



TimeGPS Rubidium

USER GUIDE

Manual P/N: **60500002**

Doc. No.: 001758AB

Published: June 2004

. . . applicable for **TimeGPS Rubidium** **P/N 84101xxx**

TimeGPS Terminal **P/N 84109012**

Symmetricom®

DISCLAIMER

Symmetricom GmbH provides this manual “as is” without warranty of any kind, either expressed or implied, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. Symmetricom GmbH may make improvements and/or change in the product(s) and or the program(s) described in this manual at any time and without notice.

This publication could contain technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of this publication.

A Reader's Comment Form is provided at the back of this publication. If this form has been removed, address comments to the Service department of Symmetricom GmbH (address shown on the back cover).

Symmetricom may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligations whatever.

WARRANTY

Symmetricom GmbH warrants for one year after delivery to the original purchaser of any product manufactured by Symmetricom GmbH, that same shall be free of defects in material and workmanship. Obligation under this warranty shall be limited to repair or replacement, at Symmetricom GmbH's discretion, of any product or part thereof which has been returned by the original purchaser with transportation prepaid, and upon examination by Symmetricom GmbH, is found to be defective. Symmetricom GmbH assumes no responsibility for loss or damage to equipment being returned for repair or replacement under the terms of this warranty.

For this warranty to be effective, the purchaser agrees that the equipment will be properly installed and maintained. Equipment which, upon examination by Symmetricom GmbH, requires repair or replacement of parts thereof as a result of improper installation, misuse, unauthorized alterations or repairs, or user negligence, such repairs or replacement of parts thereof will be made at cost.

Symmetricom GmbH makes no representation or warranty of any kind, either expressed or implied, with respect to equipment operation and procedures. Any action that the user may take in reliance upon the operation or accuracy of this equipment shall be taken solely upon the user's own responsibility and risk.

Symmetricom GmbH shall not be liable for consequential damages to purchaser, user, or any others resulting from the possession or use of this equipment.

Prior to return of a product under terms of this warranty, Symmetricom GmbH is to be notified. Notification is to include the model number and serial number of the product and full details of the problem.

PROPRIETARY RIGHTS

The information and/or drawings set forth in this document and all rights in and to inventions disclosed herein which might be granted thereon disclosing or employing the materials, methods, techniques or apparatus described herein, are the exclusive property of Symmetricom GmbH.

COPYRIGHT NOTICE

TRADEMARK NOTICE

All other marks are the property of their respective owners.

CHANGE RECORD

Revision	Issued	Para.	Subject of Change	Remarks
AA	12/2003	All	First Release	
AB	06/2004	All	GPS LC re-named into TimeGPS	

(This page is intentionally left blank)

TABLE OF CONTENTS

1. How to Use This Manual 5
1.1. Purpose of this Document 5
1.2. Structure of this Document 5
1.3. Who Should Read This Document 6
1.4. Related Documentation 6
1.5. Conventions 6
1.5.1. Acronyms and Abbreviations 6
1.5.2. Typographical Conventions 6
1.5.3. Warnings, Cautions, Recommendations and Notes 6
1.6. Where to Find Answers to Product and Document Questions 8

2. Product Description and Functions 9
2.1. Brief Product Description 9
2.2. Product Architecture 10
2.3. Applications for the TimeGPS 10
2.4. Product Views 11
2.5. Features Overview 12
2.6. Product Functions 13
2.6.1. System Power-Up 13
2.6.2. Geographical Position Determination 13
2.6.3. GPS Reference Determination 13
2.6.4. Oscillator Synchronization 14
2.6.5. Holdover 14
2.6.6. Status Indication 14
2.6.7. Service Functionality 15
2.6.8. Configuration Overview 15
2.7. Technical Data 16
2.8. Performance 19
2.8.1. Timing Accuracy 19
2.8.2. Holdover Performance 20
2.9. EC-Declaration of Conformity 21

3. Unpacking and Inspection 23
3.1. Unpacking 23
3.2. Inspection 23

4. Installation and Configuration 25
4.1. Installation of the GPS Antenna and Associated Parts 25
4.1.1. Antenna Cable Length Determination 25
4.1.2. GPS Antenna / Cable Type Selection 25
4.1.3. GPS Antenna 26
4.1.4. Antenna Cable Routing 27
4.1.5. Lightning Protection 28
4.2. Installation of the TimeGPS 29
4.2.1. Location for the TimeGPS 29
4.2.2. Pinning of the TimeGPS Connectors 29
4.2.3. TimeGPS 31
4.3. Configuration of the TimeGPS 32
4.3.1. Configuration Set-Up 32
4.3.2. Time Scale 33
4.3.3. Holdover Behaviour 34
4.3.4. Alarm Indication 36
4.3.5. Squelch of the Frequency Outputs 38
4.3.6. Framer Option 40
4.3.7. 1 PPS Offset 42
4.3.8. Reset to Factory Defaults 43
4.4. Re-Installation of the TimeGPS 44

5. Operation 45
5.1. Acclimatization 45
5.2. Power Up 46
5.2.1. First Start-Up after Supplier Delivery 46
5.2.2. Start-Up after Power Interrupts 47
5.3. User Control 47
5.4. Remote Monitoring 48

6. Functional Check 49
6.1. Required Equipment 49
6.2. Quick Test 49
6.3. Extended Test 50
6.3.1. Start-Up Sequence 50
6.3.2. Output Signal 50
6.3.3. Framer Performance 50

7. Maintenance and Troubleshooting 51
7.1. Cleaning 51
7.2. Preventive Maintenance 51
7.3. Troubleshooting and Fault Isolation 52
7.3.1. Query of the Status 52
7.3.2. Abnormal Alarm/Status Indication 53
7.3.3. Incorrect Output Signals 56
7.4. Return Procedure 56
7.5. Repacking 56

A. Procurement Information 57
A.1. TimeGPS Derivatives 57
A.2. Accessories 57

B. Factory Settings 59
B.1. GPS Timeout 1 and 2 59
B.2. Time Scale 59
B.3. 1 PPS Offset 59
B.4. Automatic Mode for the RS232 Communication 59
B.5. Event Allocation 60
B.6. Framer Functionality 60

C. Status Messages 61

D. TimeGPS Terminal 63
D.1. Host Environment 63
D.2. Installation of the Software 63
D.3. De-Installation of the Software 63
D.4. Start of the Program 64
D.5. Brief Description of the Program Functionality 64

E. RS 232 Interface 67
E.1. Parameter Settings of the RS 232 Interface 67
E.2. Communication Protocol 67
E.3. Command Syntax 67
E.4. Command Overview 68
E.5. Command Description 70

Glossary ..... Glossary – 1

(This page is intentionally left blank)

1. How to Use This Manual

1.1. Purpose of this Document

This User Guide provides necessary information for installation, configuration and operation of the unit. Furthermore it contains maintenance procedures, troubleshooting instructions and procurement information.

Additionally it provides a brief introduction into the TimeGPS Terminal, a Windows-based management software to support configuration and trouble shooting for the TimeGPS.

1.2. Structure of this Document

This document contains the following sections and appendixes:

Chapter	Title of the Chapter	Description
1	**How to Use This Manual**	Contains a general overview of this document, the intended audience, the conventions used, and lists related documents available for the user.
2	**Product Description and Functions**	Provides an overview of the product, describes the major functions, and lists the technical data including the EC-Declaration of Performance.
3	**Unpacking and Inspection**	Contains procedures for unpacking and inspecting the unit.
4	**Installation and Configuration**	Contains instructions for installing and configuring the unit.
5	**Operation**	Describes the power-up sequence and provides procedures for operating the equipment.
6	**Functional Check**	Provides checklist-based functional tests that could be performed to check that the equipment is ready for normal operation.
7	**Maintenance and Troubleshooting**	Contains cleaning and maintenance procedures including troubleshooting instructions for fault isolation.
A	**Procurement Information**	Lists necessary procurement information to purchase equipment and accessory parts associated to the TimeGPS.
B	**Factory Settings**	Provides the factory defaults for the TimeGPS derivatives. (not for OEM versions)
C	**Status Messages**	Describes the meaning of the status messages provides by the TimeGPS via the history message function.
D	**TimeGPS Terminal**	Consists of a brief description of the TimeGPS Terminal including installation instructions for this software.
E	**RS 232 Interface**	Describes the RS 232 communication with the TimeGPS by means of a commercially available terminal software. It includes interface parameter settings, the syntax, as well as a detailed description of all commands.

1.3. Who Should Read This Document

This publication is written for technical audiences. It describes instructions for installation, configuration, operation and maintenance as well as technical details primarily intended for qualified technical personnel.

The sections `Brief Product Description` and `TimeGPS Applications` are written for non-technical audiences who need information about the product.

1.4. Related Documentation

Further documents related to the product described herein which are published at time of issue of this document are listed below. See our web-site www.symmetricom.com for a complete list of actual documentation.

Part Number	Document Number	Title
60500012	001023xx	Installation Instructions for GPS Antenna Sets

1.5. Conventions

1.5.1. Acronyms and Abbreviations

Terms are spelled out the first time they appear in text. Thereafter, the acronym or abbreviation is used. In addition, the glossary defines the acronyms and abbreviations.

For convenience the well known terms “E1” and “DS1” are used instead of “E12” and “E11” which are the actual terms according G.703 issue 11/2001.

1.5.2. Typographical Conventions

When text appears this way...	... it means:
`Installation`	The title of a document or the title of a chapter
GPS sync	The name of a signal, …
... not …	A word or term being emphasized.
Caution...	A word or term given special emphasis.

1.5.3. Warnings, Cautions, Recommendations and Notes

Warnings, Cautions, Recommendations and Notes attract attention to essential or critical information in this document. The types of information in each are explained in the following:

Warning

To avoid serious personal injury or death, do not disregard warnings. All warnings use this symbol. Warnings are installation, operation, or maintenance procedures, practices, or statements, that if not strictly observed, may result in serious personal injury or even death.

Caution

To avoid personal injury, do not disregard cautions. All cautions use this symbol. Cautions are installation, operation, or maintenance procedures, practices, conditions, or statements, that if not strictly observed, may result in damage to, or destruction of, the equipment. Cautions are also used to indicate a long-term health hazard.

ESD Caution

To avoid personal injury and electrostatic discharge (ESD) damage to equipment, do not disregard ESD cautions. All ESD cautions use this symbol. ESD cautions are installation, operation, or maintenance procedures, practices, conditions, or statements that if not strictly observed, may result in possible personal injury, electrostatic discharge damage to, or destruction of, static sensitive components of the equipment.

Electrical Shock Caution

To avoid electrical shock and possible personal injury, do not disregard electrical shock cautions. All electrical shock cautions use this symbol. Electrical shock cautions are practices, procedures, or statements, that if not strictly observed, may result in possible personal injury, electrical shock damage to, or destruction of components of the equipment.

Recommendation

All recommendations use this symbol. Recommendations indicate manufacturer-tested methods or known functionality. Recommendations contain installation, operation, or maintenance procedures, practices, conditions, or statements, that provide important information for optimum performance results.

Note

All notes use this symbol. Notes contain installation, operation, or maintenance procedures, practices, conditions, or statements, that alert you to important information, which may make your task easier or increase your understanding.

1.6. Where to Find Answers to Product and Document Questions

For additional information about the products described in this guide, please contact your Symmetricom representative or our service office.

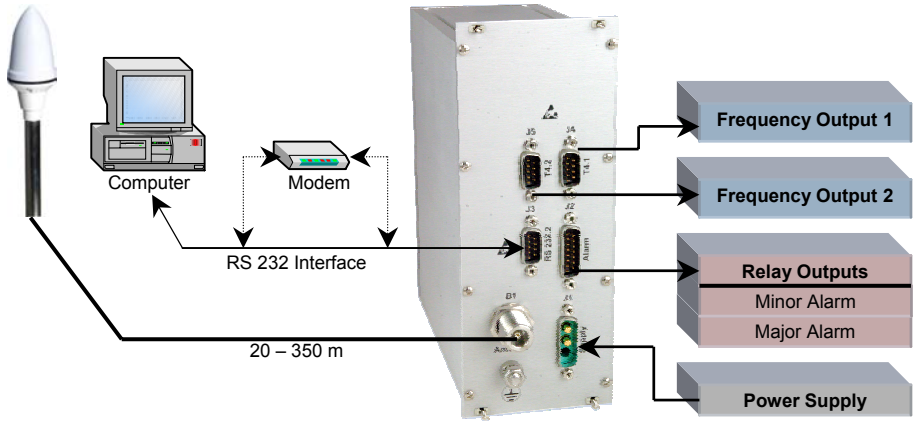
We appreciate your suggestions of ways to improve any part of this guide. Please make your suggestions on a copy of the concerned page and send it to our service office.

2. Product Description and Functions

This chapter provides an overall description of the product including typical applications and the functional behavior. Illustrations of the front and back view of the unit and the section `Technical Data` serve as the main reference for other chapters with technical content (e.g. troubleshooting).

Additionally this chapter contains the `EC-Declaration of Conformity`.

2.1. Brief Product Description



The ***TimeGPS Rubidium*** (hereafter called TimeGPS) is a rubidium oscillator based and GPS controlled standalone stratum 1 Primary Reference Source (PRS). It consists of a X72 rubidium oscillator, Symmetricom's latest rubidium technology. The system receives the satellite signals at any place on earth and uses special algorithms – based on the outstanding experience of Symmetricom over the last 30 years – to control an oscillator. Evaluating the accurate GPS timing information the TimeGPS provides three high performance output signals which comply with G.811. The rubidium oscillator maintains the accuracy even without GPS (holdover).

Easy handling, quick installation and the fact that the equipment requires no maintenance during operation are further key benefits of the product. The equipment will allow the installation of the GPS antenna up to 350 m away from the unit by using a coax cable.

The TimeGPS features a monitoring system indicating the system status via LEDs, alarm relays and RS 232 interface. This will allow the user to establish a two-level warning system for the holdover condition in order to avoid nuisance alarms and to reduce network downtime. There will be enough time for the service personal to react if an abnormal operation occurs. As the unit provides two RS 232 interfaces – both are supporting the full set of commands – remote and local management activities can be performed independently. While the first RS232 interface located at the rear panel is intended for monitoring, the second one – located at the front panel – is primarily designed to be used for local configuration and service purposes.

A separate frequency output port at the front panel allows frequency verification testing. It can also be used as an additional output for clock distribution.

Furthermore the TimeGPS provides a number of configuration features allowing the user to integrate the equipment into his specific application environment. The user will be able to selectively allocate specific events (e. g. certain failures, GPS timeouts, . . .) to the warning levels 'Minor Alarm' and 'Major Alarm'. Additionally the user can configure the squelch behaviour of the outputs if such an event occurs. To support this configuration tasks and service actions the unit comes with a Windows based LMT software.

Framer Option

For TimeGPS with the framer option one output is designated to provide a framed signal of the of the chosen frequency.

1 PPS Option

For TimeGPS with the 1 PPS option one output is designated to provide a 1 PPS signal.

2.2. Product Architecture

The TimeGPS consists of the following main functional modules:

- 12-channel single-satellite-locking GPS engine
- Micro-controller including memory and peripherals
- Rubidium oscillator
- Phase measurement, frequency control and signal generation
- Status outputs and Framing circuitries

2.3. Applications for the TimeGPS

The TimeGPS Rubidium is the high end solution of Symmetricom's low cost TimeGPS product line for synchronization in wire-line and wireless applications.

Primarily the TimeGPS Rubidium will be used as a PRS in networks where an inexpensive secondary clock is required. Additionally it can be used as a GPS front-end for SSUs with up to three clock outputs and it is ideal for synchronization of small offices with network elements.

2.4. Product Views

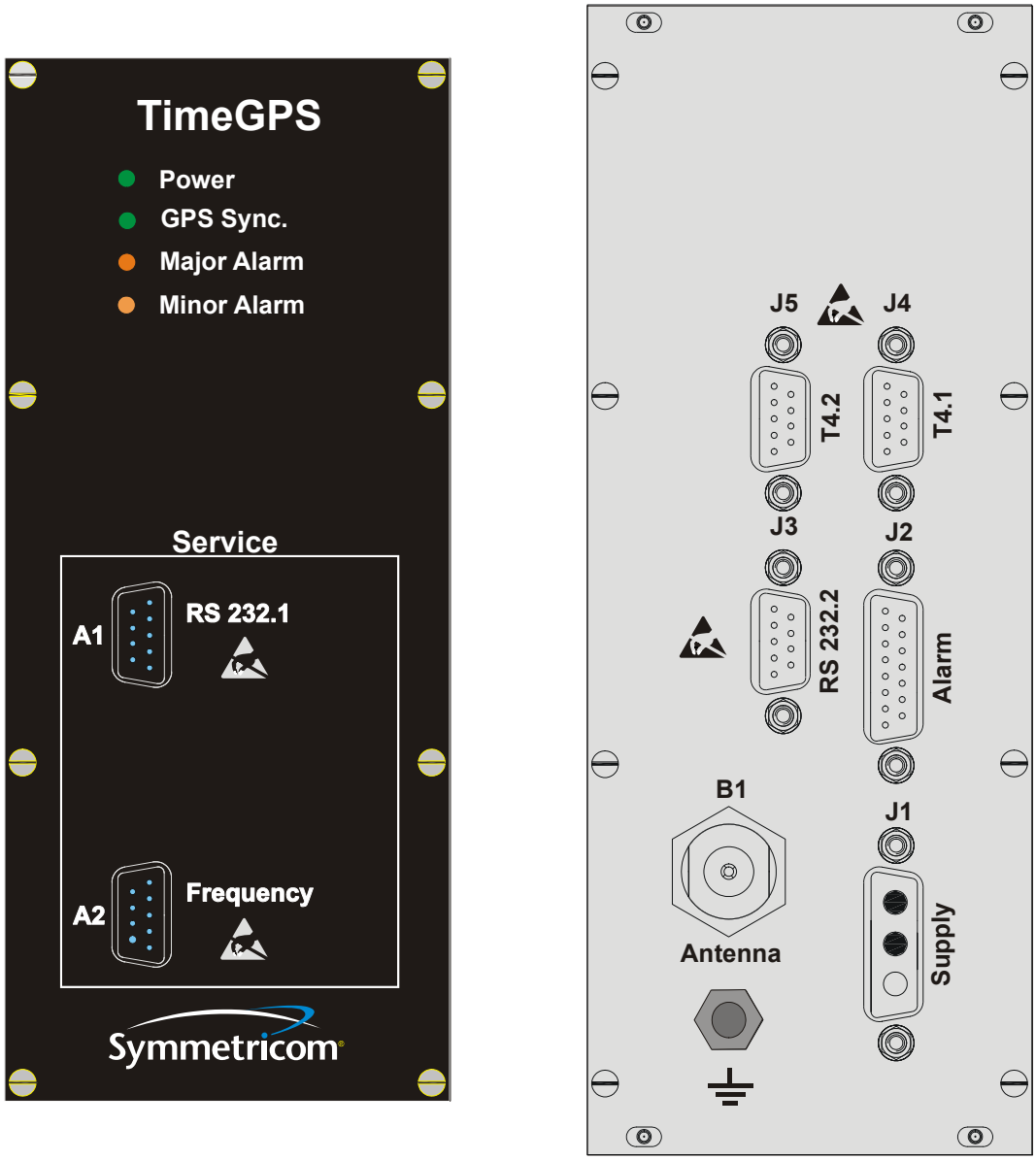


Figure 2–1: Front and Rear Panel

2.5. Features Overview

Feature	Output Version of the TimeGPS Rubidium			Remarks
	Frequency	Framer	1 PPS	
Signal Interfaces				
Clock output	3 x 2048 kHz 3 x 1544 kHz 3 x 10 MHz 3 x 5 MHz	2 x 2048 kHz 2 x 1544 kHz	2 x 2048 kHz 2 x 1544 kHz 2 x 10 MHz 2 x 5 MHz	Based on the chosen frequency
Framed output	---	1 x E1 2048 kbps 1 x DS1 1544 kbps	---	Based on the chosen frequency
1 PPS output	---	---	1	
Communication Interfaces				
RS232 interface	2			One primarily assigned for monitoring purposed, the other for service purposes
Ethernet interface	---			
Signal Performance				
Frequency Accuracy	$< 1 \times 10^{-12}$			Locked to GPS (24 h) @ 25°C
	$< 1.2 \times 10^{-11}$ / day			Holdover
Internal Time Base	X72 rubidium oscillator			
Indications				
LED Indication	Power, GPS Sync, Minor Alarm, Major Alarm			
Display (Screen)	---			
Relay Status Outputs	Minor Alarm and Major Alarm			
Warning System	2 levels (Minor and Major Alarm)			Via LED, Relay, RS232
Further Status indication	Status messages (ASCII) Occurred events (bit-coded)			Via RS232
Configuration Features				
Adaptation of warning system to customer needs	Yes, by allocation of events to the alarm levels by configuration of two holdover duration marks			
Adaptation of the system to customer needs	Yes by allocation of events to the squelch functionality of the outputs			
Output Squelch	configurable			
Time base	GPS or UTC			
Framer Performance				
Line Code	---	E1: HDB3 DS1: B8ZS or AMI	---	
Frame Format	---	E1: Double-frame or Multi-frame DS1: F4, D4 (F12), ESF (F24) or F72	---	
Alarm Indication Signal (AIS)	---	configurable	---	
Remote Alarm Indication	---	---	---	
CRC	---	supported	---	
Signaling mechanism	---	---	---	(CAS, CCS)

2.6. Product Functions

Note

This chapter describes the functionality for the TimeGPS configured with the factory defaults. The statements given herein are applicable for good GPS antenna positions only.

Flow charts will support the description of the TimeGPS behaviour.

2.6.1. System Power-Up

Immediately after supplying power the hardware of the TimeGPS will be initialized followed by a functional check of the hardware including the GPS engine. Independently the GPS engine will start to acquire satellites and the oscillator will be heated-up for correct operation.

During system power-up the clock outputs are squelched.

2.6.2. Geographical Position Determination

To optimize the performance of the TimeGPS, the GPS engine has to be operated in the position hold mode. Therefore the TimeGPS will determine the geographical position which is the prerequisite for the synchronization of the oscillator to the GPS time signal.

If there is no position stored within the TimeGPS (condition at supplier delivery) the TimeGPS will perform an arithmetic average of the position data received from the GPS engine. If the position is sufficiently verified it will be internally stored and transmitted to the GPS engine. Thereupon the GPS engine will switch over into the position hold mode.

If there is already a position stored within the TimeGPS it will be transmitted to the GPS engine to reach the position hold mode as soon as possible.

Anyway the position data will be verified for consistency. If necessary the position will be re-determined.

2.6.3. GPS Reference Determination

The internal GPS reference will be determined based on the position of the GPS antenna and the time information received from the satellites.

If the position is not available the data of three satellites have to be used to evaluate the position. At least one satellite is needed to extract the time signal. Therefore at least four satellites are required to determine the GPS reference.

In the position hold mode only one satellite is needed, however, to reach the highest possible accuracy the data from all satellites received will be used to generate the GPS time reference. This start-up sequence called warm start will typically apply for power interrupts at normal operation (position of the GPS antenna unchanged).

The start-up sequence will typically performed within 30 minutes independently from the position hold mode. That duration is mainly influenced by the warm-up time and the performance characteristic of the rubidium oscillator.

2.6.4. Oscillator Synchronization

When the oscillator is operable and the GPS reference is available (power-up finished) the TimeGPS will start to pre-synchronize the oscillator. Based on the outstanding experience of Symmetricom over the last 30 years special algorithm are used for frequency synchronization. Principle the TimeGPS will begin with a fast proportional-integral phase lock loop (fast PLL) followed by a slower one. The time information of the GPS data will be the reference.

During this process the condition 'Pre-Synchronization' will be set until certain control criteria are fulfilled. Additionally the Major Alarm will be active.

When the pre-synchronization is finished the GPS will continue to control the frequency by a kind of a slow proportional-integral phase lock loop with special algorithm of Symmetricom. The Major Alarm will be deactivated and the condition 'system operable' will be set. It means that the outputs will provide a frequency with a sufficient accuracy (probably within specification).

2.6.5. Holdover

If the GPS reference is not available further controlling of the oscillator will be interrupted and the oscillator will be operated with the last value of the control voltage. The oscillator has reached holdover condition, that means temperature and aging will affect the frequency accuracy.

If the first holdover warning level is reached (duration greater than GPS Timeout 1), a Minor Alarm will be indicated.

If the second holdover warning level is reached (duration greater than GPS Timeout 2), a Major Alarm will be indicated while the outputs will be squelched and the re-timing channels will be switched into the slave mode without data loss.

The TimeGPS will indicate these events depending on the actual configuration of the unit.

When the system recovers from holdover condition the unit will re-start to discipline the oscillator until system operable status is available again.

2.6.6. Status Indication

For monitoring purposes the system status will be provided via

- Four LEDs
- Two digital Alarm outputs (relay contacts) and
- One serial RS232 interface (rear panel)

To adapt the system to the customer needs the TimeGPS will allow the implementation of a two stage warning system.

Major Alarm: malfunction or loss of system functionality.

Minor Alarm: abnormal condition, which could lead to a loss of the system if it remains.

Allocation of single specific events to both warning levels will provide a high flexibility.

2.6.7. Service Functionality

For service purposes a second RS 232 interface located at the front panel will allow a quick connection to the unit without any influence to the main monitoring installation. This RS232 interface operates fully independent from the RS232 interface located at the rear panel. It will be typically used for

- Configuration of the equipment
- Status monitoring of the system
- Performing a functional check
- Fault isolation and trouble-shooting

An separate frequency output located at the front panel will allow verification of the clock output of the TimeGPS without any influence to the main signal distribution (rear panel).

Note

Optionally this output can be used as a third clock output.

2.6.8. Configuration Overview

Note

For details regarding configuration refer to the corresponding sub-paragraph of the chapter `Installation and Configuration`.

Duration Marks for Loss of GPS Condition

The user will be able to set two break points to trace ‘loss of GPS’ in order to be able to establish a two level warning system for the holdover condition.

- GPS Timeout 1: duration to generate event GPS timeout 1
- GPS Timeout 2: duration to generate event GPS timeout 2

Note

The TimeGPS will only accept values for GPS Timeout 2 which are greater or equal than GPS Timeout 1.

Allocation of Events

The user will be able to allocate specific events to

- both warning levels Minor Alarm and Major Alarm
- the output squelch functionality
- the framer AIS functionality

Cable Delay Offset

The user will be able to adjust the 1 PPS output signal time-wise in order to compensate the delay caused by the length of the antenna cable.

Time Scale

The user will be able to set the time scale to UTC instead of GPS (with or without leap seconds).

Framer

For E1 the TimeGPS can be configured for different frame formats.

For DS1 the TimeGPS can be configured for different line codes and frame formats.

2.7. Technical Data

Physical Data	
Maximum Size (WxHxD)	75 x 195 x 160 mm (2,95 x 7.68 x 6,3 inches)
Maximum Weight	max. 1,5 kg
Environmental Conditions	
Meets or exceeds EN 300 019	
Humidity	95 % non-condensing
Stationary use Transportation Storage	0° … 45°C (EN 300 019-1-3 class 3.2) with specified accuracy -25° … 70°C (EN 300 019-1-2 class 2.2) -40° … 85°C (EN 300 019-1-1 class 1.2)
Regulations and Standards	
ETSI ES 201 468 V1.1.1 (2000-03)	ETSI Standard, Electromagnetic compatibility and Radio spectrum Matters (ERM); Additional Electromagnetic Compatibility (EMC) requirements for telecommunication equipment for enhanced availability of service in specific applications
ETSI EN 300 386	Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; Electromagnetic Compatibility (EMC) requirements
EN 300 132 – 2	Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part2: Operated by direct current (dc)
EN 60950	Safety of information technology equipment, including electrical business equipment
Power Supply	
Voltage	-20 VDC to -70 VDC (nominal -48 VDC) reverse polarity protected electrically isolated from case and signal potential
Current Consumption	max. 1,8 A
Power Consumption	typically 13 W at -48 VDC (typically 20W during warm-up)
Connector J1	Type SubD 3W3 male (pinning see chapter `Installation and Configuration`)

Antenna Interface	
1 x connector B1	N-Type, female, active GPS antenna powered by the TimeGPS 18 dB to 36 dB external antenna gain measured at the connector of the TimeGPS Supply to the GPS-Antenna: 5 VDC, 5 ... 80 mA, short-circuit protected
Status Outputs	
2 x alarm	Connector J2, SubD15 male (pinning see chapter `Installation and Configuration`)
4 x LED	Power GPS Sync Major Alarm Minor Alarm
Communication Interface	
2 x RS232	Connectors A1 and J3, SubD9 male each, DTE-Connection (pinning see chapter `Installation and Configuration`)
Accuracy	
Accuracy (GPS available)	frequency accuracy: $< 1 \times 10^{-12}$ (24 h) timing accuracy: 100 ns (MTIE 10^4 s)
Accuracy (Holdover)	frequency accuracy: $< 1{,}2 \times 10^{-11}$ / day (within operating temperature range ± 5°C)
Frequency Outputs	
3 x Output	Connectors J4 and J5 for signal distribution, Connector A2 for service purposes SubD9 male each (pinning see chapter `Installation and Configuration`)
Nominal Frequency	2048 kHz 1544 kHz 10 MHz 5 MHz
Signal Form	2048 kHz: according G.703/13 1544 kHz: Square Wave 3.2 V_{pp} (typically) 10 MHz and 5 MHz: Sine Wave 1Vrms / 50 Ω

Framer Option (at Connector J5)	
E1* 2048 kbps	G.703/9 @ P/N 8410110x
DS1* 1544 kbps	G.703/5 @ P/N 8410180x
1 PPS Option (at Connector J5)	
Signal Form	P/N 84101x1x: square wave, pulse width typically 10 µs; TTL, minimum 2.4 V into 50 Ω (not applicable for TimeGPS Framer versions)

LED Indicators

Indication	Status	Meaning
Power	Not active	Power OFF
	Active Green	Power ON
GPS Sync	Not active	GPS signal is not available or severe malfunction
	Blinking Green	Indicates, that satellites are acquired while initialisation (system start-up)
	Active Green	GPS signal is available (even if other errors are active)
Major Alarm	Not active	No major alarm
	Active Red	Event available, to belong Major Alarm
Minor Alarm	Not active	No minor alarm
	Active Yellow	Event available, to belong Minor Alarm

* E1 = E12 according G.703 issue 11/2001
DS1 = E11 according G.703 issue 11/2001

2.8. Performance

The following diagrams show the typical performance of the TimeGPS. There is no significantly difference between the clock outputs and the framer output.

2.8.1. Timing Accuracy

The diagrams below are only applicable if GPS is available.

MTIE

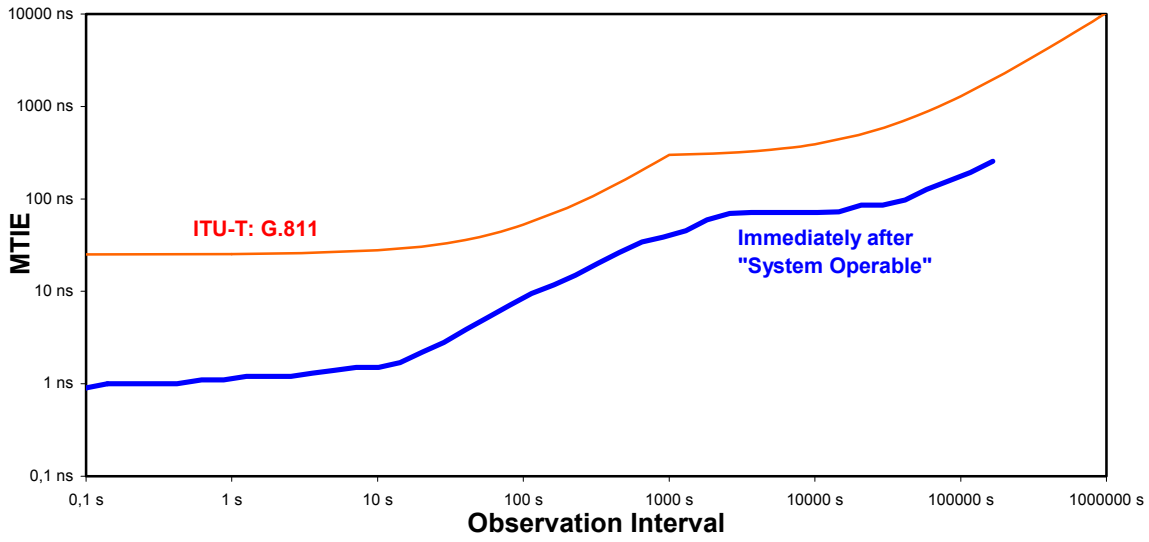


Figure 2–2: MTIE Diagram

TDEV

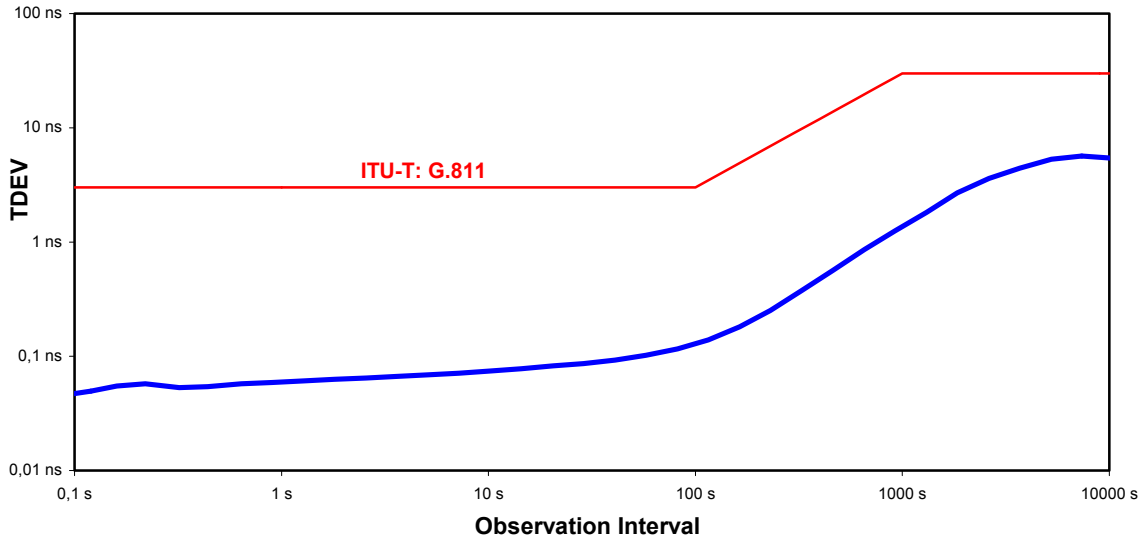


Figure 2–3: TDEV Diagram

2.8.2. Holdover Performance

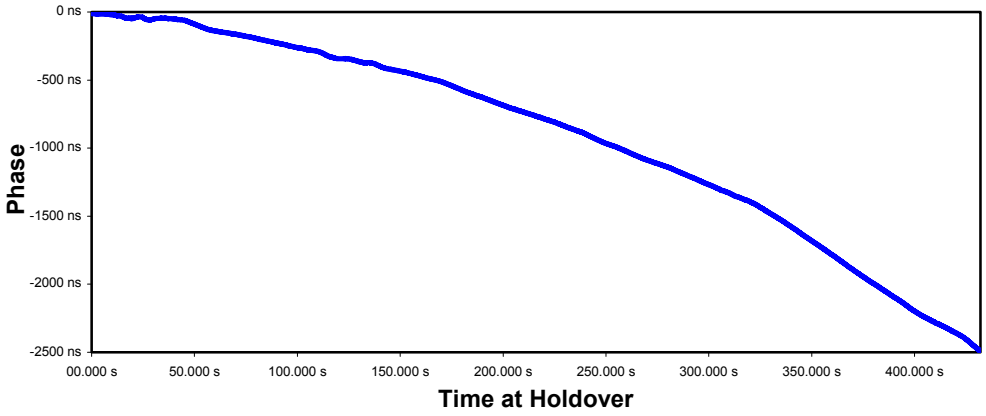


Figure 2–4: Phase Response during Holdover

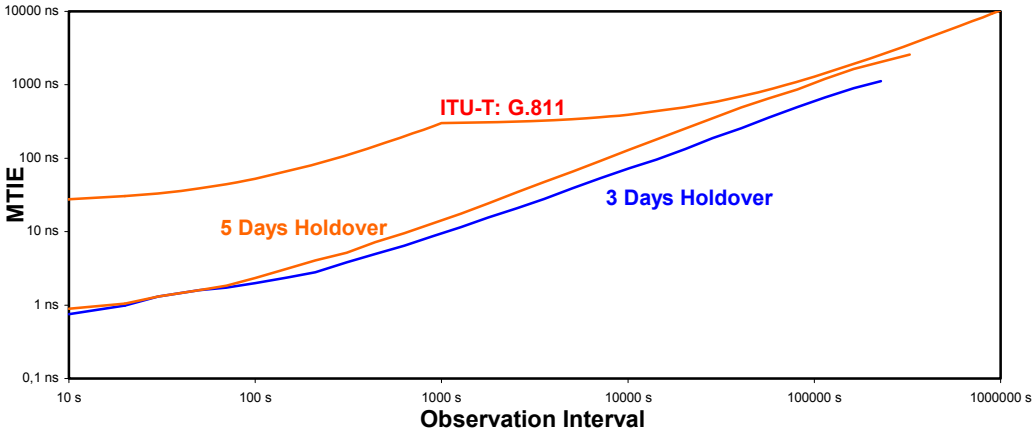


Figure 2–5: MTIE Diagram for Holdover

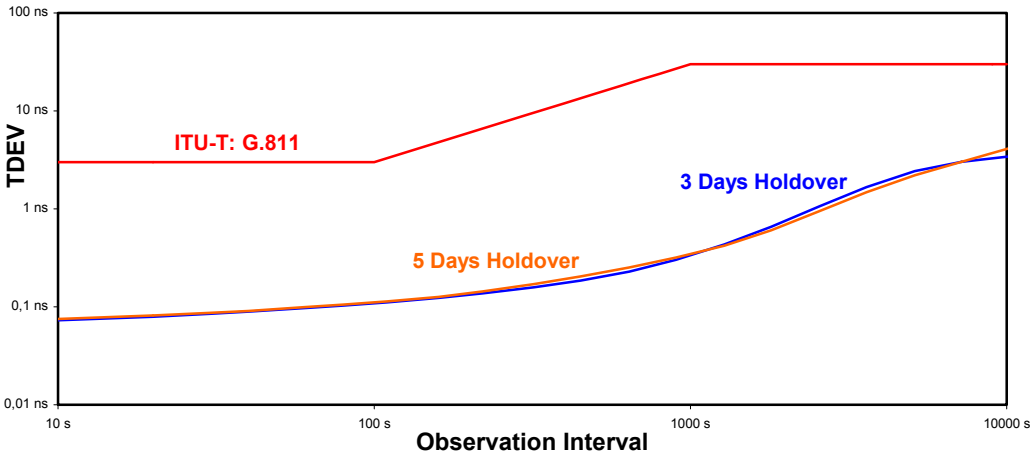
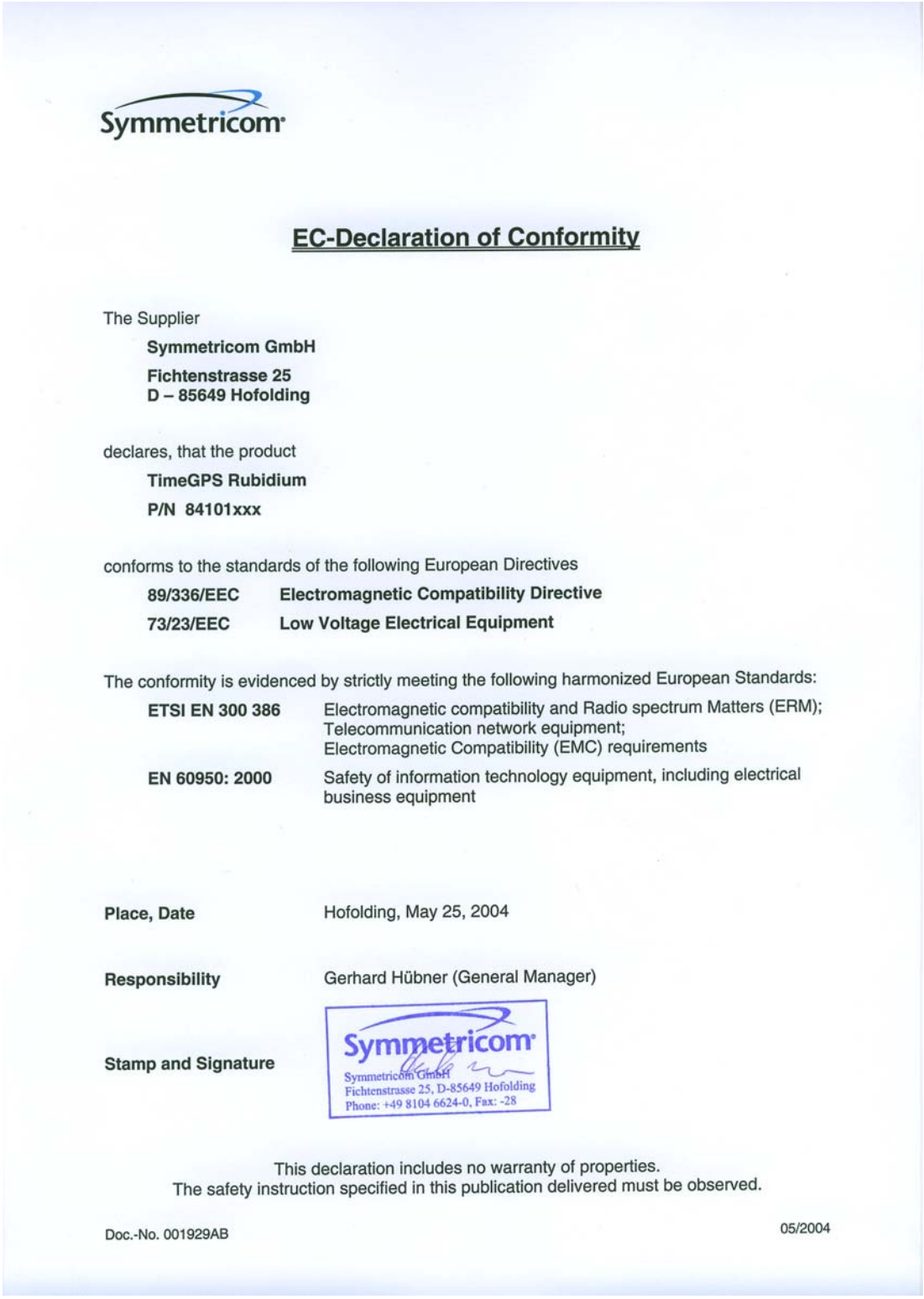


Figure 2–6: TDEV Diagram for Holdover

2.9. EC-Declaration of Conformity



Symmetricom

EC-Declaration of Conformity

The Supplier

Symmetricom GmbH

Fichtenstrasse 25
D – 85649 Hofolding

declares, that the product

TimeGPS Rubidium

P/N 84101xxx

conforms to the standards of the following European Directives

89/336/EEC	**Electromagnetic Compatibility Directive**
73/23/EEC	**Low Voltage Electrical Equipment**

The conformity is evidenced by strictly meeting the following harmonized European Standards:

ETSI EN 300 386	Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; Electromagnetic Compatibility (EMC) requirements
EN 60950: 2000	Safety of information technology equipment, including electrical business equipment

Place, Date	Hofolding, May 25, 2004
Responsibility	Gerhard Hübner (General Manager)
Stamp and Signature	Symmetricom Symmetricom GmbH Fichtenstrasse 25, D-85649 Hofolding Phone: +49 8104 6624-0, Fax: -28

This declaration includes no warranty of properties.
The safety instruction specified in this publication delivered must be observed.

Doc.-No. 001929AB 05/2004

(This page is intentionally left blank)

3. Unpacking and Inspection

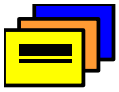
This chapter contains recommended procedures for unpacking the new equipment. It also lists instructions for inspection the delivered items for correct condition and completeness.

3.1. Unpacking

(1) Open the package on the top labeled with the unit identification.

(2) Remove the upper protection material

(3) Remove the equipment together with associated parts. Check the shipping container for loose parts.



Recommendation

Keep all packaging materials in the event the equipment or components must be returned or shipped to another location.

3.2. Inspection

(1) Check the equipment against packing list.

(2) Inspect the unit for shipping damage, including bent or loose parts, broken connectors, or other visible defects.

(3) Notify Symmetricom GmbH and the carrier who delivered the equipment if you suspect that it was damaged in transit.

(This page is intentionally left blank)

4. Installation and Configuration

This chapter provides procedures to be performed before first power up of the unit. It also contains instructions to configure the unit and to connect input and output signals. The illustrations outlined in the section `Product Views` may support you.

The chapters `Operation` and `Maintenance and Troubleshooting` require that the instructions outlined herein are correctly performed.

4.1. Installation of the GPS Antenna and Associated Parts

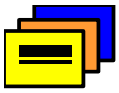
4.1.1. Antenna Cable Length Determination

(1) Determine where to place the GPS antenna.

(2) Determine where to place the lightning arrestor.

(3) Determine where to place the TimeGPS.

(4) Determine the length of cable(s) needed to interconnect these elements.



Recommendation

Consider the length of the cable route, not the direct point-to-point distance.

4.1.2. GPS Antenna / Cable Type Selection

(1) Add up the total length of all cables determined above.

(2) Choose the type of GPS antenna and the related cable type accordingly.

Range	GPS Antenna Gain	Cable Type	Remarks
0 m to 50 m	25 dB	RG213	
0 m … 90 m	25 dB	H2000flex	
50 m to 140 m	50 dB	RG213	
110 m to 260 m	50 dB	H2000flex	

Note

Complete antenna set can be purchased from Symmetricom.
See appendix A `Procurement Information`.

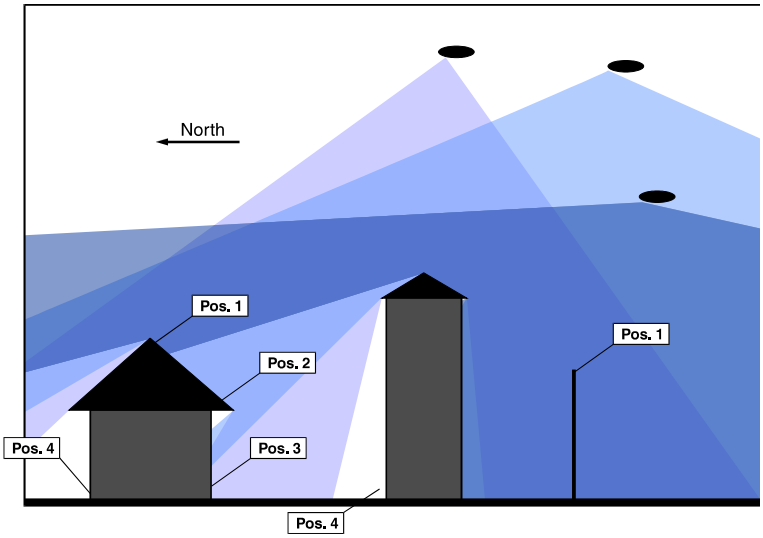
4.1.3. GPS Antenna

Note

For additional information see publication `Installation Instructions for GPS Antenna Sets.`

(1) Select a suitable location for the GPS Antenna.

GPS signals don't penetrate walls, roofs, solid metal structures or dense foliage. Tracking more satellites improves the GPS system performance. Typically at least 4 satellites are needed for start-up and at least 1 satellite continuously. For best results select an outdoor location providing as much unobstructed view to the sky as possible. Obstructions not rising more than 10° above the horizon can be ignored. Since the moving GPS satellites don't cross the polar regions view towards the earth's equator is preferable. Hence, in the northern hemisphere (Europe, North America, most of Asia) the sector E-S-W must be considered while in the southern hemisphere (Australia, South America) it's W-N-E. Rooftop mounting is ideal. Wall mounting may be acceptable, particularly at higher levels.



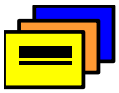
The pros and cons for different location options (see figure) are:

Position 1: Few obstructions towards the important region. Potential to track up to 8 satellites. Best results.

Position 2: Some obstructions. Potential to track 4 to 6 satellites. Reasonable results.

Position 3: Many obstructions. Potential to track 1 to 4 satellites. Depending on time of day (satellite constellation) start-up may be delayed significantly. Marginal results.

Position 4: GPS satellite signal blocked almost completely. Potential to track up to 2 satellites. No performance.



Recommendation

If the GPS antenna fails or must be checked, having the antenna positioned in an easily accessible location will facilitate maintenance. Avoid installing the antenna on a tower, which requires a specialist to maintain.

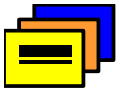
(2) Pre-assemble the mounting fixture and fix the mounting tube.

(3) Install the antenna base on the mounting tube and fasten it.

(4) Assemble the connector to one end of the antenna cable, feed it through the mounting tube and connect it to the GPS antenna.

(5) Assemble the GPS antenna to the antenna base and fasten it.

4.1.4. Antenna Cable Routing



Recommendation

Consider the specification of the antenna cable used before installing the cable.

Route the antenna cable without sharp bends or kinks from the GPS antenna to the TimeGPS. Ensure that the cable will not be damaged during installation.

4.1.5. Lightning Protection

Is lightning protection needed?

Very probably, yes. Lightning does not have to strike the antenna directly to significantly damage it and the TimeGPS. Lightning strikes induce damaging voltages in the antenna system when striking nearby objects.

This paragraph provides principal instructions to install a lightning protector in the line between GPS antenna and GPS receiver unit.

Warning

Do not install the lightning protector in the presence of thunderstorms. Failure to obey this warning may result in injury or death to you or to others.

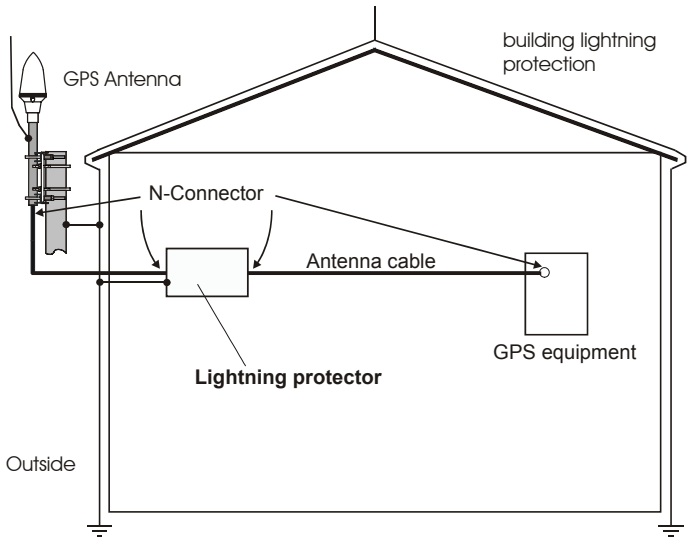
Note

For further information refer to manufacturer's installation instructions enclosed with the lightning protector.

(1) Place the lightning protector where the antenna cable enters the building (inside).

(2) Mount the lightning protector directly to the next grounding bar in order to properly ground it to a low impedance ground system. Use separate angle if suitable. If direct mounting is not possible use a straight and as large as possible grounding strap (minimum 16 mm^2).

(3) Connect the both cable segments, the one routed from the GPS antenna and the one routed from the TimeGPS.



Caution

If you are not comfortable designing your own lightning protection system, seek professional assistance in this area. Consider local building codes. This guide cannot make you an expert.

4.2. Installation of the TimeGPS

4.2.1. Location for the TimeGPS

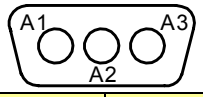
The unit shall be operated in an environment that meets the requirements of the section `Technical Data`.

Recommendation

To achieve highest precision do not subject the unit to adverse conditions such as:
- strong magnetic fields, e.g. mobile phones
- shocks
- temperature differences
- direct solar radiation

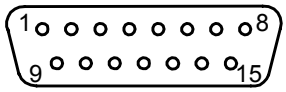
4.2.2. Pinning of the TimeGPS Connectors

Pin Allocation – Power Supply



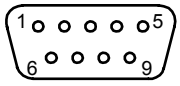
Pin	Signal Name	Signal Definition	Remarks
A1	---	Not connected	
A2	Power	-48 VDC (negative)	Nominal voltage
A3	Power Return	0 VDC (positive)	

Pin Allocation – Alarm Outputs



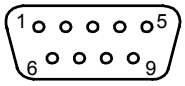
Pin	Signal Name	Signal Definition	Remarks
1...3	---	Not connected	
4	Major alarm	high impedance (≥ 10 MΩ, max 50 V) to common contact (open): no major alarm present short circuit (max. 10 Ω, max 1.0 A) to common contact (closed): major alarm present	Active during power loss.
5...7	---	Not Connected	
8	Common contact	---	
9...11	---	Not Connected	
12	Minor alarm	high impedance (≥ 10 MΩ, max 50 V) to common contact (open): no minor alarm present short circuit (max. 10 Ω, max 1.0 A) to common contact (closed): minor alarm present	
13...14	---	Not Connected	

Pin Allocation – RS 232 Interface



Pin	Signal Name	Signal Definition	Remarks
1	---	Not connected	
2	RxD	RS 232 voltage mode transmission; Asynchronous, full duplex exchance mode 9600 Baud; 8 data bits, 1 start/stop bit, no parity bit ASCII protocol without echo	according EIA standard RS 232C
3	TxD	See above	
4	DTR	---	
5	GND	Signal Ground	Serves as common ground reference potential for transmitted and received signals
6	---	Not connected	
7	RTS	---	
8	CTS	---	
9	---	Not connected	

Pin Allocation – Clock Outputs



Pin	Signal Name	Signal Definition	Remarks
1	GND	---	
2	T4a (Tip) Output Signal +	See chapter `Technical Data`	
3 … 5	---	Not connected	
6	T4b (Ring) Output Signal -	---	Units with 1PPS option: GND at connector J5
7 … 9	---	Not connected	

Note

Symmetricom's Balun Transformer can be used to convert the signal from 120 Ω balanced (Sub-D9 interface) to 75 Ω unbalanced (BNC interface).

For derivatives with the 1 PPS output option do not use the Balun Transformer at the J5 connector.

4.2.3. TimeGPS

(1) Fasten the unit at a suitable rack by using the pre-assembled screws.

(2) Connect the antenna cable at connector *B1*.

(3) Connect the signal cable to distribute the clock signals at connector *J4* resp. *J5*.

Note

If applicable the framer output respectively the 1 PPS output is only available at connector J5.

(4) To monitor the status of the unit connect a suitable cable at connector *J2* (relay alarm outputs) and/or *J3* (RS 232 interface).

(5) Connect the housing of the unit (earthing stud) to earth potential.

(6) Connect the power supply line at the connector *J1*.

(7) Secure not used connectors with the protecting caps against electrostatic discharge.

Note

Separate signal and power lines.

Use shielded cable only for all signal lines and ensure that the shield is electrically connected to the housing of the unit.

To avoid electromagnetic interference it's recommended to use cables not longer than 3 m for power supply and output connection.

4.3. Configuration of the TimeGPS

Note

The configuration can be performed either by help of the software "TimeGPS Terminal" or by means of specific RS232 commands. The following description is based on the use of the TimeGPS Terminal.

If the configuration should be performed otherwise, refer to the detailed description of the RS232 commands at Appendix E.

The factory settings are listed in the Appendix B of this user guide.

4.3.1. Configuration Set-Up

Note

For equipment required refer to chapter `6. Functional Check`.

(1) Connect the RS232 cable to the connector *A2* of the TimeGPS and to the RS232 connector of the computer.

(2) Start the software ***TimeGPS Terminal*** (for details refer to Appendix D).

(3) Supply the unit with power.

(4) Select *Configuration* at the menu item *TimeGPS.*

4.3.2. Time Scale

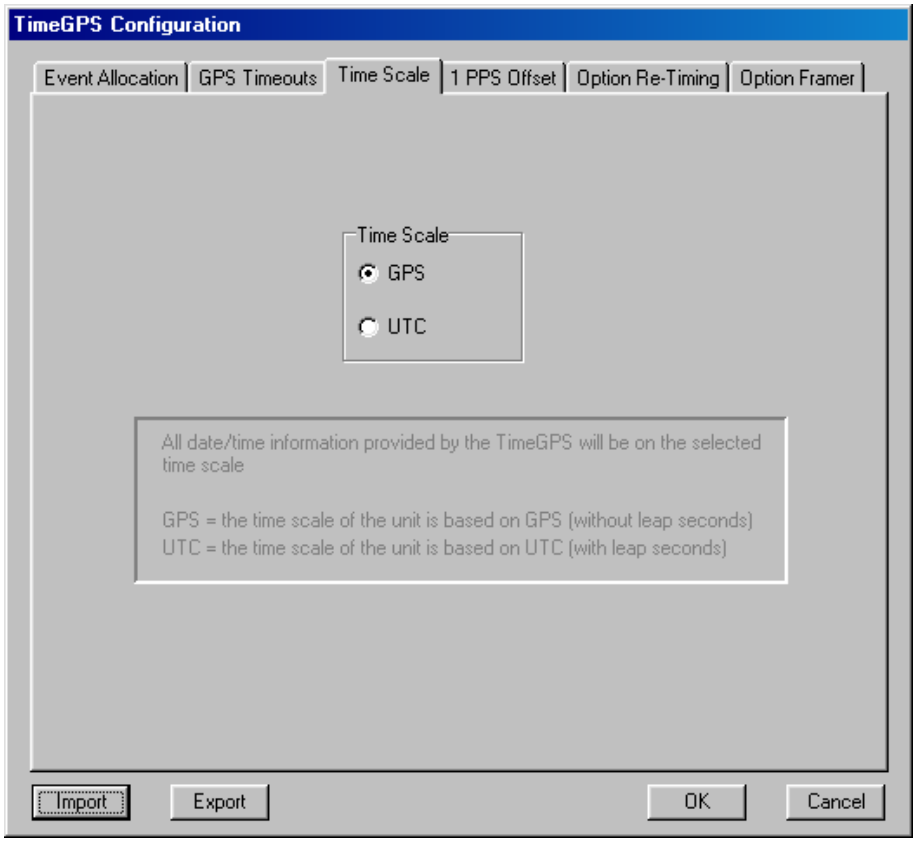
The user will be able to set the time scale to UTC instead of GPS.

If GPS time scale is selected all date/time information provided by the TimeGPS will be based on the GPS time.

If UTC time scale is selected all date/time information provided by the TimeGPS will be based on the UTC time. UTC is taking care of leap seconds.

Procedure

Choose the tab *Time Scale* within the configuration dialog and set it as required.



4.3.3. Holdover Behaviour

Recommendation

Do only change the factory defaults if there are specific reasons for your system requirements. They are very well chosen based on the outstanding experience of Symmetricom with crystal oscillator based GPS systems.

The user will be able to set two break points to trace 'loss of GPS' in order to be able to establish a two level warning system for the holdover condition.

- GPS Timeout 1: duration to generate event GPS timeout 1
- GPS Timeout 2: duration to generate event GPS timeout 2

Note

Usually (if not otherwise configured) the TimeGPS will generate a Minor Alarm if GPS Timeout 1 is expired. A Major Alarm is indicated if the holdover duration takes more than GPS Timeout2.

GPS Timeout 1

Reducing the limit will shorten the time between occurrence of the loss of GPS condition and the first warning indication. This will make your system more fault sensitive concerning loss of GPS.

Increasing the limit will extend the time for the first warning level. This will lead to a more fault tolerant system regarding loss of GPS, but will reduce the time to react before the second warning level is reached.

GPS Timeout 2

Reducing the limit will shorten the time between occurrence of the loss of GPS condition and the second warning indication as well as it will reduce the time for maintenance actions to react. This will also increase the probability that the frequency accuracy is within the specification.

Increasing the limit will extend the time for the second warning level with the consequence that the probability the frequency accuracy is out of operation will increase (depending on the temperature condition of the system environment). Take care that the clock output meets your system requirements before GPS Timeout 2 is reached.

Note

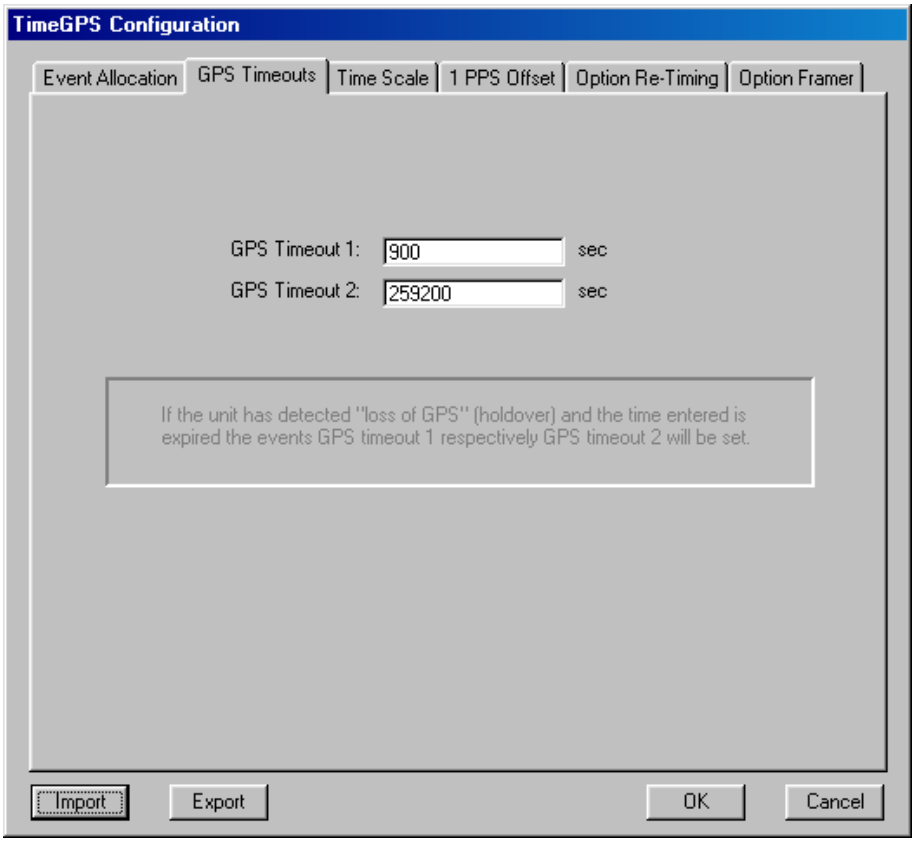
The TimeGPS will only accept values for GPS Timeout 2 which are greater or equal than GPS Timeout 1.

Procedure

Choose the tab *GPS Timeouts* within the configuration dialog and set the duration marks as required.

Note

Verify at the main view that the TimeGPS has accepted both values. If they are not as entered, configure again.



4.3.4. Alarm Indication

Recommendation

Do only change the factory defaults if there are specific reasons for your system requirements. They are very well chosen based on the outstanding experience of Symmetricom with crystal oscillator based GPS systems.

To adapt the system to the customer needs the TimeGPS will allow the implementation of a two stage warning system.

Major Alarm: malfunction or loss of system functionality.

Minor Alarm: abnormal condition, which could lead to a loss of the system if it remains.

In order to provide a high flexibility the following events/conditions can be allocated to both warning levels:

- GPS Timeout 1 Expired
- GPS Timeout 2 Expired
- GPS Antenna Failure
- GPS Engine Failure
- Phase Out of Range
- Loss of Signal or wrong Frame Format (for both Re-Timing channels)

Note

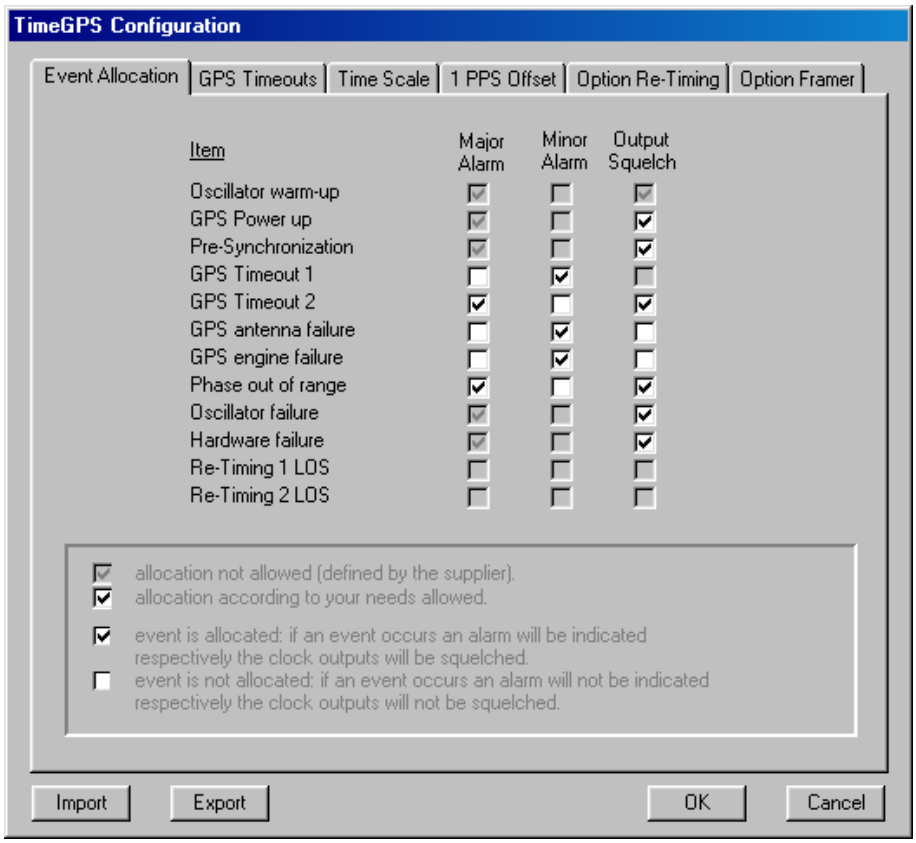
The meaning of each event is explained in the Appendix C.

Specific events are not allowed to be allocated by the customer, but their effect on the alarm indication is shown.

If an event is allocated the corresponding alarm will be generated if the event/condition occurs. Otherwise no alarm will be indicated.

Procedure

Choose the tab *Event Allocation* within the configuration dialog and set the mask for Minor and Major Alarm as required.



4.3.5. Squelch of the Frequency Outputs

Recommendation

Do only change the factory defaults if there are specific reasons for your system requirements. They are very well chosen based on the outstanding experience of Symmetricom with crystal oscillator based GPS systems.

In order to provide a high flexibility the following events/conditions can be allocated to the output squelch functionality:

- GPS Power-Up
- Pre-Synchronization
- GPS Timeout 2 Expired
- GPS Antenna Failure
- GPS Engine Failure
- Phase Out of Range
- Oscillator Failure
- TimeGPS Hardware Failure

Note

Specific events are not allowed to be allocated by the customer, but their effect on the alarm indication is shown. The allocation will be effective for all clock outputs (including the framer output).

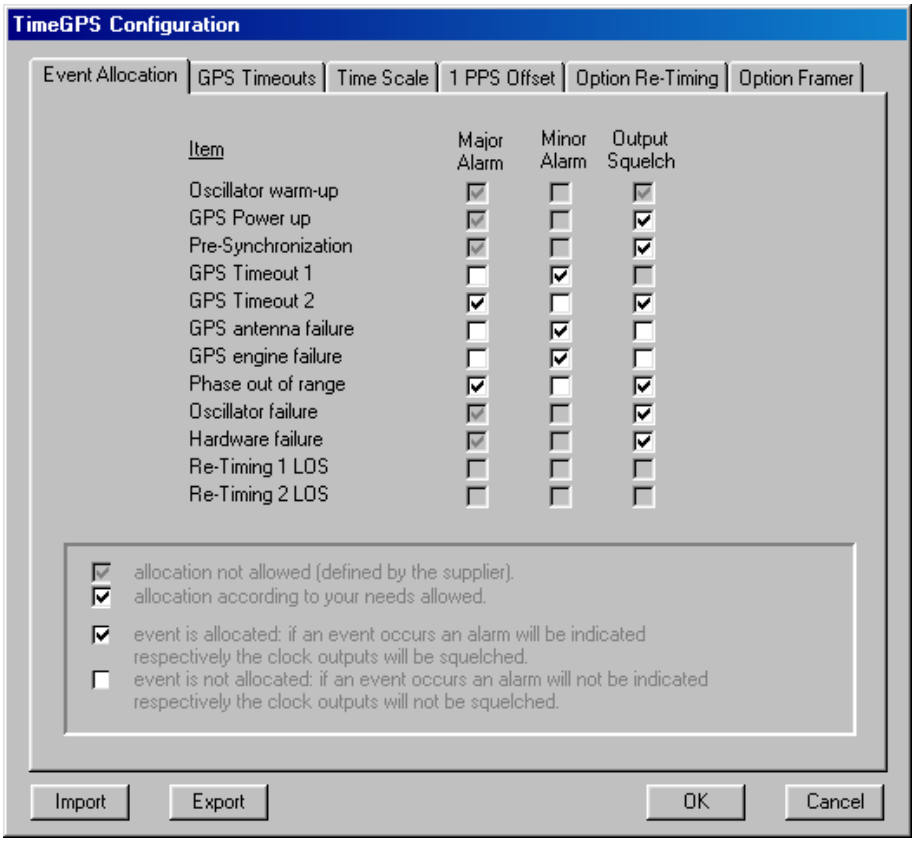
If an event is allocated the outputs will be squelched if the event/condition occurs. Otherwise the outputs will remain activated

Note

Be aware that the outputs may not meet the performance requirements for certain operating conditions if the setting is different to the factory defaults.

Procedure

Choose the tab *Event Allocation* within the configuration dialog and set the mask for Output Squelch as required.



4.3.6. Framer Option

Line Code

For the E1 version only HDB3 line code is available (configuration not necessary and not possible).

For the DS1 version AMI or B8ZS line code can be selected.

Frame Format

For the E1 version double-frame or multi-frame can be configured.

For the DS1 version the following frame formats according ITU-T G.704 can be configured:

- F4
- D4 (also known under F12 or SF)
- Extended Super Frame (ESF, also known under F24)
- F72

CRC

For the E1 version CRC cannot be configured.

For the DS1 version CRC can only be configured if ESF format is used.

Note

For E1 a multi-frame consists of a CRC bit anyway.

For DS1 F4, D4 and F72 don't have the CRC feature.

AIS Allocation

In order to provide a high flexibility the following events/conditions can be allocated to the AIS functionality:

- GPS Power-Up
- Pre-Synchronization
- GPS Timeout 2 Expired
- GPS Antenna Failure
- GPS Engine Failure
- Phase Out of Range

Note

The meaning of each event is explained in the Appendix C

Specific events are not allowed to be allocated by the customer, but their effect on the alarm indication is shown.

If an event is allocated the framer output will be provide an AIS signal if the event/condition occurs. Otherwise no AIS will be generated.

If the output squelch function is also allocated for a specific event, priority will be given to the squelch function if this event occurs.

Note

If the AIS function is desired for a specific event, the corresponding output squelch allocation has not to be selected.

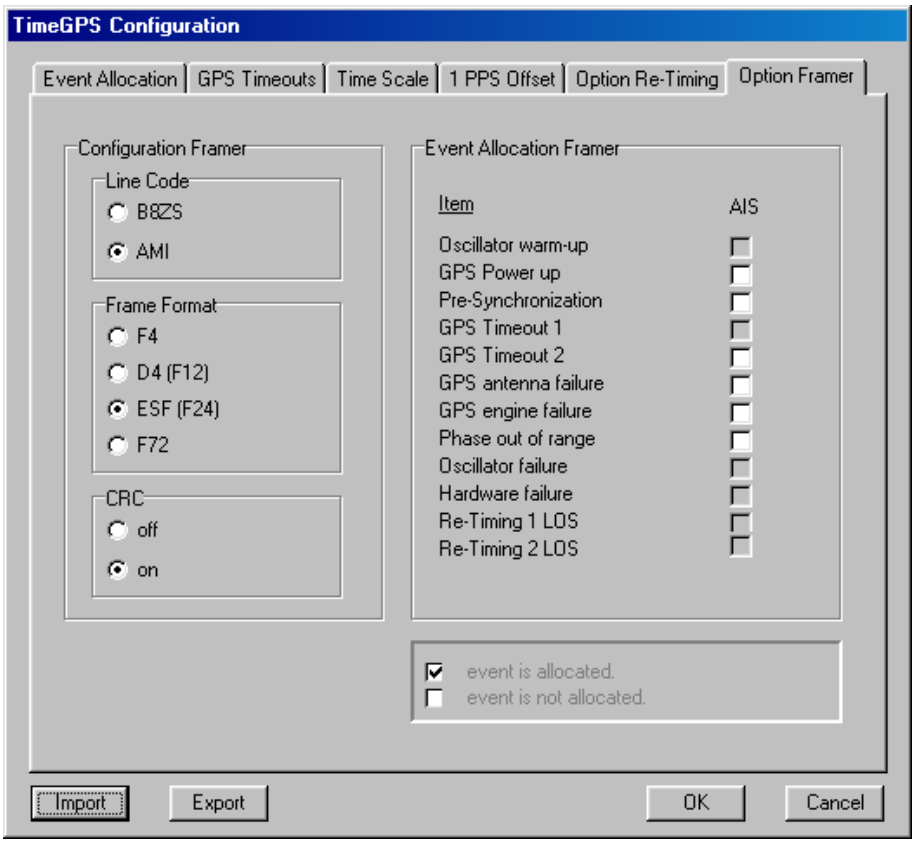
Procedure

(1) Choose the tab *Option Framer* within the configuration dialog.

(2) Set the line code (DS1 only) and the frame format as required.

(3) Set the CRC if applicable.

(4) Set the allocation masks for AIS as required.



4.3.7. 1 PPS Offset

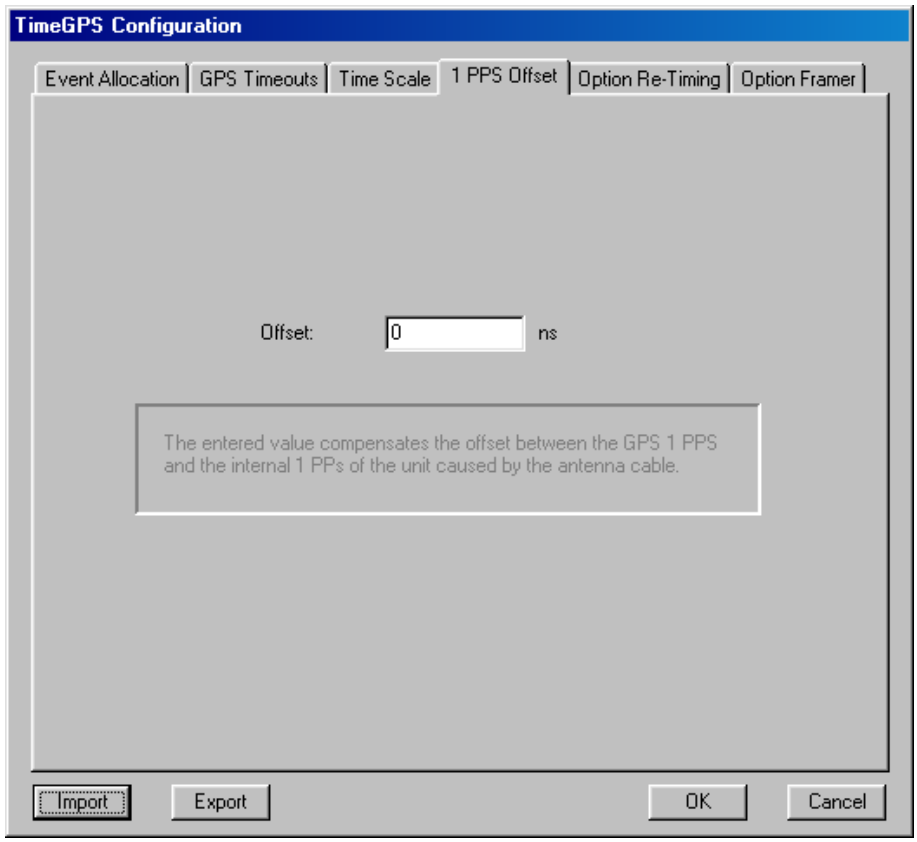
The user will be able to adjust the 1 PPS signal time-wise in order to compensate the delay caused by the length of the antenna cable.

Note

This configuration parameter instructs the GPS LS to output the 1PPS pulse earlier in time to compensate the antenna cable delay. Up to 800 microseconds of equivalent cable delay can be removed. Zero cable delay s set for a zero-length antenna cable. Please consult a cable data book for the delay per meter for the particular antenna cable used in order to compute the total cable delay needed for your particular installation.

Procedure

Choose the tab *1 PPS Offset* within the configuration dialog and set the value as required. The resolution is 1 nanosecond.

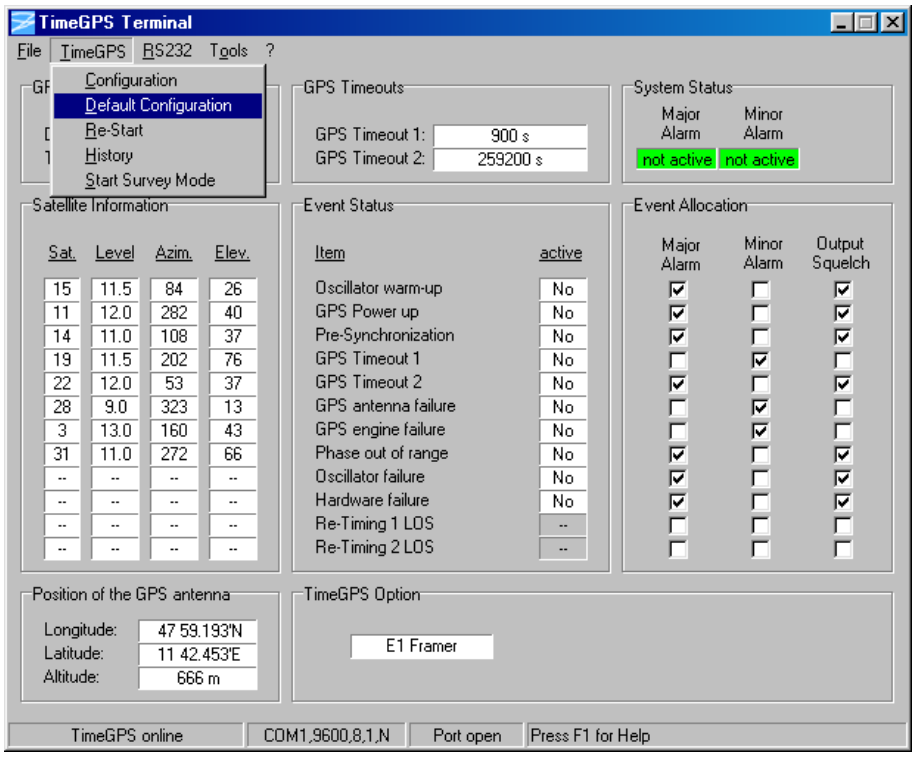


4.3.8. Reset to Factory Defaults

The user will be able to reset all configuration parameters to the factory defaults.

Procedure

Choose *Configuration Default* at the menu Item *TimeGPS* and confirm the execution of that action if the factory default performance is required.



4.4. Re-Installation of the TimeGPS

Note

This paragraph will only apply

- after antenna relocation
- for replacement units, if it has been operating at another location.

Neglecting the instructions below will cause the TimeGPS to operate with a wrong configuration and/or position. Until this is verified and corrected the unit may operate with a performance not meeting your needs or not within the specification.

(5) Install the unit as per paragraph `4.2 Installation of the TimeGPS.`

(6) Verify that the actual configuration of the TimeGPS meets your needs. Set it accordingly as per paragraph `4.3 Configuration of the TimeGPS.`

(7) Continue to operate the TimeGPS as per paragraph `5.2.3 Start-Up after Re-Installation.`

(8) Supply the unit with power.

(9) Each LED will illuminate shortly indicating the power-up sequence.

(10) At the *TimeGPS Terminal* select *Start Survey Mode* at the menu item *TimeGPS* and confirm the execution of that action.

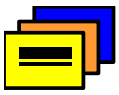
(11) The TimeGPS should perform as described at paragraph 5.2.1

5. Operation

This chapter describes all modes of operation of the product. Ensure that the unit is correctly installed as outlined in the `Installation` chapter.

If the equipment does not perform as described below follow the instructions in the `Maintenance and Troubleshooting` chapter.

For a reference of the signals and LED's refer to the illustrations outlined in the section `Product Views` and `Technical Data`.



Recommendation

To achieve highest precision do not subject the unit to adverse conditions such as:

strong magnetic fields, e.g. mobile phones
shocks
temperature differences
direct solar radiation

5.1. Acclimatization

In the case that water has condensed on the unit during transport, or storage, the equipment must be allowed to acclimatize for approximately two hours before operation.

Caution

Condensed water may damage the unit.

5.2. Power Up

Warning

To avoid personal injury do not operate the equipment while there is danger of explosion.

Caution

The equipment may not be operated while there are high atmospheric humidity, high dust level, and aggressive chemical influence.

Caution

Switch off the unit, if you assume that the operation of the unit is dangerous. Ensure that the unit cannot be re-operated unintentionally.

5.2.1. First Start-Up after Supplier Delivery

Note

This start-up sequence will take longer than a start-up after a power interrupt because there is no position internally stored. The TimeGPS needs 4 satellites to determine the position and the internal reference.

(1) Supply the unit with power.

(2) Each LED will illuminate shortly indicating the power-up sequence.

(3) The LED *Major Alarm* illuminates.
During the acquisition of satellites the LED *GPS Sync* flashes.
The clock output is not available (squelched).

(4) Typically 4 minutes after power-up the LED *GPS Sync* will illuminate permanently.

(5) After approximately 25 minutes the unit will be fully operable indicated by switching off the LED *Major Alarm*.
The clock outputs are now available.

5.2.2. Start-Up after Power Interrupts

Note

This start-up sequence will be the shortest one because the internally stored position can be used. Therefore the TimeGPS has to acquire only one satellite to determine the internal reference.

(1) Supply the unit with power.

(2) Each LED will illuminate shortly indicating the power-up sequence.

(3) The LED *Major Alarm* illuminates. During the acquisition of satellites the LED *GPS Sync* flashes.
The clock output is not available (squelched).

(4) Typically within 2 minutes after power-up the LED *GPS Sync* will illuminate permanently.

(5) After approximately 25 minutes the unit will be fully operable indicated by switching off the LED *Major Alarm*.
The clock outputs are now available.

5.3. User Control

During normal operation no handling is necessary.

5.4. Remote Monitoring

If monitoring of the TimeGPS by means of a management software is required, the commands described in Appendix E have to be used.

The following commands are primarily foreseen for monitoring purposes:

- ***ALM***, indicating the status of *Minor Alarm* and *Major Alarm* including a date/time stamp.
- ***EVT***, indicating the status of events occurred including a date/time stamp. This command can be used to trace the cause of an alarm.

Remote monitoring can be performed via

- Virtual COM (RS232 to Ethernet converter)
- a modem

Note

If the communication with the TimeGPS is performed via a modem, a 1:1 straight through cable has to be used.

6. Functional Check

This chapter provides equipment functional tests that are checklist-based. They can be performed to check that the equipment operates without malfunction.

6.1. Required Equipment

The following equipment or equivalent equipment is required to perform the functional check of the product.

Type of Equipment	Specification	Remarks
Oscilloscope	No special requirements	Standard
Computer	see appendix D.	
TimeGPS Terminal	P/N 84109012	
RS232 cable	RxD of the TimeGPS is connected to TxD of the computer; TxD of the TimeGPS is connected to RxD of the computer; (cross-over connection)	

6.2. Quick Test

(1) Ensure that the unit was started-up correctly.

(2) Verify that the LED *Power* illuminates

(3) Verify that the LED's *Major Alarm* and *Minor Alarm* are OFF.

(4) Connect an oscilloscope with 75 Ohm input impedance at connector A2 between pins 2 and 1.

(5) Verify the frequency (depending on the TimeGPS derivative) and the signal level for at least 1.5 V (peak to peak).

6.3. Extended Test

The following test is performed in a sequential order. If a test fails follow the instructions at the `Maintenance and Troubleshooting` chapter.

6.3.1. Start-Up Sequence

(1) Connect the RS232 cable to the connector *A2* of the TimeGPS and to the RS232 connector of the computer.

(2) Start the software ***TimeGPS Terminal*** (for details refer to Appendix D).

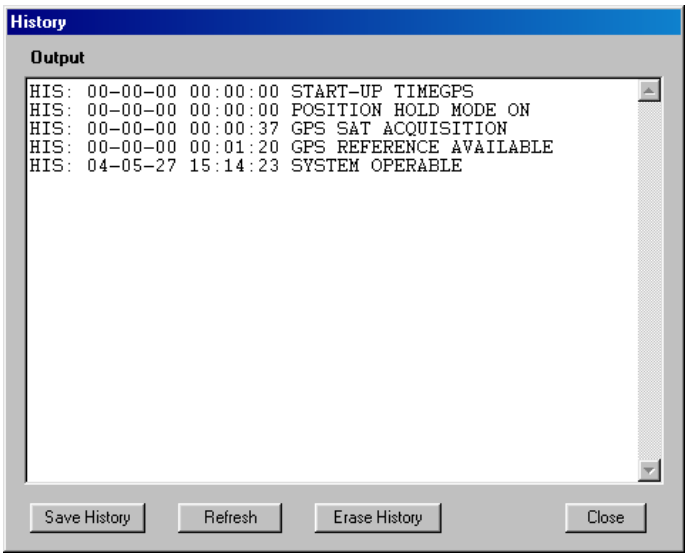
(3) Verify that the LED *Power* illuminates

(4) Verify that at least 4 satellites are detected.

(5) Verify that the LED's *Major Alarm* and *Minor Alarm* are OFF.

(6) Select *History* at menu item *TimeGPS*. Verify for correct start-up sequence by comparison with the sample beside:

(7) *System Operable* should be the last status message entry.



6.3.2. Output Signal

(1) Connect an oscilloscope with 75 Ohm input impedance at connector A2 between pins 2 and 1.

(2) Verify the frequency for 2048 kHz respectively 1544 kHz and the signal level for at least 1.5 V (peak to peak).

6.3.3. Framer Performance

(3) Connect an oscilloscope with a 120 Ohm input impedance for E1 (100 Ohm for DS1) at the connector J5 between pins 2 and 1.

(4) Verify the signal form
E1: according G.703/9, signal level 3 V_p ±10 %
DS1: according G.703/5, signal level between 2.4 V_p and 3.6 V_p

(5) Verify that the framer configuration is set according to your needs. Proceed as per paragraph 4.3.6.

7. Maintenance and Troubleshooting

This chapter contains cleaning and maintenance procedures. Troubleshooting instructions allow faulty isolation of the unit including associated equipment. These instructions refer to the `Technical Data` section as the main reference for the technical specification. Before starting with troubleshooting ensure that the unit is correctly installed.

7.1. Cleaning

Should it become necessary to clean the unit, wipe the housing with a cleaning cloth moistened with methylated spirits.

Caution

To avoid damage to the unit, always switch off and disconnect the power before cleaning the unit. Avoid exposing the unit to liquid.

7.2. Preventive Maintenance

The unit does not require any preventive maintenance.

7.3. Troubleshooting and Fault Isolation

Trouble shooting and fault isolation should be performed with help of the TimeGPS Terminal software (refer to chapter Appendix D)

7.3.1. Query of the Status

Note

Equipment as described at chapter Functional Check is needed for fault isolation.

(1) Connect the RS232 cable to the connector A2 of the TimeGPS and to the RS232 connector of the computer.

(2) Start the software ***TimeGPS Terminal*** (for details refer to Appendix D).

(3) Select *Save System Status* and/or *Print System Status* at the menu item *File*.

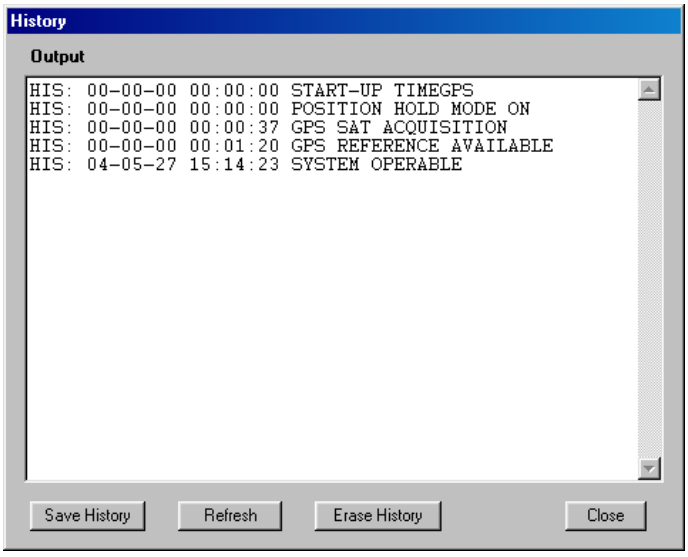
Recommendation

The system status (on file or paper) is needed by the supplier if the unit has to be returned to the manufacturer or if the supplier is asked for technical support.

(4) Record the actual LED status

LED	ON	OFF	Remarks
Power			
GPS Sync			
Major Alarm			
Minor Alarm			

(5) Select *History* at menu item *TimeGPS* and print it.



7.3.2. Abnormal Alarm/Status Indication

Note

During power loss major alarm will be indicated (applicable for relay status outputs only).

Problem Occurrence	Probable Cause	Corrective Action
Major Alarm is not indicated at connector J2 if the unit is not powered	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
Power LED does not illuminate if unit is powered	Unit is not connected to the power supply, power supply off, wrong polarity	Check the power supply connection.
	Power supply cable faulty	Check cable and replace it.
	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
GPS Sync LED does not flash during system start-up	Poor position of the GPS antenna or interference by transmitters (weak GPS signals) antenna sky view obstructed, RF interference	Check the number of satellites acquired and their signal level (at least 4 satellites, level > 11). Check the position of the GPS antenna for sufficient horizon view.
	Antenna cable too short or too long	Check the used antenna cable for suitable type and length
	Connection GPS antenna – unit does not work properly	Check the supply voltage of the GPS antenna for at least 4.5 VDC directly at the antenna.
	GPS antenna faulty	Replace the GPS antenna
	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
GPS Sync LED does not illuminate if unit is powered for at least 30 minutes	Poor position of the GPS antenna or interference by transmitters (weak GPS signals) antenna sky view obstructed, RF interference	Check the number of satellites acquired and their signal level (at least 4 satellites, level > 11). Check the position of the GPS antenna for sufficient horizon view.
	Position of the GPS antenna was changed (unit re-installed at new location). Therefore stored position not correct.	Start Survey Mode (new determination of the position).
	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4

Problem Occurrence	Probable Cause	Corrective Action
GPS Sync LED is turned off	Poor position of the GPS antenna or interference by transmitters (weak GPS signals) antenna sky view obstructed, RF interference	Check the number of satellites acquired and their signal level (at least 4 satellites, level > 11). Check the position of the GPS antenna for sufficient horizon view.
	Connection GPS antenna – unit does not work properly	Check the supply voltage of the GPS antenna for at least 4.5 VDC directly at the antenna.
	GPS antenna faulty	Replace the GPS antenna
	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
Major Alarm or Minor Alarm indicated, event GPS Power Up occurred.	Unit acquires satellites during system start-up.	Wait at least 1 hour until the alarm indication disappears.
	Unit acquires satellites after loss of GPS.	Wait at least ½ hour until the alarm indication disappears.
	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
Major Alarm or Minor Alarm indicated, event Pre-Synchronization occurred.	Unit does not provide the specified accuracy caused by system start-up or long term loss of GPS	Wait at least 1 hour until the alarm indication disappears.
	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
Major Alarm or Minor Alarm indicated, event GPS Timeout 1 occurred.	Poor position of the GPS antenna or interference by transmitters (weak GPS signals) antenna sky view obstructed, RF interference	Check the number of satellites acquired and their signal level (at least 4 satellites, level > 11). Check the position of the GPS antenna for sufficient horizon view.
	Connection GPS antenna – unit does not work properly	Check the supply voltage of the GPS antenna for at least 4.5 VDC directly at the antenna.
	GPS antenna faulty	Replace the GPS antenna
	Loss of GPS duration for at least the configured time. GPS satellites are not operating correctly.	Wait until the GPS system recovers
	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4

Problem Occurrence	Probable Cause	Corrective Action
Major Alarm or Minor Alarm indicated, event GPS Timeout 2 occurred.	Poor position of the GPS antenna or interference by transmitters (weak GPS signals) antenna sky view obstructed, RF interference	Check the number of satellites acquired and their signal level (at least 4 satellites, level > 11). Check the position of the GPS antenna for sufficient horizon view.
	Connection GPS antenna – unit does not work properly	Check the supply voltage of the GPS antenna for at least 4.5 VDC directly at the antenna.
	GPS antenna faulty	Replace the GPS antenna
	Loss of GPS duration for at least the configured time. GPS satellites are not operating correctly.	Wait until the GPS system recovers
	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
Major Alarm or Minor Alarm indicated, event GPS antenna failure occurred.	GPS antenna or connection to the unit faulty.	Check the GPS antenna and the cable connection.
	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
Major Alarm or Minor Alarm indicated, event GPS engine failure occurred.	Unit (GPS engine) faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
Major Alarm or Minor Alarm indicated, event Oscillator failure occurred.	Unit (oscillator) faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
Major Alarm or Minor Alarm indicated, event Internal HW failure occurred.	Unit faulty	Return the unit to the manufacturer.
Further problems regarding indication.		Contact the service department of Symmetricom GmbH (see end paper of this document).

7.3.3. Incorrect Output Signals

Note

The below listed fault isolation will also apply to the re-timing outputs.

Problem Occurrence	Probable Cause	Corrective Action
No output available	Unit not connected	Check power supply including connections. Check signal distribution incl. connections.
	Alarm is indicated (output probably squelched)	Proceed according fault isolation sub-paragraph “Abnormal Alarm/Status Indication” If applicable set squelch mask as needed.
	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
Output signal not accepted	Incorrect load impedance.	Check the load impedance and correct it if necessary.
	Damaged cable.	Check signal distribution cable and replace it if necessary.
	Unit faulty	Return the unit to the manufacturer. Follow instruction as per paragraph 7.4
Further problems regarding output signals.		Contact the service department of Symmetricom GmbH (see end paper of this document).

7.4. Return Procedure

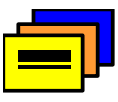
To return the unit to the manufacturer for repair, use the following instructions:

(1) Contact the service department of Symmetricom GmbH (see end paper of this document) to announce the repair/service case before returning the product.

(2) Follow the procedure provided by the service department.

7.5. Repacking

Use standard packing procedures to protect the unit during shipment. Custom foam packing material is preferred because it conforms to the shape of the instrument.



Recommendation

Use transport case and original packing materials in the event the unit must be returned or shipped to another location.

A. Procurement Information

This appendix provides information needed to procure Symmetricom's TimeGPS models including associated parts.

For further information than outline herein and for ordering please contact Marketing/Sales of Symmetricom GmbH.

Symmetricom GmbH
Marketing/Sales
Fichtenstrasse 25
D-85649 Hofolding / Munich
Germany

Phone: +49 – 8104-6624-29
Fax: +49 – 8104-6624-28
e-mail: sales@symmetricom.de
web: www.symmetricom.com/

A.1. TimeGPS Derivatives

Please provide the parts name together with the part number when ordering.

Name of the Component	Part Number
TimeGPS 2048 kHz with Rubidium	84101000
TimeGPS 2048 kHz, E1 2048 kbps with Rubidium	84101100
TimeGPS 5 MHz with Rubidium	84101400
TimeGPS 10 MHz with Rubidium	84101500
TimeGPS 1544 kHz with Rubidium	84101700
TimeGPS 1544 kHz, DS1 1544 kbps with Rubidium	84101800
TimeGPS 2048 kHz, 1 PPS with Rubidium	84101010
TimeGPS 5 MHz, 1 PPS with Rubidium	84101410
TimeGPS 10 MHz, 1 PPS with Rubidium	84101510
TimeGPS 1544 kHz, 1 PPS with Rubidium	84101710
User Guide TimeGPS Rubidium	60500002

A.2. Accessories

Please provide the parts name together with the part number when ordering.

Name of the Component	Part Number
TimeGPS Terminal (CD)	84109012
Balun Transformer	80719011
Adapter for redundant power supply	

GPS Antenna and Mounting Device

Name of the Component	Part Number
GPS Antenna, 50 dB active	23120015
GPS Antenna, 25 dB active	23120019
Mounting device for Antenna	44301802

GPS Antenna Sets

An antenna set includes a GPS antenna, the antenna cable with the chosen length, 2 connectors and the mounting device with attachment parts.

Name of the Component	Part Number
Antenna Set 25 m RG58 / 50 dB	83009002
Antenna Set 40 m RG213 / 25 dB	
Antenna Set 50 m RG213 / 50 dB	83009003
Antenna Set 75 m RG213 / 50 dB	83009004
Antenna Set 80 m LowLoss / 25 dB	
Antenna Set 100 m RG213 / 50 dB	83009005
Antenna Set 140 m RG213 / 50 dB	
Antenna Set 150 m LowLoss / 50 dB	83009006
Antenna Set 200 m LowLoss / 50 dB	83009007
Antenna Set 250 m LCF ½ “ / 50 dB	83009008

Lightning Protection

The Lightning Protection includes a Hardware kit and 2 necessary connectors.

Name of the Component	Part Number
Lightning Protector for cable type RG58	83009025
Lightning Protector for cable type RG213	83009024
Lightning Protector for cable type LowLoss	83009023

Grounding Kit

Name of the Component	Part Number
Grounding Kit for cable type RG58/RG213	36102045

B. Factory Settings

The unit will be supplied with the following factory default settings.

Note
For a detailed description refer to chapter `Operation`.

B.1. GPS Timeout 1 and 2

GPS Timeout 1 = 900 s
GPS Timeout 2 = 259,200 s

B.2. Time Scale

The time scale is based on GPS.

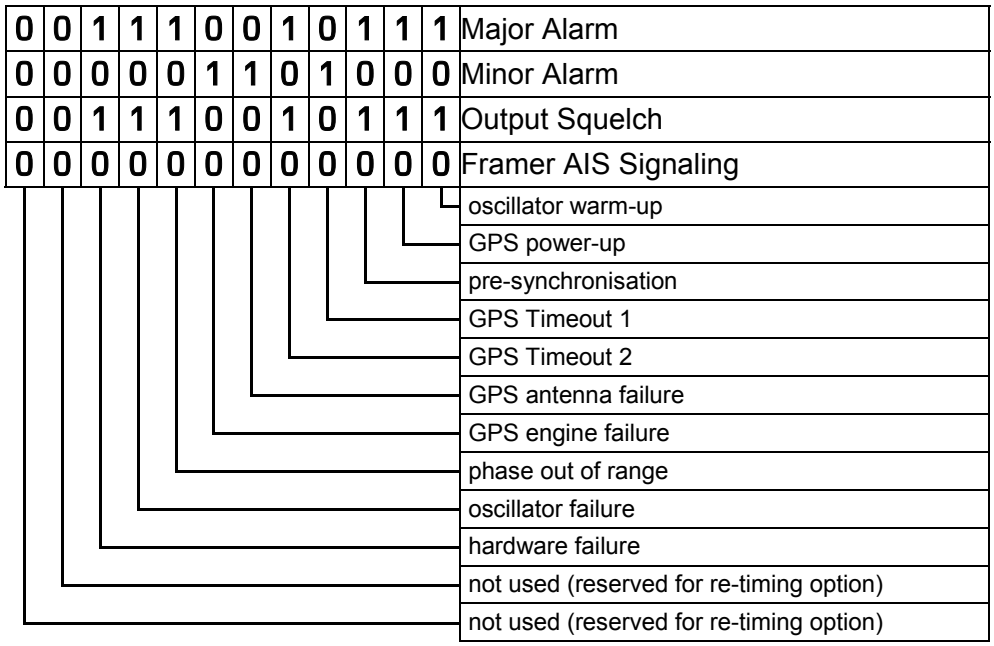
B.3. 1 PPS Offset

1 PPS offset = 0 ns

B.4. Automatic Mode for the RS232 Communication

Connector A2: Only the system status is sent automatically by means of the History message.
Connector J3: No messages are sent automatically.

B.5. Event Allocation



0 = if an event has occurred or a status is present an alarm will not be indicated respectively the frequency outputs will not be squelched
1 = if an event has occurred or a status is present an alarm will be indicated respectively the frequency outputs will be squelched

B.6. Framer Functionality

E1 Framer

Frame Format: Double frames (covers also multi frames)

DS1 Framer

Line Code: AMI
Frame Format: ESF

C. Status Messages

The following table provides the relation between events and system status information sent by means of the History message including their interpretation.

Event	occurred	Message (String)	Meaning
---	---	START-UP TIMEGPS	Indicates start of operation
---	---	SYSTEM OPERABLE	Indicates the end of the complete start-op phase. Usually the outputs are now available. If the start-up phase is completed it indicates that the synchronization process is now completed and the system is now operable again.
Oscillator warm-up	yes	---	The oscillator heats up to his operating temperature. It is not operable.
	no	OSCILLATOR OK	The oscillator has completed it's warm-up phase.
GPS power up	yes	GPS SAT ACQUISITION	The GPS engine has started with the acquisition of satellites.
	no	GPS REFERENCE AVAILABLE	Indicates that the internal GPS reference is available for disciplining the oscillator.
GPS timeout 1 expired	yes	GPS TIMEOUT 1	The pre-defined duration for holdover is expired.
	no	---	The pre-defined duration for holdover is not expired or holdover condition is not present.
GPS timeout 2 expired	yes	GPS TIMEOUT 2	Indicates that the pre-defined duration for holdover is expired.
	no	---	The pre-defined duration for holdover is not expired or holdover condition is not present.
GPs antenna failure	yes	GPS ANTENNA FAILURE	Two messages indicating appearance of the failure condition and recovery from it.
	no	GPS ANTENNA OK	
GPS engine failure	yes	GPS ENGINE FAILURE	Two messages indicating appearance of the failure condition and recovery from it.
	no	GPS ENGINE OK	
Phase out of range	yes	PHASE OUT OF RANGE	Indicates that the phase between oscillator and reference is out of an acceptable range which leads to a kind of a new synchronization process
	no	---	Normal operation regarding oscillator control.
Oscillator failure	yes	OSCILLATOR FAILURE	A failure was detected; indicates system inoperable.
	no	---	No failure detected.
TimeGPS internal HW failure	yes	HW FAILURE	A failure was detected; indicates system inoperable.
	no	---	No failure detected.
---	---	POSITION HOLD MODE OFF	Initiates a new determination of the position.
---	---	POSITION HOLD MODE ON	Indicates that the unit operates with a geographical position which leads to best results regarding output accuracy.

(This page is intentionally left blank)

D. TimeGPS Terminal

The ***TimeGPS Terminal*** is a Windows based software developed by Symmetricom to support the handling of the TimeGPS in an user-friendly way. It can be used

- for configuration of the unit
- to perform the functional check
- for trouble shooting and fault isolation
- as a local craft interface to monitor the system status

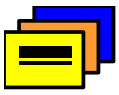
D.1. Host Environment

Hardware:	PC with at least 1 MB available hard disk memory Serial interface (RS232)
Operating System:	Windows 98SE/2000/XP Windows NT 4.0

D.2. Installation of the Software

Simply create a folder on your hard disk and copy the files ***TimeGPSTerminal.exe*** and ***TimeGPSTerminal.hlp*** into it.

The program can be run from different folders at the same time.



Recommendation

The program will generate the file ***TimeGPSTerminal.con*** to save its internal configuration data.

D.3. De-Installation of the Software

Delete the files ***TimeGPSTerminal.exe***, ***TimeGPSTerminal.hlp*** and ***TimeGPSTerminal.con*** from your computer. If applicable delete the whole folder.

D.4. Start of the Program

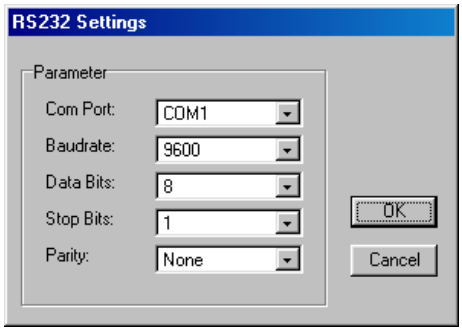
(1) Call the file *TimeGPSTerminal.exe*.

(2) Select *RS232 Settings* at the menu item *RS232* and ensure that the correct COM port is used.

(3) Verify the COM settings

(4) Close the dialog by pressing OK.

(5) The main view indicating important system information is shown.

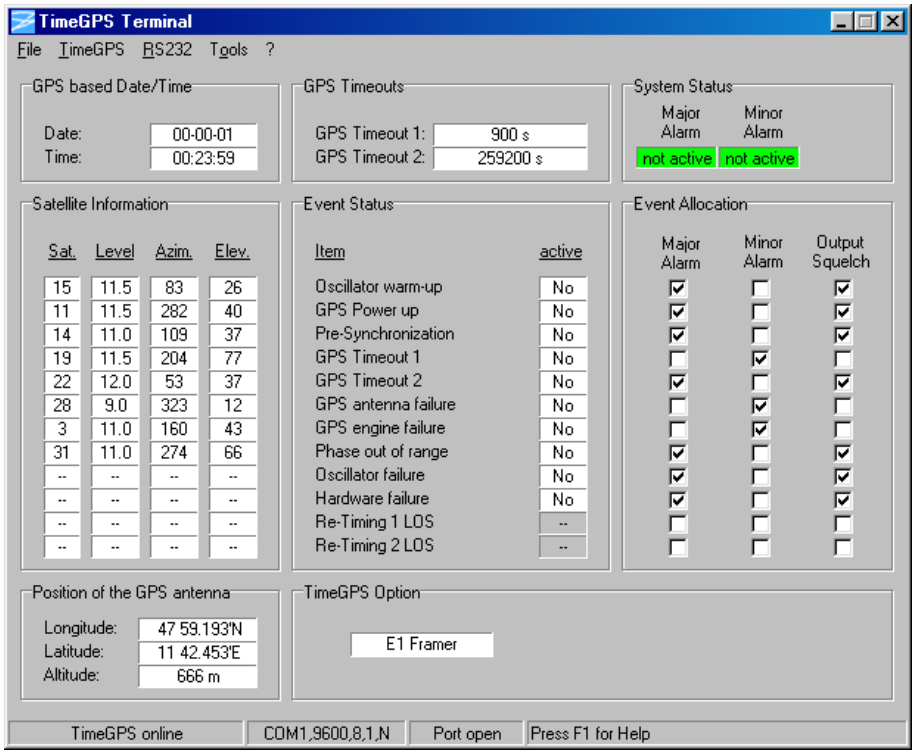


Note

The port settings are stored in the *TimeGPSTerminal.con* file to be re-used as pre-defined port settings for later program calls.

D.5. Brief Description of the Program Functionality

The main view of the program provides an overview about the system status and the important configuration settings of the connected TimeGPS. File operations, settings for RS232 and the connected TimeGPS, specific unit functions as well as a help view are accessible via the menu bar.



The TimeGPS Terminal provides the following functions (details see the help view of the program):

- Parameter setting for the RS232 interface
- Indication of the date/time
- Indication/setting of the GPS timeout parameters
- Indication of the occurrence of Minor/Major alarm
- Indication of the acquired GPS satellites
- Indication of the occurrence of events (faults)
- Indication/setting of the allocation of events to minor/major alarm and output squelch
- Indication of the position of the GPS antenna
- Indication of the status of the Re-Timing option
- Export/print of the system status
- Indication/setting of the configuration of the TimeGPS
- Reset of the configuration parameters to the factory defaults
- Query of history data
- Indication of the system status messages (via the history function)
- Erasing the history data
- Initiation of a new determination of the position
- Activation of a software reset
- Up-load of the software for the TimeGPS
- Communication by single commands (interactive command mode)
- Indication of unit specific data such as P/N, S/N
- ***Detailed help*** **functionality**

(This page is intentionally left blank)

E. RS 232 Interface

By means of a commercial available terminal software operating data of the TimeGPS can be read out as well as configuration settings can be done.

E.1. Parameter Settings of the RS 232 Interface

Protokoll:	ASCII
Baudrate:	9600
Start bit:	1
Stop bit:	1
Parity Bit:	No
Handshake:	No
Echo:	No

E.2. Communication Protocol

For communication between the TimeGPS and the user a Symmetricom proprietary ASCII protocol will be used. Only capital letters will be used except for ISO units. The language will be English (only).

All messages will end with a carriage return character followed by the line feed character.

Each input message will be responded by an output message.

Operating data (changes during operation) will be provided together with a date/time stamp.

E.3. Command Syntax

Input Message

A request command consists of a 3 characters command code.

A set command consists of a 3 characters command code followed by an input parameter. The input parameter is separated from the command by use of a “blank”-character. Input parameter will always change the unit behaviour.

All input messages will end with a carriage return character followed by the line feed character.

Syntax: <command code>_[input parameter]<cr><lf>

Example: `AMA 111110010101<cr><lf>`

Setting of the auto send mode will apply for the RS232 interface, at which the set command is received.

Output Message

An output message consists of 4 characters – 3 characters command code followed by the ":"-character – and the output data. The output data is separated from the command by use of a "blank"-character. If an answer includes a date/time stamp the command will be followed by the date, time and the output data, each block separated by use of a "blank"-character. Usually the answer correlates to the regarding input message (not for auto send mode).

Each line of an output message will end with a carriage return character followed by the line feed.

Syntax: <command abbreviation>:_<output data><cr><lf>

Example: `EVT 03-06-27 14:18:04 100000000000`<cr><lf>

The format for the date/time stamp is as follows

yy-mm-dd hh:mm:ss

If the date/time is not available (usually at power-up) the GPS uses an internal time scale (beginning with 00-00-00 00:00:00) until the GPS time is validated.

Responses to input messages which change parameters will not be answered with a date/time stamp.

If a command is not valid for a specific unit the response parameter will be "N/A".

E.4. Command Overview

Code	Description	Auto Send		
		Appl.	Default	
			Service Interface (A1)	Monitoring Interface (J3)
AAS	Command to request actual allocation of the AIS functionality for the framed utput. Command to set the desired allocation of the AIS functionality for the framed output.	No	---	---
ALM	Request will be answered by the alarm status including a date/time stamp (Minor and Major Alarm, bit-coded)	Yes (change)	ON	ON
AMA	Command to request actual allocation of events to Major Alarm (bit-coded) Command to set the desired allocation of events to Major Alarm (bit-coded)	No	---	---
AMI	Command to request actual allocation of events to Minor Alarm (bit-coded) Command to set the desired allocation of events to Minor Alarm (bit-coded)	No	---	---

Code	Description	Auto Send		
		Appl.	Default	
			Service Interface (A1)	Monitoring Interface (J3)
ASQ	Command to request actual allocation of events to the output squelch function (bit-coded). Command to set the desired allocation of events to the output squelch function (bit-coded).	No	---	---
ATM	Request will be answered by the actual date and time.	Yes (1 Hz cycle)	OFF	OFF
CTS	Command to reset all parameters to the factory default values. Additionally this command erases the history area of the EEPROM (history empty).	No	---	---
CFR	Command to request actual configuration of the framed output. Command to set the desired configuration of the framed output.	No	---	---
EVT	Request will be answered by the actual status reflection (a summary of occurred events) including a date/time stamp (bit-coded)	Yes (change)	OFF	OFF
HIS	Request will be answered by all events occurred in the past which are allocated to the history function including a date/time stamp (textual form). Number of entries are limited by the allocated memory space. Additionally the EEPROM entries can be erased.	Yes	ON	OFF
PHM	Command to initiate a new determination of the position	No	---	---
POS	Command to request the position of the GPS antenna	No	---	---
S/N	Request will be answered by unit specific information such as part number, serial number, date code, installed software version, parameter setting	No	---	---
TO1 **TO2**	Command to request actual setting for GPS Timeout 1 respectively 2. Command to set the desired duration for GPS Timeout 1 respectively 2.	No	---	---

E.5. Command Description

Command AAS

Abbreviation: AAS

Designation: Allocation AIS Signal

Description: Command to request actual allocation of the AIS functionality for the framed output.
Command to set the desired allocation of the AIS functionality for the framed output.

Auto Send Mode: No

Purpose	Command Syntax	
	Input	Output
Request	AAS	AAS: 000000000000
Set	AAS 111110000011	AAS: 000010000010

0 = if an event has occurred or a status is present an AIS will not be indicated
1 = if an event has occurred or a status is present an AIS will be indicated

Note

Answer indicates changed (new) allocation mask.
If an answer does not match with the input data the regarding events are not allowed to be allocated.

Description of the bit-coded data

A	A	S	:		0	0	0	0	0	0	0	0	0	0	0	0	Factory default shown
				Bit Position	12	11	10	9	8	7	6	5	4	3	2	1	**Description of the Event/Status**
																	oscillator warm-up
																	GPS power-up
																	pre-synchronisation
																	GPS Timeout 1
																	GPS Timeout 2
																	GPS antenna failure
																	GPS engine failure
																	phase out of range
																	oscillator failure
																	hardware failure
																	not used (reserved for re-timing option)
																	not used (reserved for re-timing option)

Background grey = disabled for allocation (defined by the supplier)
Background white = enabled for allocation (to be defined by the user)

Command ALM

Abbreviation: ALM

Designation: Alarm

Description: Request will be answered by the alarm status including a date/time stamp (Minor and Major Alarm, bit-coded)

Auto Send Mode: Yes, sent after change of the alarm status
Default Setting for Service Interface: ON
Default Setting for Management Interface: ON

Remarks: Answer correlates with LED indication.

Purpose	Command Syntax	
	Input	Output
Request	ALM	ALM: 02-06-26 14:18:04 0 0
Auto Send On	ALM 1	ALM: ON
Auto Send Off	ALM 0	ALM: OFF

Description of the bit-coded data

A	L	M	:		-	-		1		0	Major alarm is shown
Bit Position								3	2	1	**Description of the Alarm Status**
											0 = Minor Alarm not active 1 = Minor Alarm active
											blank
											0 = Major Alarm not active 1 = Major Alarm active
											blank
											Date/Time stamp

Command AMA

Abbreviation: AMA

Designation: Allocation Major Alarm

Description: Command to request actual allocation of events to Major Alarm (bit-coded)
Command to set the desired allocation of events to Major Alarm (bit-coded)

Auto Send Mode: No

Remarks: Answer correlates with LED indication.

Purpose	Command Syntax	
	Input	Output
Request	`AMA`	`AMA: 001110010111`
Set	`AMA 111100010101`	`AMA: 001100010111`

0 = if an event has occurred or a status is present a major alarm will not be indicated
1 = if an event has occurred or a status is present a major alarm will be indicated

Note

Answer indicates changed (new) allocation mask.

If an answer does not match with the input data the regarding events are not allowed to be allocated.

Description of the bit-coded data

A	M	A	:		0	0	1	1	1	0	0	1	0	1	1	1	Factory default setting
				Bit Position	12	11	10	9	8	7	6	5	4	3	2	1	**Description of the Event/Status**
																	oscillator warm-up
																	GPS power-up
																	pre-synchronisation
																	GPS Timeout 1
																	GPS Timeout 2
																	GPS antenna failure
																	GPS engine failure
																	phase out of range
																	oscillator failure
																	hardware failure
																	not used (reserved for re-timing option)
																	not used (reserved for re-timing option)

Background grey = disabled for allocation (defined by the supplier)
Background white = enabled for allocation (to be defined by the user)

Command AMI

Abbreviation: AMI

Designation: Allocation Minor Alarm

Description: Command to request actual allocation of events to Minor Alarm (bit-coded)
Command to set the desired allocation of events to Minor Alarm (bit-coded)

Auto Send Mode: No

Remarks: Answer correlates with LED indication.

Purpose	Command Syntax	
	Input	Output
Request	`AMI`	`AMI: 000001101000`
Set	`AMI 100000101000`	`AMI: 000000101000`

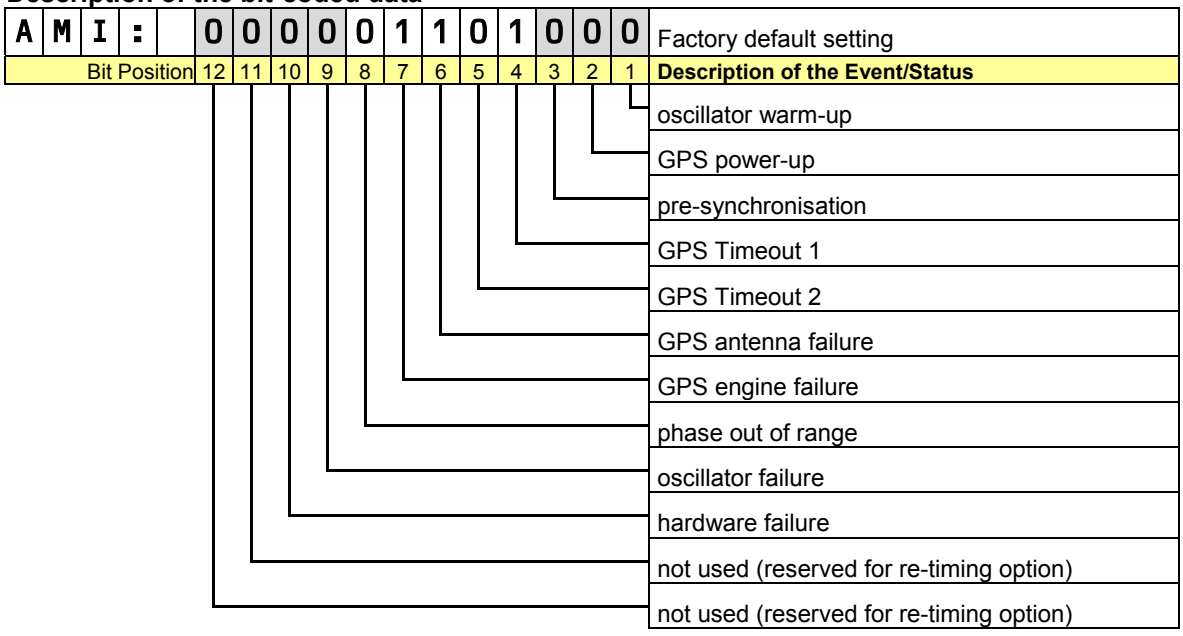
0 = if an event has occurred or a status is present a minor alarm will not be indicated
1 = if an event has occurred or a status is present a minor alarm will be indicated

Note

Answer indicates changed (new) allocation mask.

If an answer does not match with the input data the regarding events are not allowed to be allocated.

Description of the bit-coded data



Background grey = disabled for allocation (defined by the supplier)
Background white = enabled for allocation (to be defined by the user)

Command ASQ

Abbreviation: ASQ

Designation: Allocation Output Squelch

Description: Command to request actual allocation of events to the output squelch function (bit-coded).
Command to set the desired allocation of events to the output squelch function (bit-coded).

Auto Send Mode: No

Purpose	Command Syntax	
	Input	Output
Request	ASQ	ASQ: 001110010111
Set	ASQ 010000110000	ASQ: 000000110001

0 = if an event has occurred or a status is present the frequency outputs will not be squelched
1 = if an event has occurred or a status is present the frequency outputs will be squelched

Note

Answer indicates changed (new) allocation mask.

If an answer does not match with the input data the regarding events are not allowed to be allocated.

Description of the bit-coded data

A	S	Q	:		0	0	1	1	1	0	0	1	0	1	1	1	Factory default setting
				Bit Position	12	11	10	9	8	7	6	5	4	3	2	1	**Description of the Event/Status**
																	oscillator warm-up
																	GPS power-up
																	pre-synchronisation
																	GPS Timeout 1
																	GPS Timeout 2
																	GPS antenna failure
																	GPS engine failure
																	phase out of range
																	oscillator failure
																	hardware failure
																	not used (reserved for re-timing option)
																	not used (reserved for re-timing option)

Background grey = disabled for allocation (defined by the supplier)
Background white = enabled for allocation (to be defined by the user)

Command ATM

Abbreviation: ATM

Designation: Actual Date/Time

Description: Request will be answered by the actual date and time.

Auto Send Mode: Yes, sent periodically with 1 Hz
Default Setting for Service Interface: OFF
Default Setting for Management Interface: OFF

Purpose	Command Syntax	
	Input	Output
Request	ATM	ATM: 02-06-26 14:18:04
Auto Send On	ATM 1	ATM: ON
Auto Send Off	ATM 0	ATM: OFF

Command CFS

Abbreviation: CFS

Designation: Configuration Factory Setting

Description: Command to reset all parameters to the factory default values. Additionally this command erases the history area of the EEPROM (history empty).

Auto Send Mode: No

Purpose	Command Syntax	
	Input	Output
Set	CFS E	CFS: PARAMETER SET TO DEFAULT

Command CFR

Abbreviation: CFR

Designation: Configuration Framer

Description: Command to request actual configuration of the framed output.
Command to set the desired configuration of the framed output.

Auto Send Mode: No

Purpose	Command Syntax	
	Input	Output
Request	CFR	CFR: 0 1 1
Set	CFR 0 0 1	CFR: 0 0 1

Description of the bit-coded data

C	F	R	:		0		1		1	Factory default setting for E1
C	F	R	:		1		2		1	Factory default setting for DS1
Bit Position					5	4	3	2	1	**Description of the character position**
										0 = CRC off 1 = CRC on
										Blank
										Frame Format: 0 = Double Frame (E1) respectively F4 (DS1) 1 = Multiframe (E1) respectively F12/D4 (DS1) 2 = F24/ESF (DS1 only) 3 = F72 (DS1 only)
										Blank
										Line code 0 = HDB3 (E1) respectively B8ZS (DS1) 1 = AMI (DS1 only)
										Blank

Note
Line code and frame format can only be set for a DS1 Re-Timing unit.

Command CTS

Abbreviation: CTS

Designation: Configuration Time Scale

Description: Command to request actual setting for the time scale (GPS or UTC).
Command to set the time scale if UTC time information is desired instead of GPS.

Auto Send Mode: No

Purpose	Command Syntax	
	Input	Output
Request	CTS	CTS: UTC
Set	CTS U	CTS: UTC
	CTS G	CTS: GPS

G = Time scale to be set to GPS
U = Time scale to be set to UTC

Command EVT

Abbreviation: EVT

Designation: Event Status

Description: Request will be answered by the actual status reflection (a summary of occurred events) including a date/time stamp (bit-coded)

Auto Send Mode: Yes, sent after change of the event status
Default Setting for Service Interface: OFF
Default Setting for Management Interface: OFF

Purpose	Command Syntax	
	Input	Output
Request	`EVT`	`EVT: 02-06-26 14:18:04 100000000000`
Auto Send On	`EVT 1`	`EVT: ON`
Auto Send Off	`EVT 0`	`EVT: OFF`

Description of the bit-coded data

E	V	T	:	.	.	0	0	0	0	0	0	0	0	0	0	0	System operable (normal operation) shown
Bit Position						12	11	10	9	8	7	6	5	4	3	2	1	**Description of the Event/Status**
																		0 = oscillator warm-up not active 1 = oscillator warm-up active
																		0 = GPS power-up not active 1 = GPS power-up active
																		0 = pre-synchronisation not active 1 = pre-synchronisation active
																		0 = GPS Timeout 1 not expired 1 = GPS Timeout 1 expired
																		0 = GPS Timeout 2 not expired 1 = GPS Timeout 2 expired
																		0 = GPS antenna failure not present 1 = GPS antenna failure present
																		0 = GPS engine failure not present 1 = GPS engine failure present
																		0 = phase not out of range 1 = phase out of range
																		0 = oscillator failure not present 1 = oscillator failure present
																		0 = hardware failure not present 1 = hardware failure present
																		not used (reserved for re-timing option)
																		not used (reserved for re-timing option)
																		Date/Time stamp (blank before and behind)

Command HIS

Abbreviation: HIS

Designation: History

Description: Request will be answered by all events occurred in the past which are allocated to the history function including a date/time stamp (textual form). Number of entries are limited by the allocated memory space. Additionally the EEPROM entries can be erased.

Auto Send Mode: Yes, event related output will be sent at time of occurrence
Default Setting for Service Interface: ON
Default Setting for Management Interface: OFF

Remarks: Buffer slips will not be updated if auto send mode is activated.

Purpose	Command Syntax	
	Input	Output
Request	HIS	HIS: 00-00-00 00:00:00 OSCILLATOR WARMUP HIS: 02-06-26 14:18:04 OSCILLATOR OK HIS: BUFFER SLIP: 125
Erase EEPROM history entries	HIS D	HIS: HISTORY ENTRIES ERASED
Auto Send On	HIS 1	HIS: ON
Auto Send Off	HIS 0	HIS: OFF

Description of the History Output Data

String	Description
HW FAILURE	An failure was detected; leads to a endless look indicating system inoperable.
OSCILLATOR FAILURE	
OSCILLATOR OK	Indicates that the oscillator has completed it's warm-up phase.
GPS ANTENNA FAILURE	Two messages indicating appearance of the failure condition and recovery from it.
GPS ANTENNA OK	
GPS ENGINE FAILURE	Two messages indicating appearance of the failure condition and recovery from it.
GPS ENGINE OK	
POSITION HOLD MODE OFF	Initiates a new determination of the position followed by "PHM ON"
POSITION HOLD MODE ON	Indicates that the unit operates with a geographical position which leads to best results regarding output accuracy.
START-UP TIMEGPS	Indicates start of operation
GPS SAT ACQUISITION	Indicates that the GPS engine has started with the acquisition of satellites.
GPS REFERENCE AVAILABLE	Indicates that the internal GPS reference is available for disciplining the oscillator.
NO GPS REFERENCE	Indicates that the GPS reference was lost, the timeout counters will run.
SYSTEM OPERABLE	Indicates the end of the complete start-up phase. Usually the outputs are now available. If the start-up phase is completed it indicates that the synchronization process is now completed and the system is now operable again.
GPS TIMEOUT 1	Indicates that the pre-defined duration for holdover is expired.
GPS TIMEOUT 2	
PHASE OUT OF RANGE	Indicates that the phase between oscillator and reference is out of an acceptable range which leads to a new synchronization.

Command PHM

Abbreviation: PHM

Designation: Position Hold Mode

Description: Command to initiate a new determination of the position

Auto Send Mode: No

Purpose	Command Syntax	
	Input	Output
Set	PHM 0	PHM: PHM OFF

Command POS

Abbreviation: POS

Designation: Position

Description: Command to request the position of the GPS antenna

Auto Send Mode: No

Remarks: Altitude is GPS height. (WGS84 ellipsoid height)

Purpose	Command Syntax	
	Input	Output
Request	POS	POS: 02-06-26 14:18:04 47 59.172'N 11 42.460'E 566 m
	POS	POS: 02-06-26 14:18:04 NOT AVAILABLE
Auto Send On	POS 1	POS: ON
Auto Send Off	POS 0	POS: OFF

Format of the Position

<Longitude>_<Latitude>_<Height> (separated by blanks)

Longitude:<degree (3 digit)>_<minutes (3 places behind decimal point)>'<direction (E/W)>
Latitude: <degree (3 digit)>_<minutes (3 places behind decimal point)>'<direction (N/S)>
Height: <altitude>_m (number of digits variable)

Command S/N

Abbreviation: S/N

Designation: Unit S/N

Description: Request will be answered by unit specific information such as part number, serial number, date code, installed software version, parameter setting

Auto Send Mode: No

Purpose	Command Syntax	
	Input	Output
Request	S/N	S/N: PART NO 84101000AB S/N: SERIAL NO 0103 S/N: DATE CODE 25/2004 S/N: SOFTWARE 001822AB 04-05-17 S/N: PARAMETER 001895AA 03-11-20

Command TO1, TO2

Abbreviation: TO1, TO2

Designation: Timeout 1, Timeout 2

Description: Command to request actual setting for GPS Timeout 1 respectively 2.
Command to set the desired duration for GPS Timeout 1 respectively 2.

Auto Send Mode: No

Purpose	Command Syntax	
	Input	Output
Request	T01	T01: 30 s
Set	T01 100	T01: 100 s

Description of the data

T	0	1	:		1	2	0			s	
Bit Position					n	.	.	3	2	1	Description of the character position
											Unit of the GPS timeout setting (seconds)
											Blank
											Actual value of the GPS Timeout

GLOSSARY

(ONLY NON-STANDARD ABBREVIATIONS ARE LISTED)

ADEV *Allan Deviation*

The square root of AVAR (Allan Variance). A measure of the expected fractional frequency variation of a signal as a function of integration time. ADEV can also provide information about the spectral content of the phase (or frequency) noise of a signal. ADEV is dimensionless.

AIS *Alarm Indication Signal*

A code transmitted downstream to inform that an upstream failure has been detected. Replaces normal traffic signal when a maintenance alarm indication is activated.

AMI *Alternate Mark Indication*

Line code protocol in which ones are indicated by either a positive or a negative pulse, and zeros by no pulse. The ones alternate between positive going and negative going.

B8ZS *Bipolar with 8 Zero Substitution*

Bipolar line code with zero suppression scheme associated with digital service, level 1 (DS1).

BNC *Bayonet Navy Connector*

Coaxial connector with bayonet lock.

CAS *Channel Associated Signaling*

Framing mode signaling mechanism associated with E1 signaling.

CCA *Circuit Card Assembly*

CCS *Common Channel Signaling*

Framing mode signaling mechanism associated with E1 signaling.

CRC *Cyclic Redundancy Check*

D4 *12-frame multi-frame*

Frame format associated with DS1 signaling-

In DS1 digital transmission technology, D4 is the fourth-generation interface between the T1 transmission system and an analog premises device. D4 is a framing format that uses the D-4 framing bit to identify both channel and signaling frame. D4 is also known under F12 or it is called super-frame (SF).

Double-frame *2-frame multi-frame*

Frame format composed of two frames associated with E1 signaling.

DS1 *Digital Service, Level 1*

Frame alignment/synthesis for 1544 kbits/s according to ITU-T G.704
A 1.544 Mbps digital signal consisiting of 24 DS-0s and framing bit (193 bits per frame) transmitted 8000 times per second. May be carried on a T1 facility or other transmission medium.

DS1 is renamed to E11 according ITU-T G.703 issue 11/2001.

E1 *Frame alignment/synthesis for 2048 kbits/s according to ITU-T G.704*

A digital circuit with standardized characteristics that operates at 2.048 Mbps.

E1 is renamed to E12 according ITU-T G.703 issue 11/2001.

EC *European Council*

EMC *Electro-Magnetic Compatibility*

The ability of systems, equipment, and devices that utilize the electromagnetic spectrum to operate in their intended operational environments without suffering unacceptable degradation or causing unintentional degradation because of electromagnetic radiation or response.

EMI *Electro-Magnetic Interference*

Any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics/electrical equipment. It can be induced intentionally, as in some forms of electronic warfare, or unintentionally, as a result of spurious emissions and responses, inter-modulation products, and the like.

EN *Europäische Norm*

Abbreviation for German expression of European Standard

ESD *Electro Static Discharge*

The rapid, spontaneous transfer of electrostatic charge induced by a high electrostatic field.

ESF *Extended Super Frame*

A modification of the super frame format (D4) framing scheme for DS1. It extends the framing pattern from 12 frames to 24 frames. It is also called F24.

F12 *12 frame framing scheme*

see D4

F24 *24 frame framing scheme*

see ESF

F4 *4-frame framing scheme*

Frame format associated with DS1 signaling.

F72 *72-frame framing scheme*

Frame format with remote switch mode associated with DS1 signaling.

GPS *Global Positioning System* (satellite navigation system)

A satellite-based global navigation system that consists of (a) a constellation of 24 satellites in orbit 11,000 nmi above the Earth, (b) several on-station (i.e., in-orbit) spares, and (c) a ground-based control segment. The satellites transmit signals that are used for extremely accurate three-dimensional (latitude, longitude, and elevation) global navigation (position determination), and for the dissemination of precise time.

HDB3 *High Density Bipolar of Order 3*

Line code with zero suppression scheme associated with E1. It does not allow more than three consecutive zeros.

Holdover *Mode of operation in which the internal oscillator provides the synchronization reference in the event that the GPS reference is lost or the equipment internal reference is not available.*

Hz *Hertz*

A unit of frequency equal to one per second (cps.).
One kilohertz (kHz) equals 1000 cps;
One megahertz (MHz) equals 1 million cps;
One gigahertz (GHz) equals 1 billion cps.

LED *Light Emitting Diode*

A semiconductor device that emits incoherent light formed by the P-N junction. Light intensity is roughly proportional to electrical current flow. A principal light source for optical-fiber transmission used mainly with multi-mode fiber.

MTBF *Mean Time Between Failures*

An indicator of expected system reliability calculated on a statistical basis from the known failure rates of various components of the system. Note: MTBF is usually expressed in hours. 2. Of a system, over a long performance measurement period, the measurement period divided by the number of failures that have occurred during the measurement period. 3. For population of items, during a measurement period, the total functioning life of the population of items divided by the total number of failures within the population during the measurement period.

MTIE *Maximum Time Interval Error*

The maximum peak-to-peak delay variation of a given timing signal with respect to an ideal timing signal within an observation time (t = nt0) for all observation times of that length within the measurement period (T).

Multi-frame *CRC4-multiframe*

Frame format composed of 16 frames associated with E1 signaling.

PPS *Pulse Per Second*

RMS *Root Mean Square*

TDEV *Time Deviation*

A measure of the expected time variation of a signal as a function of integration time. TDEV can also provide information about the spectral content of the phase (or time) noise of a signal. TDEV is in units of time.

TNC *Threaded Navy Connector*

Coaxial connector with screw lock

UTC *Universal Time Coordinated*

Time scale based on the second (SI), as defined and recommended by the CCIR, and maintained by the Bureau International des Poids et Mesures (BIPM).

VA *Voltage Ampere*

The unit of electrical apparent power. In alternating-current power systems, the product of the rms voltage and amperage.

VAC *Volts, Alternating Current*

The unit of electromotive force

VDC *Volts, Direct Current*

The unit of electromotive force

X72 *Rubidium Oscillator*

Product name a rubidium oscillator of Symmetricom.

Symmetricom

Symmetricom GmbH
Fichtenstrasse 25
D-85649 Hofolding / Munich
Germany
www.symmetricom.com

Service/Support
Phone: +49 – 700-32886435
Fax: +49 – 8104-6624-33
e-mail: service@symmetricom.de

Sales
Phone: +49 – 8104-6624-29
Fax: +49 – 8104-6624-28
e-mail: sales@symmetricom.de