



# TimeGPS

## USER GUIDE


**Manual P/N:** **60500003**

Doc. No.: 001786AB

Published: July 2004


. . . applicable for

| | |
|---|---|
| **TimeGPS TCXO** | **P/N 84102xxx** |
| **TimeGPS OCXO** | **P/N 84103xxx** |
| **TimeGPS Terminal** | **P/N 84109012** |



Symmetricom®

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## *CHANGE RECORD*

| Revision | Issued | Para. | Subject of Change | Remarks |
|---|---|---|---|---|
| AA | 12/2003 | All | First Release | |
| AB | 07/2004 | All | Reworked, GPS LC re-named into TimeGPS | |
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*TABLE OF CONTENTS*

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# 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.

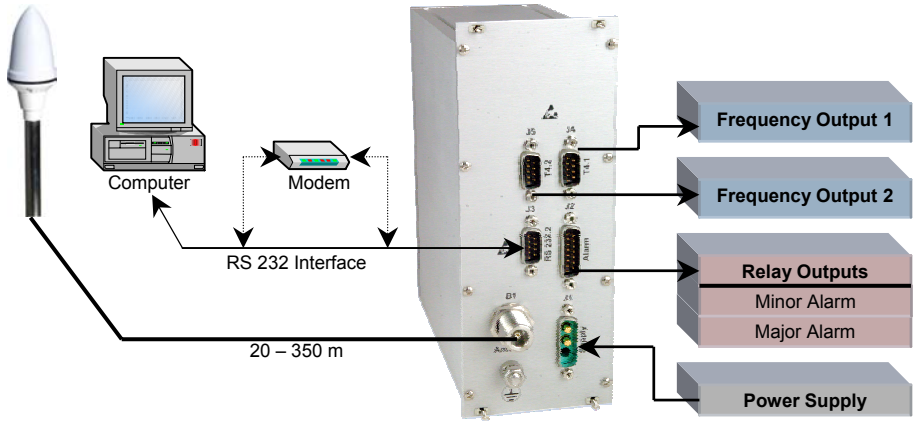
We appreciate your suggestions of ways to improve any part of this guide. Please make your suggestions on a copy of the concerned page and send it to our service office.

# 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** is a crystal oscillator based and GPS controlled multiple frequency source. 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.

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. 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 (element manager).

**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
- Crystal oscillator
- Phase measurement, frequency control and signal generation
- Status outputs and Framing circuitries

## 2.3. TimeGPS Applications

The TimeGPS is a low cost solutions for synchronization in wire-line and wireless applications.

The primarily application of the TimeGPS is the use as a frequency source. Additionally it can be used as a GPS front-end for SSUs with up to three clock outputs and it is ideal as a low cost solution for synchronization of small offices with network elements.

## 2.4. Product Views

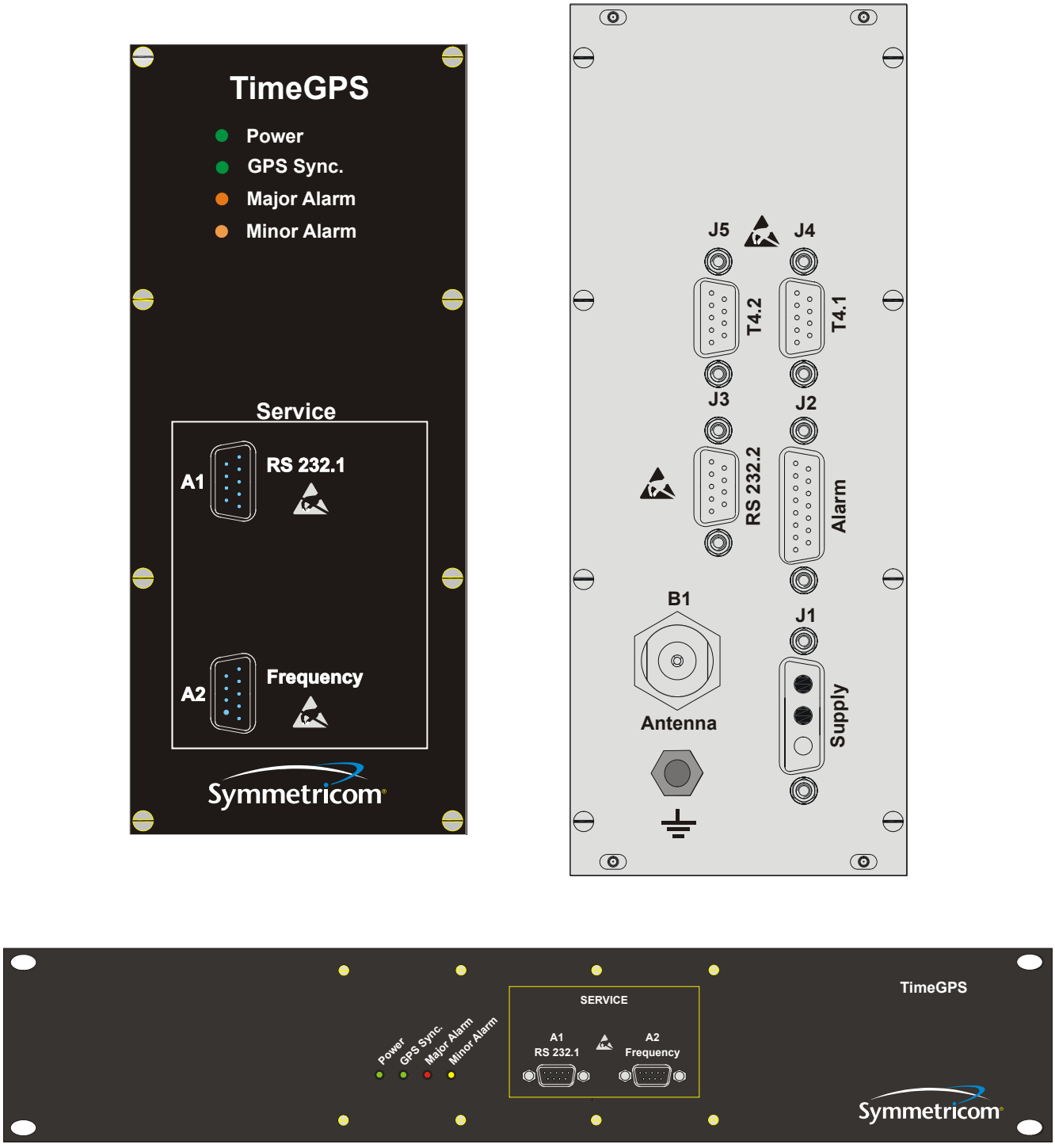



**Figure 2–1: Front and Rear Panel (Standard and 19 “ version)**

## 2.5. Features Overview

| Feature | Output Version of the TimeGPS | | | Remarks |
|---|---|---|---|---|
| | Frequency | Framer | 1 PPS | |
| **Signal Interfaces** | | | | |
| Clock output | 3 x 2048 kHz<br>3 x 1544 kHz<br>3 x 10 MHz<br>3 x 5 MHz | 2 x 2048 kHz<br>2 x 1544 kHz | 2 x 2048 kHz<br>2 x 1544 kHz<br>2 x 10 MHz<br>2 x 5 MHz | Based on the chosen frequency |
| Framed output | --- | 1 x E1 2048 kbps<br>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 x $10^{-11}$ (TCXO and OCXO) | | | Locked to GPS (24 h) @ 25°C |
| | < 5 x $10^{-10}$ / day (OCXO) | | | Holdover |
| Internal Time Base | TCXO or OCXO 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)<br>Occurred events (bit-coded) | | | Via RS232 |
| **Configuration Features** | | | | |
| Adaptation of warning system to customer needs | Yes,<br>by allocation of events to the alarm levels<br>by configuration of two holdover duration marks | | | |
| Adaptation of the system to customer needs | Yes<br>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<br>DS1: B8ZS or AMI | --- | |
| Frame Format | --- | E1: Double-frame or Multi-frame<br>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. Such a cold start will be performed typically within 15 minutes.

In 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) and will take not more than 5 minutes.

### 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. 1,3 kg |
| **Environmental Conditions** | |
| Meets or exceeds EN 300 019 | |
| Humidity | 95 % non-condensing |
| Stationary use<br>Transportation<br>Storage | 0° … 45°C (EN 300 019-1-3 class 3.2) with specified accuracy<br>-25° … 70°C (EN 300 019-1-2 class 2.2)<br>-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)<br>reverse polarity protected<br>electrically isolated from case and signal potential |
| Current Consumption | max. 0,5 A (no user-serviceable fuse inside the unit) |
| Power Consumption | typically 3 W at -48 VDC |
| Connector J1 | Type SubD 3W3 male<br>(pinning see chapter `Installation and Configuration`) |

| | |
|---|---|
| **Antenna Interface** | |
| 1 x connector B1 | N-Type, female,<br>active GPS antenna powered by the TimeGPS<br>18 dB to 36 dB external antenna gain measured at the connector of the TimeGPS<br>Supply to the GPS-Antenna: 5 VDC, 5 ... 80 mA, short-circuit protected |
| **Status Outputs** | |
| 2 x alarm | Connector J2, SubD15 male<br>(pinning see chapter `Installation and Configuration`) |
| 4 x LED | Power<br>GPS Sync<br>Major Alarm<br>Minor Alarm |
| **Communication Interface** | |
| 2 x RS232 | Connectors A1 and J3, SubD9 male each, DTE-Connection<br>(pinning see chapter `Installation and Configuration`) |
| **Accuracy** | |
| Accuracy (GPS available) | frequency accuracy: $< 1 \times 10^{-11}$ (24 h)<br>timing accuracy: 200 ns (MTIE $10^4$ s) |
| Accuracy (Holdover) | frequency accuracy: $< 5 \times 10^{-10}$ / day (OCXO)<br>(within operating temperature range ± 5°C) |
| **Frequency Outputs** | |
| 3 (2) x Output | Connectors J4 and J5 for signal distribution,<br>Connector A2 for service purposes<br>SubD9 male each<br>(pinning see chapter `Installation and Configuration`) |
| Nominal Frequency | 2048 kHz<br>1544 kHz<br>10 MHz<br>5 MHz |
| Signal Form | 2048 kHz: according G.703/13<br>1544 kHz: Square Wave 3.2 $V_{pp}$ (typically)<br>10 MHz and 5 MHz: Sine Wave 1Vrms / 50 Ω |

| **Framer Option** (at Connector J5) | |
|---|---|
| E1* 2048 kbps | G.703/9 @ P/N 8410210x or P/N 8410310x |
| DS1* 1544 kbps | G.703/5 @ P/N 8410280x or P/N 8410380x |
| **1 PPS Option** (at Connector J5) | |
| Signal Form | P/N 84102x1x or P/N 84103x1x:<br>square wave, pulse width typically 10 µs;<br>TTL, minimum 2.4 V into 50 Ω<br>(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 timing accuracy 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**

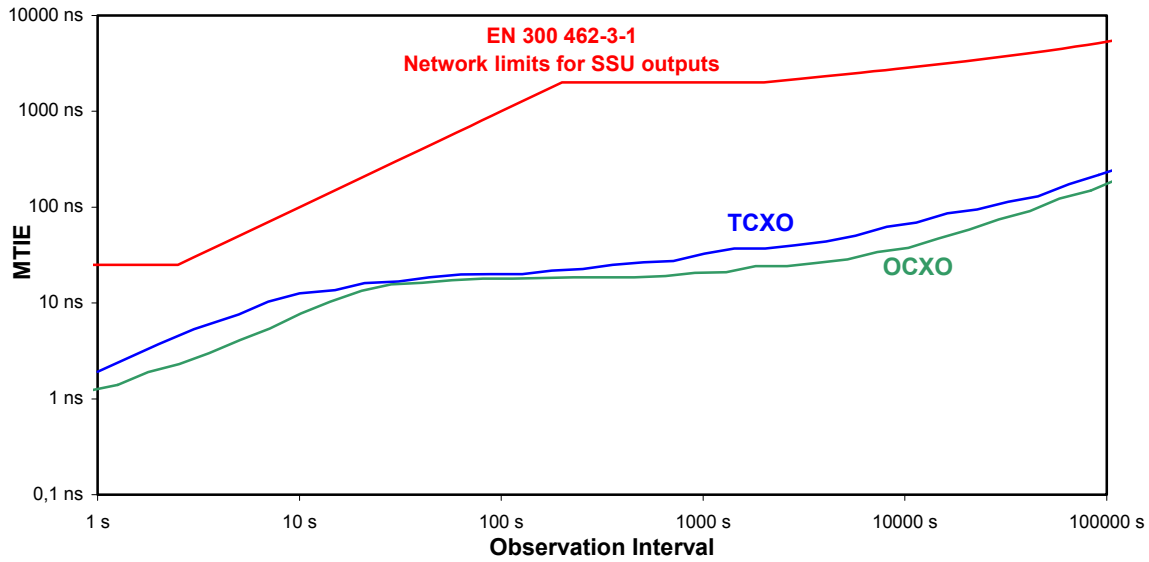



**Figure 2–2: MTIE Diagram**

**TDEV**

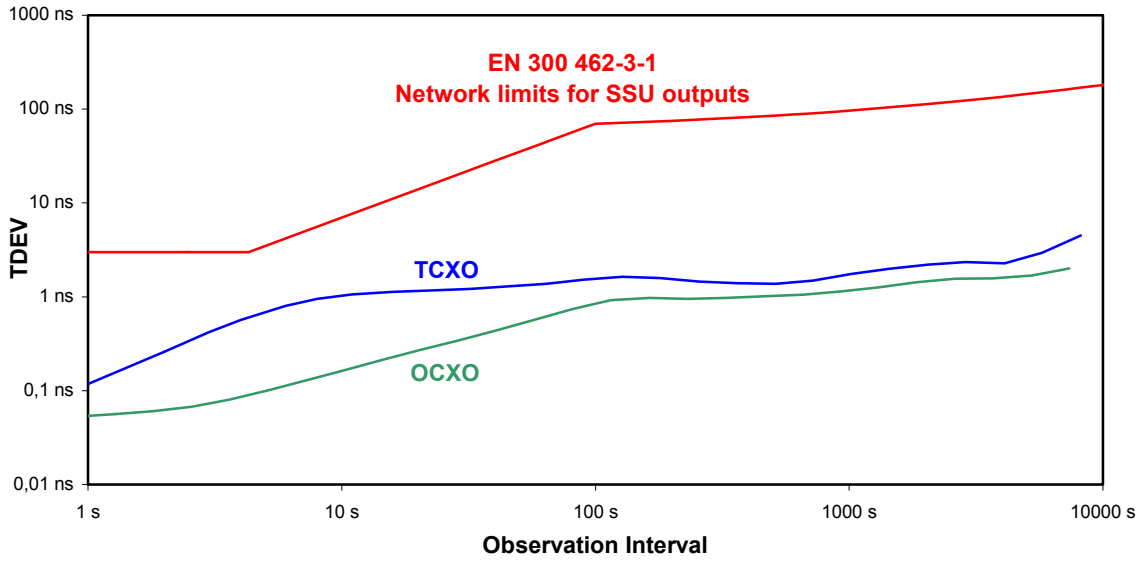



**Figure 2–3: TDEV Diagram**

### 2.8.2. Holdover Performance for TimeGPS Versions with OCXO

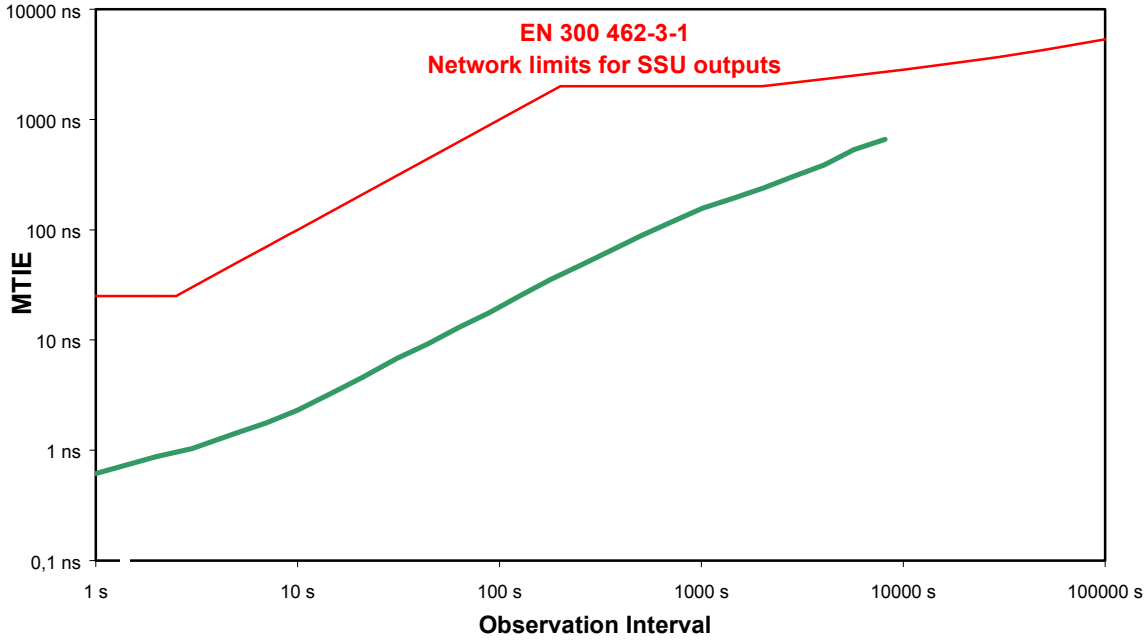



**Figure 2–4: MTIE Diagram for Holdover**

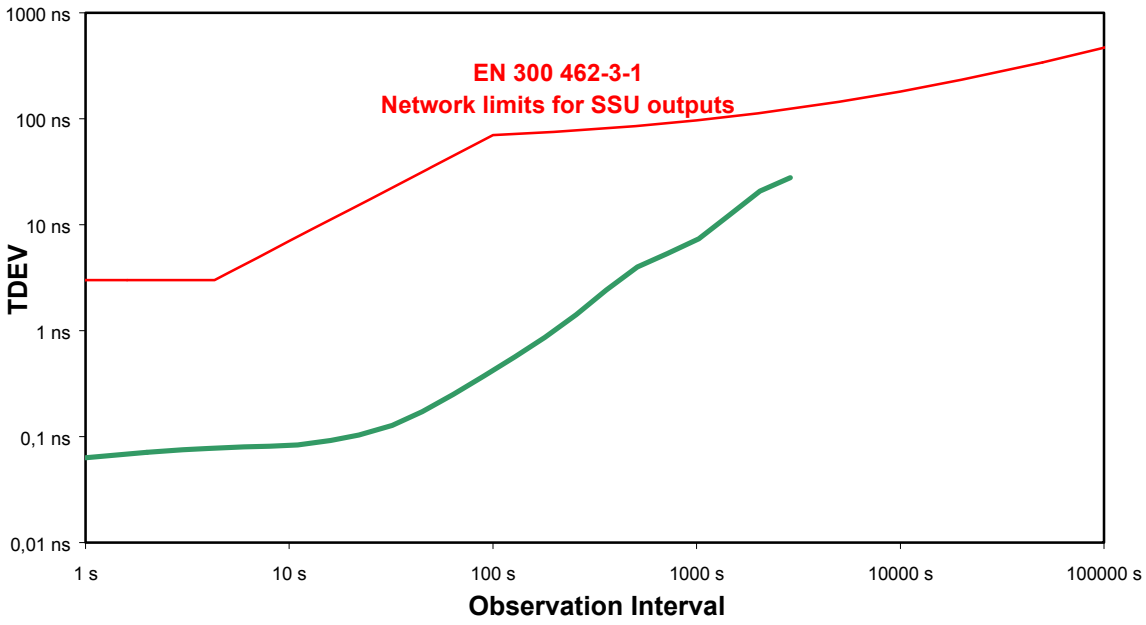



**Figure 2–5: TDEV Diagram for Holdover**

## 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**

**P/N 84102xx0 (TCXO)**

**P/N 84103xx0 (OCXO)**

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 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. 001926AB 05/2004

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# 3. Unpacking and Inspection

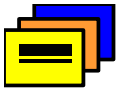
This chapter contains recommended procedures for unpacking the new equipment. It also lists instructions for inspection the delivered items for correct condition and completeness.

## 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.

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# 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

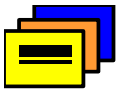
### 4.1.1. Antenna Cable Length Determination

(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 |
|---|---|---|---|
| up to 50 m | 25 dB | RG213 | |
| up to 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`.

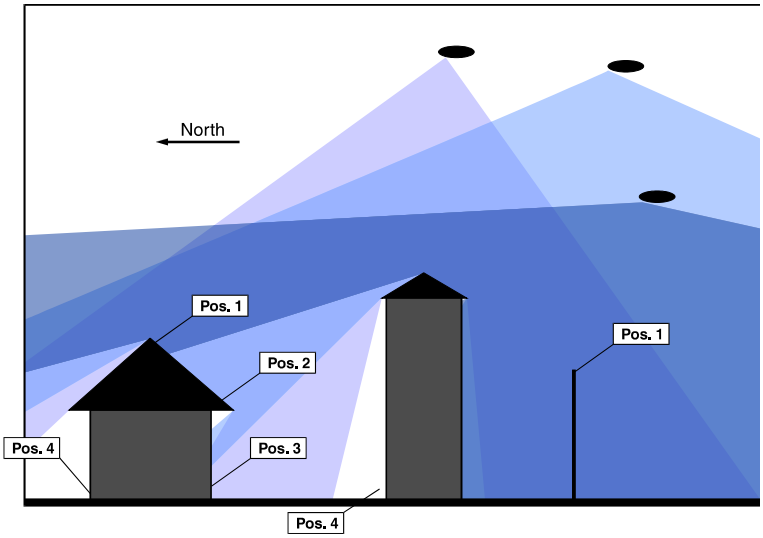
### 4.1.3. GPS Antenna

**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.



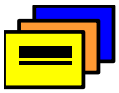

The pros and cons for different location options (see figure) are:

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.

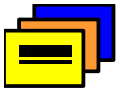
(2) Pre-assemble the mounting fixture and fix the mounting tube.

(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.

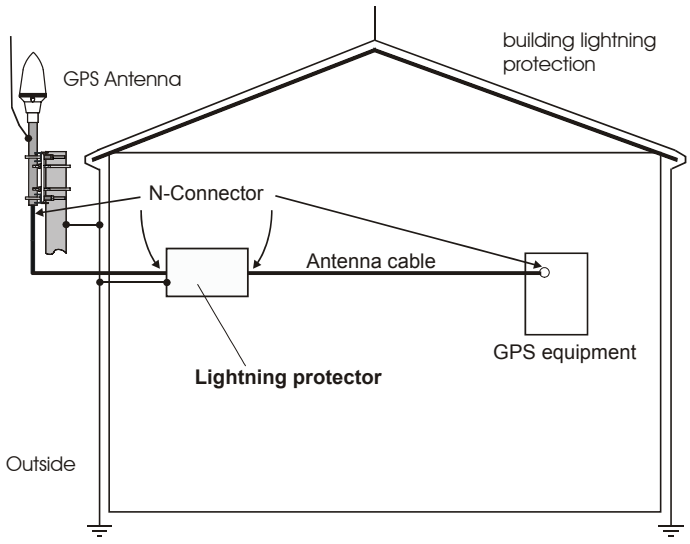
**Note**

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

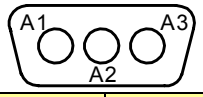
The unit shall be operated in an environment that meets the requirements of the section `Technical Data`.

**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

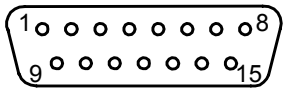
### 4.2.2. Pinning of the TimeGPS Connectors

**Pin Allocation – Power Supply**



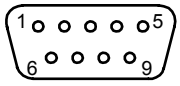

| Pin | Signal Name | Signal Definition | Remarks |
|---|---|---|---|
| A1 | --- | Not connected | |
| A2 | Power | -48 VDC (negative) | Nominal voltage |
| A3 | Power Return | 0 VDC (positive) | |

**Pin Allocation – Alarm Outputs**



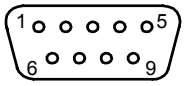

| Pin | Signal Name | Signal Definition | Remarks |
|---|---|---|---|
| 1...3 | --- | Not connected | |
| 4 | Major alarm | high impedance (≥ 10 MΩ, max 50 V) to common contact (open): no major alarm present<br>short circuit (max. 10 Ω, max 1.0 A) to common contact (closed): major alarm present | Active 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<br>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;<br>Asynchronous, full duplex exchance mode<br>9600 Baud;<br>8 data bits, 1 start/stop bit, no parity bit<br>ASCII protocol without echo | according<br>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)<br>Output Signal + | See chapter `Technical Data` | |
| 3 … 5 | --- | Not connected | |
| 6 | T4b (Ring)<br>Output Signal - | --- | Units with 1PPS option:<br>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.
If a 19” version of the equipment is used mount the unit at a rack by using attaching parts suitable for your rack.

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

(3) Connect the signal cable to distribute the clock signal 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*.

**Warning**

For continued fire protection, install power supply fuses with type and rating suitable for the TimeGPS.
There are no user-serviceable fuses in the unit itself.

(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 *A1* 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

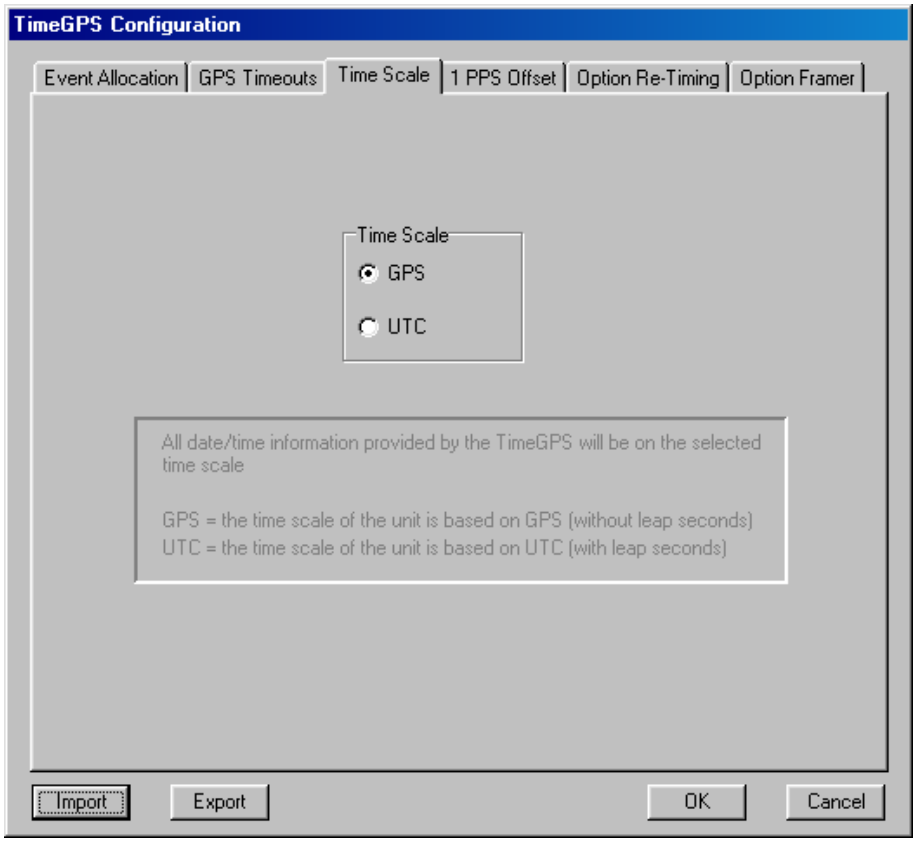
The user will be able to set the time scale to UTC instead of GPS.

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**

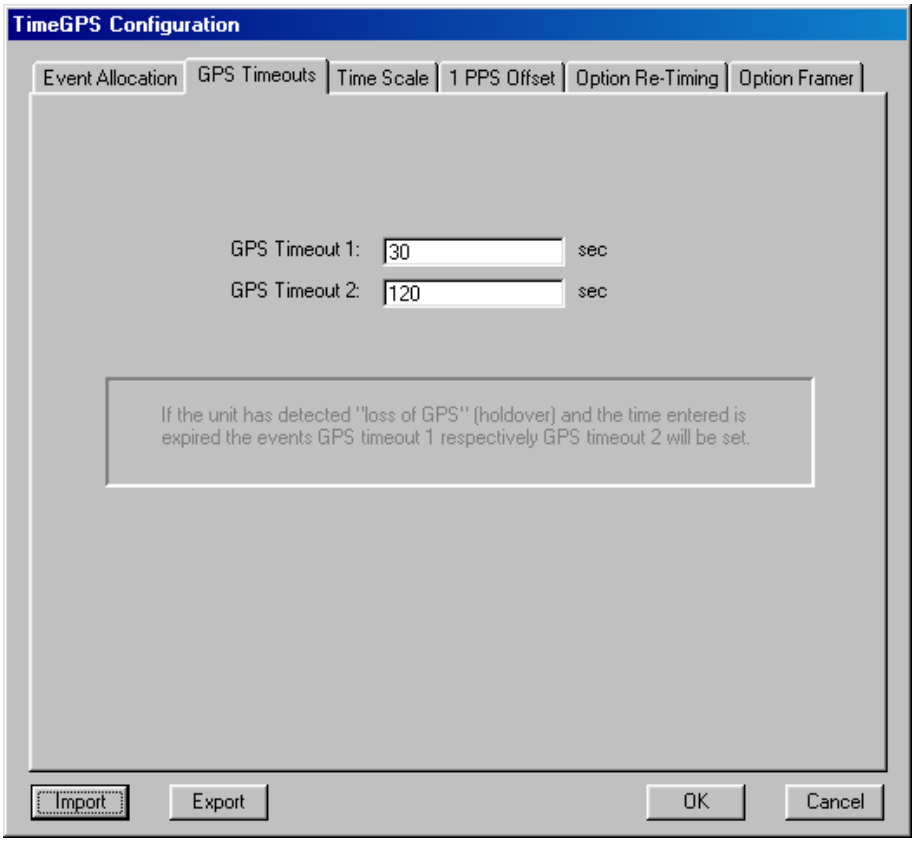
The TimeGPS will only accept values for GPS Timeout 2 which are greater or equal than GPS Timeout 1.

**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**

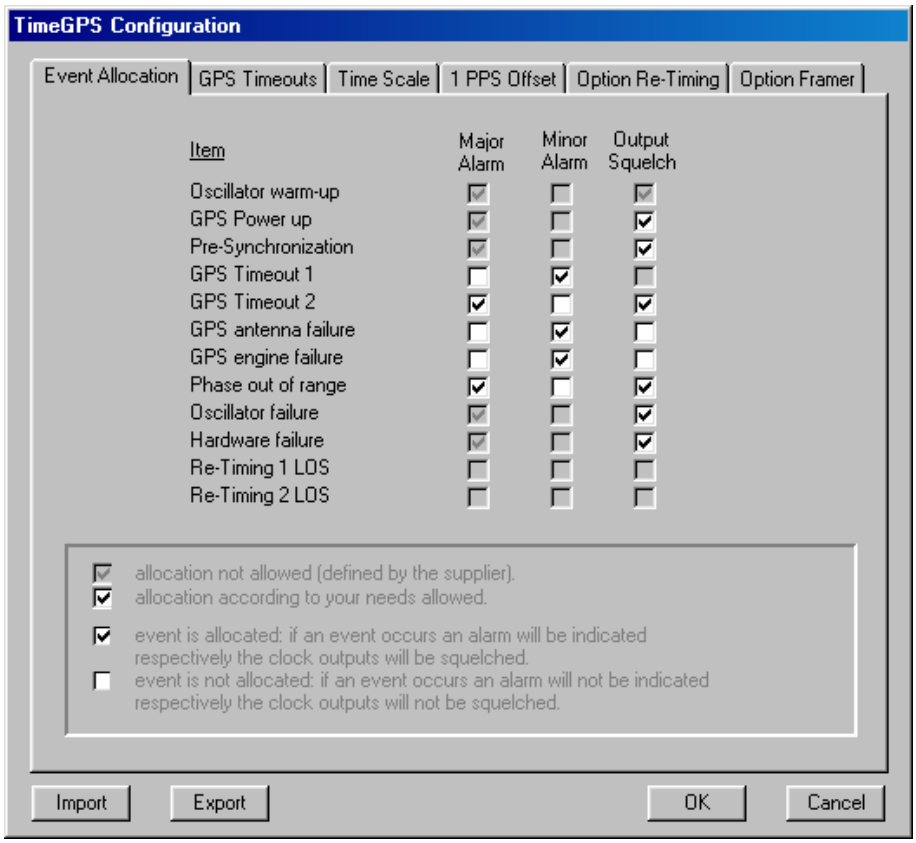
The meaning of each event is explained in the Appendix C.

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).

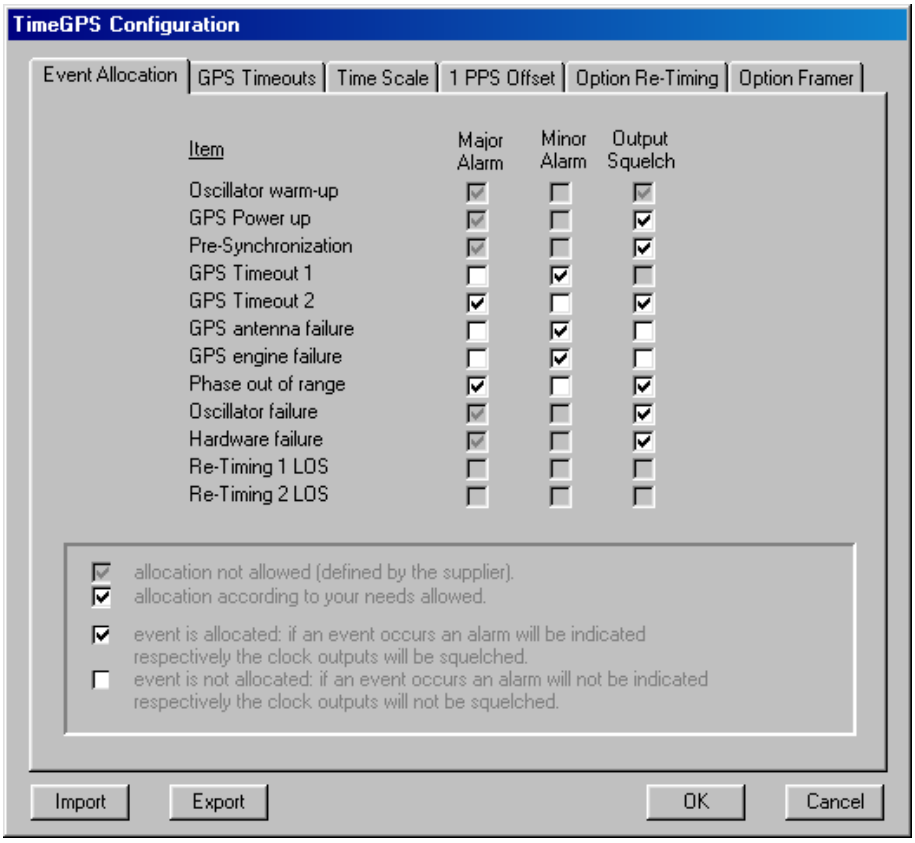
If an event is allocated the outputs will be squelched if the event/condition occurs. Otherwise the outputs will remain activated

**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.

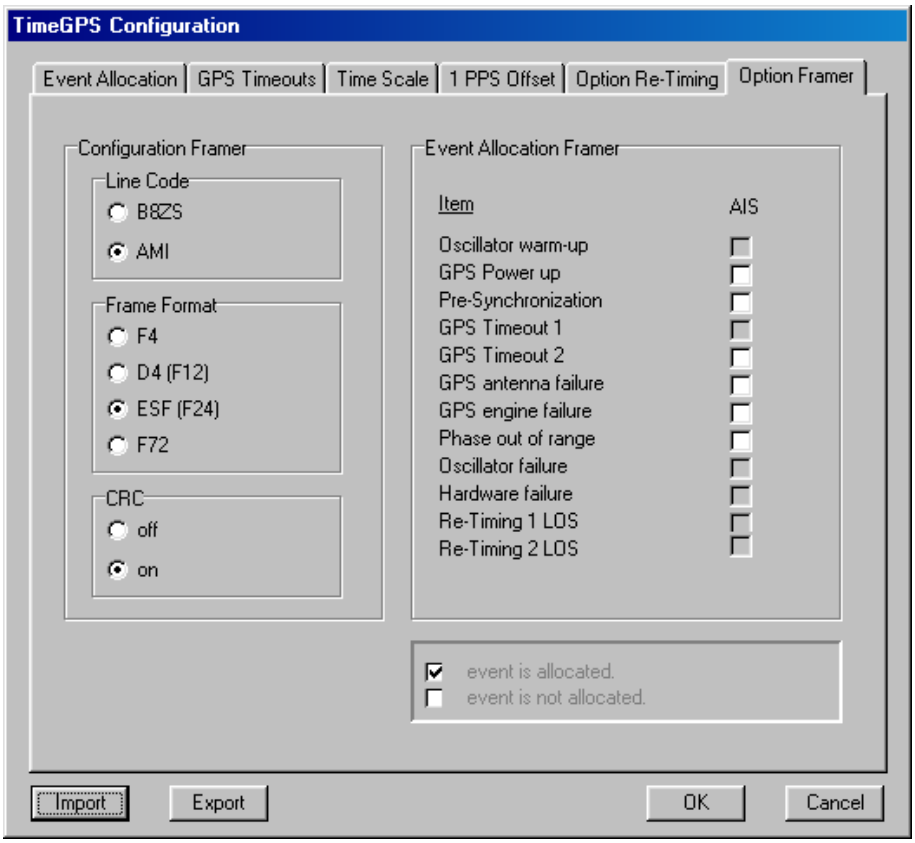
**Procedure**

(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

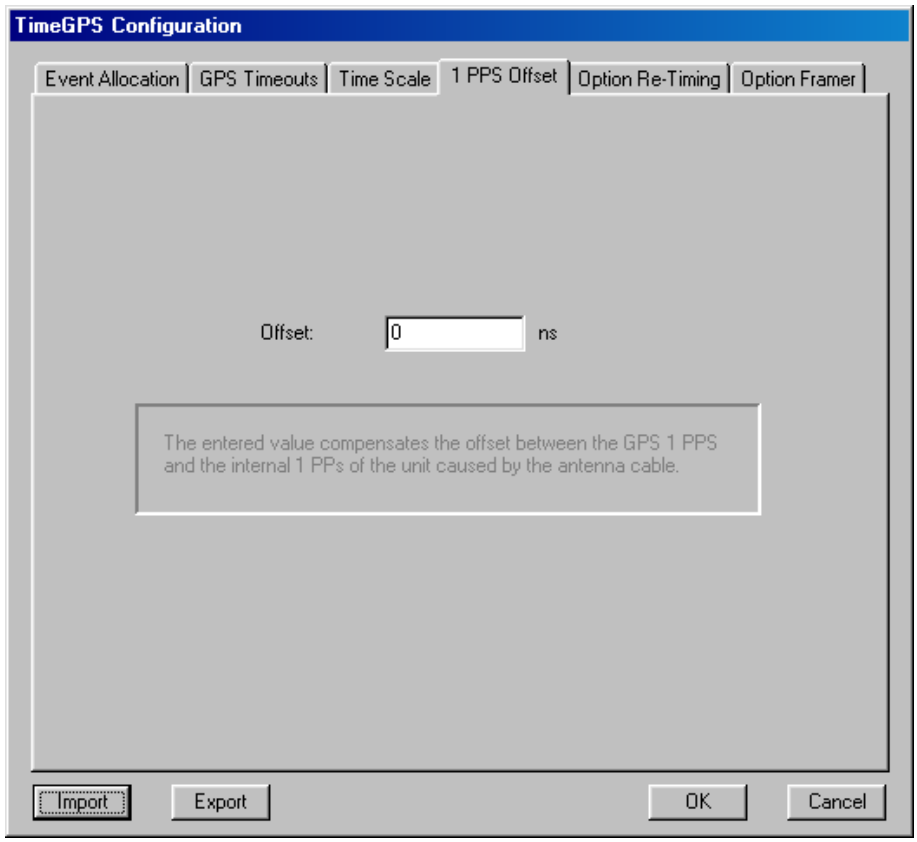
The user will be able to adjust the 1 PPS signal time-wise in order to compensate the delay caused by the length of the antenna cable.

**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.

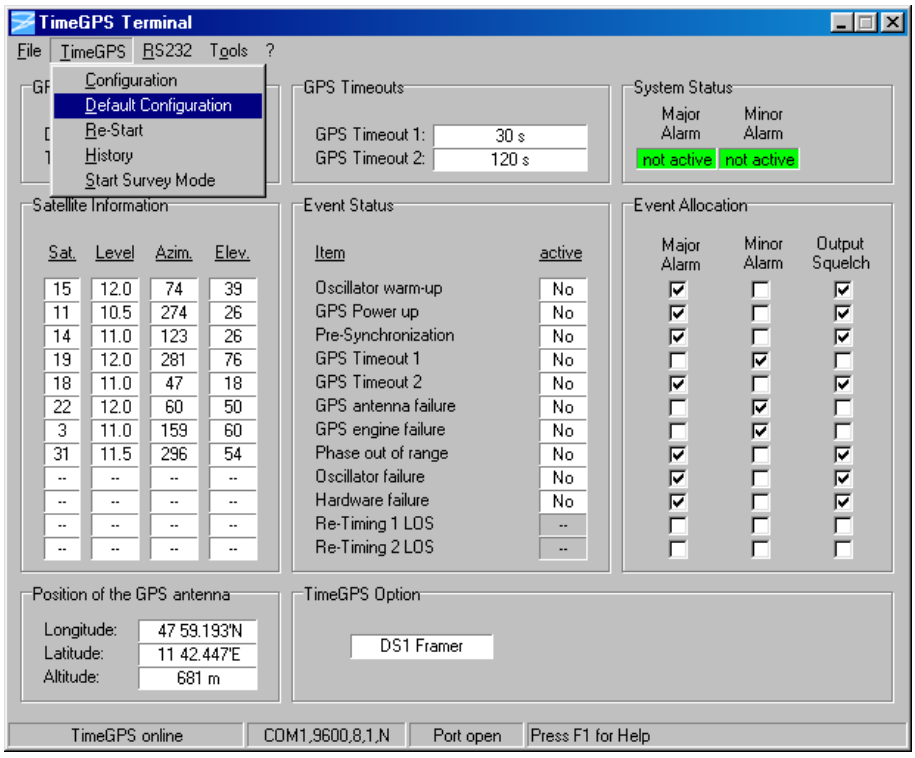


### 4.3.8. Reset to Factory Defaults

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.

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

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

(3) Supply the unit with power.

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

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

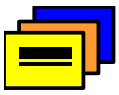
(6) The TimeGPS should perform as described at paragraph 5.2.1

# 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 5 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 2 ½ 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.

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# 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;<br>TxD of the TimeGPS is connected to RxD of the computer;<br>(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 *A1* of the TimeGPS and to the RS232 connector of the computer.

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

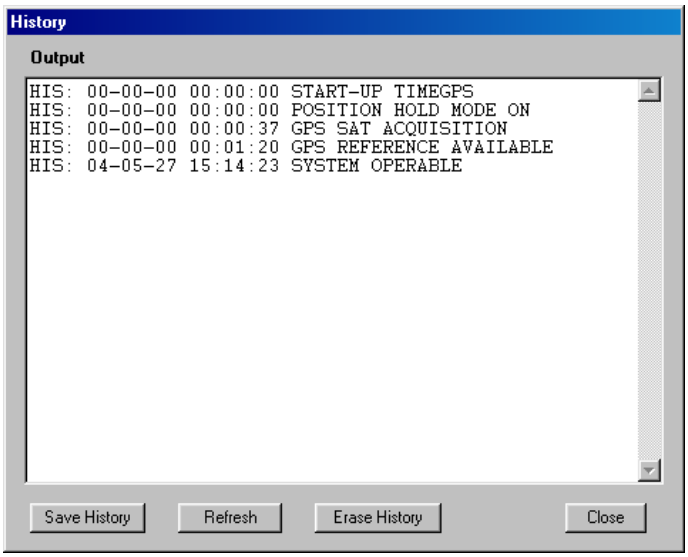
(3) Verify that the LED *Power* illuminates

(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

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

(2) 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 $V_p$

(3) 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*.

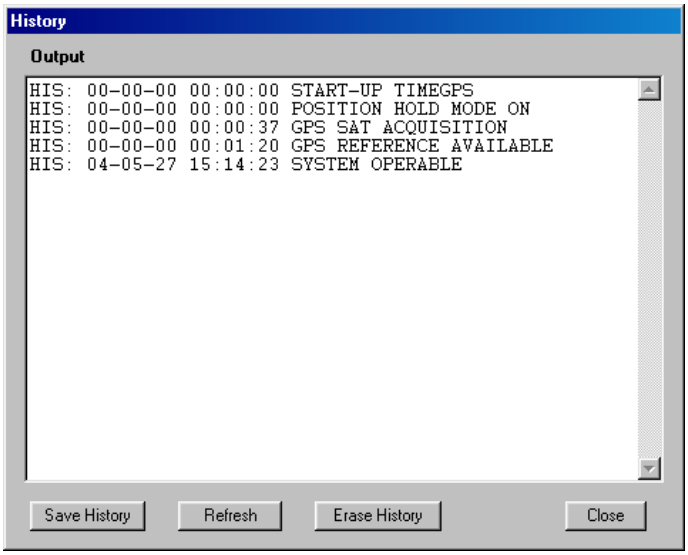
**Recommendation**

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).<br>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).<br>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).<br>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. Follow instruction as per paragraph 7.4 |
| 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.<br>Check signal distribution incl. connections. |
| | Alarm is indicated<br>(output probably squelched) | Proceed according fault isolation sub-paragraph “Abnormal Alarm/Status Indication”<br>If applicable set squelch mask as needed. |
| | Unit faulty | Return the unit to the manufacturer.<br>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.<br>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

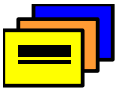
To return the unit to the manufacturer for repair, use the following instructions:

(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 TCXO | 84102000 |
| TimeGPS 2048 kHz, E1 2048 kbps with TCXO | 84102100 |
| TimeGPS 5 MHz with TCXO | 84102400 |
| TimeGPS 10 MHz with TCXO | 84102500 |
| TimeGPS 1544 kHz with TCXO | 84102700 |
| TimeGPS 1544 kHz, DS1 1544 kbps with TCXO | 84102800 |
| TimeGPS 2048 kHz, 1 PPS with TCXO | 84102010 |
| TimeGPS 5 MHz, 1 PPS with TCXO | 84102410 |
| TimeGPS 10 MHz, 1 PPS with TCXO | 84102510 |
| TimeGPS 1544 kHz, 1 PPS with TCXO | 84102710 |
| TimeGPS 2048 kHz with OCXO | 84103000 |
| TimeGPS 2048 kHz, E1 2048 kbps with OCXO | 84103100 |
| TimeGPS 5 MHz with OCXO | 84103400 |
| TimeGPS 10 MHz with OCXO | 84103500 |
| TimeGPS 1544 kHz with OCXO | 84103700 |
| TimeGPS 1544 kHz, DS1 1544 kbps with OCXO | 84103800 |
| TimeGPS 2048 kHz, 1 PPS with OCXO | 84103010 |
| TimeGPS 5 MHz, 1 PPS with OCXO | 84103410 |
| TimeGPS 10 MHz, 1 PPS with OCXO | 84103510 |
| TimeGPS 1544 kHz, 1 PPS with OCXO | 84103710 |
| 19", 2U Front Panel for TimeGPS<br>(to be ordered together with the TimeGPS) | 84109001 |
| User Guide TimeGPS | 60500003 |

## 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

**TCXO**
GPS Timeout 1 = 30 s
GPS Timeout 2 = 120 s
**OCXO**
GPS Timeout 1 = 180 s
GPS Timeout 2 = 1800 s

## B.2. Time Scale

The time scale is based on GPS.

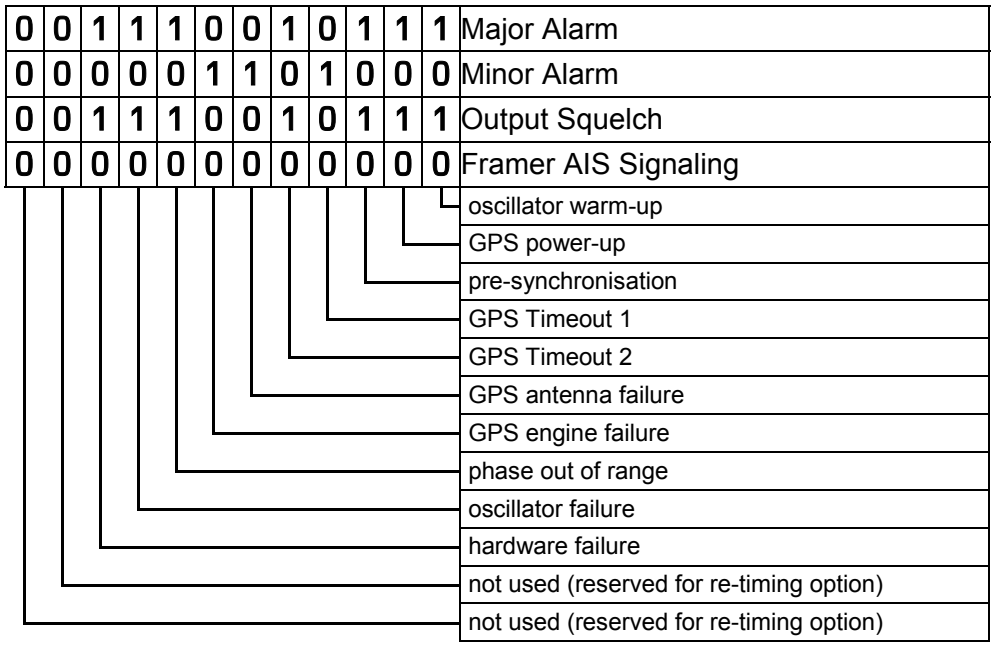
## B.3. 1 PPS Offset

1 PPS offset = 0 ns

## B.4. Automatic Mode for the RS232 Communication

Connector A1: 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.<br>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. |

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# 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

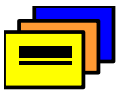
## D.1. Host Environment

| | |
|---|---|
| Hardware: | PC with at least 1 MB available hard disk memory<br>Serial interface (RS232) |
| Operating System: | Windows 98SE/2000/XP<br>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

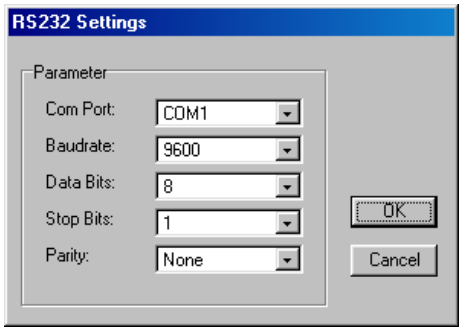
(1) Call the file *TimeGPSTerminal.exe*.

(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.

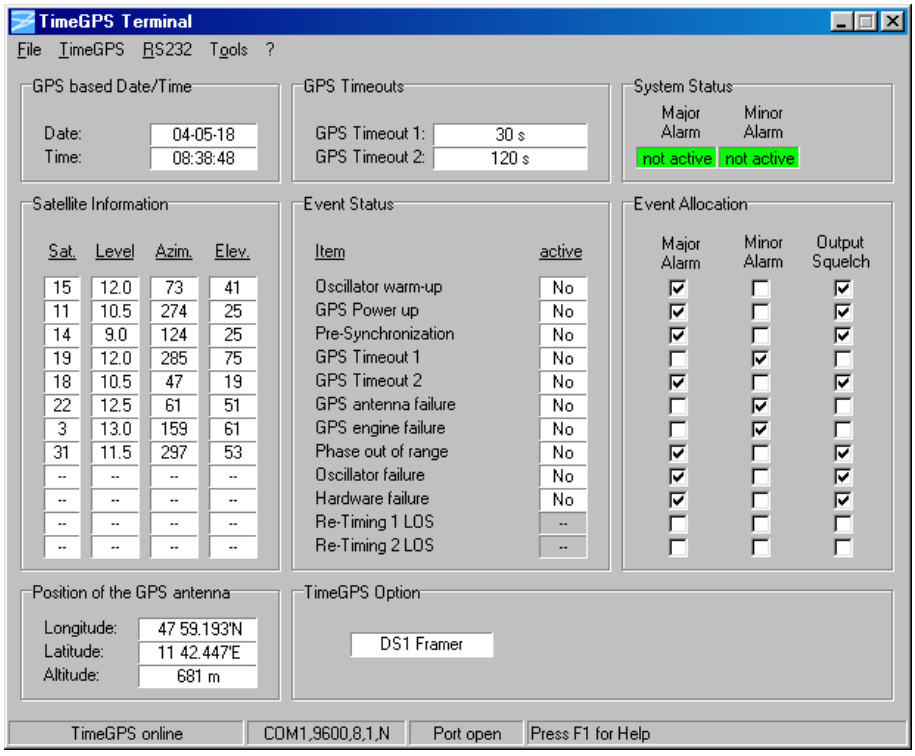



**Note**

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**

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# 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.<br>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)<br>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)<br>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).<br>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.<br>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.<br>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**<br>**TO2** | Command to request actual setting for GPS Timeout 1 respectively 2.<br>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<br>1 = Minor Alarm active |
| | | | | | | | | | | | blank |
| | | | | | | | | | | | 0 = Major Alarm not active<br>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**

| A | M | I | : | | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 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 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<br>1 = CRC on |
| | | | | | | | | | | Blank |
| | | | | | | | | | | Frame Format:<br>0 = Double Frame (E1) respectively F4 (DS1)<br>1 = Multiframe (E1) respectively F12/D4 (DS1)<br>2 = F24/ESF (DS1 only)<br>3 = F72 (DS1 only) |
| | | | | | | | | | | Blank |
| | | | | | | | | | | Line code<br>0 = HDB3 (E1) respectively B8ZS (DS1)<br>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<br>1 = oscillator warm-up active |
| | | | | | | | | | | | | | | | | | | 0 = GPS power-up not active<br>1 = GPS power-up active |
| | | | | | | | | | | | | | | | | | | 0 = pre-synchronisation not active<br>1 = pre-synchronisation active |
| | | | | | | | | | | | | | | | | | | 0 = GPS Timeout 1 not expired<br>1 = GPS Timeout 1 expired |
| | | | | | | | | | | | | | | | | | | 0 = GPS Timeout 2 not expired<br>1 = GPS Timeout 2 expired |
| | | | | | | | | | | | | | | | | | | 0 = GPS antenna failure not present<br>1 = GPS antenna failure present |
| | | | | | | | | | | | | | | | | | | 0 = GPS engine failure not present<br>1 = GPS engine failure present |
| | | | | | | | | | | | | | | | | | | 0 = phase not out of range<br>1 = phase out of range |
| | | | | | | | | | | | | | | | | | | 0 = oscillator failure not present<br>1 = oscillator failure present |
| | | | | | | | | | | | | | | | | | | 0 = hardware failure not present<br>1 = hardware failure present |
| | | | | | | | | | | | | | | | | | | not used (reserved for re-timing option) |
| | | | | | | | | | | | | | | | | | | not used (reserved for re-timing option) |
| | | | | | | | | | | | | | | | | | | Date/Time stamp<br>(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`<br>`HIS: 02-06-26 14:18:04 OSCILLATOR OK`<br>`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.<br>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 (PLL unlock) 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 84102000AB<br>S/N: SERIAL NO 0103<br>S/N: DATE CODE 25/2004<br>S/N: SOFTWARE 001822AB 04-05-17<br>S/N: PARAMETER 001896AA 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.

**OCXO** *Ofen Compensated Crystal Oscillator*

**PPS** *Pulse Per Second*

**RMS** *Root Mean Square*

**TCXO** *Temperature Compensated Crystal Oscillator*

**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

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