC, LOCAL, or STANDARD.
<CR>	=	Carriage return character.
<LF>	=	Line feed character.

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For example, enter:

F69<CR>

XL-GPS gives one of the following responses:

```
F69 GPS <CR><LF>
F69 UTC <CR><LF>
F69 LOCAL <CR><LF>
F69 STANDARD <CR><LF>
```

To set the time mode, enter a command using the following format:

F69<S><TT><CR>

where:

F	=	ASCII character F.
69	=	Function number.
<S>	=	ASCII space character.
<TT>	=	Time Type. Either GPS, UTC, LOCAL, or STANDARD.
<CR>	=	carriage return character.
<LF>	=	line feed character.

For example, to change the time mode to local time, enter:

F69 LOCAL<CR>

Or, to change the time mode to UTC, enter:

F69 UTC<CR>

F69 responds to these changes with:

```
OK<CR><LF>
RESETTING THE UNIT<CR><LF>
PLEASE WAIT...<CR><LF>
```

F71 – Oscillator Statistics

Use F71 to display the phase, frequency offset, drift rate, and DAC value of an internal or optional external oscillator.

Definitions:

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The *phase* is the instantaneous error in seconds between the oscillator and the control loop zero servo point. The *frequency offset* is computed using an averaging time that is equal to the effective averaging time of the oscillator controller. The *oscillator Drift Rate* is computed using a 24-hour average and is the daily Drift Rate of the oscillator. The *oscillator DAC value* is the signed 16-bit integer that controls the DAC output voltage. It ranges from 0 to 65536.

Command Line

To display the F71 settings, enter:

F71<CR>

F71 responds using the following format:

```
F71<S>phase=<SIGN><MULT>E<SIGN><EXP><S>s<S><S>offset=<SIGN><MULT>E<SIGN><EXP><S><S>dr
ift=<SIGN><MULT>E<SIGN><EXP>/DAY<S><S>DAC=<SIGN><INT><CR><LF>
```

where:

F	=	ASCII string indicating function F71
<S>	=	ASCII space character one or more.
<MULT>	=	multiplier, 4 digits with decimal point.
E	=	ASCII character E for exponent.
s	=	ASCII character s for seconds abbreviation
<SIGN>	=	- for negative or <S> for positive.
<EXP>	=	2 digit exponent.
/DAY	=	ASCII characters, units of Drift Rate
<INT>	=	integer, 5 digits
<CR>	=	carriage return.
<LF>	=	line feed.

For example, enter

F71<CR>

F71 responds:

```
F71 PHASE=-5.678E-09 s OFFSET=-1.986E-07 DRIFT= 6.013E-08/DAY DAC=24567<CR><LF>
```


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F72 – Fault Status

Use function F72 to display the fault status of the clock.

- Clock PLL – Locked or unlocked
- Clock Status – Locked or unlocked

Command Line

To display the status of the fault detectors, enter:

F72<CR>

F72 responds:

```
F72 CLOCK PLL              LOCKED
    CLOCK STATUS           UNLOCKED
```

where:

CLOCK PLL	=	Clock Phase Loop Lock status, LOCKED or UNLOCKED
CLOCK STATUS	=	Clock Status, LOCKED or UNLOCKED to the reference source shown. The LOCKED state is based on the F73 Time Threshold value entered by the operator. F73 Time Threshold sets the threshold in nS above which Time Error triggers an alarm. When the oscillator's predicted worst-case time error (“F13 – Time Error” on page 48) exceeds F73 Time Threshold, Time Error enters a fault state and the CLOCK STATUS becomes UNLOCKED.

F73 – Alarm Control / Status

Use function F73 to do the following:

- See the state of an indicator (“Locked/Unlocked” or “OK/Fault”)
- Enable or disable the alarm for each indicator
- See the state of the Alarm Latch for each indicator
- Clear the Alarm Latch for all indicators
- Enable or disable blinking of the Alarm Status LED on the front panel while it is green or amber
- Set the values for Time Threshold, Timeout Delay, and Power-On Alarm Suppress

The following table summarizes F73’s alarm indicators and parameters, as well as the factory settings for an XL-GPS without options. The factory settings vary depending on the options included at the XL-GPS at the time it ships from the factory.

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Upate the alarm settings when adding or removing the expansion module from the XL-GPS.

Indicator/Parameter Name	Status	Factory Setting (XL-GPS without expansion module)
Clock Status	Locked/Unlocked	Always Enabled
PLL	Locked/Unlocked	Alarm Enabled
GPS	OK/Fault	Alarm Disabled
DAC	OK/Fault	Alarm Disabled
1st Time Lock	OK/Fault	Alarm Enabled
Time Error	OK/Fault	Alarm Enabled
Time Threshold	(Range 0 to 99,999 nS)	0000 nS
LED Blink	n/a	Enabled
Timeout	OK/Fault	Alarm Enabled
Timeout Delay	(Range 0 to 86,400 sec.)	300 sec.
Power-On Alarm Suppress	(Range 0 to 86,400 sec.)	300 sec.
NTP	OK/Fault	Alarm Enabled
Clear Alarm Latch	Yes/No	No

Alarms - General Information

With Alarm Disabled, an F73 indicator does not trigger and alarm when it enters an Unlocked or Fault state.

With Alarm Enabled, an F73 indicator triggers an alarm when it enters an Unlocked or Fault state, and the following events take place:

- The Alarm Status LED changes color from green to amber or red (See “Alarm Status LED” on page 25.)
- The ALARM output on the rear panel changes from low Z to high Z (impedance).
- If configured, SNMP sends a trap out over the network port. (See “C: SNMP” on page 124.)

The following items may delay an unlocked or fault state from triggering an alarm immediately:

- Timeout and Timeout Delay postpone Time Error alarms for a user-configured interval. See “Timeout and Timeout Delay” on page 67.
- Power-on Alarm Suppress prevents alarms from being triggered for a user-configured interval after the XL-GPS boots and starts. See “Power On Alarm Suppress” on page 67.

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Alarm Definitions

Clock Status

Locked: The XL-GPS clock is locked to the GPS reference source and is operating within the F73 Time Error Threshold.

Unlocked: Check the other alarm indicators to determine the cause of the problem.

PLL

Locked: The clock PLL is locked and operating nominally.

Unlocked: The clock PLL is malfunctioning. Return to Symmetricom for service. See "H: Sales and Customer Assistance" on page 143.

GPS

Locked: The GPS receiver is receiving a sufficient number of valid GPS satellite signals and is generating a valid timing solution.

Unlocked: The GPS receiver is not providing a valid timing solution due to one of the following causes:

- Insufficient visibility of GPS satellites at the antenna location.
- Poor GPS satellite signal strength
- A poorly positioned GPS antenna
- A broken or disconnected antenna cable
- An absent or non-functioning GPS receiver card

See "Installing the GPS Antenna" on page 13 for GPS antenna installation guidelines.

DAC

Locked: The DAC, which disciplines the clock oscillator to the reference source, is operating nominally.

Unlocked: The DAC is operating out of specifications. Return to Symmetricom for service. See "H: Sales and Customer Assistance" on page 143.

1st Time Lock

Time Error and Time Threshold

Time Error issues an alarm when the worst case time error ("F13 – Time Error" on page 48) of the XL-GPS system clock exceeds the user-set Time Threshold.

Note: ***With Time Threshold set to zero, the unit applies a default value of 150 nS.***

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LED Blink

When LED Blink is enabled, the Alarm Status LED on the front panel blinks when it is green or amber. The LED does not blink when it is red, even if LED Blink is enabled. Some users disable LED Blink to ensure that the LED's color (state) is displayed without interruption.

Timeout and Timeout Delay

Timeout and Timeout Delay can be used to prevent short-term Time Error faults from triggering Time Error alarms.

Timeout Disabled: All Time Error faults trigger an alarm, regardless of duration.

Timeout Enabled: Only Time Error faults that last longer than the Timeout Delay (measured in seconds) trigger an alarm. If a Time Error fault clears and returns to an OK state before the Timeout Delay has elapsed, the 'countdown' stops and no alarms are triggered. All Time Error faults start the Timeout Delay 'countdown' from the beginning (i.e., Timeout Delay does not keep a countdown tally for multiple Time Error faults).

Power On Alarm Suppress

Power On Alarm Suppress prevents all F73 alarms from occurring for a specified interval after the unit starts up. The factory default setting is 300 seconds (five minutes). When that interval ends, current and new alarms are reported normally.

NTS

OK: NTS is operating nominally.

Fault: NTS is not operating correctly. Contact Symmetricom Customer service. See "H: Sales and Customer Assistance" on page 143.

Clear Alarm Latch

Use Clear Alarm Latch after troubleshooting or fixing the cause of an alarm so new alarms can be distinguished from previous ones.

About Alarm Latch: The Alarm Latch shows if an indicator has triggered an alarm at any time since the last time the Alarm Latch was cleared, *even if the indicator is presently "Locked" or "OK"*. This feature is useful for finding and troubleshooting transient alarms. F73 indicators must be enabled in order for alarms to occur and be latched. The alarm latch does not record the occurrence of a fault or unlocked state if the indicator is disabled. The Alarm Latch is visible as an asterisk ("*") when viewing F73 on the front panel display. For example:

```
GPS OK     *
ALARM ENABLED
```


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Save Changes

Yes: Applies all user-entered changes to the F73 configuration.

No: Clears all user-entered changes and exits the function.

Keypad

Note: The Alarm Latch asterisk is not the same as the “reference source unavailable” asterisk that can sometimes be seen on the STATUS display.

Command Line

To query the status of F73, enter:

F73<CR>

F73 responds:

F73<SP>S<STATUS>P<SP><123456789ABCD><CR><LF>

where:

F	=	ASCII character F
73	=	function number.
<SP>	=	ASCII space character.
S	=	ASCII character S, Status delimiter
<STATUS>	=	'L' Locked
		'U' Unlocked
P	=	ASCII character ‘P’ - static character, does not indicate status.
1	=	'-' PLL Synthesizer Locked
		'C' PLL Synthesizer Unlocked
2	=	'-' not used
3	=	'-' GPS OK
		'P' GPS Fault
4	=	'-' not used
5	=	'-' not used
6	=	'-' not used
7	=	'-' not used
8	=	'-' not used
9	=	'-' Rb osc OK or not installed
		'R' Rb osc Fault

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A = '-' DAC OK
'X' DAC Fault

B = '-' First time lock OK
'a' Clock has locked since power on but still within the user defined power on time out
'A' Clock has not locked since power on

C = '-' Time error OK
'U' Time error Fault

D = '-' Timeout OK
'T' Timeout Fault

E = '-' NTP OK or option not enabled
'N' NTP Fault

F = '-' Future Use

G = '-' Future Use

H = '-' Future Use

I = '-' Future Use

J = '-' Future Use

To display the latched faults, enter:

F73 LATCH

The XL-GPS responds in the following format:

F73<SP>LATCH<SEP><123456789ABCDEFGHIJ><CR><LF>

The values in <123456789ABCDEFGHIJ> field indicate the latched faults, if any, which have occurred since the last time Alarm Latch was cleared.

To clear the Alarm Latch, enter:

F73 CLEAR ALARM LATCH<CR><LF>

The XL-GPS clears Alarm Latches and responds:

OK<CR><LF>

The user can enable or disable the alarm indicators using the MASK command. To display the current mask, enter:

F73 MASK

The XL-GPS responds in the following format:

F73<SP>MASK<SEP><123456789ABCDEFGHIJ><CR><LF>

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Where the value of each character in <123456789ABCDEFGHIJ> field is either 'E' or 'D'. 'E' means the corresponding indicator is enabled, and can trigger an alarm if it enters a fault state. 'D' means the indicator is disabled (or not available) and will not trigger an alarm if it enters a fault state.

To enable ('E'), disable ('D'), or leave the indicator unchanged ('-'), enter 'E', 'D', or '-' for each character in <123456789ABCDEFGHIJ> when you enter the following string:

F73<SP>MASK<SEP><123456789ABCDEFGHIJ><CR>

The XL-GPS will sets the new alarm mask and responds:

0K<CR><LF>

The following summarizes the fault alarm mask setting in the <123456789ABCDEFGHIJ> field:

1 = 'E' PLL Synthesizer Alarm Enabled
'D' PLL Synthesizer Alarm Disabled

2 = 'D' not used

3 = 'E' GPS Alarm Enabled
'D' GPS Alarm Disabled

4 = 'D' not used

5 = 'D' not used

6 = 'D' not used

7 = 'D' not used

8 = 'D' not used

9 = "D' not used

A = 'E' DAC Alarm Enabled
'D' DAC Alarm Disabled

B = 'E' First time lock Alarm Enabled
'D' First time lock Alarm Disabled

C = 'E' Time error Alarm Enabled
'D' Time error Alarm Disabled

D = 'E' Time out Alarm Enabled
'D' Time out Alarm Disabled

E = 'E' NTP Alarm Enabled
'D' NTP Alarm Disabled (Default if NTP Option not enabled)

Query or set Time Error Threshold using the THRESHOLD command. To query the Time Error Threshold setting, enter:

F73<SP>THRESHOLD<CR><LF>

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The XL-GPS responds:

```
F73<SP>THRESHOLD<SP><nanoseconds><SP>ns<CR><LF>
```

where <nanoseconds>is the time error threshold in nanoseconds, between 0 and 9999.

To set Time Error Threshold, enter a string the following format:

F73<SP>THRESHOLD<SEP><nanoseconds><CR>

The XL-GPS will set the new time error threshold and returns the following string if the command is successful.

```
OK<CR><LF>
```

Set or query Timeout Delay using the TIMEOUT command. To query the current setting, enter:

F73<SP>TIMEOUT<CR><LF>

The XL-GPS responds:

```
F73<SP>TIMEOUT<SEP><seconds><SP>s<CR><LF>
```

where <seconds>is the timeout in seconds, between 0 and 86400.

To set Timeout Delay, enter a command string in the following format:

F73<SP>TIMEOUT<SEP><seconds><CR><LF>

The XL-GPS will set the new timeout delay and responds:

```
OK<CR><LF>
```

Led blinking can be ENABLED or DISABLED using the BLINK command. To enable LED blinking, enter:

F73<SP>BLINK<SEP>ENABLE<CR>

The XL-GPS responds:

```
OK<CR><LF>
```

To disable LED blinking, enter:

F73<SP>BLINK<SEP>DISABLE<CR>

The XL-GPS responds:

```
OK<CR><LF>
```


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Use the SUPPRESS command to suppress all F73 faults from triggering alarms for a specified duration after the XL-GPS power is turned on. To check the SUPPRESS status, enter:

F73<SP>SUPPRESS<CR>

The XL-GPS responds in the following format:

F73<SP>POWER-ON<SEP>MINOR<SEP>ALARM<SEP>SUPPRESS<SEP> <seconds><CR><LF>

where:

F	=	ASCII character F.
73	=	function number.
<seconds>	=	seconds from 0 to 86400.
<SP>	=	ASCII space character.
<SEP>	=	one or more space characters, either comma, space, or tab.
<CR>	=	Carriage Return.
<LF>	=	Line Feed.

To set the SUPPRESS enter a command using the following format:

F73<SP>SUPPRESS<SEP><seconds><CR>

The seconds can be set to any value from 0 to 86400. The XL-GPS responds:

OK<CR><LF>

F90 – Code Output Configuration

Use function F90 to select AM or DC modulation of the IRIG-B time code on the following outputs:

- the CODE output on the Main CPU card
- the J1 through J3 outputs on the Expansion Module

The factory configuration for F90 is IRIG-B AM.

Note: For the Expansion Module, the IRIG-B modulation type is controlled by a hardware jumper setting and by F90. The four “JP2 - Output Header” jumpers located on the Expansion Module individually set the modulation types on J1, J2, J3, and J4. *The modulation is AM when the jumper is set to AM, regardless of the software setting in F90*. If the jumper is set to DC, F90 can be used set the output to either AM or DC. In other words, the F90 setting applies to all outputs, unless the jumper setting is AM.

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Although the factory configuration outputs UTC time in 24-hour format, the following can be used to modify the code output of F90 for non-standard applications:

- "F2 – 12/24 Hour Format" on page 35 selects between a 12 or 24-hour time format.
- "F69 – Time Mode" on page 61 selects between the following timescales: Local, Standard, GPS, UTC, and TAI.

Command Line

To display the current settings, enter:

F90<CR>

XL-GPS responds using the following format:

F90<S>IRIG-B<S><TYPE><CR>

where:

F	=	ASCII character F.
90	=	function number.
<S>	=	Space
IRIG-B	=	ASCII string indicating that the time code output is IRIG-B
<TYPE>	=	AM, DC
<CR>	=	carriage return character.
<LF>	=	line feed character.

For example, enter:

F90<CR>

XL-GPS responds (example):

F90 IRIG-B AM<CR><LF>

To change the Code Output to DC enter:

F90 IRIG-B DC<CR>

To change the Code Output back to AM enter:

F90 IRIG-B DC<CR>

XL-GPS responds:

OK<CR><LF>

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F100 – Network Port Configuration & XL-GPS Firmware

F100 provides two groups of commands:

- Group 1, available through the keypad and the command line, provides access to network port settings and hardware/Firmware status information.
- Group 2, available through the command line only, provides commands for changing system firmware, changing NTP & SNMP parameters, changing the user name/password, resetting the unit, and pinging other network devices.

Warning: The F100 commands have the capacity to remove the XL-GPS from the network and disable the XL-GPS's system firmware. Use judiciously.

Reboot Warning: Saving changes to any F100 parameter using the keypad will reboot the XL-GPS. Some of the F100 command line commands also reboot the XL-GPS. These are identified in the following documentation.

Group 1

You can use both the keypad and the command line interface to access the following parameters:

- **Ethernet address:** XL-GPS contains a unique Ethernet or Media Access Control (MAC) address comprised of a unique number assigned to the manufacturer, and a unique number assigned to the unit. This is factory set and cannot be changed.
- **IP Address**: Sets a static Internet Protocol (IP) address for the unit.
- **Subnet Mask**: Sets a valid subnet-mask used in IP addressing. Subnetting allows for the more efficient allocation of network addresses and management of network traffic.
- **Default Gateway**: The address of the router that handles packets addressed to IP devices outside the local-area network.
- **10 100 BASE-T**: View network port setting: 10 or AUTO.
- **Remote Lockout**: Enables or disables remote access through the XL-GPS's standard network port. Enabling Remote Lockout limits users to the front-panel keypad or Serial I/O port.
- **Flash CRC**: Status - Passed or failed.
- **RAM**: Status - Passed or failed.
- **Serial**: Status - Passed or failed.
- **Version Test**: Status - Passed or failed

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The following table gives the command line equivalents for each of the preceding parameters:

Description	"F100" followed by:	Comments
Ethernet address (MAC address)	EA	Displays information
IP Address	IP	Displays, configures and reboots
Subnet Mask	SM	Displays, configures and reboots
Default Gateway	G	Displays, configures and reboots
IP Address, Subnet Mask, and Default Gateway	IC	Displays several IP parameters
10 100 BASE-T	BASET	Displays network port setting
Remote Lockout	L (for status), LOCK, UNLOCK	Displays and configures
Flash CRC	ST	Displays information
RAM	ST	Displays information
Serial	ST	Displays information
Version Test (NVRAM Ver)	ST	Displays information

Group 2

The following expanded command set is available through the command line interface:

Description	"F100" followed by:	Comments
Burn Host	BH	Configure
Burn	BU	Commit action
Burn Bootloader	BUB	Commit action
Burn Filesystem	BF	Commit action
Configure NTP & SNMP Parameters	CONFIG	Move files
Factory Mode Jumper	J	Display only
Reboot	K I L L	Commit action – reboot the XL-GPS
Change User Password	P	Configure
Ping	PI	Commit action
Change User Name	PN	Commit action

You can reconfigure two or more network parameters in a single entry by sending the F100 command and entering new values. Leading zeros may be omitted when entering IP Address, Subnet Mask, and Default Gateway. Any field may be omitted and order is not significant. Blanks are allowed on either side of a colon. The unit reboots after any network parameter is changed.

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F100 EA – Ethernet Address

Use function F100 EA to display the Ethernet Address (MAC Address) (**Note**: An Ethernet or MAC Address is not the same thing as an IP Address), a fixed, six-byte, hexadecimal value specific to the unit's standard network port. The first three bytes are registered to Symmetricom Inc.; the last three bytes are the hex value identifying the network port.

To display the Ethernet address of the unit standard network port, enter:

F100 EA<CR>

XL-GPS responds:

F100 EA:00-A0-69-xx-xx-xx<CR><LF>

where "00-A0-69" is the portion of the address assigned to the manufacturer, and "xx-xx-xx" is unit's unique address (in hexadecimal).

An example of the response is:

F100 EA:00-A0-69-99-00-37

Attempts to set this field will be rejected with a syntax error message.

F100 IP – IP Address

Use function F100 IP to display or change the unit's IP Address.

Use the following format to display the IP address:

F100<S>IP<CR>

Use the following format to set the IP address and restart the unit, enter:

F100<S>IP<S><nnn.nnn.nnn.nnn><CR>

where:

F	=	ASCII character F
100	=	unit function number
<S>	=	space
IP	=	specify IP command
<nnn.nnn.nnn.nnn>	=	dotted decimal address (0 to 255)
<CR>	=	input line terminator

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For example, enter:

F100 IP 206.54.0.21<CR>

XL-GPS responds:

```
OK<CR><LF>
RESETING THE UNIT<CR><LF>
PLEASE WAIT…<CR><LF>
```

To obtain the IP address of the unit Standard network port, enter:

F100 IP<CR>

XL-GPS responds (example):

```
F100 IP 206.54.0.21<CR><LF>
```

The three commands, F100 IP, F100 SM, and F100 G, can be concatenated to set all three values simultaneously. To do so use the following format:

F100<S>IP<S><nnn.nnn.nnn.nnn><S>SM<S><nnn.nnn.nnn.nnn><S>G<S><nnn.nnn.nnn.nnn><CR>

Note: The three commands (i.e., IP, SM, G) can be used in any order relative to each other. A colon separator ":" can be used instead of <S> following IP, SM, and G (e.g., `IP:192.168.46.150`)

For example, using appropriate values for your network, enter something similar to:

F100 IP 192.169.46.150 SM:255.255.255.0 G 192.168.46.1<CR>

XL-GPS responds:

```
OK<CR><LF>
RESETING THE UNIT<CR><LF>
PLEASE WAIT…<CR><LF>
```

F100 SM – Subnet Mask

Note: F100 SM can be used concurrently with F100 IP and F100 G. See the last example provided in the F100 IP – IP Address section, directly above this one.

Use function F100 SM to display or configure the Subnet Mask. To set the Subnet Mask and restart the unit, enter:

F100<S>SM<S><nnn.nnn.nnn.nnn><CR>

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where:

F	=	ASCII character F
100	=	unit function number
<S>	=	space
IP	=	specify IP command
<nnn.nnn.nnn.nnn>	=	dotted decimal address (0 to 255)
<CR>	=	input line terminator

For example, enter:

F100 SM 255.255.255.240<CR>

XL-GPS responds:

```
OK<CR><LF>
RESETING THE UNIT<CR><LF>
PLEASE WAIT…<CR><LF>
```

To obtain the Subnet Mask of the unit Standard network port, enter:

F100 SM<CR>

XL-GPS responds:

```
F100 SM <nnn.nnn.nnn.nnn><CR><LF>
```

where “<nnn.nnn.nnn.nnn>” is the dotted decimal address notation.

An example of the response is:

```
F100 SM:255.255.255.125<CR><LF>
```

F100 G – Gateway

Note: F100 G can be used concurrently with F100 IP and F100 SM. See the last example provided in the F100 IP – IP Address section, which starts on page 76.

Use function F100 G to display or configure the Default Gateway. To set the Default Gateway and restart the unit, enter:

F100<S>G<S><nnn.nnn.nnn.nnn><CR>

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where:

F	=	ASCII character F
100	=	unit function number
<S>	=	space
IP	=	specify IP command
<nnn.nnn.nnn.nnn>	=	dotted decimal address (0 to 255)
<CR>	=	input line terminator

For example, enter:

F100 G 206.54.0.17<CR>

XL-GPS responds:

```
OK<CR><LF>
RESETING THE UNIT<CR><LF>
PLEASE WAIT…<CR><LF>
```

To obtain the Default Gateway of the unit Standard network port, enter:

F100 G<CR>

XL-GPS responds:

```
F100 G <nnn.nnn.nnn.nnn><CR><LF>
```

where “<nnn.nnn.nnn.nnn>” is the dotted decimal address notation.

An example of the response is:

```
F100 G:206.54.0.1<CR><LF>
```

F100 IC – Network Port Settings

Use function F100 IC to review the entire configuration of the standard network port, enter:

F100<S>IC<CR>

An example of the response is:

```
F100 IP:206.54.0.21 SM:255.255.255.240 G:206.54.0.17<CR><LF>
```

F100 BASET – 10/100 BASE- T

The BASET command displays the data rate of the Ethernet port. On the current version of the Main CPU card (87-8000) running the current system software version, the user also has the option of

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selecting between 10 Base-T and Auto. If you have questions about your unit, contact H: Sales and Customer Assistance (page 143).

To display the current Base-T setting, enter:

F100<S>BASET<CR>

where

F	=	ASCII character F
100	=	unit function number
<S>	=	Space
BASET	=	specify Base-T command
<CR>	=	input line terminator

XL-GPS responds:

```
F100 BASET 10T<CR><LF>
```

To set the Ethernet port to automatically negotiate the maximum connection speed, enter:

F100<SP>BASET<SP>AUTO<Enter>

To set the Ethernet port's connection speed to 10Base-T, enter:

F100<SP>BASET<SP>10<Enter>

XL-GPS responds:

```
OK <CR><LF>
RESETING THE UNIT<CR><LF>
PLEASE WAIT…<CR><LF>
```

F100 L/LOCK/UNLOCK – Remote Lockout

Use function F100 LOCK or UNLOCK to enable/disable remote access to the command line interface through the network port. Use function F100 L to display the status of Remote Lockout. Remote Lockout can also be set using F100 on the keypad interface. The factory setting is "Unlocked". To unlock remote lockout, use the keypad or the serial port's command line interface (The network port is not available because it has been locked).

Warning: **F100 L and F100 LOCK terminates any active network sessions and prevents future network sessions. To unlock F100 L or F100 LOCK, use the serial port command line interface or the keypad display.**

To lock the unit from a remote location, enter:

F100 LOCK<CR>

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where:

F	=	ASCII character F
100	=	unit function number
<S>	=	space
LOCK	=	specify LOCK command
<CR>	=	input line terminator

For example, enter:

F100 LOCK<CR>

To users on the serial port, XL-GPS responds:

OK<CR><LF>

Or, to users on the network port, XL-GPS gives the following response and then closes the port:

GOODBYE.<CR><LF>

To unlock remote lockout, use the command line interface on the serial port to enter:

F100 UNLOCK<CR>

Or use the keypad's F100.

F100 L – Remote Lockout Status

Command Line Only – Not available in keypad.

Use function F100 L to display the status of the remote lock. For more information, see F100 LOCK above.

To view the lock setting for remote access, enter:

F100 L<CR>

where:

F	=	ASCII character F
100	=	unit function number
<S>	=	space
L	=	specify L command
<CR>	=	input line terminator

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XL-GPS responds:

```
F100 L LOCKED<CR><LF>
```

or

```
F100 L UNLOCKED<CR><LF>
```

F100 ST – Self Test Status

Use function F100 ST to display whether the Self Test Status parameters passed or failed. The parameters include: flash-memory checksum test, nonvolatile (NV) RAM, Serial Port, and version check.

To query the self-test status, enter:

```
F100<S>ST<CR>
```

where:

F	=	ASCII character F
100	=	unit function number
<S>	=	space
ST	=	specify ST command
<CR>	=	input line terminator

XL-GPS responds:

```
F100<S>ST<S>FLASH/CRC:<S><STATUS>,<S>RAM:<S><STATUS>,<S>SERIAL:<S><STATUS>,
<S>NVRAM<S>VER:<S><STATUS><CR><LF>
```


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where:

F	=	ASCII character F
100	=	Unit function number
<S>	=	Space
ST	=	Specify ST command
FLASH/CRC:	=	Specify flash checksum result
RAM:	=	Specify RAM test result
SERIAL:	=	Specify Serial Port test result.
NVRAM VER:	=	Specify version test result. This test compares the version of the code against the version recorded in Non-Volatile memory
<STATUS>	=	Is either ASCII PASS or FAIL
,	=	ASCII comma
:	=	ASCII colon
<CR><LF>	=	Output line terminator

An example of the response is:

```
F100 ST FLASH/CRC : PASS, RAM : PASS, SERIAL : PASS, NVRAM VER : PASS<CR><LF>
```

F100 BH – Burn Host

Use function F100 BH, when upgrading firmware, to select the FTP host and the file to be transferred.

To select the FTP host and file for upgrading, enter:

```
F100 BH <FTP HOST IP ADDRESS><S><UPGRADE FILE PATH>/<FILE NAME><CR>
```

Use UNIX style forward slashes ‘/’ in path and do not describe the drive (for example, ‘C’) in the path.

For example:

```
F100 BH 10.1.7.20 symmetricom/XL-GPS/192-8001.bin<CR>
```

XL-GPS responds:

```
BURN HOST IS READY!!!<CR><LF>
```

F100 BUB – Burn BootLoader

Note: See “B: Upgrading System Firmware” on page 118.

When upgrading the system firmware, use function F100 BUB to burn the BootLoader, to write the BootLoader to flash memory.

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To write the BootLoader to the flash, send the F100 BH command with the FTP host, file path and name, and then enter:

```
F100 BUB<CR>
```

XL-GPS responds:

```
OK<CR><LF>
```

For example:

```
>f100 bub
OK
BURNING FILE 192-8000.bt WITH SIZE 452164 TO PARTITION:0 SECTOR:0
SEC: 0 RE: 0
SEC: 1 RE: 0
SEC: 2 RE: 0
SEC: 3 RE: 0
SEC: 4 RE: 0
SEC: 5 RE: 0
SEC: 6 RE: 0
FLASH SUCCESSFULLY PROGRAMMED CRC32 = 0x9EFBE60A
```

If more than ten flash sectors are written during this process, then an error has occurred in the burn. You must rewrite both the bootloader sectors (0 to 9) and the program binary sectors (10 to 93).

F100 BU – Burn

Note: See “B: Upgrading System Firmware” on page 118.

Use function F100 BH when upgrading firmware, to write the file selected with F100 BH to the flash memory. Flash memory is checked to ensure that the correct file is used.

To write the file to the flash, send the F100 BH command with the FTP host, file path and name, and then enter:

```
F100 BU<CR>
```

XL-GPS responds:

```
OK<CR><LF>
```

And, for example, displays the following text:

```
>f100 bu
OK

BURNING FILE 192-8001.bin WITH SIZE 803016 TO PARTITION:1 SECTOR:16
SEC: 16 RE: 0
SEC: 17 RE: 0
SEC: 18 RE: 0
SEC: 19 RE: 0
```


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```
SEC: 20 RE: 0
SEC: 21 RE: 0
SEC: 22 RE: 0
SEC: 23 RE: 0
SEC: 24 RE: 0
SEC: 25 RE: 0
SEC: 26 RE: 0
SEC: 27 RE: 0
SEC: 28 RE: 0
FLASH SUCCESSFULLY PROGRAMMED CRC32 = 0x2D9A260A
```

F100 BF – Burn File System

Note: See "B: Upgrading System Firmware" on page 118.

Use function F100 BF to burn file system when upgrading firmware, to write a file system to the flash memory.

To write the file system to the flash, send the F100 BH command with the FTP host, file path and name, and then enter:

```
F100<S>BF<CR>
```

XL-GPS responds:

```
OK<CR><LF>
```

For example:

```
>f100 bf
OK
BURNING FILE 192-8002.fs WITH SIZE 524288
SEC: 94
SEC: 95
SEC: 96
SEC: 97
SEC: 98
SEC: 99
SEC: 100
SEC: 101
SEC: 102
```

F100 BUFP – Burn FPGA Firmware

Note: See "B: Upgrading System Firmware" on page 118.

F100 BUFP - Burn FPGA firmware from host to target flash

Use Serial/Network port F100 BUFP when upgrading FPGA firmware - to write the FPGA program file selected with F100 BH to the flash memory. Prior to issuing the F100 BUFP command, the host computer must be setup as an FTP server with the new FPGA program file stored on the FTP server.

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The existence of the FPGA program file on the FTP server and an Ethernet connection is checked when the command is issued.

To write the FPGA program to the flash, send the F100 BH command with the FTP host, file path and name, and then send the following command:

F100 BUFP<Enter>

This command is only valid for XL-GPS with an 86-8000 Rev. G or higher Main CPU card. If the Main CPU card is of the wrong version, an error message "ERROR: INVALID COMMAND!" will be displayed.

This command is valid only via the command line interface in the following scenarios: (1) the terminal is communicating to the XL-GPS directly via the serial port, or (2) the terminal is connected to the XL-GPS network port and the user is logged in as an "operator". If the terminal is connected to the XL-GPS network port and the user is logged in as a "guest", this command will be deemed invalid and an error message, "ERROR: ACCESS DENIED!" will be displayed.

Prior to burning the FPGA program to the target flash, another error checking step is performed. The new FPGA program size is checked against the designated memory sector in the target flash. If the memory sector is not big enough to store the FPGA program, the command will be aborted, an error message, "FILE FN, EXT (yyy BYTES) TOO LARGE FOR PARTITIONING (zzz BYTES), LOAD ABORTED" will be displayed, and the new program will not be loaded to the flash.

After all the requirements for burning the FPGA program are met, XL-GPS will proceed to burn the FPGA program from the FTP host computer to the target flash by responding with the following output string.

```
OK<CR><LF>
```

Then, during the file burning process, output strings will be displayed on the terminal to provide status to the operator. The following is an example of a successful F100 BUFP command execution.

```
    BURNING FILE 182-9004V001.bin TO PARTITION: 3, SECTOR: 10
FILE: 166792 BYTES, PARTITION: 262132 BYTES (63% USED)
    SEC: 10 RE:  0
    SEC: 11 RE:  0
    SEC: 12 RE:  0
    SEC: 13 RE:  0
    SEC: 14 RE:  0
    SEC: 15 RE:  0
    SEC: 16 RE:  0
    FLASH SUCCESSFULLY PROGRAMMED
```

To load the FPGA program from the target flash to the FPGA, a reboot of the XL-GPS is required for the new FPGA program to take effect. The XL-GPS can be rebooted via power cycle or by issuing the F100 K I L L command on the serial port interface.

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F100 CONFIG – Configure NTP & SNMP

Notes:

- See “A: Using F100 Configuration” on page 114.
- NTP is an optional feature. If purchased at the same time as the XL-GPS, it comes enabled on the system. To purchase this option after you have purchased the XL-GPS, contact Symmetricom Sales. See “H: Sales and Customer Assistance” on page 143.

F100 CONFIG GET instructs the XL-GPS unit to transfer its NTP and SNMP configuration files to an FTP server. After editing the NTP and SNMP configuration files on the FTP server, the user transfers them back to the XL-GPS using the F100 CONFIG SET command.

Open a Telnet session with the XL-GPS and enter the commands below. Replace <*IP Address*> with that of the workstation/FTP Server. Leave <*subdir*> blank (unless you have a specific reason for placing the files in a subdirectory of the anonymous user’s home directory).

To get the NTP config files, type:

>f100 config ntp get host:<*IP Address*> dir:<*subdir*><CR>

To get the SNMP config file, type:

>f100 config snmp get host:<*IP Address*> dir:<*subdir*><CR>

To get both the SNMP and NTP config files, type:

>f100 config ntp snmp get host:<IP Address> dir:<subdir><CR>

Here’s an example of a successful SNMP and NTP config file transfer:

```
>f100 config ntp snmp get host:192.168.0.1 dir:
Host config ip 192.168.0.1 already configured
Source file /config/snmp.conf bytes read: 1275
Dest file snmp.conf bytes written: 1275
Source file /etc/ntp.conf bytes read: 1166
Dest file ntp.conf bytes written: 1166
Source file /etc/ntp.keys bytes read: 44
Dest file ntp.keys bytes written: 44
Configuration files transferred successfully!
```

Note: The following steps cause the XL-GPS to reboot.

Using the command line, enter the commands, replacing <*IP Address*> with the workstation/FTP server’s IP address.

To move the NTP config files back onto the XL-GPS, type:

>f100 config ntp set host:<*IP Address*> dir:<*subdir*><CR>

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To move the SNMP config file back onto the XL-GPS, type:

>f100 config snmp set host:<IP Address> dir:<subdir><CR>

To move the NTP and SNMP config files back onto the XL-GPS, type:

>f100 config ntp snmp set host:<IP Address> dir:<subdir>

Here's an example of a successful SNMP and NTP config file transfer:

```
>>f100 config set ntp snmp host:192.168.0.1 dir:
Host config ip 192.168.0.1 already configured
Are you sure(y/N)?y
Source file snmp.conf bytes read: 1275
Dest file /config/snmp.conf bytes written: 1275
Source file ntp.conf bytes read: 1166
Dest file /etc/ntp.conf bytes written: 1166
Source file ntp.keys bytes read: 44
Dest file /etc/ntp.keys bytes written: 44
Configuration files transferred successfully!
Resetting...
```

After XL-GPS receives the configuration files, it reboots, and goes through the normal startup process.

F100 J – Factory Mode Jumper

Use function F100 J command to test the state of the 'factory mode' jumper. A value of 1 means the jumper is installed and a value of 0 means the jumper is not. The factory mode jumper can be identified because it is the only three-prong jumper on the Main CPU card, and is labelled "J3".

Units are shipped to the customer with no jumper installed. The jumper is used by Symmetricom technicians to test and configure the unit. With this jumper installed, the operation and integrity of the XL-GPS are compromised.

Warning: **Do not run the XL-GPS with the jumper, unless specifically directed to do so by a qualified Symmetricom technician.**

To test the state of the factory mode jumper:

F100<S>J<CR>

where:

F	=	ASCII character F
100	=	unit function number
<S>	=	space
J	=	specify User Name command
<CR>	=	input line terminator

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XL-GPS responds:

```
F100 J FACTORY MODE=1<CR><LF>
```
or
```
F100 J FACTORY MODE=0<CR><LF>
```

F100 K I L L – Reboot

Use function F100 K I L L to reboot the unit. Use F100 K I L L after upgrading the system firmware.

K I L L is a case-sensitive command. When entering this command, ***use all capital letters*** and ***put spaces between each letter***.

To reboot the unit, enter:

```
F100 K<S>I<S>L<S>L<CR>
```

For example:

```
F100 K I L L<CR>
```

XL-GPS responds:

```
OK <CR><LF>
RESETING THE UNIT<CR><LF>
PLEASE WAIT…<CR><LF>
```

In a network port session, rebooting the XL-GPS terminates the network port session; open a new network port session when the XL-GPS has finished rebooting. In a serial port session, the XL-GPS displays text *similar* to the following example when the XL-GPS has finished rebooting and is ready to receive additional commands:

```
>SYSTEM POWER ON SELF TEST RESULTS:
SERIAL LOOPBACK TEST PASSED.
RAM TEST PASSED.
PROG CRC TEST PASSED
NETWORK INTERFACE 192-8001      (c) 1998 - 2003 SYMMETRICOM
ALL RIGHTS RESERVED
FLASH FILE SYSTEM MOUNTED.
SOURCE FILE /config/symmetricom.conf BYTES READ: 1210
FILE SYSTEM REV #  1.80

SCAN_FOR_OPT_CARD BEGINS.
FOUND @ ADDR 30004000H, ID NUM= 87H
SCAN_FOR_OPT_CARD ENDS.
INSTALL_SMART_OPTIONS BEGINS.
FOUND GPS CARD; QTY=1, ID#=8028-2H.
INSTALL_SMART_OPTIONS ENDS.

QUERYING FOR SYMMETRICOM DEVICE. PLEASE WAIT...
```


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```
SYMMETRICOM GPS DEVICE.
XL-GPS
INITIALIZATION SUCCESSFULLY COMPLETED.
>
```

F100 P – Change User Password

Use function F100 P to change a user password. In a network port session, F100 P changes the password of the user you logged in as; *operator* or *guest*. In a serial port session, F100 P changes the password of the *operator* user. See “Command Line Interface” on page 29.

Valid password size is from no characters to 64 characters. If more than 64 characters are entered, F100 P truncates the string to 64 characters. When selecting a password, use appropriate levels password security for the XL-GPS’s operating environment. Examples include:

- Mixing random alpha and numeric characters
- Avoiding words or word combinations that can be found in a dictionary

To change the user password, enter:

```
F100<S>P<CR>
```

where:

F	=	ASCII character F
100	=	unit function number
<S>	=	space
P	=	specify Password command
<CR>	=	input line terminator

XL-GPS responds:

```
ENTER NEW USER PASSWORD:
```

When you enter the new password, XL-GPS responds:

```
CONFIRM NEW USER PASSWORD:
```

Enter the same new password again, to confirm the spelling. If the same new password has been entered twice, XL-GPS responds:

```
OK<CR><LF>
```

In this case, the new password will be used for the next login. However, if the new password is entered differently the second time, XL-GPS responds:

```
ERROR: PASSWORDS DO NOT MATCH. NEW PASSWORD REJECTED.
```


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F100 PI – PING

Use function F100 PI to ping a remote host to see if it is reachable. If no IP Address is provided, F100 PI uses the XL-GPS's own IP Address, and tests whether the XL-GPS's network port has a good network connection.

To ping a known host, enter:

F100 PI<S><IP Address><CR>

For example:

F100 PI 206.254.000.021<CR>

The unit responds (example):

PING 206.254.000.021: REMOTE HOST FOUND.<CR><LF>

or

PING 206.254.000.021 : REMOTE HOST NOT FOUND.<CR><LF>

To test if the XL-GPS's network port has a good connection, enter the following using in a serial port session:

>f100 PI<CR>

XL-GPS responds:

PING : REMOTE HOST FOUND.<CR><LF>

or it responds:

PING : REMOTE HOST NOT FOUND.<CR><LF>

F100 PN – Change User Name

Use function F100 PN to change a user name. In a network port session, F100 PN changes the name of the user you logged in as; *operator* or *guest*. In a serial port session, F100 PN changes the name of the *operator* user. See "Command Line Interface" on page 29.

To change the user name, enter:

F100<S>PN<CR>

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where:

F	=	ASCII character F
100	=	unit function number
<S>	=	space
PN	=	specify User Name command
<CR>	=	input line terminator

XL-GPS responds:

```
ENTER NEW USER NAME:
```

When you enter a new user name, XL-GPS responds:

```
CONFIRM NEW USER NAME:
```

Enter the same new user name again, to confirm the spelling. If the same new user name has been entered twice, XL-GPS responds:

```
OK<CR><LF>
```

In this case, the new user name will be used for the next login using the command line interface. However, if the new user name is entered differently the second time, XL-GPS responds:

```
ERROR: USER NAMES DO NOT MATCH. NEW USERNAME REJECTED!<CR><LF>
```

In this case, the old user name will be used for the next login using the command line interface.

If you have forgotten the operator or guest user name and/or password, use “Bootloader Mode” to change them. In Bootloader Mode, log in using the default user names (“operator” and ”guest”) and passwords (See “Using the Command Line Interface” on page 18.). Then use F100 PN and F100P to set the new user names and passwords. Once this has been completed, reboot the unit and log in using the new username or password. See “F100 P – Change User Password” on page 90.

Bootloader Mode

To enter Bootloader Mode when resetting a forgotten user name (F100 PN) or password (F100 P):

- Reboot the XL-GPS using the F100 K I L L – Reboot command.
- Immediately press the MENU key on the keypad and hold down while the XL-GPS is rebooting. The XL-GPS will display will ‘hang’ while displaying “BOOTING”.
- After a few moments, release the MENU key.
- Open a command line session with the XL-GPS.
- Use the F100 PN or F100 P commands as needed and then reboot the XL-GPS again.

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F108 – Oscillator Configuration

Use function F108 to display the type of oscillator being used:

- TCXO
- OCXO

For oscillator specifications, see “Oscillators” on page 11.

Command Line

The oscillator type is defined by the hardware configuration of the clock, and is not configurable through the command line or keypad user interfaces. To request the oscillator configuration, enter:

```
F108<S><CR>
```

XL-GPS responds:

```
F108<S>OSCILLATOR<S>CONFIG<S><OSC><CR><LF>
```

where:

F	=	ASCII character F
108	=	Function number
<S>	=	ASCII space character one or more
<CR>	=	Carriage Return, equivalent to pressing the Enter key on a keyboard
<OSC>	=	Oscillator type: TCXO, OCXO

For example, enter the following string:

```
F108<CR>
```

XL-GPS responds (example):

```
F108 OSCILLATOR CONFIG TCVCXO<CR><LF> (or OCXO)
```

F110 – J1 Input (TIET)

Note: Time Interval - Event Time (TIET) is an optional feature. If purchased at the same time as the XL-GPS, it comes enabled on the system. To purchase this option after you have purchased the XL-GPS, contact Symmetricom Sales. See H: Sales and Customer Assistance (page 143)

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F110 performs two separate functions:

- Configure the J1 input port for a TIET signal
- Display TIET information.

Keypad

- **J1 Input Config**: Displays “DISABLE” if the function has not been purchased and installed. Displays “TIET” if the TIET option has been purchased and installed.
- **J1 Select Function**: If TIET is enabled, select DISPLAY TIET MEAS to display TIET information such as Time Interval or Event Time, or select J1 INPUT CONFIG to configure the J1 for a TIET input signal.
- **Select TIET Measurement**: If DISPLAY TIET MEAS was selected, select whether to display TIME INTERVAL or EVENT TIMING on the front panel.
- **J1 Input Impedance**: For short runs (<200 ft.), select 100 kΩ. For long runs (>200 ft.), select 50Ω.
- **Input Polarity**: Positive only.

Upon changing the settings, the last display prompt asks:

- **Save Changes?**: (Yes, No) Yes applies the changes. No cancels the changes.

For J1 specifications, see “1 PPS Out” on page 6.

Notes: Stray capacitance loading on the J1 input adversely impacts TIET measurements.

Command Line

Use F110 to query or configure the J1 TIET input, or to query TIET information.

To request the J1 Input Configuration, enter:

```
F110<CR>
```

The port responds with the ASCII character string:

```
F110<S>TIET<S><Impedance><S><Sign><CR><LF>
```

(when TIET option is enabled and J1 has a TIET input)

Where the F110 entry and request formats are defined as:

`F`	=	ASCII character F.
`110`	=	function number.
`TIET`	=	ASCII character string "TIET" for configuring J1 for TIET measurement
`<S>`	=	ASCII space character one or more

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F	=	ASCII character F.
<Impedance>	=	100K, 50
<CR><LF>	=	line terminator, either a carriage return and line feed for output strings or a carriage return only for input strings.

Sample request:

F110<CR>

XL-GPS responds (example):

```
F110 TIET 50 POSITIVE<CR><LF>
```

To the configure TIET input with a different impedance value, enter (example):

F110 TIET 100K POSITIVE<CR>

XL-GPS responds:

```
OK<CR><LF>
```

To obtain TIET measurement from J1, enter:

F110 TIET TIME<CR>

XL-GPS responds:

```
OK<CR><LF>
.xxxxxxxxx<CR><LF>
```

(Time Interval (display continues until function termination with Ctrl+C)

Or, (example):

F110 TIET EVENT<CR>

XL-GPS responds:

```
OK<CR><LF>
ddd:hh:mm:ss.xxxxxxxxx<CR><LF>
```

(Event Timing display continues until function termination with Ctrl+C)

F110 responds "F110 TIET OPTION IS NOT ENABLED" to any of the commands above if the TIET option has not been enabled by the operator using the F126 Options Key Entry command.

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F111 – J2 Output (Rate, PPO)

Use function F111 to configure the J2 Output to generate one of several rates or, optionally, a Programmable Pulse Output (PPO). F111 selects from one of the following rates: 1 PPS, 10 PPS, 100 PPS, 1 kPPS, 10 kPPS, 1 MPPS, 5 MPPS, 10 MPPS, or PPO. The default factory setting is 10 MPPS.

Note: PPO is an optional feature. If purchased at the same time as the XL-GPS, it comes enabled on the system. To purchase this option after you have purchased the XL-GPS, contact Symmetricom Sales. See “H: Sales and Customer Assistance” on page 143.

For J2 specifications, see “J2 - Rate Out” on page 5 or “J2 - Optional Programmable Pulse Out (PPO)” on page 6.

Notes on F111 PPO:

- PPO can provide a single pulse output or repetitive pulse outputs.
- PPO can start and stop the pulse at any time in the year, with a resolution of one microsecond.
- The repetition rates from PPO are based on "wildcards". See “Repetitive PPO pulse outputs” on page 98 regarding usage of "wildcards" to specify PPO repetition rates.
- PPO can provide the following sub-second repetition rates: 100 kPPS, 10 kPPS, 1 kPPS, 100 PPS, and 10 PPS.
- If PPO only specifies one time, it is the start time. The stop time is automatically set for one microsecond later.

Keypad

Selecting one of the Standard Rates: Using the keypad, press the **ENTER**, **111**, **ENTER** buttons. Select one of the standard rates using the up/down arrow buttons and press the ENTER button again. When prompted “**Save changes? Yes**”, press the ENTER button one more time.

Programming the PPO option: If available, “**PPO**” appears as the first option when you enter F111. Press the **ENTER** button to start programming PPO (Otherwise, use the up/down arrow buttons to select one of the standard rates). The display shows the “PULSE START TIME” followed by the Time of Year and Time of Day fields. Program the PPO option as explained in the *Command Line* section, below. Use the **CLR** key to enter the “X” wildcards, if needed.

Command Line

Requesting the Current Configuration

To request the J2 Output Configuration, enter the following:

```
F111<CR>
```

XL-GPS responds in the following format:

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```
F111<S><RATE><CR><LF>
```

Or

```
F111<S>PPO<S><START><S><STOP><CR><LF>
```

Where:

F	=	ASCII character F
111	=	Function number
PPO	=	ASCII character string "PPO"
<S>	=	ASCII space character one or more
<RATE>	=	Output rate or type, RATE 1 PPS, RATE 10 PPS, RATE 100 PPS, RATE 1 kPPS, RATE 10 kPPS, RATE 100 kPPS, RATE 1 MPPS, RATE 5 MPPS, RATE 10 MPPS
<START> & <STOP>	=	Time-of-year with microsecond resolution in the format of yyy:hh:mm:ss.uuuuuu. Range: [001:00:00:00.000000, 366:23:59:59.999999] Note: Wildcard character: 'X' or 'x' can also be entered. See the section regarding time string with wildcard character. Colon separators (":") are required
<CR><LF>	=	Line terminator: a carriage return and line feed for output strings, or a carriage return for input strings

Sample request:

```
F111<CR>
```

The XL-GPS displays a fixed 10 PPS rate output (example):

```
F111 RATE 10PPS<CR><LF>
```

. Or, displays the PPO settings (example):

```
F111 PPO 120:22:56:12.000000 120:22:56:12.000003<CR><LF>
```

Setting the J2 Output Configuration

To set the J2 Output Configuration, send a character string with the previously defined F111 entry format to the Serial/Network port. Only valid values are accepted. The J2 Output Configuration can be set to specify one of several predetermined rates, a single PPO pulse outputs, and repetitive PPO pulse outputs. The following sections provide examples (and some explanations) for each.

Predetermined RATE output

For example, to produce a fixed 100 kPPS rate output, enter:

```
F111 RATE 100KPPS<CR>
```

XL-GPS responds:

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```
OK<CR><LF>
```

Single PPO pulse output

For example, to produce a a single pulse with duration of 1 second on January 1, enter:

```
F111 PPO 001:00:00:00.000000 001:00:00:01.000000 <CR>
```

XL-GPS responds:

```
OK<CR><LF>
```

Or, for example, to produce a single pulse with duration of 1 microsecond on January 1, enter:

```
F111 PPO 001:00:00:00.000000<CR>
```

XL-GPS responds:

```
OK<CR><LF>
```

Repetitive PPO pulse outputs

Repetitive PPO pulse output function can be used to produce repetitive pulses from once per year up to 100,000 per second.

To issue repetitive pulses using PPO, "wildcards" are utilized in the Start Time (and Stop Time) fields. Through the command line interface, the user may place 'X' (or 'x') in the time fields of the F111 command. The 'X' (or 'x') character is referred to as the "wildcard" in the PPO time fields. The most significant non-wildcard-digit in the time field is used to specify the Start (or Stop) Time of the repetitive pulses, which in turn specifies the pulse width of the repetitive pulses. The least significant "wildcard" character (the one to the immediate left of the most significant non-wildcard-digit) specifies the period of repetition.

When specifying repetitive rates, the Start Time must include the same number of significant digits as the Stop Time or an ambiguous output may occur.

Any time the clock reads a new time that matches the specified least significant digits, a pulse either starts or stops. For example, the following string produces a pulse at midnight every day with a “1” in the least significant digit:

```
F111 PPO XX1:00:00:00.000000 XX1:00:00:01.000000<CR>
```


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Clock Reading	Pulse
001:00:00:00.000000	Start
001:00:00:00.000001	No Change
001:00:00:01.000000	Stop
001:01:00:00.000000	No Change
001:00:00:00.000000	Start (etc...)

For example, to produce a repetitive 5 microsecond pulse occurring every 10 microseconds (i.e., repetitive pulses with 100 kPPS frequency with the start time or rising-edge on-time and the stop time or falling-edge at 5 μS- or 10 μS pulse period with 5 μS pulse width), enter:

F111 PPO XXX:XX:XX:XX.XXXXX0 XXX:XX:XX:XX.XXXXX5<CR>

XL-GPS responds:

OK<CR><LF>

Or, for example, to produce a repetitive 50-microsecond pulse occurring every 100 microseconds (i.e., repetitive pulses with 10 kPPS frequency with the start time or rising-edge at 5 μS and the stop time or falling-edge at 55 μS - or 100 μS pulse period with 50 μS pulse width), enter:

F111 PPO XXX:XX:XX:XX.XXXX05 XXX:XX:XX:XX.XXXX55<CR>

XL-GPS responds:

OK<CR><LF>

Or, for example, to produce a repetitive 50-microsecond pulse occurring every 100 milliseconds (i.e., repetitive pulses with 10 PPS frequency with the start time or rising-edge at 5 μS and the stop time or falling-edge at 55 μS - or 100ms pulse period with 50 μS pulse width), enter:

F111 PPO XXX:XX:XX:XX.X00005 XXX:XX:XX:XX.X00055<CR>

XL-GPS responds:

OK<CR><LF>

Or, for example, to produce a repetitive one-minute pulse occurring every hour, enter:

F111 PPO XXX:XX:10:00.000000 XXX:XX:11:00.000000<CR>

XL-GPS responds:

OK<CR><LF>

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Or, for example, to produce a repetitive one-microsecond pulse occurring on every hour, enter:

```
F111 PPO XXX:XX:10:00.000000<CR>
```

XL-GPS responds:

```
OK<CR><LF>
```

F113 – J3 Input (Freq Meas)

Note: Frequency Measurement is an optional feature. If purchased at the same time as the XL-GPS, it comes enabled on the system. To purchase this option after you have purchased the XL-GPS, contact Symmetricom Sales. See “H: Sales and Customer Assistance” on page 143.

Use function F113 to configure J3 for a Frequency Measurement (Freq Meas) input, to display Frequency Measurement information, or to disable J3 inputs.

F113 offers the following keypad settings:

- J3 Input Configuration: (FREQ MEAS, **DISABLED**) Displays “Disabled” if the Frequency Measurement option has not been installed. Displays “Freq Meas” if it has.
- J3 Select Function: (DISPLAY FREQ MEAS, J3 INPUT CONFIG) Select to display the Freq Meas information of to configure the Freq Meas input on J3.
- J3 Input Frequency: 1 MHz, 5 MHz, **10 MHz** (Select the Freq Meas input frequency)
- J3 Input Impedance: **1k**Ω, 50 Ω (Select the input impedance)
- Freq Meas Interval: 1 to 99999 seconds

The factory settings are 10 MHz, and 1kΩ.

Frequency Measurement (Freq Meas) Input

The Frequency Measurement (Freq Meas) option measures an external frequency applied to the J3 input relative to the disciplined XL-GPS oscillator.

Operation: Measurements are displayed on the front panel display and on the command line at the specified measurement interval. The front panel displays the measured frequency offset (FREQ OFFSET) and a countdown (COUNT) to completion of the measurement interval. The command line states the measurement interval (e.g.,“Interval is 1 seconds”) on the first line, and then starts displaying each measurements; each one on a new line.

Limitations: Note that the accuracy of the frequency measurement is based on the accuracy and stability of the disciplined XL-GPS oscillator over the measurement interval. Short interval measurements of external very high stability oscillators (e.g., Cesium) tend to measure the XL-GPS oscillator instead. Refer to “Time and Frequency Accuracy” on page 3, and to “Oscillators” on page 11 for more information for the specifications of disciplined oscillators (while locked to a GPS reference source).

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Theory of Operation: Freq Meas uses a heterodyne phase error multiplier to achieve high resolution at short sample periods. Using its internal disciplined frequency, the XL-GPS records or timestamps the zero crossing of the J3 input frequency once per measurement cycle with 240 picosecond resolution. The number of zero crossings between successive measurement intervals is also recorded.

When the measurement interval elapses, the previous measurement timestamp is subtracted from the current one and the difference is divided by the number of zero crossings between the two timestamps. The result is the average period of the external frequency over the interval. The reciprocal of this period is compared to the nominal frequency to determine the fractional frequency offset. The timestamp reported with the resulting measurement is the ending timestamp of the two phase readings used to make the measurement. Since this ending timestamp is now the beginning timestamp for the next measurement, there is no “dead time” in the measurements.

The reported timestamp resolution is sufficient to allow integrating the fractional frequency offset measurements to fully recover the relative phase of the external frequency source being measured versus the disciplined XL-GPS internal or external oscillator.

Display: Freq Meas appears as follows in the front panel display/keypad:

FREQ OFFSET	COUNT
+x.xxxxxx-xx	xxxxxx

Where `FREQ OFFSET +x.xxxxxx-xx` is the fractional frequency offset measurement divided by the `COUNT xxxxxxx` measurement interval. These measurements are displayed until a new F113 configuration is selected, or another function performed.

Command Line

To display the J3 Input Configuration, enter:

F113<CR>

XL-GPS responds as follows if the Freq Meas option has not been installed:

F113<S>DISABLE<CR><LF>

When the Frequency Measurement option is enabled, F113 responds:

F113<S>FREQ MEAS<S><FREQ><S><IMP><S><INT><CR><LF>

Where the F113 entry and request formats are defined as:

F	=	ASCII character F.
113	=	function number.
SHOW	=	ASCII character string "SHOW" for displaying frequency measurements.
DISABLE	=	ASCII character string "DISABLE" to disable J3 as input port

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F	=	ASCII character F.
FREQ MEAS	=	ASCII character string "FREQ MEAS" to set J3 to make frequency measurements
<S>	=	ASCII space character one or more.
<FREQ>	=	FREQ MEAS Input Frequency: 1MHZ, 5MHZ, 10MHZ
<IMP>	=	Input Impedance: 1K or 50
<INT>	=	Frequency Measurement Interval. This is the gate time of the measurement. Range: [000001, 999999] in seconds.
<CR><LF>	=	line terminator, either a carriage return and line feed for output strings or a carriage return only for input strings.

For example, enter:

F113<CR>

The XL-GPS displays the current configuration (example):

```
F113 DISABLE<CR><LF>
```

Or

```
F113 FREQ MEAS 1MHZ 50 000001<CR><LF>
```

To set the J3 Input Configuration, enter a character string ***using the same formats as the preceding XL-GPS responses***. Only valid values are accepted.

To disable F113, enter:

F113 DISABLE<CR>

Or, to enable Freq Meas of a 1 MHz input with a 50 Ω input impedance every 1 seconds, enter:

F113 FREQ MEAS 1MHZ 50 1<CR>

To all three of the above examples, XL-GPS responds:

```
OK<CR><LF>
```

If enabling Freq Meas, display the Freq Meas measurements using the following format:

F113<S>SHOW<CR>

XL-GPS responds using the following format:

```
Interval<S>is<S><INT><S>seconds<CR><LF>
+#.######e-##<CR><LF>
```


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Where

`Interval is`	=	ASCII character string “Interval is”
`<S>`	=	ASCII space character or separator.
`<INT>`	=	Frequency Measurement Interval
`seconds`	=	ASCII character string “seconds”
`+`	=	ASCII plus “+” or minus “-” character
`#`	=	ASCII integer from 0 to 9
`e-`	=	ASCII characters “e-”
`<CR><LF>`	=	line terminator, either a carriage return and line feed for output strings or a carriage return only for input strings

For example, enter:

```
F113 SHOW<CR>
```

XL-GPS responds (example):

```
Interval is 1 seconds<CR><LF>
+9.600000e-10<CR><LF>
+1.080000e-09<CR><LF>
+1.560000e-09<CR><LF>
```

To stop Freq Meas, enter Ctrl+C on the command line.

Note: Freq Meas remains active while the function is displayed on the front panel or command line. Changing the function on the front panel or command line terminates Freq Meas.

F117 – Factory Configuration

Use function F117 to display the XL-GPS factory Serial Number and the availability optional software features. Send the string:

```
F117<CR>
```

XL-GPS responds:

```
F117<S>SN<S><SERIAL#><CR><LF>
     NTP <STATE><CR><LF>
     FREQ MEAS <STATE><CR><LF>
     TIET <STATE><CR><LF>
     PPO <STATE><CR><LF>
```


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where:

F	=	ASCII character F.
117	=	function number.
<S>	=	ASCII space character one or more.
NTP	=	NTP option
FREQ MEAS	=	FREQ MEAS option
TIET	=	TIET option
PPO	=	PPO option
<CR>	=	carriage return.
<STATE>	=	ENABLE or DISABLE
<LF>	=	line feed.

For example, enter:

F117<CR>

XL-GPS responds:

```
F117 SN 31234<CR><LF>
     NTP ENABLE<CR><LF>
     FREQ MEAS ENABLE<CR><LF>
     TIET ENABLE<CR><LF>
     PPO ENABLE<CR><LF>
```

F119 – GPS Receiver Configuration

Summary

Use function F119 to query and configure the 6: GPS M12 Receiver (87-8028-2) (page 109).

F119 provides the following GPS receiver information:

- Available/Not Available
- Part Number
- Software Version
- FPGA Number

F119 provides the following GPS receiver status:

- GPS Status (Locked or Unlocked)
- GPS Antenna (Ok or Open)

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- GPS Acquisition State - (Dynamic Mode, Stop Site Survey, Stop TRAIM, Start Site Survey, Start TRAIM, Survey Position, Position Hold, TRAIM Active)

Operation

Each of F119's information, status, and configuration items are explained below. Because F119 and the GPS receiver are important elements of the XL-GPS Time and Frequency System, this section explains interactions and behavior of the F119, the GPS receiver, and other system functions in some detail.

Part Number, Software Version, and FPGA Number

This information may be useful for identifying the GPS receiver to Symmetricom technical support.

GPS Status (Locked or Unlocked)

During normal operation, "Locked" means the receiver has its current *position* and the current GPS time. "Unlocked" means the receiver doesn't have its current position yet, or that no "good current" satellites are available to provide the current GPS time. For additional information on "good current" GPS satellites, see "F60 – GPS Receiver Satellite List" on page 56.

Note: GPS status can be "Locked" before the GPS receiver is a valid time reference. This is explained below.

The GPS receiver serves as a UTC time reference for the XL-GPS system clock. To be a valid time reference, the receiver requires the following information:

- The GPS time (at least one "good current" GPS satellite)
- The current position of the receiver
- The UTC leap-second offset

Following power-up and initialization, the receiver requires at least four concurrent "good current" satellites () to resolve its current position. In rare cases, when a pair of "good current" satellites are on intersecting paths, the receiver requires additional "good current" satellites or waits for the intersecting satellites to diverge before resolving the current position. Once resolved, the current position information is saved.

For additional information on GPS position information, see "F50 – GPS Receiver LLA/XYZ Position" on page 49.

While resolving its current position, the GPS receiver also listens for the *UTC leap-second offs*et periodically transmitted by GPS satellites along with GPS time and position information. Up to thirteen minutes may elapse from the time the receiver acquires its *first* "good current" satellite to the time it receives the UTC leap-second offset. Once received, the UTC leap-second offset is saved.

When the receiver has *the current position*, *the UTC leap-second value*, **and** *the current GPS time*, it starts providing valid time to the XL-GPS system clock. When the system clock is locked to the GPS time reference and is operating within specifications, the system status is locked. The interval from initialization to system status lock is typically under twenty minutes, under nominal conditions. This transition is illustrated below.

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Following initialization, the front panel display of an XL-GPS with only one GPS receiver (GPS Status: Unlocked) would show the following:

```
UNLOCKED     * GPS PRI

LOCAL        365:16:01:05 1969
```

With the GPS receiver as a valid time reference, the following changes would take place:

- The asterisk (“*”) indicating the absence of a valid reference would disappear
- The system status would change to locked

The front panel status display would look like this:

```
LOCKED        GPS PRI

LOCAL        233:18:21:29 2005
```

Once the GPS receiver is a valid time reference, it requires at least one “good current” satellite to remain a valid time reference. If “good current” GPS satellites become temporarily unavailable, GPS status changes to unlocked and the XL-GPS stops using the receiver as a valid time reference.

Typically, when a “good current” satellite becomes available again, GPS status locks and the receiver becomes a valid time reference almost immediately. Typically, the receiver it does not need extra time to resolve its current position unless it is being used in a very mobile/dynamic environment such as an aircraft.

If the unit is powered-cycled, the receiver repeats the complete position and leap-second acquisition process before GPS status locks.

Note: GPS satellite visibility and signal strength affect the ability of the GPS receiver to lock and provide valid time to the XL-GPS. Therefore, it is very important to select the best possible antenna site and follow the recommendations in sections “Installing the GPS Antenna” on page 13, and.

GPS Antenna (OK or Open)

The GPS antenna is powered by a 12-volt current from the ANTENNA connector on the rear of the XL-GPS. If this circuit is complete (e.g., connected to an antenna) GPS Antenna status is OK. If the circuit is incomplete (e.g., no antenna, a cable break, or a splitter) the GPS Antenna status is Open. If circuit detects a short, the receiver opens a relay to disconnect power from the circuit, and the GPS Antenna status is Open.

GPS Acquisition State

In Time Mode: The system has been instructed by the user that its position will remain in a static location and has set the GPS mode to Time Mode. See “F53 – GPS Operation Mode” on page 55.

- Start Site Survey: The receiver is checking for changes in its saved static position (occurs after boot).
- Survey Position: If the save static position is determined to be invalid, the receiver begins to

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reestablish its current most accurate position.

- Position Hold: The receiver has determined its most accurate position, and is using this static position to calculate its most accurate time solution.
- Start TRAIM: (for Time Receiver Autonomous Integrity Monitoring) The receiver is in Position Hold and is monitoring the integrity of the time solution using redundant satellite measurements in order to eliminate unreliable signal information.
- TRAIM Active: The TRAIM mode is active and working.

In Dynamic Mode: The system has been instructed by the user that its position could change and has set the GPS mode to Dynamic Mode (see "F53 – GPS Operation Mode" on page 55):

- Stop Site Survey: The receiver has finished checking for changes in its static position.
- Stop TRAIM: The receiver has completed TRAIM monitoring.
- Dynamic Mode: The position is being resolved on an ongoing basis.

Command Line

To obtain the status of the GPS Receiver, enter:

F119<S>S<CR>

For example, enter:

F119 S<CR>

XL-GPS responds (example):

```
F119 :<CR><LF>
GPS PART NUMBER  87-8028-2<CR><LF>
SOFTWARE  230-01510-04v1.9<CR><LF>
FPGA      230-01510-01<CR><LF>
GPS STATUS  LOCKED<CR><LF>   (or  UNLOCKED)
GPS ANTENNA OPEN<CR><LF>     (or SHORT or OK)
GPS ACQUISITION STATE: POSITION HOLD (or one of the following:
                                      DYNAMIC MODE,
                                      STOP SITE SURVEY,
                                      STOP TRAIM,
                                      START SITE SURVEY,
                                      SURVEY POSITION,
                                      POSITION HOLD,
                                      TRAIM ACTIVE)
```


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where:

F	=	ASCII character F.
119	=	function number.
<S>	=	ASCII space character one or more.
<CR><LF>	=	line terminator, either a carriage return and line feed for output strings or a carriage return only for input strings.

XL-GPS responds:

```
OK<CR><LF>
```

F126 – Options Key Entry

Use function F126 to enter the Options Key, which enables certain functions (e.g., PPO, TIET, NTP, FREQ MEAS) if the correct key is entered. To check the status of these XL-GPS options, see "F117 – Factory Configuration" on page 103. After entering the key code using F126, reboot the XL-GPS.

To set the Options Key code, enter the following:

```
F126<S><KC><CR><LF>
```

where:

F	=	ASCII character F (f or F for input string).
126	=	the function number
<S>	=	ASCII space character one or more
<KC>	=	Key Code, 0 to 999999999999999. A value of all nines will clear all Option enable flags.
<CR>	=	carriage return character
<LF>	=	line feed character

For example, enter:

```
F126<S>5674397586090<CR>
```

XL-GPS responds:

```
OK<CR><LF>
```

Use function F117 to verify that the correct code was entered. ***Then reboot the unit to activate the option.***

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6: GPS M12 Receiver (87-8028-2)

Introduction

The optional GPS M12 Receiver acts as a Stratum 0 timing reference source to the XL-GPS Time and Frequency System. It tracks up to 12 L1 GPS satellites, decodes their signals for time and position, and feeds this data to the XL-GPS through the internal backplane. When available and enabled, the GPS M12 Receiver card provides superior time and frequency accuracy on the XL-GPS (See “Time and Frequency Accuracy” on page 3). The GPS M12 Receiver card comes with an L1 GPS antenna, cabling, and mounting hardware unless otherwise specified at the time of purchase.

The GPS M12 Receiver uses a TRAIM (Time Receiver Autonomous Integrity Monitoring) algorithm to monitor the integrity of the receiver’s timing solution. Using redundant measurements, TRAIM detects and quarantines anomalous GPS signals, independent of the GPS health ephemeris data. The quarantined signal is excluded from the timing solution for 12 hours before it is requalified for inclusion in the timing solution.

For more information about the M12 receiver, visit http://www.motorola.com/ies/GPS/products_positioning.html.

See “Installing the GPS Antenna” on page 13 for information on selecting an antenna site, mounting the antenna, and signal strength requirements.

The GPS M12 Receiver card can be managed and configured using F53 – GPS Operation Mode (page 55) and F119 – GPS Receiver Configuration (page 104).

Specifications

Frequency	1575.42 MHz (L1 signal)
Code	Coarse Acquisition (C/A) code
Tracking	Up to 12 satellites with TRAIM
Position Accuracy	Typically < 10m when tracking four (4) satellites
TRAIM Mask	1 μS
1 PPS Accuracy	UTC-USNO ±30 nS RMS 100 nS Peak
Time standard:	UTC or GPS
Antenna input	Female BNC
Antenna Power	20 mA – 220 mA, +12 V

Related topics:

- “Installing the GPS Antenna” on page 13
- “Verifying Antenna Installation” on page 22
- “F50 – GPS Receiver LLA/XYZ Position” on page 49

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- “F51 – GPS Antenna Cable Delay” on page 52
- “F60 – GPS Receiver Satellite List” on page 56
- “F69 – Time Mode” on page 61
- “F73 – Alarm Control / Status” on page 64
- “F90 – Code Output Configuration” on page 72
- “F119 – GPS Receiver Configuration” on page 104

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7: XL-GPS-Generated Messages

Error Messages

ERROR 01 VALUE OUT OF RANGE

You entered a command using the correct format that contained a value, probably numeric, that was outside the range of acceptable values.

Recovery Action: Re-enter the command using an acceptable value.

ERROR 02 SYNTAX

You entered a valid command, but using the wrong format.

Recovery Action: Re-enter the command, using the correct format.

ERROR 03 BAD/MISSING FIELD

You entered a command that lacks a required field.

Recovery Action: Re-enter the command, using the required fields.

ERROR 04 - BAD DATA/TIMEOUT CONDITION

The GPS option card did not respond to the XL-GPS soon enough.

Recovery Action: Re-enter the command, using the required fields.

ERROR: Invalid Command

You have entered an invalid command.

Recovery Action: Consult the manual for the correct command and re-enter.

ERROR: Can’t create netdevice <NAME>

The XL-GPS can not create the device needed to map the host to a drive.

Recovery Action: Restart the Unit. If this error message persists, contact Symmetricom Technical Customer Service.

ERROR: Can’t set host <NAME> ip <ADDRESS>

You have incorrectly entered a parameter, or there is no room currently in the Host table for another IP Address.

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Recovery Action: Verify correct parameter values. If correct, restart the XL-GPS. If this error message persists, contact Symmetricom Technical Customer Service.

ERROR: Action (get or set) is not specified

You have omitted the “get” or “set” parameter from the F100 NTP Configuration command.

Recovery Action: Re-enter the command, specifying the desired action.

ERROR: Can’t open source file <NAME>

The file containing the needed data is unavailable.

Recovery Action: Check file location and directory names to verify the path is accurate, then re-enter the command.

ERROR: Can’t open dest file <NAME>

The destination file is unavailable.

Recovery Action: Check file location and directory names to verify the path is accurate, then re-enter the command.

ERROR: Can’t write file <NAME>

Data from the source file cannot be copied to the destination file.

Recovery Action: Check file location and directory names to verify the path is accurate, then re-enter the command.

ERROR: Configuration failed.

Your attempt to configure new parameters was unsuccessful.

Recovery Action: Verify parameter values, then re-enter the command.

ERROR: Configuration type is not specified

You did not specify the file type.

Recovery Action: Re-enter the command, specifying SNMP and/or NTP.

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Informational Messages

Messages in this section inform you of an event and do not require any action on your part.

Deleted previously set IP host address

Your last action deleted the previously set IP host address.

NOTICE: Cannot respond to command because Utility Port session has priority.

A Utility Port session has started and takes precedence. Wait until it is over before logging in or expecting a response to an entered Telnet command.

Host <NAME> ip <ADDRESS> configured successfully!

Host configuration was successful.

Source file <NAME> bytes read: <NUMBER>

Source file was successfully read.

Dest file <NAME> bytes written: <NUMBER>
Configuration files transferred successfully!

Information was successfully transferred to the destination file.

Restarting the Unit
Please wait…

A command has just been executed that requires a soft restart of the XL-GPS. The restart happens immediately after this message is sent.

OK

Command accepted and processed as specified.

Goodbye.

The XL-GPS has just terminated a session.

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A: Using F100 Configuration

Configuring NTP & SNMP Parameters

F100 CONFIG instructs the XL-GPS unit to transfer its NTP and SNMP configuration files to an FTP server so the user can edit them. When finished editing, the user transfers the config files back to the XL-GPS using the F100 CONFIG command.

Overview of Steps

- Set up an FTP server on your workstation.
- Using the XL-GPS's command line interface, enter the **`F100 CONFIG get`** command. The XL-GPS transfers copies of its configuration files over the network to the FTP on your PC.
- Edit the configuration files.
- Give the XL-GPS a new command, **`F100 CONFIG set`**. The XL-GPS retrieves copies of the edited configuration files from the FTP and overwrites it's current config files with the newly edited ones.

Set up the FTP Server

To save time and trouble, download a ***pre-configured*** FTP server from http://www.ntp-systems.com/zip/warftpd1.zip and extract it to the C:\ drive on your workstation. Otherwise, customize your existing FTP server setup as described in this section.

When performing these operations, the user issues command line instructions to the XL-GPS. The XL-GPS responds to those commands by connecting to the FTP server and transferring files to and from the FTP. The XL-GPS gives the FTP server 'Anonymous' as its user name, and uses a **null** password (e.g., the equivalent of pressing the Enter key on your keyboard instead of entering text). The FTP server must be configured as follows:

- Anonymous log-ins are enabled
- The password for Anonymous is disabled, or allows a null password
- Anonymous has read/write privileges to Anonymous's home directory.

Get the IP Address of the FTP Server/Workstation

If the FTP server is running on your Windows workstation, open a DOS command line window on the workstation:

- Click **Start**, **Run**, and type **cmd**, or
- Click **Start**, **Programs**, (and **Accessories** in some cases), and select **Command prompt** or **DOS prompt**.
- At the command line, type **ipconfig**
- Make note of the IP Address.

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For other operating systems and configurations, consult the appropriate documentation for obtaining the FTP server's IP address.

Copy the Configuration Files to the FTP Server

Telnet to the XL-GPS or open a terminal session to it over the serial port.

Using the command line, enter the commands below. Replace **<*IP Address*>** with that of the workstation/FTP Server. Leave **<*subdir*>** blank - the FTP server will save the files in anonymous's home directory.

Note: See "Using the Command Line Interface" on page 18 if you need instructions for connecting to the command line interface

To get the NTP config files, type:

>f100 config ntp get host:<*IP Address*> dir:<*subdir*>

To get the SNMP config file, type:

>f100 config snmp get host:<*IP Address*> dir:<*subdir*>

To get the SNMP and NTP config files, type:

>f100 config ntp snmp get host:<IP Address> dir:<subdir>

Here's an example of a successful SNMP and NTP config file transfer:

```
>f100 config ntp snmp get host:192.168.0.1 dir:
Host config ip 192.168.0.1 already configured
Source file /config/snmp.conf bytes read: 1275
Dest file snmp.conf bytes written: 1275
Source file /etc/ntp.conf bytes read: 1166
Dest file ntp.conf bytes written: 1166
Source file /etc/ntp.keys bytes read: 44
Dest file ntp.keys bytes written: 44
Configuration files transferred successfully!
```

If you get "`Error: Can't write file`" when you enter the get command, verify the following FTP server items:

- FTP server is running.
- Anonymous has a home directory.
- The home directory for Anonymous has read, write, and delete enabled (make sure to *apply* changes).

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Edit the Configuration Files

In Windows, edit the configuration files using a text editor such as Notepad or Wordpad. For more information, see “D: Network Time Protocol (NTP)” on page 135.

If using the preconfigured FTP server (downloaded from http://www.ntp-systems.com/zip/warftpd1.zip), the FTP places the configuration files in C:\Symmetricom, the default or home directory of “anonymous”.

Note: Follow these guidelines when editing the configuration files:

- If the editor displays odd 'box' characters or the lines of text don't wrap properly, close the file without saving changes and switch to a different text editor.
- Don't rename or save the configuration files as a new file type.
- Some text editors encode end-of-line carriage returns that cause errors when XL-GPS refers to the file. Notepad, WordPad, Microsoft Word, and Vim don't seem to have this problem.
- The configuration files are automatically transferred to/from the FTP server in binary format. They retain the DOS or UNIX file conventions of the editor. XL-GPS works with either format.

Move the Configuration Files Back to the XL-GPS

Reboot Warning: The following steps cause the XL-GPS to reboot.

Using the XL-GPS’s command line, enter one of the commands below, replacing <*IP Address*> with the IP address of your workstation/FTP server.

To move the NTP config files, type:

```
>f100 config ntp set host:<IP Address> dir:<subdir>
```

To move the SNMP config file, type:

```
>f100 config snmp set host:<IP Address> dir:<subdir>
```

To move the NTP and SNMP config files, type:

```
>f100 config ntp snmp set host:<IP Address> dir:<subdir>
```

Here’s an example of a successful SNMP and NTP config file transfer:

```
>>f100 config set ntp snmp host:192.168.0.1 dir:
Host config ip 192.168.0.1 already configured
Are you sure(y/N)?y
Source file snmp.conf bytes read: 1275
Dest file /config/snmp.conf bytes written: 1275
Source file ntp.conf bytes read: 1166
Dest file /etc/ntp.conf bytes written: 1166
Source file ntp.keys bytes read: 44
Dest file /etc/ntp.keys bytes written: 44
Configuration files transferred successfully!
```


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```
Resetting...
```

If you get “`Error: Can't open source file`”, verify that the FTP server’s <<Local Server>> is running.

After XL-GPS receives the configuration files, it reboots, and goes through the normal startup process.

End of Procedure

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B: Upgrading System Firmware

Caution: Consideration must be given to the firmware and the hardware version numbers of the XL-GPS and it's optional components. Consult with Symmetricom's Customer Service department before performing upgrades.

This section explains how to completely upgrade the system firmware. This is done using the F100 BH, F100 BUB, F100 BU, and F100 BF commands.

Overview of Procedure

- Set up a network connection between your XL-GPS and the FTP server.
- Set up an FTP Server with the firmware upgrade files.
- Open a command line session to the XL-GPS.
- Install the firmware version 8 files.
- Reboot the XL-GPS.

Note: If your system's NTP and SNMP configuration files (ntp.conf, ntp.keys, snmp.conf) have been customized, make backup copies and later re-install those configuration files. See "A: Using F100 Configuration" on page 114.

Set up the FTP Server

To save time and trouble, download a ***preconfigured*** FTP server from http://www.ntp-systems.com/zip/warftpd1.zip and extract it to the C:\ drive on your workstation. Otherwise, customize your existing FTP server setup as described in this section.

When performing these operations, the user issues command line instructions to the XL-GPS. The XL-GPS responds to those commands by connecting to the FTP server and burning the software to system memory. The XL-GPS gives the FTP server 'Anonymous' as its user name, and uses a **null** password (e.g., the equivalent of pressing the Enter key on your keyboard instead of entering text). The FTP server must be configured as follows:

- Anonymous log-ins are enabled
- The password for Anonymous is disabled, or allows a null password
- Anonymous has read/write privileges to Anonymous's home directory.

Obtain the current system firmware files (E.g., 192-8001.bin, 192-8000.bt, 192-8002.fs) from Symmetricom's customer support website.

Place the system firmware upgrade files in home directory of the 'anonymous' user. *If you're using the preconfigured FTP server, C:\Symmetricom is the default or home directory.*

Open a Command Line Session on the XL-GPS

Note: The XL-GPS and FTP server need to be connected by a TCP/IP network. Ideally they should be on an isolated subnet. Connecting them over a network with multiple 'hops' or one with heavy

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network traffic raises the possibility that the system software files could be corrupted, yielding the XL-GPS inoperable.

Telnet to the XL-GPS over the network. For example, at your workstations command line, type “telnet 192.168.46.10”.

When prompted, log in to the unit using the operator’s username and password; the user name and password are usually “operator” and “janus”.

Upgrade the Firmware

Command Format

When issuing the firmware upgrade commands, use the following format:

```
F100 <command> <ftp_server_ip_address> <relative_path>/<file.ext>
```

If the FTP server is on your workstation, <ftp_server_ip_address> is the IP address of your workstation.

<relative_path> is a subdirectory *inside* the anonymous user’s home directory on the FTP server. If there is no subdirectory (i.e., if the upgrade files are sitting in anonymous user’s home directory), drop <relative_path> from the command line.

For example, if c:/ftpworkfiles is the anonymous user’s home directory, and the upgrade files are in c:/ftpworkfiles/XL-GPS/, you would enter the command as follows:

```
F100 bh 192.168.49.120 XL-GPS/192-8000.bt
```

On the other hand, if the files are in c:/ftpworkfiles, the anonymous user’s home directory, you would drop the <relative_path> and enter the command as follows:

```
F100 bh 192.168.49.120 /192-8000.bt
```

Issuing the Upgrade Commands

Adapt the following examples as needed to match your system, such as differences in IP address, path, and filename).

Enter the following command:

```
F100 bh <IP_address> <relative_path>/<file.bt>
```

For example:

```
F100 bh 192.168.49.120 /192-8000.bt
```

XL-GPS responds:

```
BURN HOST IS READY<CR><LF>
```


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Then ‘burn’ the bootloader to the XL-GPS’s flash memory by entering:

F100 bub

XL-GPS responds:

```
OK
BURNING FILE 192-8000.bt WITH SIZE 452164 TO PARTITION:0 SECTOR:0
SEC: 0 RE: 0
SEC: 1 RE: 0
SEC: 2 RE: 0
SEC: 3 RE: 0
SEC: 4 RE: 0
SEC: 5 RE: 0
SEC: 6 RE: 0
FLASH SUCCESSFULLY PROGRAMMED CRC32 = 0x9EFBE60A
```

Do the same for the ‘firmware’ (.bin) file:

F100 bh <IP_address> <relative_path>/<file.bin>

For example:

F100 bh 192.168.49.120 /192-8001.bin

XL-GPS responds:

```
BURN HOST IS READY<CR><LF>
```

Then enter:

F100 bu

XL-GPS responds:

```
OK
BURNING FILE 192-8001.bin WITH SIZE 803016 TO PARTITION:1 SECTOR:10
SEC: 16 RE: 0
SEC: 17 RE: 0
SEC: 18 RE: 0
SEC: 19 RE: 0
SEC: 20 RE: 0
SEC: 21 RE: 0
SEC: 22 RE: 0
SEC: 23 RE: 0
SEC: 24 RE: 0
SEC: 25 RE: 0
SEC: 26 RE: 0
SEC: 27 RE: 0
SEC: 28 RE: 0
FLASH SUCCESSFULLY PROGRAMMED CRC32 = 0x2D9A260A
```


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Then do the same for the ‘file system’ (.fs) file:

```
F100 bh <IP_address> <relative_path>/<file.fs>
```

For example:

```
F100 bh 192.168.49.120 /192-8002.fs
```

XL-GPS responds:

```
BURN HOST IS READY<CR><LF>
```

Then enter:

```
F100 bf
```

XL-GPS responds:

```
OK
BURNING FILE 192-8002.fs WITH SIZE 524288
SEC: 94
SEC: 95
SEC: 96
SEC: 97
SEC: 98
SEC: 99
SEC: 100
SEC: 101
SEC: 102
```

Then enter “K (space) I (space) L (space) L” as shown here:

```
F100 K I L L
```

The “K I L L” command reboots your unit. You have completed the firmware upgrade procedure

Troubleshooting

Most problems upgrading the firmware are due to problems with the configuration of the FTP server, such as:

- setting the server to accept a null password
- configuring the anonymous home directory
- setting the correct access rights
- entering the correct relative file path

The following error messages may provide some indication of the underlying problem:

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Message: >Can't set the burn host - wrong IP address

Cause: The IP address entered for the FTP server is incorrect. Check that you've entered the IP address of the FTP server (not the XL-GPS) and re-enter if necessary.

Message: >Can't open file: 192-####.##

Cause: There's a problem with the FTP server that is preventing access to the file. Verify the following:

- The FTP server is correctly configured.
- The anonymous user account is enabled.
- The anonymous user account password is "guest".
- The anonymous user account has read access to the ftpworkfiles directory.
- The ftpworkfiles directory located in the anonymous user's home directory.
- The FTP server is running.
- There aren't any other 'anonymous' users logged into the FTP server.

Try connecting to the FTP server as 'anonymous' using an FTP client. You should automatically see the product name directory (e.g., "XL-GPS") you created inside the anonymous users home directory (e.g., "c:\ftpworkfiles\"). Open the product name directory. You should see the firmware upgrade files you put there. If either the product name directory or the firmware upgrade files aren't visible, there's a problem with the FTP configuration.

Message: >Wrong File type

You may be using the wrong firmware files for the product being upgraded. This may be due to the incorrect files being place in the upgrade directory. It may also be that the wrong directory was entered (one for another product) in the path information on the F100 command line. 'Wrong file type' is also associated with 'Can't open file' errors - see the preceding message.

Message: Unit hangs on "Burning Boot" message.

Check that your IP Address, Subnet Mask, and Default Gateway of the XL-GPS are correctly configured.

FAQ

How does one check the unit's firmware version number?

Log on to the XL-GPS and enter the following command:

```
> F100 VER
```


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An example XL-GPS response is:

```
F100 VER
BOOTLOADER     192-8000
SOFTWARE       192-8001
FILE SYSTEM    192-8002v1.80
NVRAM VER      5
PROJ REV       #1.80
```

The "PROJ REV" number is the firmware version number. The "v" number in "FILE SYSTEM" is the file system version number, which may not be the same as the firmware version number.

How does one check the IP address, subnet mask, and default gateway of the XL-GPS?

Log on to the XL-GPS and enter the following command:

```
> F100 IC
F100 IP:192.168.47.156 SM:255.255.255.0 G:192.168.47.1
```

Is the null modem cable necessary? What if I'm upgrading a XL-GPS remotely?

The null-modem cable is optional. If you decide to Telnet to the XL-GPS over TCP/IP network, you don't need the null modem cable.

I'm using a null modem cable to connect to the XL-GPS from my laptop and the XL-GPS keeps rebooting?

An ungrounded voltage level on one of the pins in the null modem cable causes the unit to reset. Use one of the following work-arounds:

- Connect the laptop to a grounded power supply, if it has one, or ground the laptop's chassis.
- Do away with the null modem cable. Telnet to the unit over the network.

Use a regular PC instead of the laptop. The PC is connected to a grounded power supply and doesn't cause this problem.

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C: SNMP

The mibs for this product are available on the product CD.

Key:

`MIB=/config/ttmib.o,`	Don't touch. This is a factory setting.
`GenTraps=YES,`	Global enable/disable setting for all SNMP traps. YES, the default setting, enables all traps. NO disables all traps. This setting overrides all the other TRAP parameter settings.
`NAME =`	The community name password. This should be the same as the community name being used by the administrators.
`VIND =`	View Index. This is a reserved term that has no effect and is currently unused in SNMP. This parameter should be set to "1".
`TRAP =`	YES enables/NO disables SNMP traps for a particular community.
`ACCESS =`	Read and write privileges to members of a community. R sets read only privileges, and W sets read and write privileges.
`IP =`	Provide the IP address of the SNMP management stations within that community. These addresses are required in order for the management station to receive SNMP traps and to communicate with the XL-GPS system using SNMP. **Note**: A special address of 255.255.255.255 grants any IP addressed unit access to the Enterprise MIB variables.

SNMP Private Enterprise MIB Structure

This section describes the top level structure & design of the XL-GPS SNMP Private Enterprise MIB.

SNMP Addressing

SNMP addressing is structured as a very large tree database. A root node address is an integer value that ranges from 0 to some very large number. Conceptually, there are no limits to the numbers of sub nodes either. SNMP addressing is written in "doted decimal" notation. For example the address of Symmetricom's ntpInPkts Enterprise MIB variable is "1.3.6.1.4.1..1896.6.1.2.1.1.0". The address fragment 1.3.6.1.4.1 is fixed by the IANA (Internet Assigned Number Authority) and is the address of the SNMP Private Enterprise MIB's. The 1896 is the address assigned by IANA to Symmetricom for our Enterprise MIB's. Symmetricom assigns the addresses after that at our discretion and design.

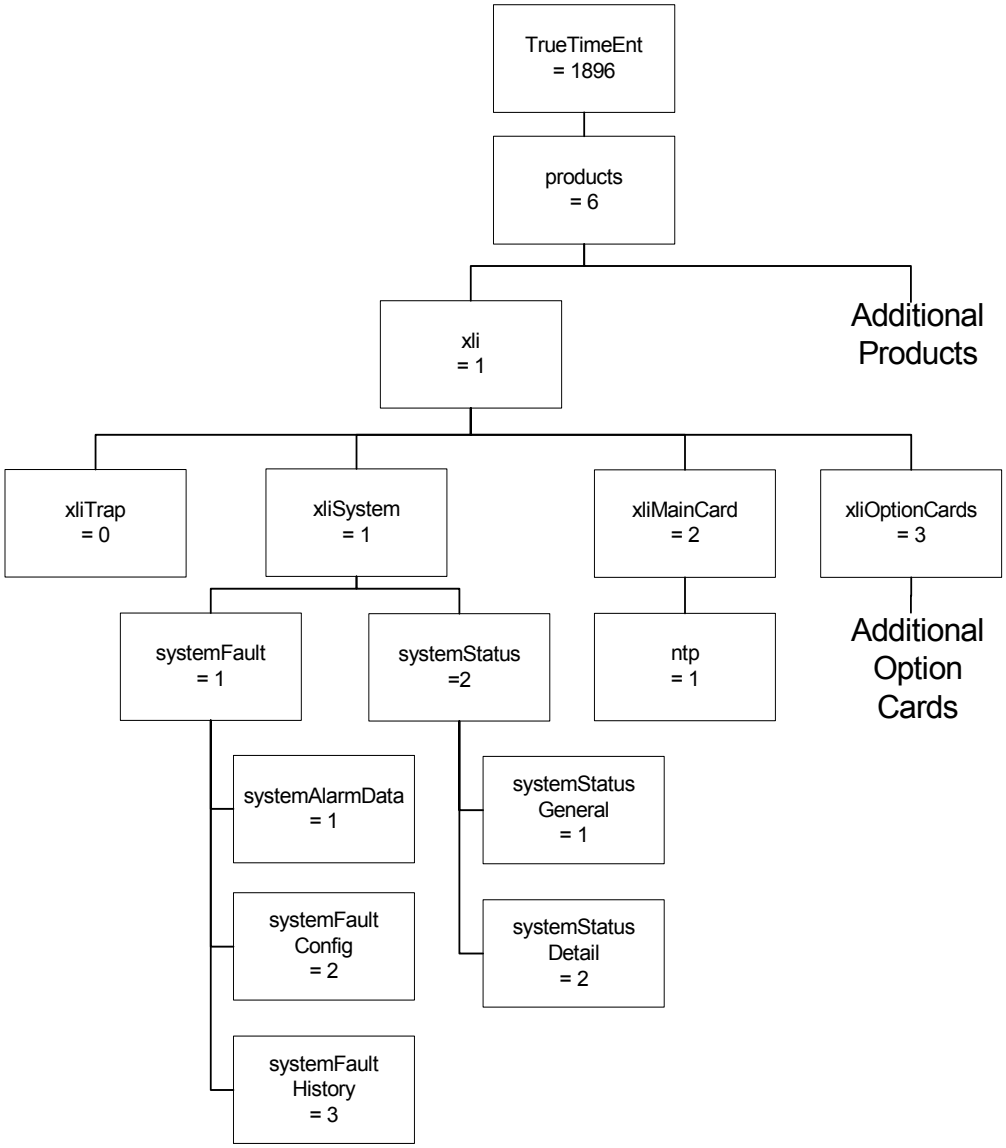
New Top Level Structure of Enterprise MIB for XL-GPS

The former address structure of Symmetricom's Enterprise MIB is as follows:

```
Symmetricom = 1896
TrapMsg = 1    ntp = 2    ntsControl = 3    gps = 4    acts = 5
```


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For the XL-GPS, groups 1, 2, 3, 4 and 5 have been deprecated and a new group 6, products, has been added. For the XL-GPS and future Symmetricom products, groups 1 through 5 will be absent from the XL-GPS Enterprise MIB definition supplied with the unit. The top structure for the XL-GPS is:



Note: For the figures in this chapter, substitute “xlgps” for “xli”.

The level under the *XL-GPS* group is divided into three groups; the first two of which will be explained later. The *optionCardGroup* has all the available option cards under it.

The current *traps* message group is located under the *fault*. The *ntp* group is under the *xlGpsMainCard* group as an option, and is related only to NTP on the standard network port on the XL-GPS’s Main CPU card.

This MIB structure also provides a useful definition for the system object ID. SNMP managers may use the system object ID to identify the class of object being accessed. With this structure, the system object

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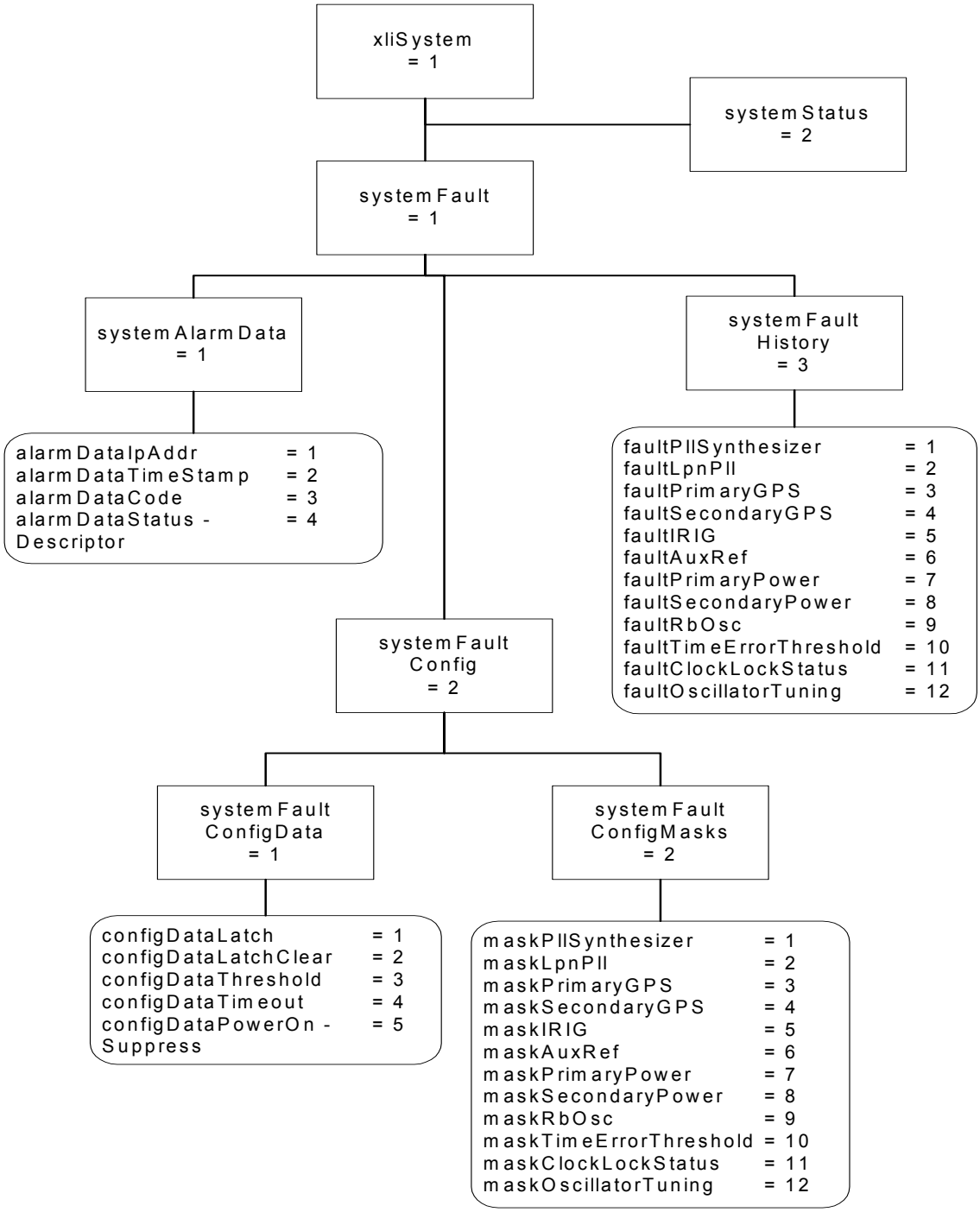
ID is defined as *Symmetricom.products.xlGps* for the XL-GPS product and *Symmetricom.products.xxx* for all subsequent products.

XL-GPS System Group

The *xlGpsSystem* system group contains the *systemFault* and the *systemStatus* groups. These groups contain information describing the operation of the XL-GPS system as a whole. The *systemFault* group contains information concerning system faults that have occurred, as well as configuration parameters for the generation of system alarms, called traps in SNMP, resulting from those faults. The *systemStatus* provides two different views of the operational system. The first is a general view specifying if the clock is operational. The second is a detailed view containing the current status of each system component. The *systemFault* and *systemStatus* groups are described below.

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The XL-GPS Fault Group



Note: For the figures in this chapter, substitute “xlgps” for “xli”.

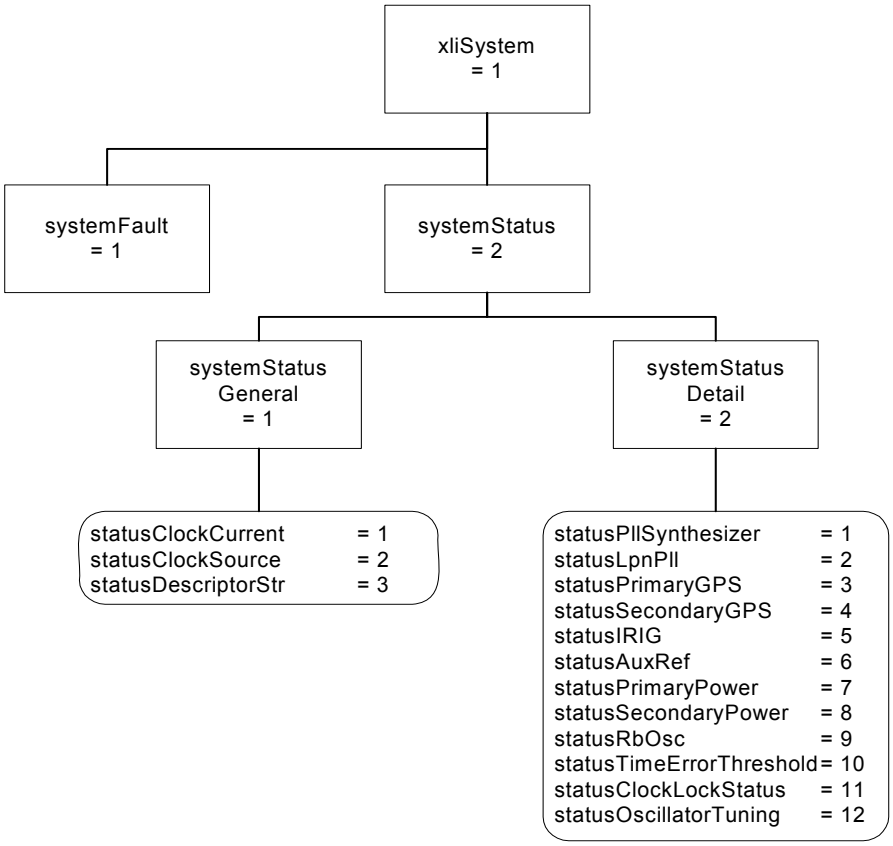
The XL-GPS *systemAlarmData* group defines SNMP traps and cannot be directly retrieved by the SNMP manager. When a system alarm event occurs an SNMP trap *alarmSystemNotification* is sent to the SNMP managers previously configured to receive traps. Included in the trap message are the variables contained in the *systemAlarmData* group: IP address, timestamp, alarm code, and the F73 status string.

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The *systemFaultConfig* sub-group contains parameters to control the generation of system alarms. The timeout, threshold and power on suppress values are contained in the *systemFaultConfigData* group. Also in this group is a method object *configDataLatchClear*. By setting this object the user clears all latched faults. Reading the *configDataLatchClear* object has no effect and its value is not defined. The *systemFaultConfigMasks* group contains masks for each possible system alarm event. When the status changes, for example if the primary GPS becomes unlocked, the associated mask is checked. Only if the mask is enabled will a system alarm be generated.

The *systemFaultHistory* group contains latched status indicators for each of the system alarm events. If a system alarm event goes into fault status, even if this status is transient, then the associated entry in the *systemFaultHistory* group will maintain a record of that fault occurrence until the latch is cleared, using the *configDataLatchClear* object, resetting all *systemFaultHistory* entries.

The XL-GPS System Status Group

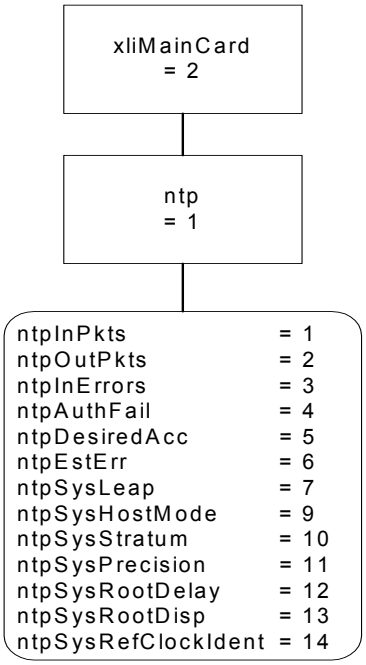


Note: For the figures in this chapter, substitute “xlgps” for “xli”.

The XL-GPS *systemStatus* group is used to provide a current operational view of the system. The *systemStatusGeneralGroup* gives on overview of the system status, including the status of the clock and the reference clock source. The *systemStatusGeneralGroup* also contains the *statusDescriptorStr* object that returns a text string identical to the output of the F73 command on the command line interface. The *systemStatusDetail* group contains objects describing the current status of each system object. See the graph above and refer to the xlGpsSystem-SMIv2.mib MIB for a complete description of each object.

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XL-GPS MainCard Group



Note: For the figures in this chapter, substitute “xlgps” for “xli”.

At present the *xlGpsMainCard* group contains only the NTP subgroup as shown above. Refer to the xlGpsMainCard-SMIv2.mib MIB definitions for a description of each of the NTP statistics.

XL-GPS Traps

The trap for the XL-GPS product are defined under Symmetricom.products.xlGps.xlGpsTrap. This is required to maintain compatibility with MIBS defined using the Structure of Management Information version 2 definitions.

The XL-GPS SNMP agent will send SNMP version 1 traps. This is done to maintain compatibility with SNMPv1 managers.

The trap presently defined is: alarmSystemNotification

The *alarmSystemNotification* trap is sent when the state of an object in the *systemStatusDetail* group changes and the corresponding mask object in the *configDataMasks* group is enabled.

Future Expansion

This section outlines the possibilities for future expansion of the Symmetricom Enterprise MIB. The general overview is that new objects may be added to any location. Existing objects may not be altered in order to maintain backward compatibility. There are two varieties of expansions to consider: additional products and additional features within an existing product.

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This model makes adding additional products and maintaining compatibility a straightforward process. Each additional product will be given a branch in the tree under enterprises.SymmetricomTtm.products. For now, we have only enterprises.SymmetricomTtm.products.xlGps and enterprises.SymmetricomTtm.products.nic56k.

Future products will take the form enterprises.SymmetricomTtm.products.product.XXX. Each product will use enterprises.SymmetricomTtm.products.product.XXX as its system object identifier. Each product will also define an enterprises.SymmetricomTtm.products.product.XXX.xxxTrap subgroup for the definition of all enterprise specific traps that can be generated by that product.

Making additions to the XL-GPS product MIB is also a straightforward task with several caveats. The first is that additions may be made but the object identifier and the semantics of existing objects may not be altered. A likely place for additions is under the *systemStatusDetail* group as addition system objects are defined.

Glossary of SNMP-Related Terms

Depreciation: In SNMP when an SNMP variable or group of variables is no longer recommended for use, they are listed as deprecated in the formal definition of the MIB. Users are often times still allowed to use this data, but the MIB's authors for one reason or another no longer recommend it.

Enterprise MIB: See Private Enterprise MIB.

IANA - Internet Assigned Number Authority: This is the group at IETF that is in charge of assigning Internet related numbers like Ethernet addresses, TCP/UDP port numbers and SNMP Private Enterprise MIB numbers.

IETF – Internet Engineering Task Force: The group responsible for standardizing numerous Internet communication protocols.

Management agent: An Internet connected remote host that accumulates the raw data that is entered into the MIB and Enterprise MIB for that host. This data is at some point transmitted to a Management station. In other network applications this would be called a network server of the SNMP protocol.

Management station: An Internet connected remote host that consumes SNMP data provided by a Management agent for the display of human network managers. In other network applications this would be called a client of the SNMP protocol.

MIB – Management Information Base: This is the data structure for the SNMP protocol. The current version of this standard, that is in general use, is MIB II defined by RFC's 1213 and 1212.

NTP – Network Time Protocol: A network time distribution protocol developed at the University of Delaware under the direction of Dr. Mills. NTP is a client / server based protocol where the server is the supplier of time and the client is the consumer of the time information.

Private Enterprise MIB: SNMP allows private organizations to define their own MIB extensions. The IANA of the IETF issues, for a fee, a unique number to an organization that is an address entry point from the MIB II into the private data for that organization. Only one Enterprise address is assigned to an organization. The Enterprise address for Symmetricom is 1896. This address space has grown to over

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12,000 private addresses and Symmetricom is by comparison one of the earlier adopters of SNMP with an Enterprise MIB!

RFC – Request for Comments: A document reviewed and released by the IANA that defines the formal definitions of various Internet communication protocols and related information.

SNMP – Simple Network Management Protocol: This Internet communications protocol is used for the status and control of remote network devices. Numerous IANA standards committees starting in 1990 and continuing to day define this protocol.

Trap or Trap Message: A packet issued from an SNMP Management agent to an SNMP Management station. The message is intended to relay and important even that occurred within the agent that requires attention or notification.

Configuring and Testing SNMP

This section outlines the procedure to perform verification tests on the SNMP component of the XL-GPS product.

Prerequisite: XL-GPS unit, PC with HP OpenView installed, located on the same subnet.

HP OpenView Configuration

Create the Network Map

1. Power on the XL-GPS unit.
2. Log on to the PC with HP OpenView installed as the “Administrator” user.
3. Start the HP OpenView Network Node Manager application.
4. Select the menu item Map->New
5. In the “Name” field, enter “xlGpsTestMap”
6. Click the <Next> button 3 times and the <Finish> button 1 time to complete the Map definition and open the Map.

Load the Symmetricom Enterprise MIBs

1. Select the menu item Options–>Load/Unload MIBs: SNMP. A dialog box titled “Load/Unload MIBs:SNMP” will pop up.
2. In the dialog box click the <Load> button to load the MIBS: symmetricomTtm-SMIv2.mib, xlGps-SMIv2.mib, xlGpsMainCard-SMIv2.mib, and xlGpsSystem-SMIv2.mib.
3. When xlGpsSystem-SMIv2.mib is loaded a dialog box with the title “Load Trap-Type/Notification-Type macro?” will appear. Click the <OK> button to add the trap definition into the OpenView event

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system. Click the <OK> button again to confirm the action.

4. Click the <Close> button to exit the “Load/Unload MIBs:SNMP” dialogue box.

Configure Traps

1. Select the menu item “OptionsEvent Configuration”. A pop window titled “Event Configuration” will appear.

2. In the “Event Configuration” window, scroll through the “Enterprises” list to the bottom and select “XL-GPS”.

3. In the “Events for Enterprise XL-GPS” select the “alarmSystemNotification” entry. Then select the menu item “Edit->Events->Modify…”. A popup titled “Modify Events” will appear.

4. In the “Modify Events” popup click the “Event Message” tab. Under “Actions” select the “Log and display in category”. In the “Event Log Message” field, enter “XL-GPS System Trap: $*”. Do not enter the quotation marks.

5. Select the menu item “Options->MIB Application Builder: SNMP”. A popup titled “MIB Application Builder: SNMP” will appear.

6. In the “MIB Application Builder: SNMP” popup select the menu item “Edit->New…” A popup titled “New MIB Application” will appear.

7. Enter “xlGpsStatus” in the “Application ID:” field and the “Application Title:” field. Leave “Application Type:” as “Form”. Click the “Next” button.

8. The title of the popup will now be “New Application Builder – Display Fields”. Click the “Add” button. A popup titled “New Application Builder / Add MIB Objects will appear”.

9. In the “New Application Builder / Add MIB Objects will appear” popup descend the MIB tree by clicking on the plus symbol next to the entries “iso -> org -> dod -> private -> enterprises -> symmetricomEnt -> products -> xlGps -> xlGpsSystem -> systemStatus -> systemStatusGeneral”. Select all items under “systemStatusGeneral”. Do this by clicking on the first item and then holding the “shift” key while clicking on the last item. Then click the “Add” button. Back up to “xlGps -> xlGpsSystem -> systemStatus -> systemStatusDetail”. Select all items under “systemStatusDetail” and then click the “Add” button. Then click the “Close” button.

10. In the “New Application Builder – Display Fields” popup click the “Next” button. In the “Menu Path” field enter “xlGps->Status”. Click the “Finish” button.

11. Repeat steps 6 – 10 using the “Application ID:” of xlGpsConfig selecting all items under “iso -> org -> dod -> private -> enterprises -> symmetricomTtm -> products -> xlGps -> xlGpsSystem -> systemFault -> systemFaultConfig” and using the “Menu Path” of “xlGps->Configuration”.

12. Repeat steps 6 – 10 using the “Application ID:” of xlGpsFault selecting all items under ““iso -> org -> dod -> private -> enterprises -> symmetricomTtm -> products -> xlGps -> xlGpsSystem -> systemFault -> systemFaultHistory” and using the “Menu Path” of “xlGps->Fault History”.

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Additional OpenView configuration

1. Select the menu item “Options->SNMP Configuration”. A popup titled “SNMP Configuration” will appear.

2. In the “SNMP Configuration” popup: set the “Community” field to “public” the “Set Community” field to “private” and the “Retries” field to 0.

XL-GPS Configuration

SNMP Configuration

Follow the manual to load the snmp.conf configuration file into the XL-GPS. The IP address of the HP OpenView PC must be in both the public and private communities.

Test Procedure

Testing “Get”

1. From the Network Node Manager root level double click the icon “Internet”. Select the icon corresponding to your test subnet, e.g. “192.168.11”, and double click. Double click the “Segment1” icon.

2. Select the icon labeled “NIC” by single clicking with the mouse.

3. Select the menu item “xlGps->Status”, “xlGps->Configuration”, then “xlGps->Faults”. Verify the values by comparing with the output of the keypad display.

Testing “Set”

1. Follow “Get Testing” procedure steps 1-2.

2. Select the menu item “Tools->SNMP MIB Browser”. A popup titled “Browse MIB” will appear.

3. In the “Browse MIB” popup descend the MIB tree to “iso -> org -> dod -> private -> enterprises -> symmetricomTtm -> products -> xlGps -> xlGpsSystem -> systemFault -> systemFaultConfig -> systemFaultConfigMasks” by clicking the “+” symbol next to each entry.

4. In the “Browse MIB” popup select the “maskPllSynthesizer” entry. In the “MIB Instance” field type 0. In the “SNMP set value” field type 1. Click the “Set” button.

5. Verify that a popup appears saying “Set has completed successfully”.

6. Select the menu item “xlGps->Configuration”. In the popup “xlGpsconfig” verify that the “maskPllSynthesizer” entry is set to “disabled”.

7. In the “Browse MIB” popup select the “maskPllSynthesizer” entry. In the “MIB Instance” field type 0. In the “SNMP set value” field type 2. Click the “Set” button.

8. Verify that a popup appears saying “Set has completed successfully”.

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9. Select the menu item “xlGps->Configuration”. In the popup “xlGpsconfig” verify that the “maskPll-Synthesizer” entry is set to “enabled”.

10. Repeat steps 4-9 in turn for each additional entry under systemFaultConfigMasks.

Trap Testing

1. 1. Perform an action to generate a trap.

2. 2. Select the menu item “Fault->Alarms”.

3. 3. Verify in the “All Alarms” popup that there is an entry of the form:

```
Normal  Thu Mar 21: 14:30.09 192.168.11.218 XL-GPS system trap:
[1] private.enterprises.symmetricomTtm.products.xlGps.alarmDataIpAddr.0 (IpAddress)
192.168.11.218
[2] private.enterprises.symmetricomTtm.products.xlGps.alarmDataTimeStamp.0
(OctetString): HH:MM:Ss UTC
[3] private.enterprises.symmetricomTtm.products.xlGps.alarmDataCode.0 (Integer):
alarmPrimaryPower
[4] private.enterprises.symmetricomTtm.products.xlGps.alarmDataDescriptorStr.0
(OctetString): F73 S LP LL----PSR---
```


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D: Network Time Protocol (NTP)

As an option, Symmetricom can factory configure the XL-GPS to function as a Stratum 1 network time server. Network time servers use Network Time Protocol (NTP) to synchronize computer clocks across a network. Alternatively, customers can upgrade a XL-GPS unit in the field by purchasing the NTS option and installing a key to enable it.

Support for version 4.0 of the NTP, RFC 1305 as well as the Simple Network Time Protocol (SNTP), RFC2030 is available. In addition, the XL-GPS responds to TIME protocol requests, RFC868.

The Network Time Server responds to time synchronization requests from hosts using these User Datagram Protocol/Internet Protocols (UDP/IP):

Type/Protocol	Port Number	RFC
NTP ver. 4.0:	UDP Port 123	RFC1305
SNTP:	UDP Port 123	RFC2030
TIME:	UDP Port 37	RFC868

NTP Packet Transmitted Timestamp Accuracy ±10 milliseconds.

Editing ntp.conf

Note: The XL-GPS is a Stratum 1 NTP server. Therefore, it does not support NTP peering, in which a time server gets time information by sending an NTP query to another time server. Entering valid IP addresses for the 'server' parameters (e.g., "`server 216.210.169.40`") in ntp.conf does not enable peering in the XL-GPS.

The current text of "ntp.conf" is as follows:

```
# X L - G P S   N T P . C O N F
# Load this version into the XL-GPS NTP Server for NTP MD5 and NTP broadcast
#
# The line below to enables NTP broadcast mode using MD5 key 1.
broadcast     192.168.47.255     key 1

# Trust and accept NTP packets using MD5 keys 1 or 2.
# The MD5 keys and key ID specified in the XL-GPS's NTP.KEYS file must match the
# same ones in the UNIX/Linux client NTP.KEYS file.  The same keys for both
# units must be specified as trusted by the line below.
trustedkey     1     2
```


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Editing MD5 keys on the XL-GPS

NTP keys are needed if you are using NTP in broadcast mode with MD5 authentication. This (and the following) section provide configuration guidelines. For additional information, consult Dr. Mills NTP site at: http://www.ntp.org

Broadcast mode adjusts its periodicity according to feedback from its broadcast client. The periodicity will typically settle-out to about every 2 minutes. This activity is not adjustable.

MD5 private keys have to be edited on both the NTP server and the NTP client. The private keys are defined in the “ntp.keys” file.

The NTP client “ntp.keys” file is identical to the one on the NTP server. For the specific keys used by the NTP server, the NTP client must have the identical line in its version of the file. You’ll want to use your own hard-to-guess key names, using random letters. The critical lines of the “ntp.keys” file are:

```
1     M   symmetricom
2     M   TTXL-GPS
```

where:

- “1” and “2” are the key identifiers
- “M” specifies MD5 authentication, the only type available
- “symmetricom” and “TTXL-GPS” are the arbitrarily chosen keys

The first column is the key identification number, which may range in whole positive numbers from 1 to 65,535. The second column is the type of key, which is always set to the letter *M* when using MD5 authentication. The third column is the private key that is ASCII text from 1 to 32 characters in length.

Up to eight MD5 can be established.

Editing MD5 keys on the NTP Client

For NTP client authentication, the line `trustedkey 1 2` in the “ntp.conf” file is required to enable the private keys 1 and 2 from the “ntp.keys” file. The line `bclient` is required for broadcast time packets to be processed by the NTP client. In this case, sample information from a client “ntp.conf” file might look like:

```
trustedkey      1      2
bclient
```

Network Time Protocol (NTP) does not permit comments in the ntp.keys files. Inserting comments will prevent the ntp.keys files from being parsed correctly and turns off authentication at initialization.

Sample information in a client “ntp.keys” file might look like:

```
      1     M     symmetricom
```


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```
      2     M     TTXL-GPS
```

When you invoke the NTP client at the command line, use the following options:

- `b`
to turn on broadcast reception

- `k /etc/ntp.keys`
to specify the name and location of the keys file

- `d`
for debugging.

An example command line might look like:

```
ntpd -d -d -d -b  -k /etc/ntp.keys
```

Important lines in the ntp.conf file of the ntp ***client*** (not server) are:

```
trusted key     1     2
```

If you do not use MD5 authentication, remove # from “#disable auth”.

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E: Time Code Formats

The following section provides a summary description of the three time code types used by the XL-GPS. The definitive IRIG time code specification, the Range Commanders Council's IRIG Serial Time Code Formats, IRIG Standard 200-98, is available on the Web at http://jcs.mil/RCC/manuals/200/

Overview

Please refer to the Input and Output specifications in the front of the manual for details regarding the voltage amplitudes / modulation ratios of the following time codes provided or used by the Model XL-GPS.

IRIG

Introduction

The document 200 95 "IRIG STANDARD TIME FORMATS" by the Telecommunications Working Group, Inter range Instrumentation Group, Range Commanders Council describes IRIG-B time code.

The standard time formats of IRIG codes were designed for use in missile, satellite and space research programs. Use of these codes facilitates efficient interchange of test data. These formats are suitable for recording on magnetic tape, oscillographs, film and for real time transmission in both automatic and manual data reduction. IRIG-B from the Model XL-GPS is suitable for remote display driving, magnetic tape recording and many other uses. IRIG codes, in the strict sense, encode Universal Coordinated Time (UTC) in 24 hour format and not local time. Nonetheless, this instrument can encode UTC or local time in either 24 or 12 hour formats.

IRIG Code Format

Reference "IRIG Standard Format A" on page 140. The level shifted, pulse width modulated, serial formats of IRIG-B are divided into three segments. The first segment encodes time of year in binary coded decimal (BCD) notation. The second segment encodes control functions. This segment is generally available for data of the user's choice. In the IRIG-B code output of Model XL-GPS, this segment encodes worst case time error flags as explained below. The third segment sometimes encodes time of day in straight binary seconds (SBS) notation. Both IRIG-B encodes SBS on the Model XL-GPS.

The three code segments are contained within one "frame". The frame length for IRIG-B is 1 second long and contains 100 "elements" (pulses) each of which start every 10 milliseconds.

An element may represent either a binary zero, a binary one, a reference marker or a position identifier. A zero is 0.2 of the duration of an element, a one is 0.5 of the duration of an element and a position identifier or reference marker is 0.8 of the duration of an element. A reference marker locates the

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beginning of each frame and a position identifier marks the end of every ten elements. IRIG-B has ten position identifiers per frame.

The elements prior to position identifier P5 comprise the time of year segment. The first ten elements encode the seconds, the second ten elements encode the minutes and so on through days. Each element is a digit in a binary number with a place value sequence 1 2 4 8.

IRIG-B Time Quality Flags

Five flags are encoded in the control function segment of the IRIG-B code. The first flag encoded at element P5+40ms is the LOCK indicator. It is a binary 1 when the XL-GPS is not locked to a reference. The second flag encoded at element P5+60ms is a binary 1 when the worst case time error exceeds threshold 1 (refer to "Function 5 -- Time Quality Enable/Setup"). Element P5+70ms is a binary 1 when the worst case time error exceeds threshold 2. Element P5+80ms encodes a binary 1 when the error exceeds threshold 3 and P5+90ms when the error exceeds threshold 4.

Output

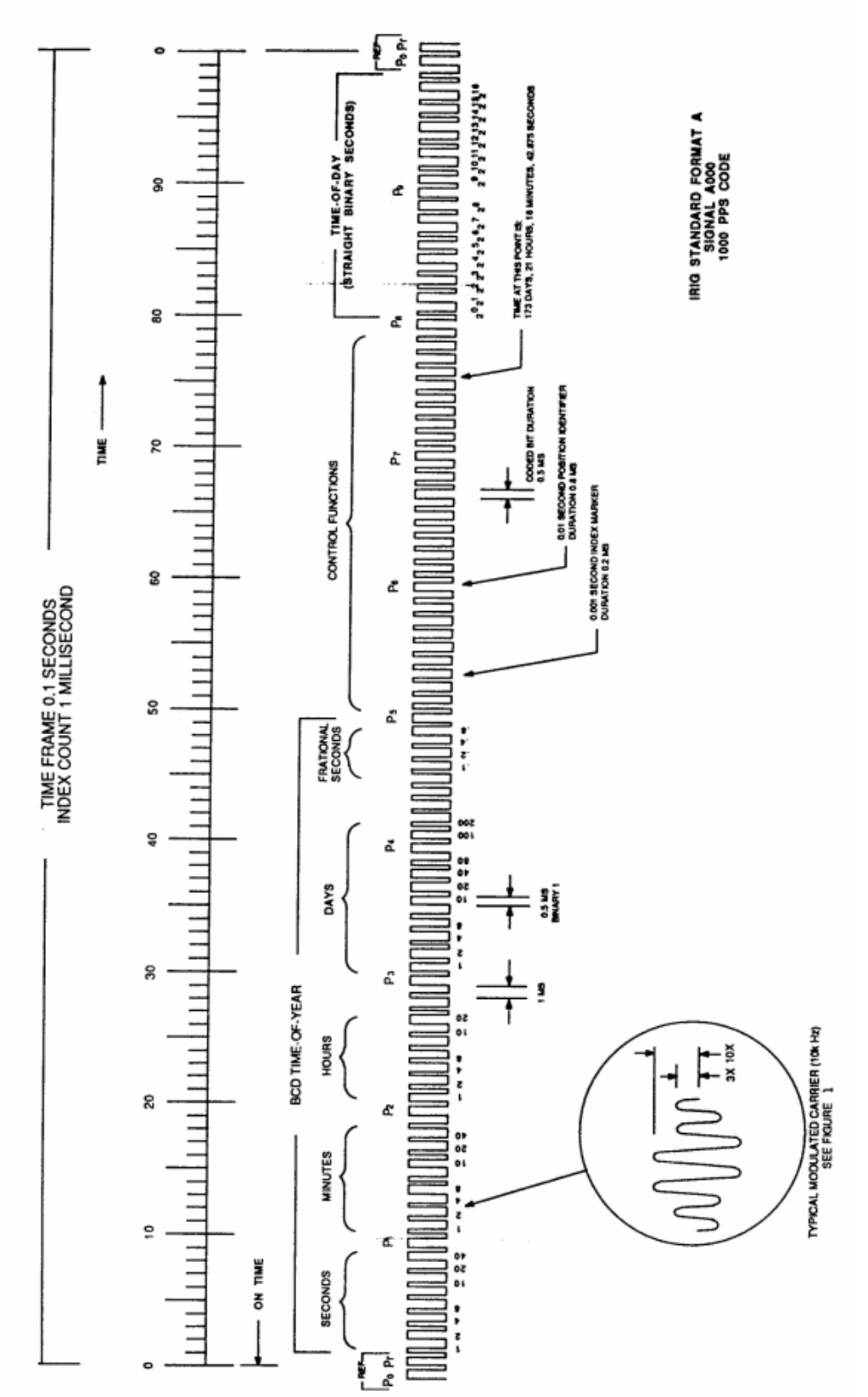
The XL-GPS provides the following IRIG time code outputs (refer to IRIG Standard 200-95):

IRIG-B: B120 1 kHz sine wave amplitude modulated with BCD, CF, SBS

B000 DC level shift, width coded with BCD, CF, SBS

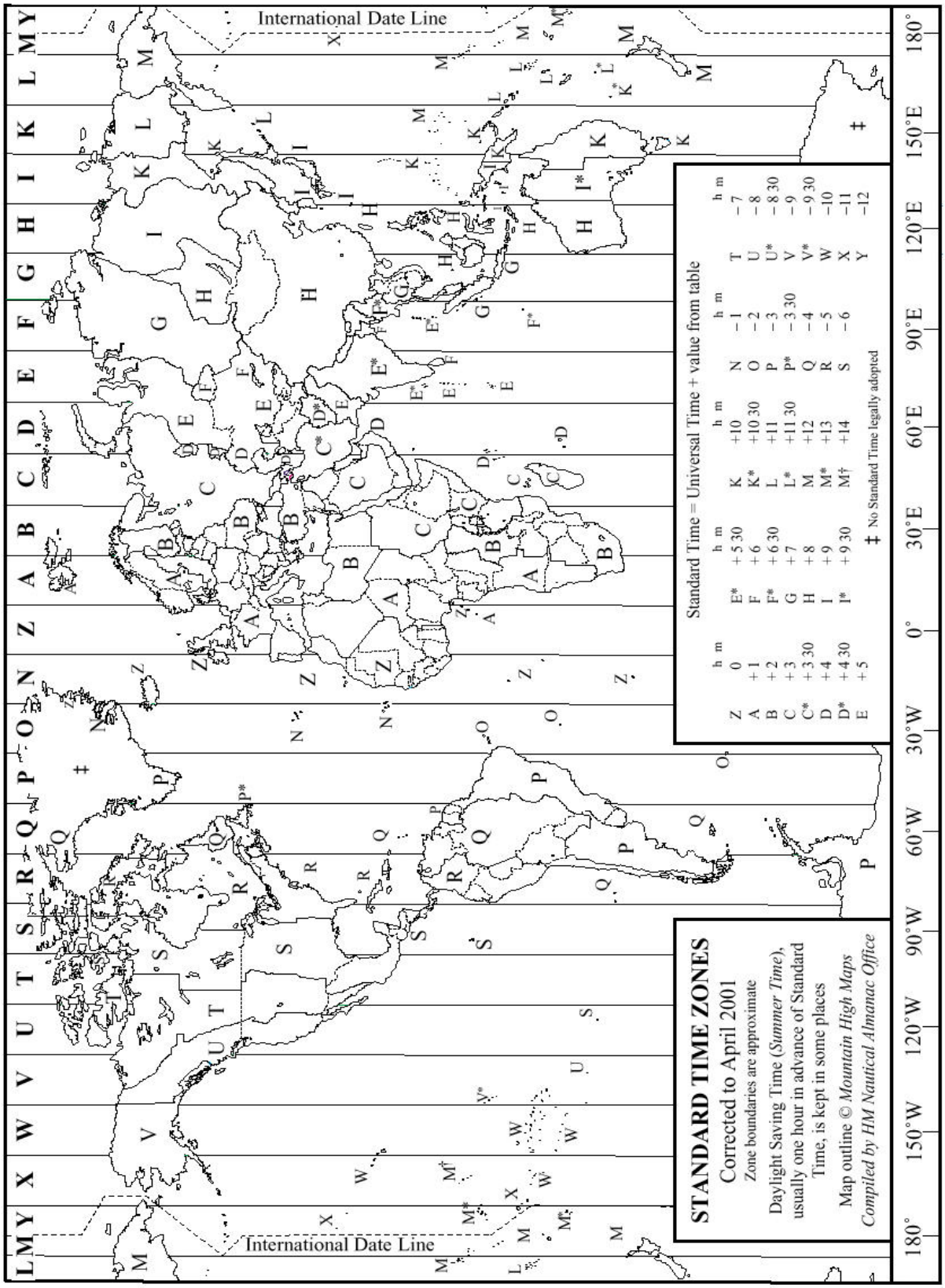
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Figure 4: IRIG Standard Format A



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F: World Map of Time Zones:



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G: Part Names

Standard Chassis

- Model XL-GPS 1UChassis w. Main CPU Card

Software-Key Enabled Options

- Network Time Protocol on Standard Network Port
- Time Interval - Event Time (TIET) on Main CPU Card's J1 connector
- Programmable Pulse Output (PPO) on Main CPU Card's J2 connector
- Frequency Measurement (Freq Meas) on Main CPU Card's J3 connector

Options

- Expansion Module
- Alarm Relay
  (must be used in conjunction with the expansion module)
- OCXO Oscillator

Rack Mount Kit

- 2 mounting brackets for 1 U chassis
- 4 flat-head Phillips screws

Slide Mount Kit

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