OSCILLOQUARTZ
SWATCH GROUP ELECTRONIC SYSTEMS

OSA 4531-E1 GPS-SB
GPS - Synchronization Box

USER MANUAL

Model 945.453.1S0.x00

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What's new in this revision

- SUB-D connector description - distinguish male or female

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Chapter

1. Introduction

Including :

- About this Manual
- Reading Guide
- Safety
- Warranty
- Certification

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1.1 About this Manual

This manual has been designed to provide basic and detailed information for the correct use and operation of the OSA 4531-E1. It summarizes the overall equipment concept and theory of operation, describes the hardware itself and provides information related to installation, operation and maintenance.

It is intended for the use of the following types of users:

Systems Engineers:	An overview of the equipment concept and theory of operation.
Installation Engineers:	Detailed technical information and procedures for correct installation, operation, configuration and commissioning as well as equipment specifications and maintenance guidelines.
Maintenance Engineers:	Information on troubleshooting, maintenance and equipment technical data.

1.1.1 Copyright Notice

1.2 Reading Guide

Special icons, attracting your attention, precede important and/or critical information in this document. Hereafter are explanations of each icon.

CAUTION

This symbol is extremely important and must not be neglected. It precedes information or procedures regarding installation, operation or maintenance. Follow all steps or procedures, as instructed, to avoid any damage to equipment or serious personal injury.

ELECTRICAL SHOCK HARZARD

This warning symbol is extremely important and must not be neglected. It indicates that there are dangerous high voltages present inside the enclosure of this product and precedes important warnings to avoid any risk of fire or electrical shock that could lead to serious personal injury or loss of life.

ESD CAUTION

Electrostatic Discharge (ESD) must be avoided so as not to damage or destroy static sensitive components.

Note:

A note symbol informs the reader that additional information on the related subject is provided in order to simplify a described task, suggest other references or even just simplify an explanation.

Recommendation:

Recommendations advise the user on manufacturer tested methods and procedures proven valuable for correct use and optimum equipment results.

1.3 Safety Instructions

IMPORTANT SAFETY INSTRUCTIONS.
DO NOT DISCARD, READ BEFORE OPERATING

GENERAL

Exercise extreme care when handling any electronics equipment as it contains precision parts that can be damaged by improper handling.

Avoid touching connector pin surfaces. Foreign matter deposited on contact surfaces can cause corrosion, and eventually lead to degradation of performance. In addition, do not use abrasives to clean contact/pin surfaces.

ESD CONSIDERATION

Each module contains semiconductor devices that can be damaged by electrostatic discharges. It is advisable to take anti-static precautions when handling electronic boards or static sensitive components. Use an approved anti-static bracelet in accordance with company practice.

WATER AND MOISTURE

Do not place containers with liquids such as coffee, water, sodas, etc. on this unit. Do not operate this equipment in a wet environment.

HEATING

Do not install this product near heat sources such as radiators, air ducts, areas subject to direct, intense sunlight, or other products that produce heat.

VENTILATION

Slots and openings in the unit are provided for ventilation and to ensure reliable operation of the product. To protect the unit from overheating, those openings must not be blocked or covered.

GROUNDING

EARTH CONNECTION IS ESSENTIAL BEFORE CONNECTING TO THE SUPPLY.

The OSA 4531-E1 must be connected to Earth Ground (common bounding network (DC-C)). The wire used for the connection must be a minimum of AWG16.

Ensure that all other devices connected to the 4531-E1, are connected to protective (earth ground). (Grounding one conductor of a two-conductor outlet is not sufficient.)

Any interruption of the protective (grounding) conductor (inside the equipment) or disconnecting the protective earth terminal is likely to make this equipment dangerous. Intentional interruption is prohibited.

POWER

Make sure the power sources are compatible with the power inputs of the equipment. The equipment's protective earth terminals must be connected to the protective conductor of the (mains) power cord or the station earth. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of an extension cord (power cable) without a protective conductor (grounding).

POWER CORD PROTECTION

The power supply cord for this product should be routed or installed in such a manner to protect it from being walked on or pinched. The unit should be powered down completely before connecting or disconnecting the power cable. The power cord should be removed before moving the unit. The power cord must be placed near an easily accessible unobstructed socket outlet.

CLEANING

Connected and running equipment can only be dusted using a soft dry cloth.

ONLY WITH**, <u>AUTHORIZED PERMISSION</u>,** OUT OF SERVICE & UNPLUGGED equipment can be cleaned with a soft cloth slightly moistened with a mild detergent solution. Do not use liquid cleaners, aerosols, abrasive pads, scouring powders or solvents, such as benzine or alcohol. Ensure the surface cleaned is fully dry before reconnecting power.

SERVICING AND MODIFICATIONS

To avoid dangerous electric shock, do not perform any servicing or modifications other than what is recommended in this User Manual. Do not attempt to gain access to areas of the unit where dangerous voltages are present. Refer servicing to qualified service personnel.

DAMAGE REQUIRING SERVICE

- Refer servicing to qualified service personnel under the following conditions:
- When the power supply cord is damaged.
- If liquid has been spilled into the enclosure of the unit.
- If the product does not function normally by following the instructions in the User's Manual. Adjust only those controls that are covered by the operating instructions. Improper adjustment of other controls may result in damage and will often require rework by a qualified technician to restore the product to its normal operation.
- If the product has been damaged in any way.

When the unit displays a negative, distinct change in performance.

1.4 Warranty

This Oscilloquartz product carries a warranty which commences from date of dispatch from factory. Unless agreed otherwise or stipulated differently on the original acknowledgement of order, the duration of the warranty is twenty four months.

It applies to demonstrably faulty material or poor workmanship, but excludes batteries.

Oscilloquartz shall bear only the cost of repair or replacement in its own premises. Should this not be possible for reasons beyond our control, all additional costs are at customer expense.

Repairs under warranty carry either the balance of the original warranty or a six months warranty, whichever is longer.

Damages resulting from natural wear, improper maintenance, failure to observe the operating instructions, excessive strain, unsuited consumption material as well as improper environmental and mounting conditions are excluded from this warranty.

The warranty expires if the customer or a third party modifies or repairs the product without Oscilloquartz's prior written consent or if the customer does not take immediate steps to prevent the damage from becoming more serious; likewise, if insufficient time is provided for repair or replacement.

The customer will not be entitled to other warranty claims. Oscilloquartz is not liable for consequential damage.

1.5 Certification

EQUIPMENT CERTIFICATION:

Oscilloquartz equipment is tested according to well-defined procedures. Appropriate testing and inspection takes place at the component, board, equipment and system levels. The company maintains in-house cesium standards that are continuously compared to UTC. Before any equipment is released, it must satisfy the relevant tests and inspection schedules. The equipment is then issued with a "Certificate of Conformity" that guarantees its conformance with the relevant performance criteria.

The OSA 4531-E1 GPS is designed to be compliant to:

- EMC : EN50081-1, EN50082-1, EN61000-6-2
- SAFETY : EN60950

A variety of Oscilloquartz products are certified world-wide. For details, please refer to our web site at www.oscilloquartz.com

COMPANY CERTIFICATION:

- Certified since 1998 by the Swiss Accreditation Service and Swiss Federal Office of Metrology as an accredited laboratory for time and frequency.
- Certified ISO 9001 since 1994 and ISO 14001 since 2000 by The Swiss Association for Quality and Management Systems (SQS)

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Chapter

2. General Description

Including :

- Overview
- Functions

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2.1 Overview

The OSA 4531-E1 GPS-SB is a GPS receiver which provides an accurate frequency derived from the Coarse Acquisition Link 1 signals transmitted by the Navstar Global Positioning System (GPS) satellites. In addition, the GPS 4531-E1 module is equipped with an auxiliary input, which accepts either frequency or E1 code. Depending of the configuration of the module, the GPS or the auxiliary input can be used as the reference for the tracking function.
When locked, the 'GPS 4531-E1' regenerates the selected reference and attenuates jitter and wander on this reference. The time constant of the loop is programmable in the range of 100 to 50'000 seconds (2'000s default). When no valid input reference is available, the 'GPS 4531-E1' enters hold-over mode and holds its output frequency to the one that was available just before the loss of the input.

2.2 Functions

The OSA 4531-E1 GPS-SB (GPS-Synchronization Box) is an Oscilloquartz GPS receiver with holdover capability together with G.703 auxiliary input. When locked to GPS, the OSA 4531-E1 GPS-SB fulfils the ITU-T rec. G.811.

The OSA 4531-E1 GPS-SB performs the following:

- Supplies ITU-T G.811 references with valid GPS signal,
- Accepts one back-up synchronization reference input,
- Monitors the status of the reference input signals (GPS and auxiliary synchronization signal),
- Selects the highest priority (operator specified) synchronization input,
- Selects the next available synchronization input in the priority table, if the current synchronization input has failed,
- Automatic switching without phase jump,
- Attenuates jitter and wander on the selected synchronization input,
- Operates as a standby reference clock in hold-over mode if all synchronization inputs have decreased in quality or failed,
- Communicates by a serial port (RS-232) with IBM-compatible PC for alarm reporting and equipment control.

In addition, the OSA 4531-E1 GPS-SB also features:

- Totally maintenance-free design.

The OSA4531-E1 is manageable locally via Local Manager software and remotely via the renowned Oscilloquartz' SyncView™ synchronization network management system. This allows to combine, in the same network, the OSA with other Oscilloquartz synchronization

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Chapter

3. Equipment Description

Including :

- Block Diagram
- Input Selection
- Holdover Capability
- Phase Build-Out
- Output Squelching
- Front Panel Layout

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3.1 Block Diagram

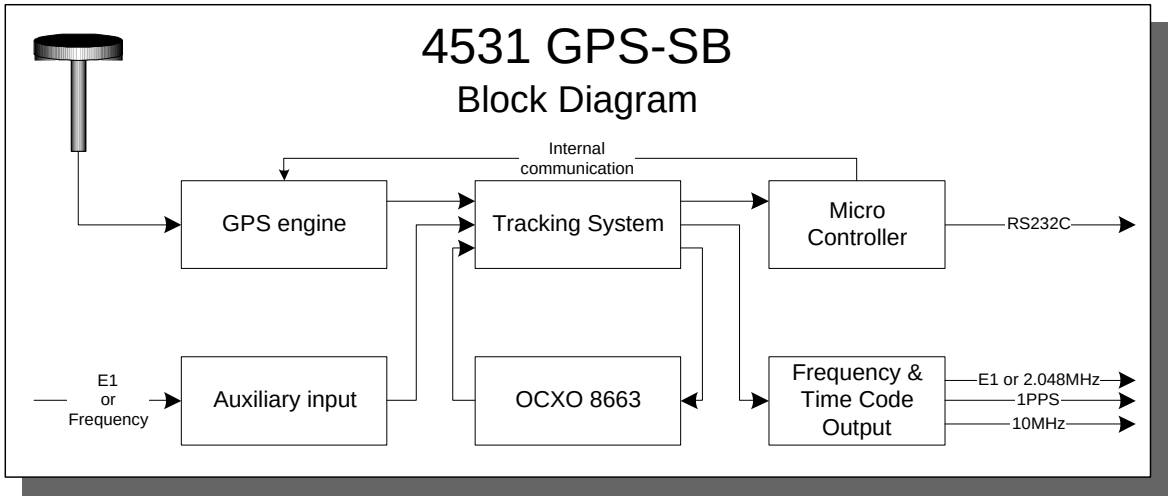


Figure 3-1 Block Diagram

3.2 Input Selection

The user has the possibility to configure the input selection process of the OSA 4531-E1 GPS-SB by choosing from a table listing the priority of each input. For example : Selecting the GPS signal to have higher priority than the auxiliary synchronization input.

Input selection is reversible.[1]

[1] **Reversible**: If a valid input with higher priority than the current reference returns, the equipment will select the higher priority input as its primary reference input.

3.3 Holdover Capability

The GPS 4531-E1 includes a holdover function provided by an OSA 8663 OCXO oscillator.

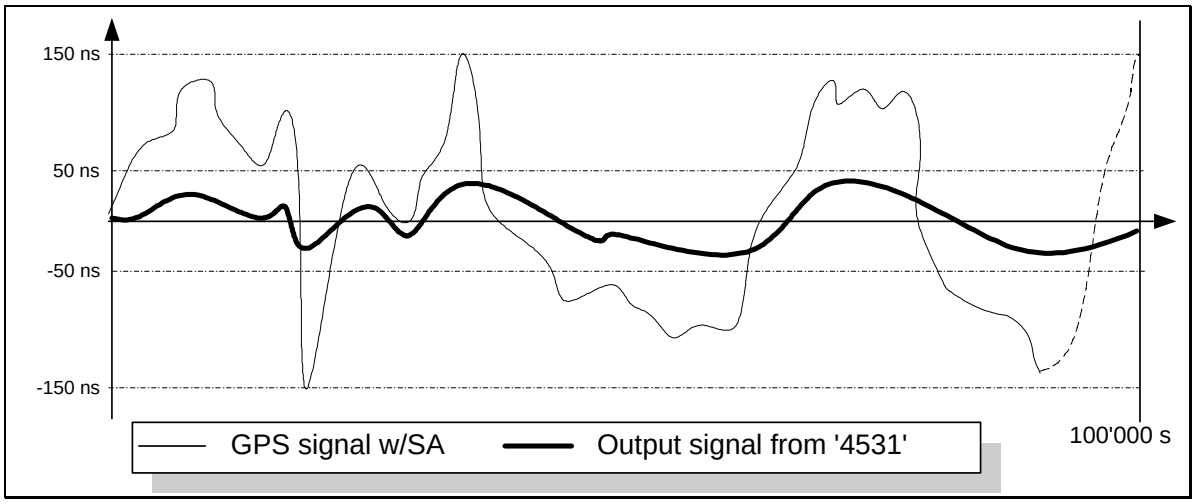


Figure 3-2 Example of Filtering the GPS Synchronization Signal

When the input module is locked to a GPS signal, the internal oscillator and memory function ensure that the reference synchronization signal fulfils ITU-T recommendation G.811, as shown in above Figure[2].
By using the oscillator OSA 8663 OCXO, the OSA 4531-E1 GPS-SB maintains a sufficient synchronization signal, compliant to ITU-T rec. G.811, for some hours without visual GPS signal.

[2] Please note that the U.S. DoD (Department of Defence) decided to disconnect the SA (Selective Availability) after May 1st, 2000. In order to ensure that potential adversaries do not use GPS, the U.S. military is dedicated to the development and deployment of regional denial capabilities in lieu of global degradation.

3.4 Phase Build-Out

When the equipment changes reference, it will go into holdover for a short period of time (approx. 2s) in order to provide a constant synchronization signal to the output units. Even though the two synchronization sources (GPS and Auxiliary) have the same frequency, they can still vary in phase. The result would be that the synchronization output would be affected by jump in phase, as shown in the figure (dotted line).

In the OSA 4531-E1 GPS-SB, Oscilloquartz has eliminated this phase jump by adjusting the phase of the "new" reference signal during an extended holdover period (additional 20s). During this period, the element calculates a phase build-out constant that is used to align the phase of the reference with the phase of the internal holdover oscillator. Hence the elements avoid getting a phase jump on the outputs when switching from the internal holdover, to the reference signal.

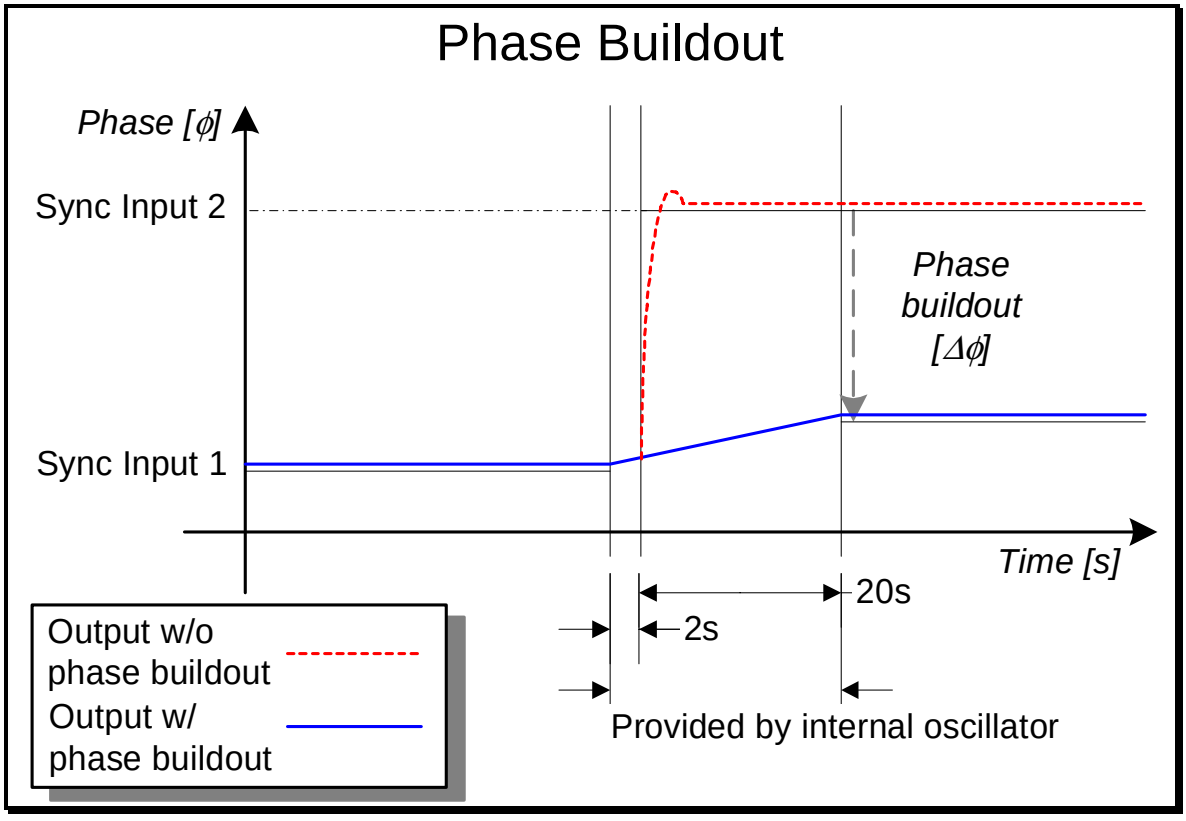


Figure 3-3 Schematic Presentation of the Phase Build-Out.

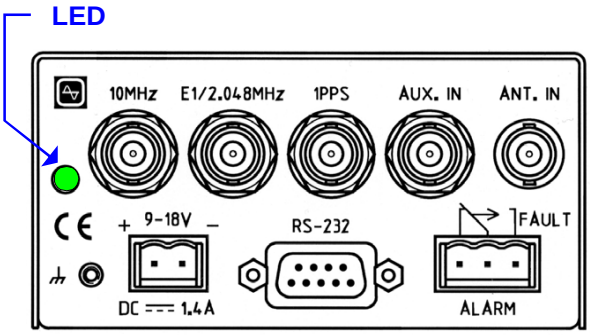
3.5 Output Squelching

The OSA 4531-E1 GPS-SB supports conditional squelching where the operator can set the condition under which the outputs are squelched after a configurable delay after entering holdover mode.

3.6 Front Panel Layout

3.6.1 Connectors

Figure 3-4 Front Panel - 9-18V Version



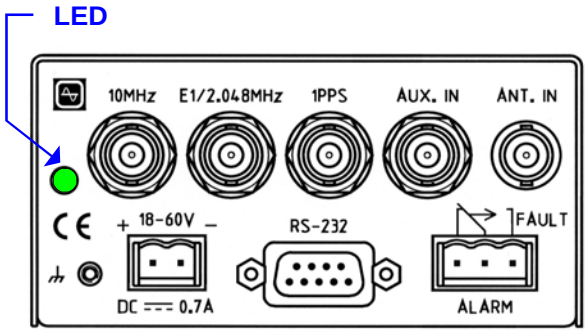


Figure 3-5 Front Panel - 18-60V Version

Connector Name	Type	Description
ANT. IN	BNC jack	GPS Antenna Input
AUX. IN	BNC jack	Auxiliary Reference Input
E1/2.048MHz	BNC jack	2.048Mbps Output Signal, G703 / 75Ω
		2.048MHz Output Signal, G703 / 75Ω
10MHz	BNC jack	10MHz Sine Wave Output Signal, $1V_{RMS}$ @ 50Ω
1PPS	BNC jack	1PPS Output Signal, $2.4V_{PP}$ @ 50Ω (ACMOS)
18-60V or **9-18V**	*Weidmüller* 5.08 / 2 poles	Supply Voltage Input (floating)
RS-232	SUB-D 9p, male	RS-232 Communication Port
ALARM	*Weidmüller* 5.08 / 3 poles	Electrical Alarm Output
⏚		**Signal** Ground

Table 3-1 Connector Description

3.6.2 Operational State

Power Supply	Alarm Conditions			Bicolor LED	ALARM
	Initialisation Warm-Up Tracked-Fast OCXO GPS AUX_IN	***Antenna***	***Holdover***		
ON	0	0	0	**Green**	**ON**
ON	x	0	1	**Red**	**OFF**
ON	0	1	x	**Red** (blinking)	**OFF**
ON	1	0	0	**Green** (blinking)	**OFF**
ON	1	1	0	**Red/Green** (blinking)	**OFF**
OFF / Failure	x	x	x	**Blank**	**OFF**

0 : no alarm condition or masked alarm condition
1 : active alarm condition
ALARM Output :

Table 3-2 Operational State

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Chapter

4. Installation

Including :

- Unpacking and Inspection
- Working Conditions
- Tools required
- Wall Mounting Option
- Rack Mounting Option
- Power Supplies
- GPS Antenna and Auxiliary Input Connections
- Output Connection
- Alarm Output Connection
- Start-Up

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This section provides unpacking and Inspection instructions, working conditions, tools required and power up for the OSA 4531-E1. To prevent injury and/or equipped damage, do not ignore the warnings, notes and recommendations and read the section Safety Considerations

Note:

If you encounter problems during any of the following procedures, please contact Customer Services.

4.1 Unpacking and Inspection

ESD CAUTION

Electrostatic Discharge (ESD) must be avoided so as not to damage or destroy static sensitive components in the OSA 4531-E1. Please observe proper ESD handling procedures.

Check first that the packing does not have any signs of rough handling such as dents or scratches, which might have occurred during transportation. Also inspect the equipment carefully for possible damages (knobs broken, handles bent, etc.).
Should the equipment have suffered any damage, immediately notify the carrier and retain the packing material for inspection.

CAUTION

This instrument must be operated only as specified by the manufacturer. Use other than as specified may compromise the safety precautions of the system.

4.2 Working Conditions

In order to work within specification, the OSA 4531-E1 GPS-SB should be installed at a location which does not exceed the following working conditions:

Operating temperature range : -5°C to +55°C
Humidity : Up to 95% non condensing

4.3 Tools required

For the installation and commissioning of the OSA 4531-E1 the following tools are needed:

An IBM-compatible PC meeting the following requirements :

a) Monitor
b) Pentium Processor or better
c) At least 16M of RAM
d) Windows 98 or later
e) CD-ROM drive
f) RS-232 serial port
g) Mouse

- An RS-232 cable to connect the PC to the OSA 4531-E1 GPS-SB.
- Configuration and Monitoring Software for the OSA 453x GPS Receiver Family (or Terminal Software)
- Multimeter (DC and AC, frequency range up to at least 3 MHz)
- Oscilloscope (bandwidth of at least 30 MHz)

4.4 Wall Mounting Option

For this purpose, the bottom of the shell provides six screw holes (M3) as below.

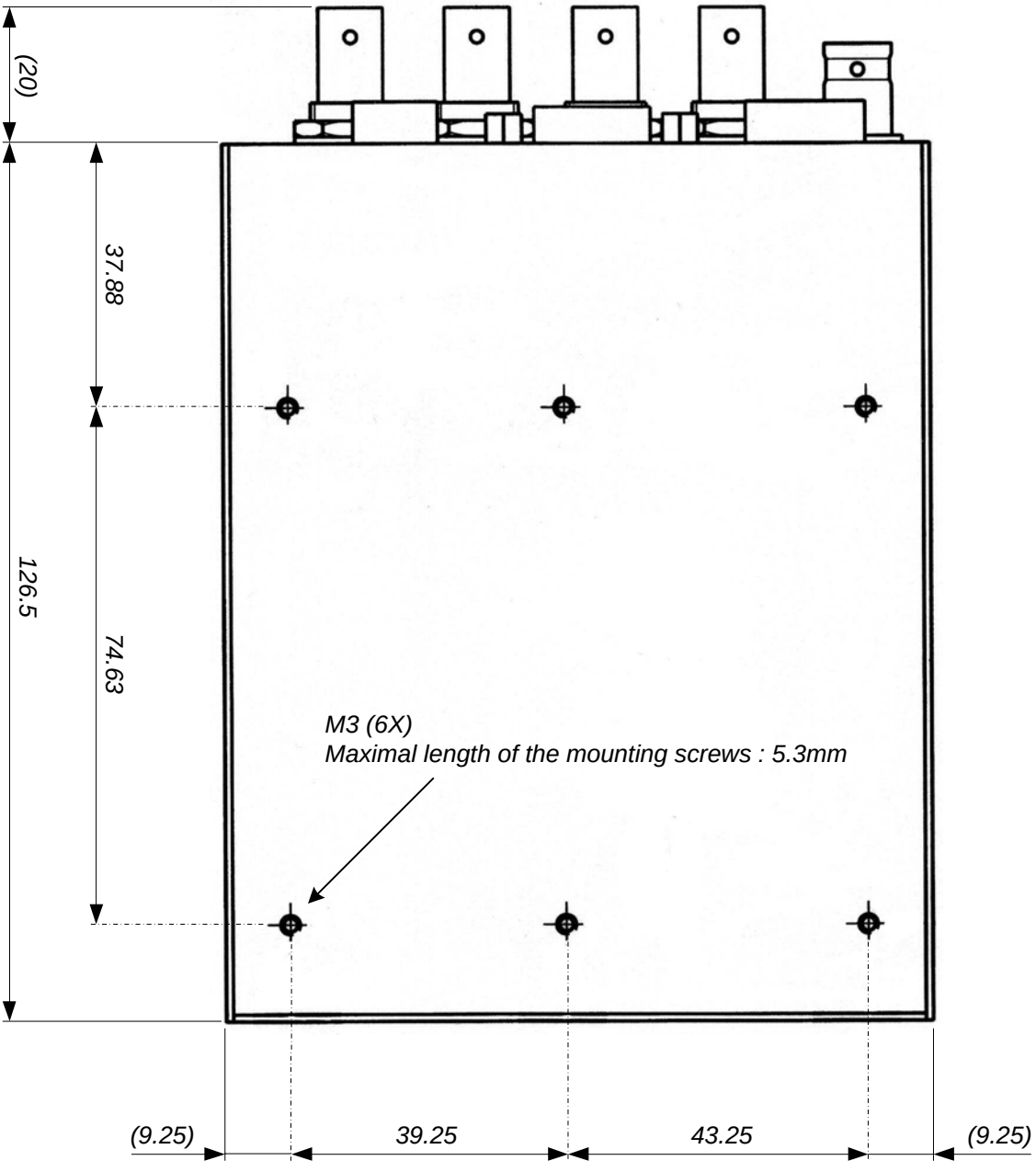

Figure 4-1 Wall Mounting Option

4.5 Rack Mounting Option

4.5.1 19" Mounting

The GPS-SB can be mounted in a 19" rack. The complete mounting kit can be ordered separately.

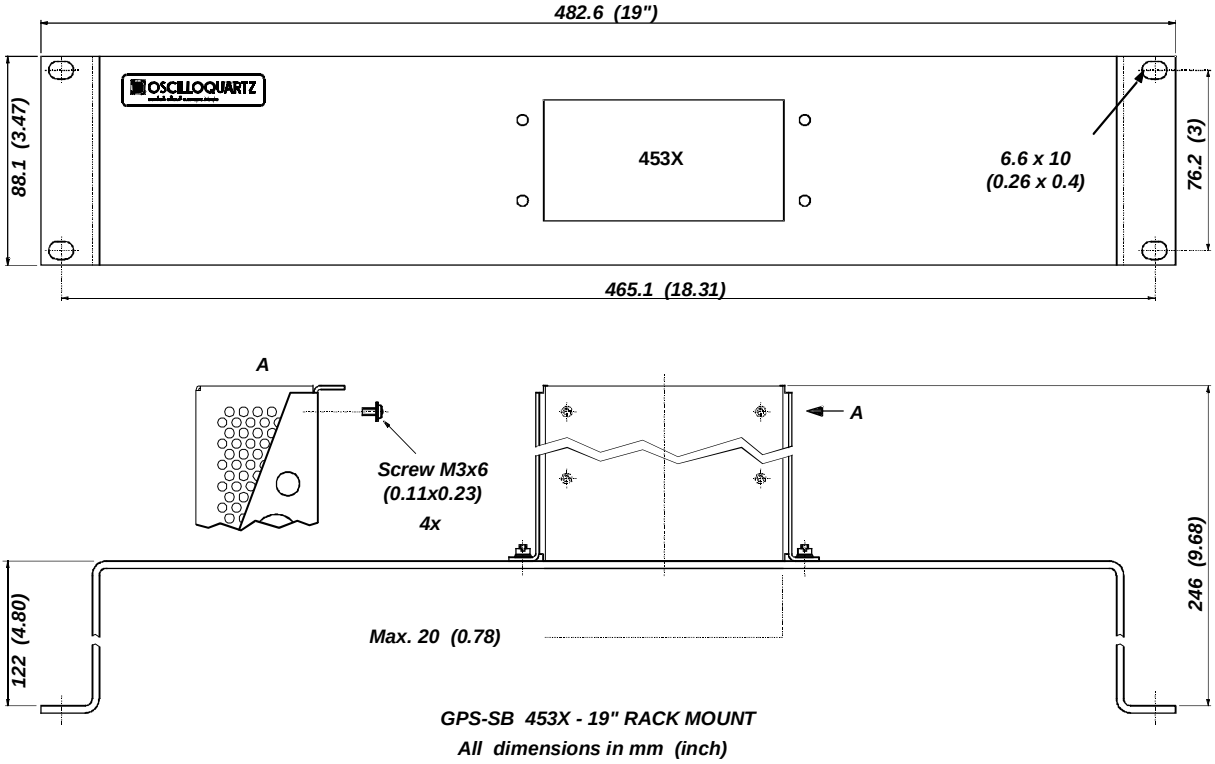

Figure 4-2 Rack Mounting Option

4.5.2 ETSI Mounting

ETSI rack mounting is also possible. In this case, a 19" mounting kit (including mounting tray) and an additional ETSI kit (including ears to mount on the 19" tray) must be ordered.

4.6 Power Supplies

The OSA 4531-E1 GPS-SB is available in either of these power supply versions:

Part Number	Voltage Range
945.453.1S0.100	9 - 18 V_{DC}
945.453.1S0.000	18 - 60 V_{DC}

CAUTION

Check that the type of supply voltage corresponds to your power feed.

4.6.1 Power-Up

In order to ensure correct powering-up of the system, it is necessary to follow these instructions:

Procedure 4-1 Power-Up

STEP	ACTION
1	Connect the ground cable to the *Signal Ground* Stud if you wish to link the signal ground of the OSA 4531-E1 GPS-SB to earth. The ground stud is an M3 screw. Connection must be made with a suitable connector.
2	Measure voltage and polarity of the external power source before connecting it to the power input of the OSA 4531-E1 GPS-SB. The voltage must be within the specified range.
3	Allow for the GPS-SB to warm up, so that the internal oscillator can reach its operating temperature. The minimum warm-up time is 10 minutes (24 hours before full specification are obtained). During this time no outputs are available(*). (*) Depends firmware version.
4	Power Consumption : 8 W typical @ +25°C (steady state).

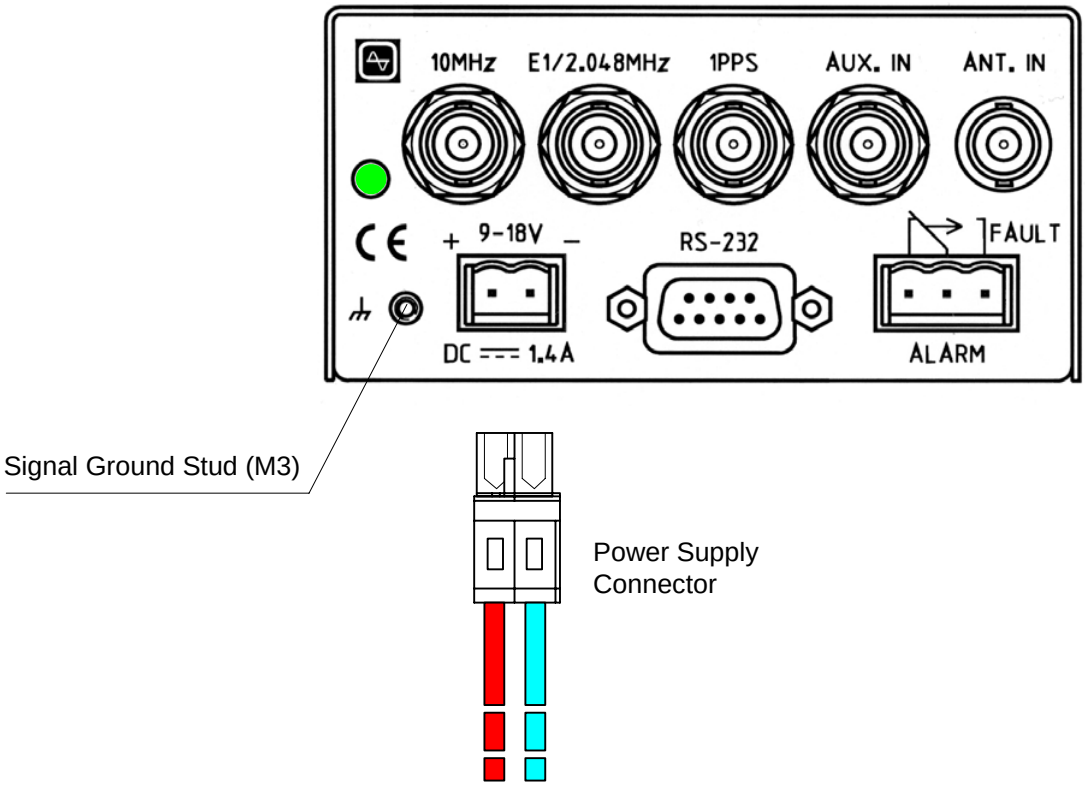

Figure 4-3 Power Supply Connection

4.7 GPS Antenna and Auxiliary Input Connections

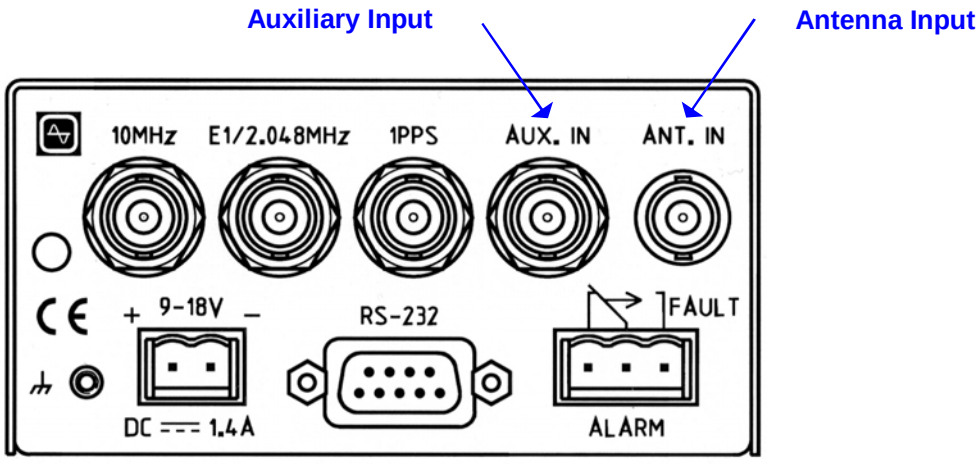

Figure 4-4 Input Connections

4.7.1 Auxiliary Input Connection

Recommendation:

Check that the incoming reference signals match the Auxiliary Input type (shape, level, frequency, impedance).

Connect the input line to the Auxiliary Input connector according to the wiring plan. In the case where an input reference signal must be derived from a G.703-6 traffic carrying signal, insert an OSA TEX-P Passive Timing Extractor (part no. 942.089.035) and connect it to the OSA 4531-E1 GPS-SB as described below

Note:

For balanced input type (G703-10 & G703-6), an adapter (120->75Ω) is furnished with the accessories of the OSA 4531-E1 GPS-SB.

4.7.1.1 Timing Extractor – Passive (TEX-P)

Signal from unterminated E1 link can be connected to the OSA 4531-E1 GPS-SB using an external TEX-P. The TEX-P is a passive in-line device normally mounted externally to the equipment. It is used to couple the E1 link to the equipment. The device works as a sort of a "sniffer" which taps off a portion of the digital signal without interfering with traffic or degrading the link in any way. The TEX-P handles up to two separate E1 feeds.

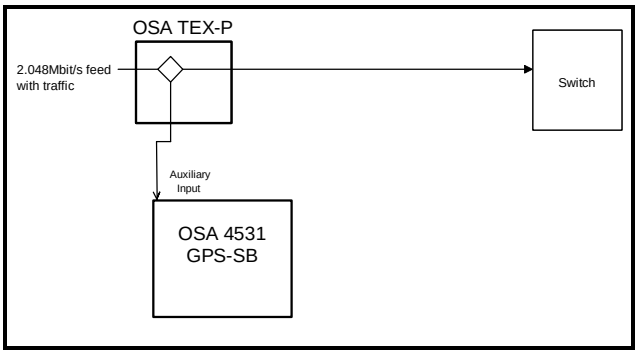

Figure 4-5 TEX-P Connection to OSA 4531-E1

4.8 Output Connection

These need to be connected in accordance with the user's network plan and/or wiring schedules.

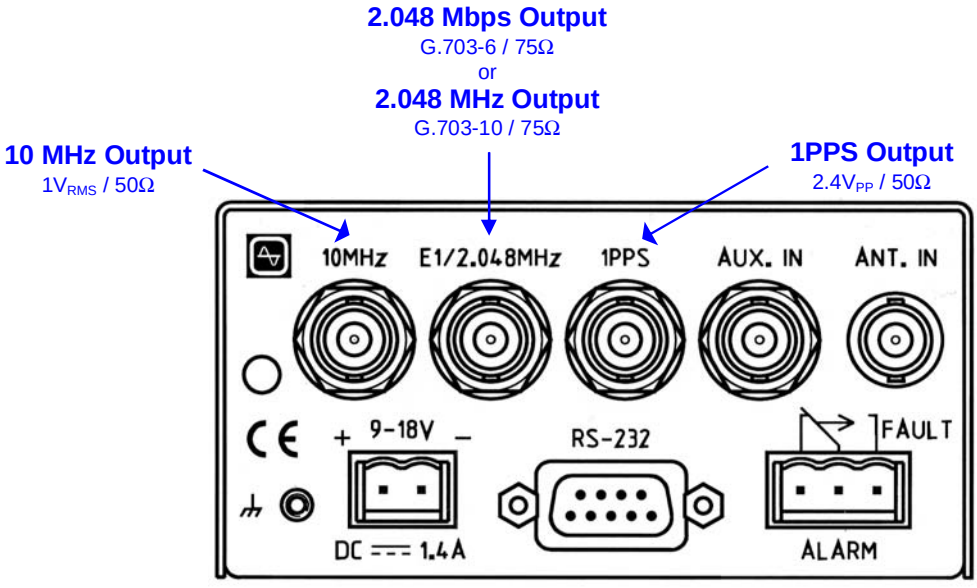

Figure 4-6 Output Connection

Recommendation:

Check that the required output signals are compatible with the outputs available on the OSA 4531 GPS-SB (shape, level, frequency, impedance)..

Connect the outputs to the equipment that needs synchronization in accordance with the user's network plan and/or wiring schedules

Note:

For balanced output type (G703-10 & G703-6), an adapter (75->120Ω) is furnished with the accessories of the OSA 4531-E1 GPS-SB

4.9 Alarm Output Connection

This electrical alarm is issued from relay isolated contacts and is available on the 'ALARM' connector.

Absolute maximum ratings

U = 150V_{DC} or 125V_{AC} I = 1A

The alarm output works in "Normally Closed" or "Normally Opened" mode (depending of the wiring). In "Normally Closed" mode, the relay contacts are closed when there is an alarm condition or when the OSA 4531-E1 GPS-SB is switched-off while it is open in "Normally opened" mode.

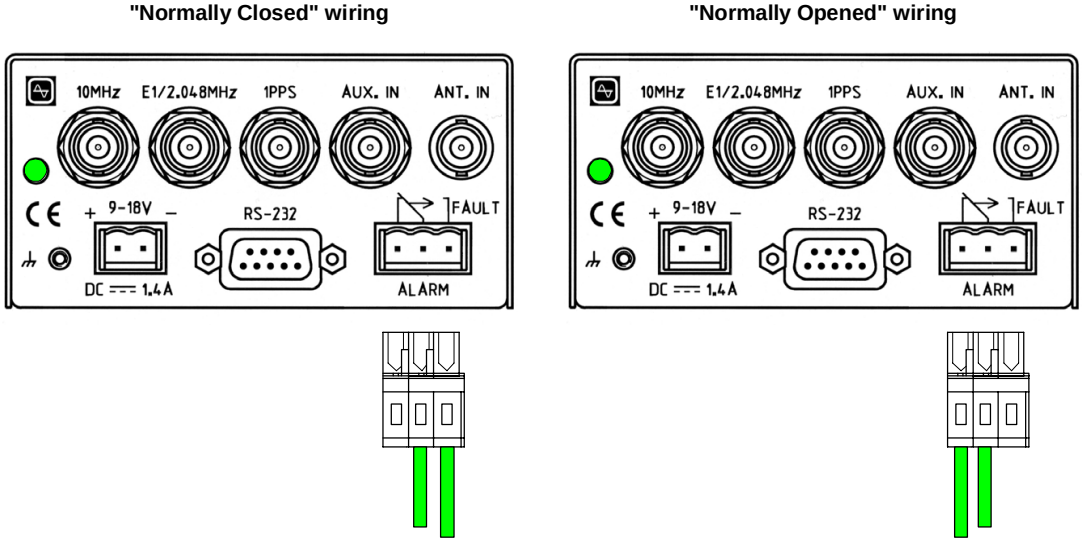

Figure 4-7 Alarm Output Connection

4.10 Start-Up

4.10.1 Operation Modes

Depending of the conditions, the module can work in one the following modes:

- **Initialization**

  After a power-up, the initialization mode assures the configuration of the system. The typical time to perform the configuration of the system is up to 10 seconds.

- **Warm-up**

  In this mode, the system is waiting for the GPS initialization (Satellites acquisition, tracking algorithms..) and for the OCXO stabilization.

- **Tracking Fast**

  After the warm-up phase, the OCXO is ready to be tracked, but with a short time constant to assure that the system is able to compensate the deviation of the phase during the retrace phase of the OCXO.

  The duration of this phase depends of the status of the OCXO regarding the following process:

  During WARM-UP phase, the system continuously monitors the slope of the phase variation versus time between the OCXO signal and the frequency reference (GPS or auxiliary input). The result of this computation leads to four ways:

  - The system stays in WARM-UP mode (cold OCXO or unavailable reference)
  - The system enters in long time TRACKING FAST mode (1 hour)
  - The system enters in short time TRACKING FAST mode (10 minutes)
  - The systems enters directly in NORMAL TRACKED mode.

- **Normal Tracked**

  This is the normal mode of working. The system uses the time constant defined by the user (2000s by default)

- **Holdover**

  If no input is available, the module enters in holdover mode. The tracking function is blocked and the OCXO delivers its own frequency for the outputs.

The state diagram hereunder shows the different transitions that could be appear in the OSA 4531-E1 GPS-SB module.

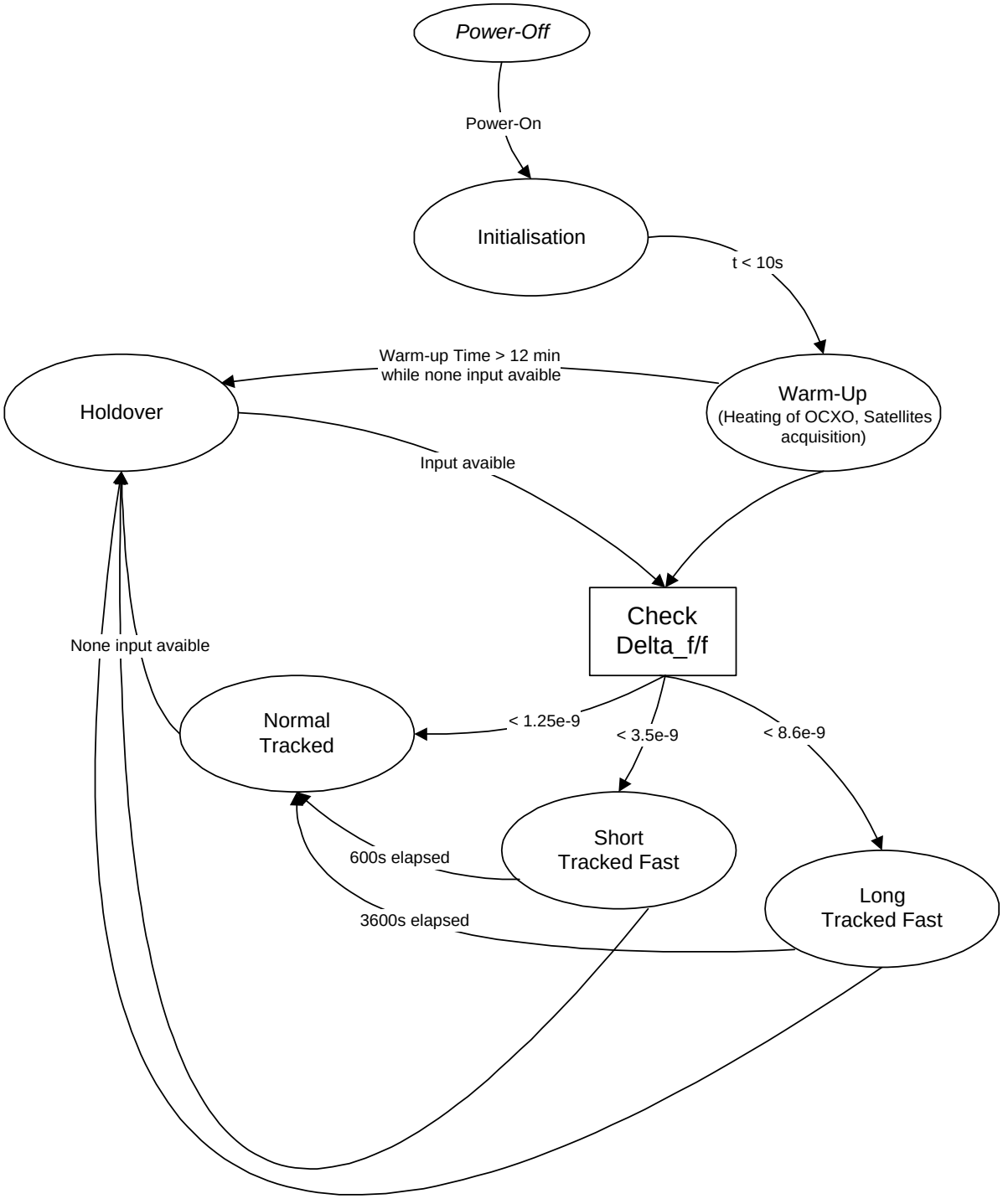

Figure 4-8 State Diagram

4.10.2 Power-Up

A few seconds after power-up, the status of the system must be:

- Green LED is blinking,
  indicates that one or more unmasked alarm conditions are active on the module (INIT/WARM-UP, GPS, AUX, OCXO alarm conditions).

⇒ **If the red LED is blinking,**
it indicates a connection problem between the module and the antenna (antenna over-current or undercurrent). Antenna alarm condition has to be unmasked. This indication could appear only a few minutes after power-up even if the antenna is incorrectly connected.

After approximately 12 minutes:

- If both GPS and AUX references are unavailable (or disabled) :
  red LED is on,
  means that the module is in HOLDOVER mode
- If GPS or AUX references are available :
  green LED is blinking,
  means that the module is operating in TRACKING FAST mode. Depending of the status of the OCXO, the TRACKING FAST mode duration can be either 10 minutes or 1 hour.
- Green LED is on.
  Means that the module is working in NORMAL TRACKED mode.

Chapter

5. Configuring the Unit

Including :

- Overview
- User Settings
- Default Factory Settings

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5.1 Overview

The configuration is performed by software using the serial RS-232 communication port through the graphical interface of the Configuration and Monitoring Software for the 453x GPS Receiver Family or by using low level commands described in later chapter.

5.2 User Settings

5.2.1 Auxiliary Input

The auxiliary input can be configured for frequency (default) with 64kHz, 1.544MHz, 2.048MHz, 5MHz or 10MHz. The OSA 4531 detects the frequency and automatically configures its dividers.

The OSA 4531 also accepts a 2.48 Mbit/s E1 signal. The code can be HDB3 (default) or AMI (either CRC4 or CAS). The user must configure this input for HDB3 or AMI.

5.2.2 Loop Time Constant

The loop time constant defines the bandwidth of the filter in the tracking function. The default value (2000s) is the best one respecting the ITU G.812 type 1 recommendation (Filtering and Generation) and offers a G.811 quality when the GPS input is selected.
Higher value increases the quality of the filtering but also the sensitivity to the temperature changes since the OCXO is more 'free'.

Note:

In the TRACKING FAST mode, the loop time constant is fixed at 200s, whatever the user value is.
As soon as the system goes in NORMAL TRACKED mode, the user loop time constant will be used.

5.2.3 Time Zone

By default, the OSA 4531-E1 GPS-SB gives the GMT (or UTC) time. The module is able to provide a local time, by adding or subtracting an offset in hours and minutes.

5.2.4 Cable Delay

The 4531-E1 GPS-SB is able to compensate the propagation delay in the cable between the antenna and the receiver.
The value has to be entered in nanosecond. The total delay depends of the specification of the used cable. The default value is 0ns.
When using an inline Amplifier, a delay of 10ns has to be added.

5.2.5 User Offset

This functionality allows the user to offset the 1PPS in one nanosecond increments. This offset can be used to place the time mark anywhere within the one second epoch. The default value is 0ns.
The user offset has a positive effect in the time domain, whereas the cable delay has a negative effect.

5.2.6 Administrative State

The administrative state allows the user to disable a specific reference input. This functionality is very useful if an input is not used, to avoid the generation of an alarm. Either the GPS or the AUX inputs can be set in the enabled (default) or in the disabled state.

5.2.7 Priorities

If both GPS and Aux. inputs are available, the OSA 4531-E1 GPS-SB needs to know which reference has to be used. This is performed by the Priority Table command. The objective is to enter a priority level for each input (default value: GPS has the highest priority). The input selection process is reversible, according to the following definition:

- If the input with the highest priority failed, the system selects the input with the second level of priority.
- If the input with the highest priority becomes valid again, the system will return on this input as reference. In other words, the selection process of a new input is always checking if a higher priority is available.

5.2.8 Wait-To-Restore Time

The wait-to-restore time ensures that a previously failed synchronization source is only again considered as available by the selection process if it is fault free for a certain time.
This functionality avoids frequent commutations in case of non stable references. The default value is 60s. In the low level commands, this parameter is called WTR (**W**ait-**T**o-**R**estore).

5.2.9 Conditional Squelch

The conditional squelch allows the system to disable all the outputs (frequency, code and 1PPS) after a certain time in HOLDOVER mode. It means that the outputs are considered as poor quality (ageing of the OCXO). If the delay is set to 0, the functionality is disabled (default) and the outputs stay always active. In the low level commands, this parameter is called HBSQ (**H**oldover **B**efore **S**quelch).

5.2.10 Working Mode

The OSA 4531-E1 GPS-SB could be set in AUTOMATIC working mode (default) or in HOLDOVER mode.

- In AUTOMATIC working mode, the OCXO is tracked while GPS or AUX references are available.
- In HOLDOVER working mode, the OCXO works in free run mode even if GPS and/or AUX references are available.

5.2.11 Alarm Mask

Some alarm conditions could be masked, it means that the corresponding alarm condition will not be shown by the system. As default value, all alarm conditions are unmasked.

5.2.12 Output Type

The BNC connector "E1/2.048MHz" is used as output for both E1 code **or** 2.048MHz (default). The type of output signal can be selected by software.

5.2.13 Baud Rate

The RS-232 serial communication port can work at 9600 baud (default) or 4800 baud. The baud rate is selected by software.
4800 baud is used to be compatible with NMEA 0183 standards.

5.2.14 Time-Of-Day Function

The OSA 4531-E1 GPS-SB can send automatically on RS-232 port the **Time & Date** string regarding *NMEA 0183* command ZDA. This function can be enabled or disabled (default) by software.

5.3 Default Factory Settings

5.3.1 Generic Settings

Parameter	Value	Unit
AUX input	Frequency (code setting: HDB3)	-
Loop Time Constant	2000	s
Offset for Local Time	0	h min
Cable Delay	0	ns
1PPS User Offset	0	ns
Adm state	GPS and AUX enable	-
Priority table	GPS: high AUX: low	-
Wait-to-restore Time	60	s
HBSQ	0 (disable)	min
Working mode	AUTOMATIC	-
Alarm mask	none	-
Output type	Frequency (2.048MHz)	-
Baud Rate	9600	baud
Time Of Day	off	-

Table 5-1 Generic Factory Settings

5.3.2 Setting for Article A014494 / 945.453.1S0.060

Parameter	Value	Unit
AUX input	Disabled	-
Loop Time Constant	2000	s
Offset for Local Time	0	h min
Cable Delay	0	ns
1PPS User Offset	0	ns
Adm state	GPS and AUX enable	-
Priority table	GPS: high AUX: low	-
Wait-to-restore Time	60	s
HBSQ	6	min
Working mode	AUTOMATIC	-
Alarm mask	none	-
Output type	Frequency (2.048MHz)	-
Baud Rate	9600	baud
Time Of Day	off	-

Table 5-2 Factory Settings for Article A014494

Chapter

6. Local Management

Including :

- Overview
- RS-232 Port Connection
- RS-232 Port Configuration
- Command List
- Command Description

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6.1 Overview

The OSA 4531-E1 GPS-SB can be locally managed via the 'RS-232' port on the connector panel, using an IBM-compatible PC loaded with the Communication and Monitoring Software, or a Terminal software.

6.2 RS-232 Port Connection

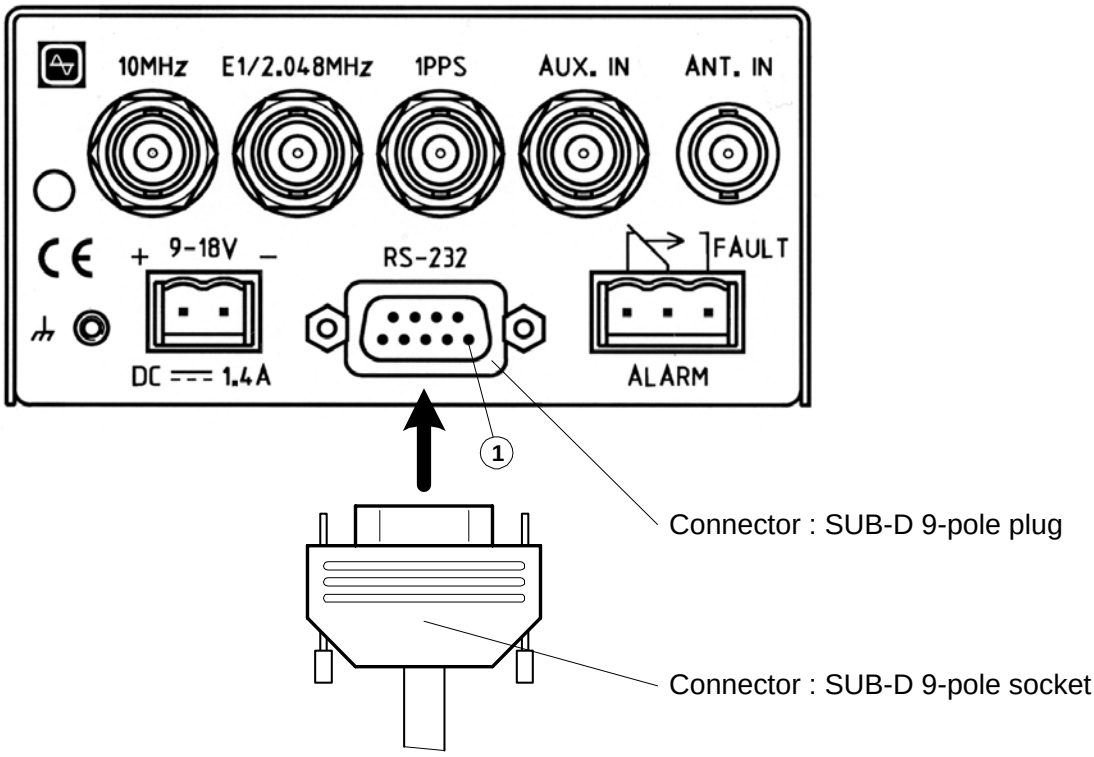

Figure 6-1 RS-232 Connection

6.3 RS-232 Port Configuration

- Baud-rate: 9600 or 4800
- Data bits: 8
- Stop bits: 2 @ 9600 baud, 1 @ 4800 baud
- Parity: None
- Handshake: None

- The format for sending commands is ASCII, terminating by <CR><LF>.
- The format of the receiving commands is ASCII, terminating by <CR><LF> at the end of each line. The end of message is terminating by <CR><LF><ETX>.

Pin#	Description
2	Rx
3	Tx
5	Ground
1,4,6,7,8,9	NC

6.4 Command List

Command	Type	Description	Parameters
ADM_STATE	Request	Return the administrative state of both GPS and AUX inputs.	--
ADM_STATE=ga	Entry	Set the administration state of GPS and AUX inputs	g: GPS input a: AUX input 0 ⇒ Input Disabled 1 ⇒ Input Enabled
AL_MASK	Request	Return the current alarm mask	--
AL_MASK=gawhfoi	Entry	Set the alarm mask	g: GPS alarm a: Antenna alarm w: Init. or Warm-up alarm h: Holdover alarm f: Tracking Fast alarm o: OCXO alarm i: AUX input alarm 0 ⇒ al. mask disabled 1 ⇒ al. mask enabled
AUX_INPUT	Request	Return the configuration of the auxiliary input	--
AUX_INPUT=ct	Entry	Configure the auxiliary input	c=0: Frequency c=1: Code E1 t=0: Code HDB3 t=1: Code AMI
BAUD_RATE	Request	Return the current baud rate	--
BAUD_RATE=b	Entry	Set the baud rate	b=4800 : 4800 Baud b=9600 : 9600 Baud
CLEAR_WTR_GPS	Request	Clear the current WTR timer for GPS input	--
CLEAR_WTR_AUX	Request	Clear the current WTR timer for AUX input	--
CONF	Request	Return the current configuration	--
DEFAULT_PARAMETERS	Request	Return the factory setting parameters	--
GMT_OFFSET=shh:mm	Entry	Set the offset between local and GMT time	s: + or - $00 \leq hh \leq 23$ $00 \leq mm \leq 59$

Command	Type	Description	Parameters
HBSQ	Request	Return the current value of HBSQ	--
HBSQ=h	Entry	Set the HBSQ delay	0 ≤ h ≤7200
INFO_CHAN	Request	Return detailed status about the 8-channel receiver.	--
INFO_GPS	Request	Return geographical information provided by the GPS receiver.	--
INFO_VIS_SAT	Request	Return information about the status of the visible satellites (1 line per satellite)	--
INV	Request	Return the module's inventory	--
MODE=m	Entry	Set the working mode	m=HOLDOVER m=AUTOMATIC
OUTPUT_TYPE	Request	Return the set output signal (Frequency or E1-code)	--
OUTPUT_TYPE=oo	Entry	Set the output signal (Frequency or E1-code)	oo=FR : frequency oo=E1 : E1-code
PPS_CABLE_DELAY=d	Entry	Set the propagation's delay of the antenna cable (in nano-sec)	0 ≤ d ≤ 999999
PPS_USER_OFFSET=o	Entry	Set the user 1PPS offset (in nano-sec)	0 ≤ 0 ≤ 999999999
PRIOR_TABLE	Request	Return the current priority table	--
PRIOR_TABLE=p1p2	Entry	Set the priority table	p1 : priority of GPS input p2 : priority of AUX input 1 : 1st priority 2 : 2nd priority
RESTART	Request	The module is resetting and starting up again	--
SET_DEFAULT	Request	The module is resetting and starting up again with its default parameters	--
STATUS	Request	Return the current status	--
TAU=t	Entry	Set a new value of the time constant	100 ≤ t ≤ 50000
TOD	Request	Return a NMEA 0183-format message about Time-Of-Day	--
TOD_STATE	Request	Return the status of the spontaneous send of the TOD message	--

Command	*Type*	*Description*	*Parameters*
TOD_STATE=s	Entry	Set the status of the spontaneous send of the TOD message	s=D : (disable) polled mode s=E : (enable) TOD message sent each second
WTR	Request	Return the set WTR value and the current WTR timer value for both GPS and AUX input	--
WTR=w	Entry	Set the wait-to-restore time (in 10s of second)	0 ≤ w ≤ 250

Table 6-1 Command List

In case of wrong command name or wrong/missing parameters, the module will return some error messages as described below:

ERROR, UNKNOWN COMMAND means that the received command is unknown

ERROR, BAD PARAMETERS means that some received parameters are not compatible with the corresponding command

6.5 Command Descriptions

ADM_STATE<cr><lf>

Description: Return the administration state of both GPS and AUX input of the GPS-SB module. Each input can be Enabled or Disabled.

Type: Request

Parameter: None

Answer: **ADM_STATE=ga**<cr><lf><etx>
g: Administrative state of GPS Input 0=>Disabled 1=>Enabled
a: Administrative state of Aux. Input 0=>Disabled 1=>Enabled

ADM_STATE=ga<cr><lf>

Description: Set the administrative state of both GPS and AUX input of the GPS-SB module. An input in the DISABLED state is ignored by the selection process of the module. This functionality is useful when an input is not used, to avoid the generation of an alarm condition.

Type: Entry

Parameters: g=0 : Set the GPS input in disabled state
a=0 : Set the AUX input in disabled state (default)

g=1 : Set the GPS input in enabled state
a=1 : Set the AUX input in enabled state (default)

Answer: None

AL_MASK<cr><lf>

Description: Return the current alarm mask.

Type: Request

Parameter: None

Answer: **AL_MASK=gawhfoi**<cr><lf><etx>
- g: GPS Input alarm mask.
- a: Antenna alarm mask.
- w: Initialization or Warm-up mode alarm mask.
- h: Holdover mode alarm mask.
- f: Tracking Fast mode alarm mask.
- o: OCXO alarm mask.
- i: AUX Input alarm mask.
  - 0 : alarm mask disabled (default)
  - 1 : alarm mask enabled

AL_MASK=gawhfoi<cr><lf>

Description: Set the alarm mask. When an alarm is masked (alarm mask enabled) the corresponding alarm criteria will be ignored by the system.

Type: Entry

Parameters:
- g: GPS Input alarm mask.
- a: Antenna alarm mask.
- w: Initialization or Warm-up mode alarm mask.
- h: Holdover mode alarm mask.
- f: Tracking Fast mode alarm mask.
- o: OCXO alarm mask.
- i: AUX Input alarm mask.
  - 0 : alarm mask disabled
  - 1 : alarm mask enabled

Answer: None

AUX_INPUT<cr><lf>

Description: Return the configuration of the Auxiliary input.

Type: Request

Parameter: None

Answer: **AUX_INPUT=ct**<cr><lf><etx>
c=0 : The Auxiliary input recognises frequency signal (default)
c=1 : The Auxiliary input recognises E1-code signal
t=0 : Selects HDB3 coding (default)
t=1 : Selects AMI coding

AUX_INPUT=ct<cr><lf>

Description: Configure the Auxiliary Input. Either Frequency or E1-code can be selected with this command. If E1-code is selected, the second parameter selects the HDB3 or AMI coding.

Type: Entry

Parameters: c=0 : The Auxiliary input recognises frequency signal.
c=1 : The Auxiliary input recognises E1 code signal.
t=0 : Selects HDB3 coding
t=1 : Selects AMI coding

Answer: None

BAUD_RATE<cr><lf>

Description: Return the current baud rate of the serial RS-232 port.

Type: Request

Parameter: None

Answer: **BAUD_RATE=b**<cr><lf><etx>
b=9600 : The baud rate is 9600 baud (default)
b=4800 : The baud rate is 4800 baud

BAUD_RATE=b<cr><lf>

Description: Configure the baud rate of the serial RS-232 port. The baud rate could be 4800 baud to be compatible with NMEA 0183 standard (see TOD function).

Type: Entry

Parameter: b=9600 : The baud rate is 9600 baud
b=4800 : The baud rate is 4800 baud

Answer: None

CLEAR_WTR_GPS<cr><lf>

Description: Clear the current WTR timer of the GPS input. Complete the WTR mode.

Type: Request

Parameter: none

Answer: none

CLEAR_WTR_AUX<cr><lf>

Description: Clear the current WTR timer of the Auxiliary input. Complete the WTR mode.

Type: Request

Parameter: none

Answer: none

CONF<cr><lf>

Description: Return the current configuration of the GPS-SB module

Type: Request

Parameter: none

Answer:
CONF=TAU:tu/trMODE:mu/mrGMT_OFFSET:shhmmPPS_CABLE_DELAY:ddddddPPS_OFFSET:ooooooooWTR:www/gggg/aaaa<cr><lf><etx>

TAU: tu: User Loop Time Constant. In seconds.
5 ASCII characters (with possible spaces at left): $100 \leq tu \leq 50000$
tr: Loop Time Constant currently used by the system. In seconds.
5 ASCII characters (with possible spaces at left): $100 \leq tr \leq 50000$
Default value : tu = 2000 s

MODE mu: User working mode
9 ASCII characters (with possible space at the right of the string)
mu=AUTOMATIC or HOLDOVER
mr: Current working mode of the system
12 ASCII characters (with possible space at the right of the string)
mr: INIT or WARM-UP or TRACKED-FAST or TRACKED or HOLDOVER
Default value : AUTOMATIC

GMT_OFFSET:
shhmm: Offset between local and GMT(UTC) time. If the offset is zero, the time will be GMT(UTC) time. With offset other than zero, the time will be a local time.
5 ASCII characters:
s: Sign of the offset + or -
hh: Offset in hours $00 \leq hh \leq 23$
mm: Offset in minutes $00 \leq mm \leq 59$
Default value : +00:00

PPS_CABLE_DELAY:
dddddd: Negative offset of the 1PPS signal to compensate the delay of propagation in the cable between antenna and GPS receiver. In nano-seconds.
6 ASCII characters (with possible spaces at left): $0 \leq d \leq 999999$
Default value : 0 ns

PPS_OFFSET:
oooooooo: Positive user offset of the 1PPS signal. In nano-seconds.
9 ASCII characters (with possible spaces at left): $0 \leq o \leq 999999999$
Default value : 0 ns

WTR: www: Set Wait-to-restore Time. In 10s of seconds
3 ASCII characters (with possible spaces at left): $0 \leq w \leq 250$
Default value : 6 (≅ 60 s)

gggg: Remaining time for WTR on GPS input, in seconds.
In normal operation, gggg = 10·www.
4 ASCII characters (with possible spaces at left) : $0 \leq gggg \leq 2500$

aaaa: Remaining time for WTR on AUX input, in seconds.
In normal operation, aaaa = 10·www.
4 ASCII characters (with possible spaces at left) : $0 \leq aaaa \leq 2500$

DEFAULT_PARAMETERS<cr><lf>

Description: Return the default parameters (Factory settings) of the GPS-SB module. It is just a printout of the values, no action will be taken on the current settings.

Type: Request

Parameters: None

Answer:
DEF_CONF=TAU:tttttMODE=*m*GMT_OFFSET=shhmmPPS_CABLE_DELAY:ddddddPPS_OFFSET:ooooooooHBSQ:hhhhWTR:wwwAUX:ct<cr><lf><etx>

TAU: ttttt : User Loop Time Constant.
5 ASCII characters (with possible spaces at left) : $100 \leq t \leq 50000$

MODE: *m*: User working mode
9 ASCII characters (with possible space at the right of the string)
m=AUTOMATIC or HOLDOVER

GMT_OFFSET:
shhmm: Offset between local and GMT(UTC) time. If the offset is zero, the time will be GMT(UTC) time. With offset other than zero, the time will be a local time.
5 ASCII characters:
s: Sign of the offset + or -
hh: Offset in hours $0 \leq hh \leq 23$
mm: Offset in minutes $0 \leq mm \leq 59$

PPS_CABLE_DELAY:
dddddd: Negative offset of the 1PPS signal to compensate the delay of propagation in the cable between the antenna and the module. In nanoseconds
6 ASCII characters (with possible spaces at left) $0 \leq d \leq 999999$

PPS_OFFSET:
oooooooo: Positive user offset of the 1PPS signal. In nano-seconds.
9 ASCII characters (with possible spaces at left) $0 \leq o \leq 999999999$

WTR: www: Set Wait-to-restore Time. In 10s of seconds
3 ASCII characters (with possible spaces at left): $0 \leq w \leq 250$

AUX: c : type of Auxiliary input.c = 0 : frequency, c = 1 : E1-code
t : type of E1-code. t = 0 : HDB3, t = 1 : AMI

GMT_OFFSET=shh:mm<cr><lf>

Description: Set a new value for the offset between local and GMT(UTC) time. If the offset is zero, the time given by the module will be the GMT(UTC) time. For an offset other than zero, the time information will be a local time.

Type: Entry

Parameters:
- s: Sign of the offset + or -
- hh: Offset in hours00 ≤ hh ≤ 23
- mm: Offset in minutes 00 ≤ mm ≤ 59

Answer: None

HBSQ<cr><lf>

Description: Return the current value for the delay in holdover mode, before the outputs will be squelched. In minutes.

Type: Request

Parameter: None

Answer: **HBSQ=hhhh/rrrr**<cr><lf><etx>
- hhhh: current HBSQ value in minutes. 4 ASCII characters with possible spaces at left 0 ≤ h ≤ 7200
- rrrr: remaining time of HBSQ function in minutes. In normal operation, this value is equal to the HBSQ one. 4 ASCII Characters with possible spaces at left

Default value : 0 (HBSQ function disabled)

HBSQ=h<cr><lf><etx>

Description: Set a new value for the delay in holdover mode, before the outputs will be squelched. In minutes.

Type: Entry

Parameter: h: new value for the HBSQ function 0 ≤ h ≤ 7200

Answer: None

INFO_CHAN<cr><lf>

Description: Return detailed status about the height GPS receiver channel.

Type: Request

Parameters: None

Answer: **INFO_CHAN=<cr><lf>**
CH*1*:ID:*id*MODE:*m*S/N:*s*<cr><lf>
CH*2*:ID:*id*MODE:*m*S/N:*s*<cr><lf>
CH*3*:ID:*id*MODE:*m*S/N:*s*<cr><lf>
CH*4*:ID:*id*MODE:*m*S/N:*s*<cr><lf>
CH*5*:ID:*id*MODE:*m*S/N:*s*<cr><lf>
CH*6*:ID:*id*MODE:*m*S/N:*s*<cr><lf>
CH*7*:ID:*id*MODE:*m*S/N:*s*<cr><lf>
CH*8*:ID:*id*MODE:*m*S/N:*s*<cr><lf><etx>

id: Satellite identifier: $0 \leq id \leq 32$

m: Tracking mode:
- 0: Code search
- 1: Code acquire
- 2: AGC set
- 3: Preq acquire
- 4: Bit sync detect
- 5: Message sync detect
- 6: Satellite time available
- 7: Ephemeris acquire
- 8: Available for position

S/N: Carrier to noise density ratio: 0 to 255 dB-Hz

INFO_GPS<cr><lf>

Description: Return geographical information provided by the GPS receiver.

Type: Request

Parameter: None

Answer:

INFO_GPS=VSAT:vvTSAT:tLAT:sddmmssLON:sdddmmssHEI:shhhhhhDATE:ddmmyyyyTIME:hhmmss<cr><lf><etx>

vv: Number of visible satellites. 2 ASCII characters $0 \leq v \leq 12$

t: Number of tracked satellites. 1 ASCII character $0 \leq t \leq 8$

LAT Latitude. 7 ASCII characters

s:	sign of the latitude	+ or -
dd:	Number of degrees	$0 \leq dd \leq 90$
mm:	Number of minutes	$0 \leq mm \leq 59$
ss:	Number of seconds	$0 \leq ss \leq 59$

LON Longitude. 8 ASCII characters

s:	sign of the longitude	+ or -
ddd:	Number of degrees	$0 \leq d \leq 180$
mm:	Number of minutes	$0 \leq m \leq 59$
ss:	Number of seconds	$0 \leq s \leq 59$

HEI Height 7 ASCII characters

s:	sign of the height	+ or -
hhhhhh:	height in centimetres	$-100000 \leq h \leq 999999$

DATE Date of the day. 8 ASCII characters(After a power-up, the date is no valid during a few minutes and the parameters are 99999999)

dd:	Day of the month	$1 \leq dd \leq 31$
mm	Month of the year	$1 \leq mm \leq 12$
yyyy	Year	$1980 \leq yyyy \leq 2077$

TIME Time of the day. 6 ASCII characters(After a power-up, the date is no valid during a few minutes and the parameters are 999999)

hh:	Hours	0 <= hh <= 23	
mm:	Minutes	$0 \leq mm \leq 59$	
m:	Minutes	$0 \leq ss \leq 60$	60 is used when 1 leap second is inserted to correct the GPS time versus the UTC time

INFO_VIS_SAT<cr><lf>

Description: Returns information about the status of the visible satellites

Type: Request

Parameter: None

Answer: **INFO_VIS_SAT=nn<cr><lf>**
ID:iiDOP:dddddAZIM:aaaELEV:eeSTAT:s<cr><lf>
ID:iiDOP:dddddAZIM:aaaELEV:eeSTAT:s<cr><lf>
... (1 line per satellite, max 12)
ID:iiDOP:dddddAZIM:aaaELEV:eeSTAT:s<cr><lf><etx>

nn:	Number of visible satellites	0 ≤ nn ≤ 12
ii:	Satellite identifier	0 ≤ ii ≤ 32
ddddd:	Doppler frequency	-5000 ≤ ddddd ≤ +5000 Hz
aaa:	Azimuth in degrees	0 ≤ aaa ≤ 359
ee:	Elevation in degrees	0 ≤ ee ≤ 90
s:	Satellite status	0: Healthy and not removed
		1: Healthy and removed
		2: Unhealthy and not removed
		3: Unhealthy and removed

INV<cr><lf>

Description: Returns the inventory information of the GPS-SB module.

Type: Request

Parameter: None

Answer:
INV=-ModuleNameArticleNumberCommercialNumberSerialNumber
LayoutVersionFirmwareVersionDateOfTestReserveTestSoftwareVersion
OcxoType<cr><lf><etx>

ModuleName:	12 ASCII characters	Example: 4531-E1-E1 12V
ArticleNumber	12 ASCII characters	Example: 9454531-E1S0100
CommercialNumber	6 ASCII characters	Example: 013067
SerialNumber	5 ASCII characters	Example: 00100
LayoutVersion	2 ASCII characters	Example: 03
FirmwareVersion	4 ASCII characters	Example: 0100
DateOfTest	8 ASCII characters	Example: 28012002
Reserve	8 ASCII characters (8 x "space" character)	
TestSoftwareVersion:	4 ASCII characters	Example: 0100
OcxoType	10 ASCII characters	Example: 8663-B6SG

MODE=m<cr><lf>

Description: Set a user working mode. Allows the user to force the Holdover mode, for example to make some measurements concerning the OCXO specifications.

Type: Entry

Parameter: m=AUTOMATIC or m=HOLDOVER

Answer: None

OUTPUT_TYPE<cr><lf>

Description: Return the type of the signal present on the "E1/2.048MHz" output connector. The signal can be either frequency square wave (2.048MHz) or E1-Code (2.048Mbps)

Type: Request

Parameter: None

Answer: **OUTPUT_TYPE=oo**<cr><lf><etx>
oo=FRoutput is frequency square wave (2.048MHz)
oo=E1 output is E1-code (2.048Mbps)

Default value: FR

OUTPUT_TYPE=oo<cr><lf>

Description: Set the type of signal on the "E1/2.048MHz" output connector. The signal can be either frequency square wave (2.048MHz) or E1-Code (2.048Mbps)

Type: Entry

Parameter: oo=FR output is frequency square wave (2.048MHz)
oo=E1 output is E1-code (2.048Mbps)

Answer: None

PPS_CABLE_DELAY=d<cr><lf>

Description: Set a new value to compensate the delay in the cable, between the antenna and the GPS-SB module. It corresponds to a negative offset of the 1PPS signal, regarding its initial position.

Type: Entry

Parameter:d: new value for cable delay, in nanoseconds $0 \leq d \leq 999999$

Answer: None

PPS_USER_OFFSET=o<cr><lf>

Description: Set a new value for the user 1PPS offset. It corresponds to a positive delay of the 1PPS signal, regarding its initial position.

Type: Entry

Parameters:o: new value for 1PPS offset, in nanoseconds $0 \leq o \leq 999999999$

Answer: None

PRIOR_TABLE<cr><lf>

Description: Return the priority table of the module. As the GPS-SB is able to use either GPS or AUX input as reference, the "priority table" indicates which input has to be used in priority when both inputs are OK.

Type: Request

Parameters: None

Answer: **PRIOR_TABLE=p1p2**<cr><lf><etx>

p1 : priority level of GPS input $1 \leq p1 \leq 2$

p2 : priority level of AUX input $1 \leq p2 \leq 2$

Default value: 12

PRIOR_TABLE=p1p2<cr><lf>

Description: Set the priority table of the module. As the GPS-SB is able to use either GPS or AUX input as reference, the "priority table" indicates which input has to be used in priority when both inputs are OK.

Type: Entry

Parameters: p1 : priority level of GPS input $1 \leq p1 \leq 2$

p2 : priority level of AUX input $1 \leq p2 \leq 2$

Answer: None

RESTART<cr><lf>

Description: This command allows the user to reset and restart the module with current parameters.

Type: Request

Parameter: none

Answer: none

SET_DEFAULT<cr><lf>

Description: This command allows the user to reset and restart the module with default parameters.

Type: Request

Parameter: none

Answer: none

STATUS<cr><lf>

Description: Returns the current status of the GPS-SB module. It includes the alarms information, the LED and the inputs status.

Type: Request

Parameter: none

Answer: **STATUS=ALARMS:a1a2a3a4a5a6a7LED:lSTAT_IN:s1s2s3**<cr><lf><etx>

ALARMS: For each digit, '0' means alarm condition no active while '1' means alarm condition active.

a1: Alarm *GPS* (Timing)
a2: Alarm *Antenna* (shorted or opened connection)
a3: Alarm *Initialization* or *Warm-up* mode
a4: Alarm *Holdover* mode
a5: Alarm *Tracking Fast* mode
a6: Alarm *OCXO* (warm-up or failure)
a7: Alarm *Auxiliary input*

LED: '0' means LED is OFF
'1' means LED is red on
'2' means LED is red blinking
'3' means LED is green on
'4' means LED is green blinking.
'5' means LED is green-red blinking

STAT_IN: For s1 and s2, '0' means Input is disabled, '1' means Input is in Alarm, '2' means Input is in Stand-by, '3' means Input is operational
s1: GPS input
s2: Auxiliary Input.
s3: 0 : Auxiliary Input in alarm
1 : Frequency 64kHz detected on Aux. Input
2 : Frequency 1.544MHz detected on Aux. Input
3 : Frequency 2.048MHz detected on Aux. Input
4 : Frequency 5MHz detected on Aux. Input
5 : Frequency 10MHz detected on Aux. Input
6 : E1-code detected on Aux. input

TAU=t<cr><lf>

Description: Allows the user to set a new value for the Loop Time Constant.

Type: Entry

Parameter: t: new value for the Loop Time Constant in seconds $100 \leq t \leq 50000$

Answer: none

TOD<cr><lf>

Description: Return a NMEA 0183-format message about Time-Of-Day.

Type: Request

Parameter: none

Answer: The Time-Of-Day is provided by GPS receiver. This data may be unavailable during few minutes after stating-up or if antenna is incorrectly connected. There are three ways to answer to the TOD request.

1st: TOD not available
ERROR, TOD IS NOT VALID<cr><lf>

2nd: TOD is available, GMT_offset = 0 (UTC time)
$GPZDA,101534,18,02,2002,+00,00,*CC<cr><lf>

3rd: TOD is available, GMT_offset ≠ 0 (local time)
$GPZDA,124534,18,02,2002,+03,30,*CC<cr><lf>

TOD_STATE<cr><lf>

Description: Return the status of the spontaneous send of the TOD message.

Type: Request

Parameter: none

Answer: **TOD_STATE=s**<cr><lf><etx>
- s = D Spontaneous send of the TOD message is disabled. The TOD message could be sent in polled mode by using the **TOD** command.
- s = E Spontaneous send of the TOD message is enabled. The TOD message is sent each second. The **TOD** command is not active in this case.

TOD_STATE=s<cr><lf>

Description: Set the status of the spontaneous send of the TOD message.

Type: Entry

Parameter:
- s = D Spontaneous send of the TOD message is disabled. The TOD message could be sent in polled mode by using the **TOD** command.
- s = E Spontaneous send of the TOD message is enabled. The TOD message is sent each second. The **TOD** command is not active in this case.

Answer: none

WTR<cr><lf>

Description: Return the value of the wait-to-restore time and the remaining WTR time for both GPS and AUX input.

Type: Request

Parameter: none

Answer: **WTR=www/gggg/aaaa**<cr><lf><etx>

www: Set Wait-to-restore Time. In 10s of seconds
3 ASCII characters (with possible spaces at left): $0 \leq w \leq 250$
Default value : 6 (≅ 60 s)

gggg: Remaining time for WTR on GPS input, in seconds.
In normal operation, gggg= 10·www.
4 ASCII characters (with possible spaces at left) : $0 \leq gggg \leq 2500$

aaaa: Remaining time for WTR on AUX input, in seconds.
In normal operation, aaaa= 10·www.
4 ASCII characters (with possible spaces at left) : $0 \leq aaaa \leq 2500$

WTR=w<cr><lf>

Description: Set a new value for the wait-to-restore time. In 10s of seconds. The value can be between 0 and 2500 seconds. It means that to enter the value 2000 seconds for WTR, the user have to write 200 as w parameter.

Type: Entry

Parameter: w: New value for the WTR functionality. $0 \leq w < 250$

Answer: none

Chapter

7. Specifications

Including :

- Input Specifications
- Tracking Subsystem Characteristics
- Output Specifications
- Remote Functions
- General Specifications

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7.1 Input Specifications

AUXILIARY INPUT	
2.048 Mbps Mode	
Specifications	• Input: 2.048 Mbps (G.703-6), HDB3 or AMI coded (either CRC4 or CAS) • 75Ω (120Ω via TEX-P or impedance adapter - not included)
Input Qualification	Detection of the following criteria causes input changeover: - Loss of Signal (LOS) - Alarm Indication Signal (AIS) - Frame Alignment error (LFA) - Excessive error rate ($\geq 1^{E-3}$) on frame alignement (ER)
Frequency Mode	
Specification	• Input: 0.064, 1, 1.544, 2.048 (G.703-10), 5 or 10 MHz. • Automatic detection of input frequency and division. • Sine wave input level: 0.15 to 1.5 V_{RMS} • Square wave input level: 0.5 to 5 V_{PP} • 75Ω (120Ω via external impedance adapter - not included)
Input Qualification	Detection of the following criteria causes input changeover: - Loss of Signal (LOS). - Frequency Out Of Limit (OOL)
INPUT MANAGEMENT	
Input Selection	
Input Validation	Input validation criteria depend on input signal type. See paragraph on Input Characteristics.
Max. Output Phase Change after Input Changeover	Phase build-out function cancels phase offsets between inputs. Output phase change: typically < 10 ns; exact value depends on environmental conditions.

Table 7-1 Input Specifications

7.2 Tracking Subsystem Characteristics

TRACKING SUBSYSTEM	
Type	GPS Receiver Module (GPS) incorporating Digital Phase Locked Loop (DPLL).
Jitter & Wander Filtering Characteristics	Exceeds ITU-T G.812. Type I, V and VI (with loop time constant of 2000s). Filter bandwidth: 20µHz (τ=50000s) to 10mHz (τ=100s). Settable by the management software Gain peaking: < 0.2 dB
Loop Time Constant (t)	Variable between 100 and 50000 seconds (to optimise filtering characteristics) programmable via RS-232 port. Factory Setting: 2000 s
Noise Generation	Better than G.812 type I, V and VI: Observation Period: 0.1 to 9 s; 9 to 400 s; 400 to 10000 s MTIE: 24 ns; $8*\tau^{0.5}$ ns; 160 ns Observation Period: 0.1 to 25 s; 25 to 100 s; 100 to 10000 s TDEV: 3 ns; $0.12*\tau$ ns; 12 ns
OSCILLATOR (inside GPS module)	
Holdover Stability (at 25°C)	< ± 1 x 10^{-10}/day, after 30 days of continuous operation
Stability Versus Temperature	6 x 10^{-10} peak-peak (- 5 to 55 °C)
Initial Frequency Offset (at entry into hold-over mode)	< 1.5 x 10^{-11}
Short Term Stability (Bw=1kHz)	< 1.5 x 10^{-11} (0.2 - 10 S)
Pulling Range (peak to peak)	> 6 x 10^{-7}
In-service adjustments	Not required
Life time	> 15 years

Table 7-2 Tracking SubSystem Characteristics

7.3 Output Specifications

FREQUENCY OUTPUTS	
2.048 MHz Output G703-10	
Specifications	• Level: G.703-10, Square wave • Impedance: 75Ω • Connector: BNC
2.048 Mbps Output G703-6	
Specifications	• Level: G.703-6 • Impedance: 75Ω • Connector: BNC • Code E1: Multiframe CRC4
10 MHz Output G703-10	
Specifications	• Level: 1.0 V_{RMS} ± 20%, Sine wave • Impedance: 50Ω • Connector: BNC
1PPS Output	
Specifications	• Level: 2.4 V_{PP} ± 20% (AC-MOS/50Ω), Square wave • Pulse Width: 200ms • Rise Time: ≤ 20ns • Impedance: 50Ω • Connector: BNC

Table 7-3 Output Specifications

7.4 Remote Functions

MONITORING & ALARMS	
User Interface	RS-232 on 9 way D-type connector
Protocol	TTY.
Communications Parameters	4800 baud, 8 data bits, 1 stop bit, parity: none 9600 baud, 8 data bits, 2 stop bits, parity: none (Factory setting)
Electrical Outputs	1 relay contact I_{MAX} = 1A, V_{MAX} = 150V_{DC} or 125V_{AC} Contacts available from a 3 ways type (weidmüller) connector. "Normally Open" or "Normally Closed" function selected by wiring.

Table 7-4 Remote Functions Specifications

7.5 General Specifications

POWER SUPPLY	
Configuration	Single power supply converter
Input Voltage	9 to 18VDC (945.453.1S0.**1**00) 18 to 60VDC (945.453.1S0.**0**00)
Power Consumption	Warm-up : < 12 W Steady state : < 8 W
ENVIRONMENTAL	
Environment	Storage: as specified in ETS 300 019-1-1, class 1.1 Transportation: as specified in ETS 300 019-1-2, class 2.2 Operation: as specifies in ETS 300 019-1-3, class 3.2
Operating Temperature Range	-5° to +55°C
Storage Temperature	-40° to +85°C
Humidity	5 to 95% non condensing.
EMC, ESD & SAFETY - CE Mark	
EMC & ESD	Certified to EN50081-1 and EN50082-1 Susceptibility to IEC 801 parts 2, 3, 4, 5 and 6
Safety	Conformance to EN61010-1
MECHANICAL	
Mounting	5"x4"x2" standard case
Size **D x W x H [mm]**	147 x 101 x 50.25 (including connectors)
Weight	~ 400g
Connector Access	Front access.

Table 7-5 General Specifications

Chapter

8. Maintenance

Including :

- Overview
- Oscilloquartz Contact Information

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8.1 Overview

No periodic maintenance is required for this unit.

8.2 Oscilloquartz Contact Information

8.2.1 Technical Assistance

For technical assistance, contact the following:

8.2.1.1 International

Oscilloquartz SA
Customer Support & Services
16, Rue de Brévards
2002 Neuchâtel 2
SWITZERLAND

Tel: +41-32-722-5555
Fax: +41-32-722-5578
e-mail: css@oscilloquartz.com

8.2.1.2 North America

Oscilloquartz USA
Customer Support & Services
14 Inverness Drive East, Suite F-240
Englewood, CO 80112-5640
USA

Tel: +1-303-790-0281
Fax: +1-303-790-9197
e-mail: osausa@oscilloquartz.com

8.2.2 Sales

For sales assistance, contact the following:

8.2.2.1 International

Oscilloquartz SA
Sales & Marketing
16, Rue de Brévards
2002 Neuchâtel 2
SWITZERLAND

Tel: +41-32-722-5555
Fax: +41-32-722-5556
e-mail: osa@oscilloquartz.com

8.2.2.2 North America

Oscilloquartz USA
Sales & Marketing
14 Inverness Drive East, Suite F-240
Englewood, CO 80112-5640
USA

Tel: +1-303-790-0281
Fax: +1-303-790-9197
e-mail: osausa@oscilloquartz.com

Appendix A:

Ordering Information

The following tables contain the articles and drawing numbers for supplementary accessories and kits.

Please include Article and Drawing numbers in purchase orders.

Units

Items	Description	Article number	Drawing number
4531-E1 GPS-SB	8663 OCXO, 24/48 VDC, BNC	A013066	945.453.1S0.000
	8663 OCXO, 12 VDC, BNC	A013067	945.453.1S0.100

Table 8-1 Ordering Units

Miscellaneous Accessories

Items	Description	Article number	Drawing number
DOC	User Manual - Printed Version	A013237	990.500.041
Software	Configuration & Monitoring Software	A013082	S10.CM1.A81
TEX-P	Passive Timing Extraction Module	A006144	942.089.035
Power Supply	AC/DC (90-264VAC - 24VDC)	A012950	930.200.004.10
Power Supply	AC/DC (90-264VAC - 12VDC)	A013382	930.200.006.10
19" mounting kit	▪ Mounting Tray ▪ screws and screw cages	A014605	982.060.390
ETSI mounting kit	▪ Mounting Ears ▪ screws and screw cages	A014637	942.089.919
RS-232 cable	Null Modem Cable	A012740	957.520.901
120/75 ohms Balun	--	A005318	938.752.011

Table 8-2 Ordering Miscellaneous Accessories

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Glossary

DPLL	Digital Phase Lock Loop
f_o	Oscillator Output Frequency
f_c	Cut-off Frequency
Jitter	Short-term non-cumulative variations of the significant instants of a digital signal form their ideal positions in time, expressed in seconds or in UI (unit interval).
τ or Tau	Loop Time Constant
Wander	Long-term non-cumulative variations of the significant instants of a digital signal form their ideal positions in time, expressed in seconds or in UI (unit interval).
x(t)	Offset of phase-time between two signals in function of time, expressed in seconds
XO	Crystal Oscillator
xin	Phase-time difference at the input of the digital PLL filter (PI controller)
y(t)	Fractional frequency offset, normalized instantaneous offset from a reference, in function of time.

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C	05.09.2005	- Update GPS Installation instructions - Update Factory Settings - New page layout
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E	08.12.2005	- Update Warm-up outputs conditions
F	27.03.2006	- Add section for rack mounting options - Add Ordering Information Appendix - Add Technical & Sales Assistance links
G	10.10.2006	- Change mistake drawing number (ETSI mounting kit) - Update GPS Antenna installation and description
H	21.02.2008	- Extract GPS Antenna Installation chapter
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