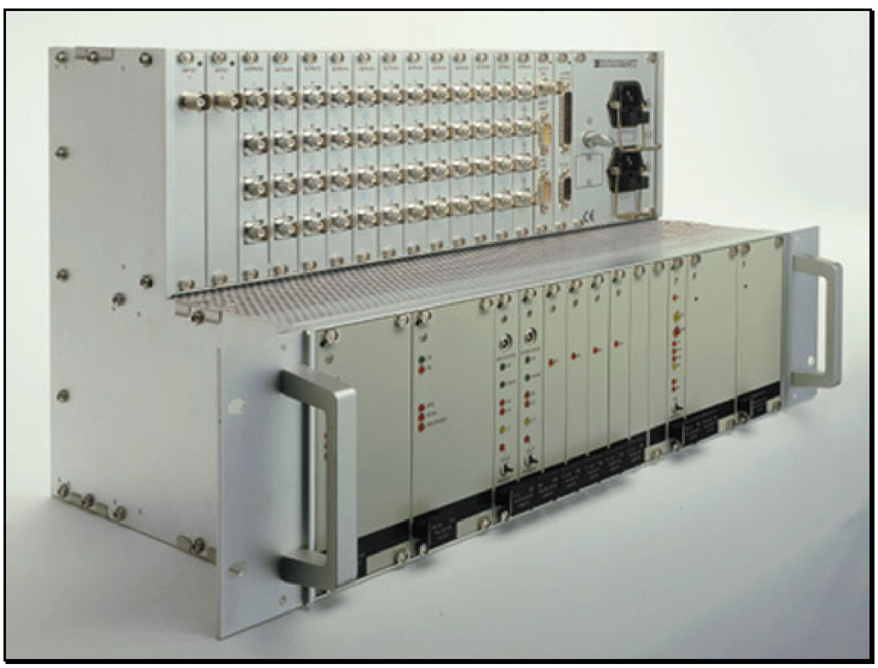
OSCILLOQUARTZ

# OSA 5581C GPS-SR

## GPS - Synchronisation Receiver

## Product Booklet





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SCS 004

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# 1 Applications for the OSA 5581C GPS-SR

The OSA 5581C GPS-SR is a versatile GPS receiver for all kind of synchronisation applications. Depending on the chosen configuration, it can provide framed signals, frequency & phase and/or time synchronisation signals.

Telecommunications applications examples requiring synchronisation are circuit switched network elements, SDH and SONET transport networks, and all TDMA-/CDMA-based mobile networks. In the case of circuit switched network elements and transport networks, the OSA 5581C GPS-SR can be used as a replacement for classical Primary Reference Clocks (PRC) and Synchronisation Supply Units (SSU). Each node equipped with an OSA 5581C GPS-SR gets PRC-grade synchronisation signals derived from the GPS satellites. Auxiliary electrical synchronisation input ports provide alternative references as a protection of the GPS-derived reference signal. This enables operators to adopt conceptual synchronisation planning that are different from the classical master-slave synchronisation and for isolated SDH islands. These GPS-based and mixed concepts lead to synchronisation network topologies that are simpler and easier to maintain. The OSA 5581C GPS-SR is also very useful in modern DWDM networks. It is particularly useful in cases where cell-switched or packet-switched network layers are transported directly over DWDM networks without going over SDH. In these cases there is no SDH layer that can be used for transporting synchronisation to synchronous equipment. The OSA 5581C GPS-SR is used to provide synchronisation directly where it is needed. In TDMA-based mobile networks (GSM, IS-54 D-AMPS, IS-136 D-AMPS 1900, UWC-136, etc.) the OSA 5581C GPS-SR synchronises base stations controllers and/or base stations, in order to ensure that the air interface operates with the required synchronisation stability. Sometimes SDH-based synchronisation distribution to base stations proves difficult. In such cases the OSA 5581C GPS-SR is a welcome alternative.

The OSA 5581C GPS-SR not only provides accurate and stable frequency, it is also suitable as a source of reference signals that are phase-coherent with UTC (Universal Time Co-ordinated). Many new telecommunications applications make use of phase synchronisation. The most prominent examples are CDMA-based mobile networks such as IS-95 cdmaOne, UMTS, and third generation technologies endorsed by ITU's ITM-2000 project (cdma2000 proposed by TIA, WCDMA and TD-SCDMA proposed by the 3GPP partners). These networks require the base stations to transmit frames aligned with UTC. GPS is the obvious solution. New Locations Services such as the U.S. E911 emergency call service are being defined and deployed in many kinds of mobile networks (TDMA and CDMA). These enhancements make use of the accuracy of GPS-based phase-synchronisation in the network's base stations. Similar requirements exist in digital broadcasting, namely in DVB (Digital Video Broadcasting) and DAB (Digital Audio Broadcasting) systems.

# 2 Functions of the OSA 5581C GPS-SR

The OSA 5581C GPS-SR (GPS-Synchronisation Receiver) is a GPS receiver, accepting up to two G.703 auxiliary inputs, with holdover capability. When locked to the Global Positioning System (GPS) the OSA 5581C GPS-SR fulfils the ITU-T rec. G.811. The internal oscillators fulfil the G.812 rec.[1] whenever the GPS signal is not available.

The OSA 5581C GPS-SR is specifically designed to e.g.:

- Work as a PRC in small networks
- To be used as a high quality SSU with full SSM capability
- To supply high quality synchronisation to important end-customers
- To be installed in large and/or important nodes like MSC nodes in e.g. GPRS, 3G GSM and UMTS networks.

## 2.1 Functions:

The OSA 5581C GPS-SR performs the following main functions:

- Supplies ITU-T G.811 references with valid GPS signal,
- Supplies ITU-T G.812 (type I, II, V, and VI)1 references when in holdover (without GPS signal),
- Can be equipped in single or dual GPS configuration,
- Accepts up to two back-up synchronisation reference inputs,
  - E1, T1, or frequencies,
- Monitors the status of the reference input signals (GPS and auxiliary synchronisation signal),
- Selects the best or the operator preferred sync input,
- Selects the next best or the next preferred sync input if the current has failed or fallen in quality,
- Provides automatic switching without phase jump,
- Attenuates jitter and wander on the selected synchronisation input,
- Operates as a standby reference clock in hold-over mode if all synchronisation inputs have fallen in quality or failed,
- Provides up to 64 standard telecom signal output[3],
  - E1, T1, and frequencies
- Provides different output protection schemes[2];
  - Up to 32 1+1 protected output signals,
  - Up to 32 1+1 protected & 32 unprotected output signals[3],
  - Up to 64 unprotected output signals[3],
- Provides different types of time-code outputs,
  - 1 PPS
  - Optional NTP (Network Timing Protocol),
  - Optional IRIG-B outputs
- Provides re-timing of up to 24 E1 or T1 traffic carrying signals,

[1] Fulfilment of the G.812 rec. depends on the equipped input module. Please consult Table 2, pager 11, for further details.
[2] Do not comply with RTU module due to the protection philosophy of the traffic in the connector field.
[3] 64 unprotected output signals provided with limited choice of connectors, due to physical restriction in the connector area.

- Supports different supervision schemes:
  - Local (on-site) management via Local Manager software
  - Remote management via Local Manager and Remote Access Manager™ software
  - Centralised via SyncView™ management application

## 2.2 Features:

- Available in ETSI or 19” sub-rack with single or dual power supplies,
- Wide range of output connectors,
- Choice of Rubidium or Quartz oscillators
- Partially equipped configurations available,
- Modular approach – cards can be replaced in a hot condition,
- Totally maintenance-free design.

# 3 Equipment description

## 3.1 Equipment Layout

The OSA 5581C GPS-SR comes as an ETSI or 19” sub-rack. In the ETSI version the connectors are located on the front panel, while on the 19” version the connectors are located on the rear panel.

The physical layout of the OSA 5581C GPS-SR (ETSI version) is shown in Figure 1.

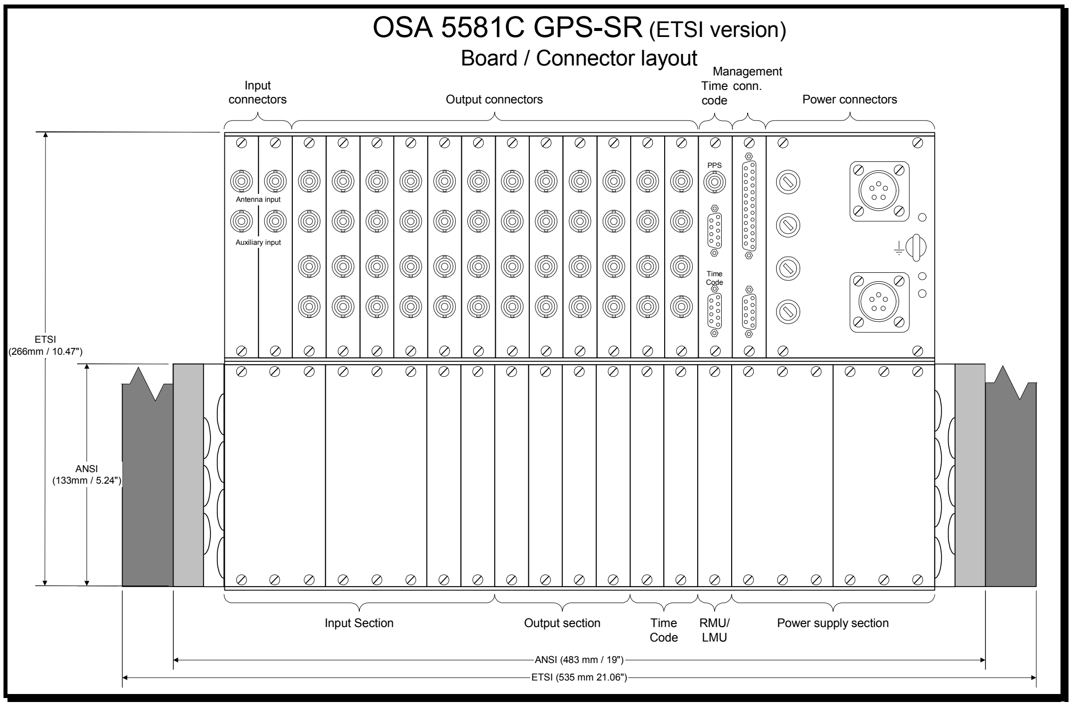


Figure 1: Equipment layout of the OSA 5581C GPS-SR, ETSI version.

The above drawing shows the maximum configuration of the equipment:

- 2 × Input & Holdover modules for GPS signal, E1 (T1) or MHz auxiliary input
- 2 × Phase Stepper Switch (PSS).
- 4 × Output Interface Unit (OIU).
- 1 × Time Code Unit (TCU) for NTP or IRIG-B time outputs.
- 1 × Management slot for Remote/Local Manager Unit (RMU/LMU)
- 2 × Power Supply Unit (PSU).
- 3 × Connector tiles Set (16 outputs each).
- 1 × Connector panel (for power supply and management).

Please refer to sections 4 and 7 for further details

## 3.2 System architecture

Figure 2 shows the block diagram of the OSA 5581C GPS-SR.

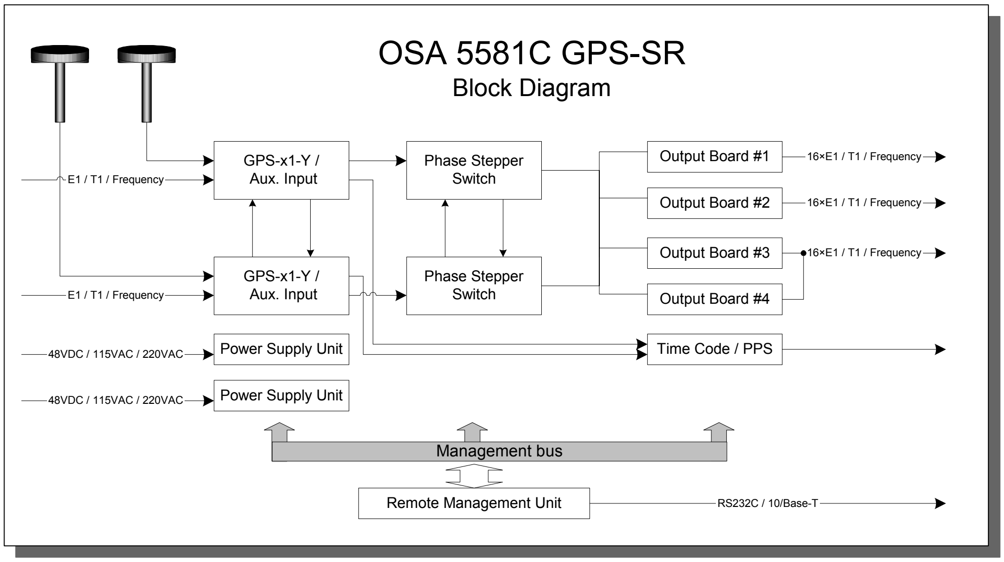


Figure 2: Block diagram of the OSA 5581C GPS-SR.

The above drawing illustrates how all the critical parts in the OSA 5581C GPS-SR are duplicated in order to obtain the highest possible reliability.

Reliability figures are given in section 5, pp. 19.

All units in the OSA 5581C GPS-SR communicate via an internal communication bus, which forms a part of the back plane. The management module, either MAC2-R, RMU or LMU, communicate with all other units via this bus.

**Important**: Thanks to its robust design, the OSA 5581C GPS-SR is fully operational even if the management module is faulty or removed.

### 3.3 Release features overview

Table 1 below lists the major features available in the different releases of the OSA 5581C GPS-SR.

Table 1: Features chart for the OSA 5581C GPS-SR.

| **Release** | **1.1** | **1.2** | **2.0E** | **2.1E** | **2.1T** |
|---|---|---|---|---|---|
| G.812 type I, V, VI (SSU for SDH) oscillator | ✓ | ✓ | ✓ | ✓ | ✓ |
| G.812 type II (Stratum 2) oscillator | | ✓ | ✓ | ✓ | ✓ |
| Auxiliary Frequency input | ✓ | ✓ | ✓ | ✓ | ✓ |
| Auxiliary E1 input | ✓ | ✓ | ✓ | ✓ | |
| Auxiliary T1 input | ✓ | ✓ | | | ✓ |
| Full SSM functionality (E1) | | | | ✓ | |
| Full SSM functionality (T1) | | | | | ✓ |
| Manageable only locally via MAC2-R module | ✓ | ✓ | | | |
| Manageable remotely/locally via RMU/LMU | | | ✓ | ✓ | ✓ |
| Manageable locally via LM software | ✓ | ✓ | ✓ | ✓ | ✓ |
| Manageable remotely via LM + RAM software | ✓ | ✓ | ✓ | ✓ | ✓ |
| Manageable remotely via SyncView™ | | | ✓ | ✓ | ✓ |
| Embedded NTP Server | | ✓ | ✓ | ✓ | ✓ |
| Four IRIG-B outputs | | | | ✓ | ✓ |
| Retiming of E1 traffic signals | ✓ | ✓ | ✓ | ✓ | |
| Retiming of T1 traffic signals | ✓ | ✓ | | | ✓ |

# 4 Theory of Operation

## 4.1 Input stage & Holdover capability

The OSA 5581C GPS-SR can be equipped with one or two GPS receivers, each with an auxiliary (E1/T1/frequency) synchronisation input.

Four types of the Input & Holdover module are available.

- GPS-E1-A
  E1 / frequency auxiliary input, internal Rubidium oscillator
- GPS-T1-A
  T1 / frequency auxiliary input, internal Rubidium oscillator
- GPS-E1-B
  E1 / frequency auxiliary input, internal Oven-Controlled oscillator
- GPS-T1-B
  T1 / frequency auxiliary input, internal Oven-Controlled oscillator

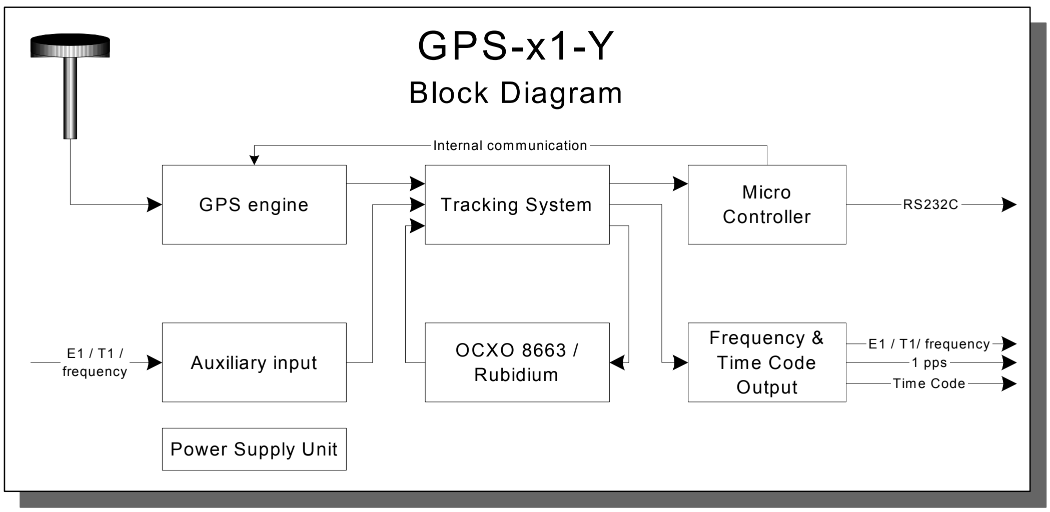


Figure 3: Block diagram of the GPS-x1-Y Input Interface Unit (IIU).

### 4.1.1 Input selection

The equipment selects the active sync input according to a user-defined priority table and the SSM[4] signal if available. When input selection is based on the SSM, the input signal with the best SSM value will be selected as the reference sync input (whenever the two input signals have the same SSM value, the signal with the highest priority will be selected).

The OSA 5581C management software also allows to associate a (static) SSM value to inputs that do not carry SSM information (e.g. frequency inputs).

[4] ITU-T rec. G.781 describes three SSM sets for lower bit rate traffic carrying signals in the SDH, SONET and Japan. Oscilloquartz have based the implementation of the SSM in the IIU on the SSM set description for SDH and SONET networks in this recommendation.

The input selection is working in a revertive mode.[5]

### 4.1.2 Holdover capability

The Input & Holdover module is based on the Motorola UT-Oncore GPS receiver and a holdover function provided by the internal OSA 8663 OCXO or Rubidium oscillator. These two items provide stability and filtering characteristics compliant to the ITU-T recommendation G.812 type I, II, V, and VI (i.e. they fulfil the requirements for an SSU used in a SDH and SONET network) as indicated in Table 2.

When the input module is locked to a GPS signal, the filtering function ensures that the reference synchronisation signal fulfils ITU-T recommendation G.811[6].

Table 2: Source: ITU-T recommendation G.812 (06/98).

| | G.811 | G.812 | | | | | |
|---|---|---|---|---|---|---|---|
| | | Type I | Type II | Type III | Annex I | | |
| | | | | | Type IV | Type V | Type VI |
| Holdover | NA | $2 \times 10^{-10}$ | $1 \times 10^{-10}$ | $1 \times 10^{-9}$ | $4 \times 10^{-8}$ | $1 \times 10^{-9}$ | $2 \times 10^{-8}$ |
| Accuracy | $1 \times 10^{-11}$ | NA | $1.6 \times 10^{-8}$ | $4.6 \times 10^{-6}$ | $4.6 \times 10^{-6}$ | NA | NA |
| Period T | Lifetime | NA | 1 year | 1 year | 1 year | NA | NA |
| Pull-in | NA | $1 \times 10^{-8}$ | $1.6 \times 10^{-8}$ | $4.6 \times 10^{-6}$ | $4.6 \times 10^{-6}$ | ND | ND |
| Hold-in | NA | NA | $1.6 \times 10^{-8}$ | $4.6 \times 10^{-6}$ | $4.6 \times 10^{-6}$ | ND | ND |
| Pull-out | NA | TBD | NA | NA | NA | ND | ND |
| GPS Module | GPS-x1-A[7] | | GPS-x1-A | | | | |
| | GPS-x1-B[7] | GPS-x1-B | | | | GPS-x1-B | GPS-x1-B |
| | | | | (GPS-x1-C)[8] | (GPS-x1-C)[8] | | |

NA Not Applicable
TBD To Be Decided
ND Not Decided
NOTE – The time period T applies after 30 days of continuous synchronised operation.

By using an internal oscillator (OSA 8663 OCXO or Rubidium), the OSA 5581C GPS-SR fulfils the above requirement for Synchronisation Supply Units (SSU) in an SDH or SONET network.

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[5] Revertive: 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.
[6] Please note that the U.S. DoD (Department of Defence) has set the SA (Selective Availability) to OFF as from May 1st, 2000. At the same time the maintenance of the GPS was transferred to DoT (Department of Transport).
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.
[7] When locked to GPS signal.
[8] GPS-x1-C: Stipulated input module with OSA OCXO 8741 Fulfilling ITU-T G.812 (III & IV). Please contact your local representative or Oscilloquartz directly, for further detail and release plan.

#### 4.1.3 Oscillators

The input unit can contain one of two different oscillators, depending on the expected performance of the system. The different oscillators are:

##### *4.1.3.1 OSA 8663 OCXO*

The performance of the OSA 8663 OCXO meets or exceeds ITU-T G.812 type I, V & VI.

The long-term holdover stability[9] of the OSA 8663 OCXO is:

- $< \pm 1 \times 10^{-10}$ / day
- $< \pm 2 \times 10^{-8}$ / year

Expected lifetime for the OSA 8663 OCXO is more than 15 years. It is totally maintenance-free and does not require any kind of mechanical adjustment.

##### *4.1.3.2 OSA Rubidium oscillator*

The performance of the OSA Rubidium oscillator meets or exceeds ITU-T G.812 type II.

The long-term holdover stability[10] of the OSA Rubidium oscillator is:

- $< \pm 5 \times 10^{-11}$ / month
- $< \pm 5 \times 10^{-10}$ / year

The frequency stability is:

- $< 5 \times 10^{-10}$ / day peak-to-peak (-5°C - +55°C)

Expected lifetime for the OSA Rubidium oscillator is more than 7 years. It is totally maintenance-free and does not require any kind of mechanical adjustment.

### 4.1.4 GPS antenna system

The GPS module kit for the OSA 5581C GPS-SR is delivered with a standard antenna with mounting accessories, EMP protection kit and 10m interconnection cable (between antenna and EMP protection).

The remaining antenna cable (between EMP protection and equipment) has to be ordered separately. The antenna cable is available in length of 20m (RG58), 60m (RG213), and 120m (2 × RG213 [60m] with line amplifier). For lengths longer than 120 meters Oscilloquartz proposes the CellFlex cable, which can be ordered in exact lengths up to 300 meters.

Please contact Oscilloquartz if other requirements exist.

Figure 4 shows the principle for the GPS antenna installation.

[9] Typical values after 30 days of continuous operation.
[10] Typical values after 60 days of continuous operation.

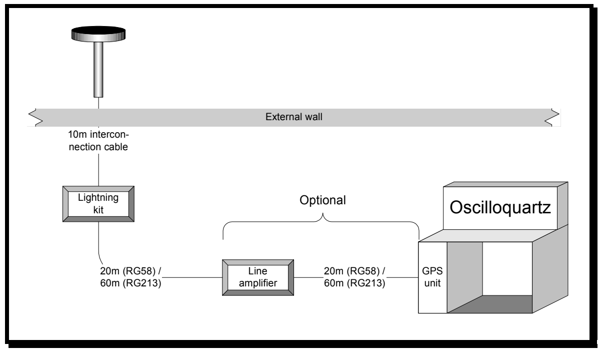


Figure 4: GPS antenna installation diagram.

## 4.2 Phase Stepper Switch

The Phase Stepper Switch (PSS) keeps the output signal from the standby GPS module in phase with that of the active GPS module.

### 4.2.1 Phase build-out

When the equipment changes reference, it will go into holdover for a short period of time (2 seconds) in order to provide a constant synchronisation signal to the output units.

Although the two inputs from the two GPS modules have the same frequency, they still can vary in phase [$\phi$] (as shown in Figure 5). The result would be that, when switching between the two inputs, the synchronisation output would be affected by a phase jump, as shown in the figure (dotted line).

In the OSA 5581C GPS-SR Oscilloquartz has eliminated this phase jump by adjusting the phase of the “new” reference signal during an extended holdover period (additional 20 seconds). 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 (as shown in Figure 5).

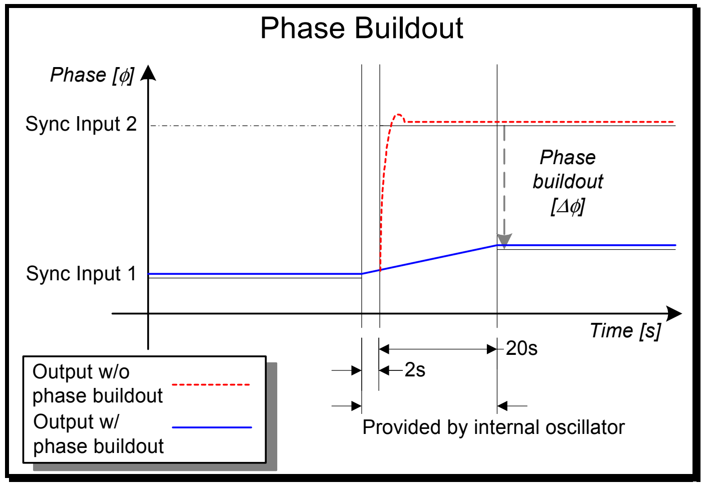


Figure 5: Schematic presentation of the phase buildout.

## 4.3 Synchronisation outputs

The OSA 5581C GPS-SR can be equipped with up to four Output Interface Units (OIUs) each providing 16 synchronisation output signals. Hence the OSA 5581C GPS-SR provides the following capacity of protected and unprotected outputs[11]:

- 32 1+1 protected outputs (requires 4 OIUs)
- 16 1+1 protected and 32 unprotected outputs (requires 4 OIUs)
- 48 unprotected outputs (requires only 3 OIUs)[12]

The OSA 5581C GPS-SR can of course be equipped with only one or two OIUs, if fewer outputs are needed.

All outputs from the OSA 5581C GPS-SR can be individually squelched by operator commands via the management software. The default condition is for all outputs to be active.

The OSA 5581C GPS-SR also supports conditional squelching where the operator can set the condition under which the outputs are squelched.

Conditional squelching is possible for the following conditions:

- During the warm-up phase
  (configurable squelching period)
- After a configurable delay after entering holdover mode
  (configurable period before and after squelch)

When SSM mode is enabled, the OSA 5581C GPS provides SSM information on its E1/T1 outputs according to ITU-T G.781 specification. This information consists of the SSM value of the currently selected input or, if the equipment is in holdover, the SSM value corresponding to the holdover quality of the fitted oscillator.

[11] RTU modules can not be used in protected mode.
[12] In this configuration, the 4th OIU can not be used due to physical constrains in the connector area

## 4.4 Re-Timing Unit (RTU)

A Re-Timing Unit (RTU) synchronises a traffic signal based upon the synchronisation signal from the OSA 5581C GPS-SR. Each channel in the RTU has a re-timing buffer holding two traffic frames. Each RTU provides retiming of up to 8 channels.

If the re-timing buffer overflows, controlled slips are applied to the traffic signals. Slips caused in the internal buffer can be monitored by suitably configuring alarm thresholds via the Local Manager or the SyncView™ Management software. Slip thresholds can be set in terms of slips per hour, day or week on an individual channel basis.

The RTU takes up one of the slots utilised for an Output Interface Unit.

**Important**: To ensure that traffic is not lost due to RTU card removal, card fault or loss of power in the equipment, the traffic signals are passed through the by-pass relays situated in the RTU connector tile set.

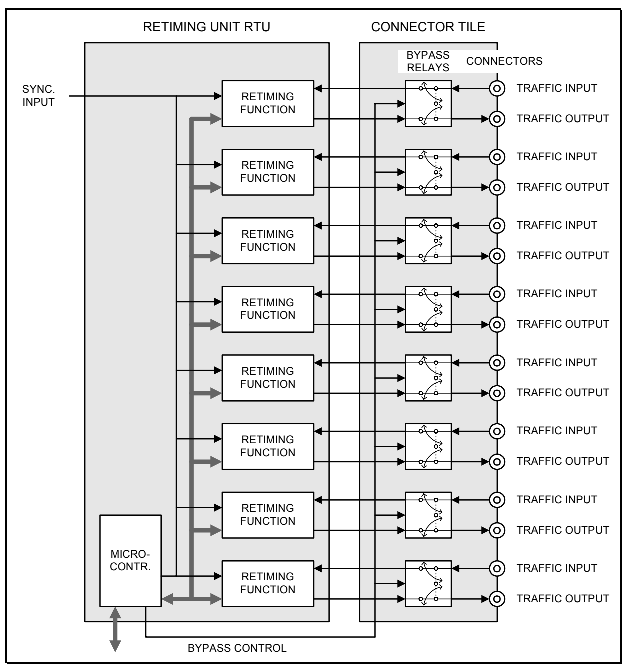


Figure 6: Block diagram of the Re-Timing Unit.

## 4.5 Output Connectors

Several output connector types are available. Output impedance can be either unbalanced (75Ω) or balanced (100Ω for T1 outputs, 133Ω for 64kbit/s cc outputs, 120Ω for all other output types). Field-exchangeable Output Connector Tiles determine the output connector type and output impedance.

RTU cards require specially designed connector tiles, which includes by-pass relays in case of unit failure.

## 4.6 Time Code Units (TCU)

### 4.6.1 Embedded NTP Server

The TCU-NTP module provides an embedded NTP (Network Time Protocol) Stratum 1 server functionality without having to provision and maintain a separate GPS receiver with antenna, cabling and management connection. Moreover, time information is kept even in case of loss of the GPS signal, that is, when the system is locked on an auxiliary input or when it is in holdover, with the accuracy of the active reference.

### 4.6.2 IRIG-B Outputs

The TCU-IRIG-B module provides four IRIG-B outputs as follows:

- 2 x IRIG-B code 122 (AM 1kHz)
- 2 x IRIG-B code 012 (ACMOS, pulse width coded)

Similarly to the TCU-NTP module, time information is kept even in case of loss of the GPS signal, that is, when the system is locked on an auxiliary input or when it is in holdover, with the accuracy of the active reference.

## 4.7 Management unit (MAC / RMU /LMU) and connection

The management unit (Monitoring and Alarms Controller [MAC], Remote Manager Unit [RMU] or Local Management Unit [LMU]) concentrates the alarms from all modules within the OSA 5581C GPS-SR and provides management connection(s) to the equipment. These units provide front panel LED indications, relay contact outputs for in-station monitoring, and an RS-232C port for external control using the Local Manager (LM for 5581C) software. LM software provides an user-friendly, graphical interface running on any IBM compatible computer equipped with MS Windows 98 / NT / 2000 / XP operating system. RMU additionally provides a connection to the SyncView™ synchronisation management system via a TCP/IP connection.

It is worth mentioning that failure or removal of the management unit will eliminate only the management functions provided by the unit itself, without affecting synchronisation in any way. For example, protection switching and input selection processes will still be ensured, as well as all the selected synchronisation outputs will still be active, with the same quality as before.

### 4.7.1 Remote Monitoring via Modem

The OSA 5581C GPS-SR can be supervised/managed in three different manners, using either the MAC, LMU or RMU management unit:

- Locally using LM for 5581C (MAC, LMU and RMU)
- Remotely using LM for 5581C and RAM (MAC, LMU and RMU)
  This solution connects the LM to the management unit via a dial-up connection provided via telephone line or a LAN / WAN.
  (Please refer to the RAM data sheet for more information on this solution)

- Remotely using SyncView™ (RMU only)
  The OSA 5581C GPS-SR can be managed from SyncView™, the Synchronisation Management System from Oscilloquartz through a TCP/IP network using the RMU management unit.
  (Please refer to the SyncView™ Booklet for further details)

## 4.8 Power Supply

The Power Supply Units (PSUs) 1 and 2 operate in a 1:1 hot standby protection mode. Failure or removal of one PSU has no effect on the synchronisation outputs of the OSA 5581C GPS-SR.

The OSA 5581C GPS-SR accepts 48VDC, 115VAC, or 220VAC in any combination.

## 4.9 Cover Plates

All non-equipped slots in the OSA 5581C GPS-SR must be fitted with cover plates for mechanical protection and for compliance with the relevant EMC and safety norms.

## 4.10 Configuration

All plug-in modules in the OSA 5581C GPS-SR are hot-pluggable i.e. can be replaced while the equipment is in use. The passive splitters and combiners are permanently fixed to the back plane for maximum security.

The table below shows an example of minimal configuration of the OSA 5581C GPS-SR.

Table 3: Minimal configuration of the OSA 5581C GPS-SR.

| Quantity | Module |
|---:|---|
| 1 | GPS-x1-Y (GPS input & holdover module) |
| 1 | PSS Bypass |
| 1 | OIU |
| 1 | OIU connectors Tile Set |
| 1 | PSU |
| 1 | PSU connector set |
| 1 | LMU |
| N | Cover plates to fill empty card and connector tile slots[13] |

## 4.11 Passive Timing Extractor (TEX-P)

Signals from non-terminated E1 / T1 links can be connected to the OSA 5581C GPS-SR using an external TEX-P. The TEX-P is a passive in-line device, normally mounted externally to the equipment, that taps off a

[13] Needed for EMC and safety reason.

portion of the digital signal without interfering with traffic or degrading the link in any way. One TEX-P handles up to two separate E1 / T1 feeds.

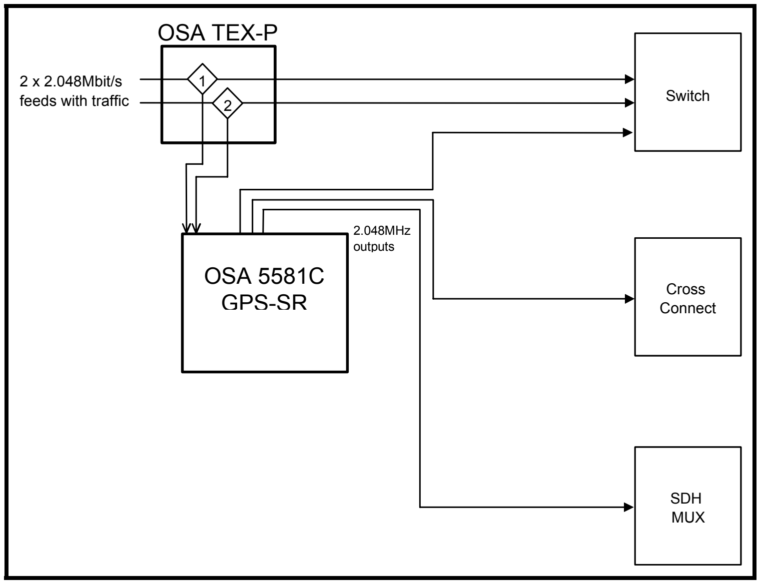


Figure 7: Typical use of the TEX-P with the OSA 5581C GPS-SR.

### 4.12 Impedance Adapter

Oscilloquartz supplies two kind of adapters, which both can be fitted to the equipment connectors.

- Impedance matching between 120Ω and 75Ω (Balun),
- Impedance matching between 75Ω and 50Ω.

Please refer to sections 7 for further details.

# 5 Reliability

## 5.1 Method

The MTBF figures given in Table 4 were calculated according to MIL HDBK 217F1.0. The MTBF and availability values for the complete equipment were derived from these MTBF figures of the Table and the following assumptions:

- The failure rates $\lambda_i$ of the modules is constant.
- MTTR is independent of time and of the number of modules to be repaired, its value is 3 days.
- The availability is constant (stationary condition).
- There is no down-time during repair of redundant modules.

The MTBF values of the complete equipment reflect the mean time between failures of the synchronisation function, i.e. the function of receiving and selecting an input reference, regenerating it or generating a local frequency in case of holdover mode, and distributing the output synchronisation signal to the equipment's outputs. The MTBF is calculated for the total failure of this synchronisation function. However, the system MTBF value does not account for failures of the equipment management function, since the latter has no influence on the integrity of the synchronisation function.

## 5.2 Reference Configuration

The calculations of MTBF and availability are based on the following reference configuration:

- 2×GPS-E1-B in hot redundancy
- 2×PSS
- 2×OIU-6 in hot redundancy
- 2×PSU-48VDC in hot redundancy

The reliability diagram of the reference configuration is given in Figure 8. In this diagram, the availability of the two input signals is assumed to be equal to 1. Protection of the OIUs can be obtained in two ways:

- Use an OIU pair in protected operating mode
- Use two unprotected OIUs and combine the two unprotected signals in the equipment they are connected to.

Table 4: MTBF figures of individual modules

| Module | MTBF [h] | Module | MTBF [h] |
|---|---|---|---|
| GPS-E1-A (incl. antenna) | 134,300 | GPS-E1-B (incl. antenna) | 134,300 |
| GPS-T1-A (incl. antenna) | 134,300 | GPS-T1-B (incl. antenna) | 134,300 |
| PSS | 96,000 | PSS-Bypass | 15,000,000 |
| OIU-CC | 45,000 | RTU-T1 | 183,600 |
| OIU-2 | 86,000 | RTU-E1 | 183,600 |
| OIU-6 | 86,000 | PSU-115VAC | 359,500 |
| OIU-10 | 90,000 | PSU-230VAC | 398,400 |
| OIU-5 MHz | 90,000 | PSU-48VDC | 398,400 |
| OIU-10 MHz | 90,000 | MACR-2 | 114,000 |
| TEX-P | 10,320,000 | RMU | 114,000 |
| | | Combiner/Splitter[14] | 15,000,000 |

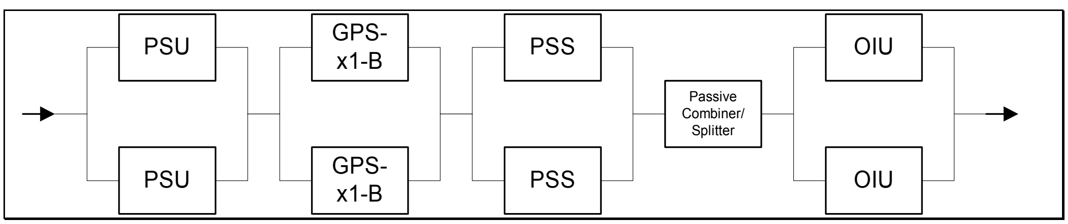


Figure 8: Reliability diagram of the reference configuration.

## 5.3 Reliability Calculations

$$MTTR = 3days = 72hours$$

$$\mu = \frac{1}{MTTR}$$

$$\lambda_i = \frac{1}{MTBF_i},$$ For $i$ = GPS, PSS, OIU, PSU, and CS[15]

$$\lambda_1 = 2 \times \frac{(\lambda_{GPS})^2}{\mu} \qquad \lambda_2 = 2 \times \frac{(\lambda_{PSS})^2}{\mu}$$

[14] Passive component on the wiring backplane
[15] CS = Combiner / Splitter
GPS = GPS Module GPS-x1-Y
PSS = Phase Stepper Switch
PSU = Power Supply Unit
OIU = Output Interface Unit

$$\lambda_3 = 2 \times \frac{(\lambda_{OIU})^2}{\mu} \qquad \lambda_4 = 2 \times \frac{(\lambda_{PSU})^2}{\mu}$$

$$MTBF = \frac{1}{\lambda_1 + \lambda_2 + \lambda_3 + \lambda_4 + \lambda_{CS}}$$

$$Availability = \frac{MTBF}{MTBF + MTTR}$$

**Results:**

| |
|---|
| MTBF = 9,225,300 hours = 1,037 years |
| Availability = 0.999992 |

# 6 Technical data

All values are given at +25°C unless otherwise stated

## 6.1 Input / Hold-Over section[16]

Table 5: Technical data for the input and Hold-over section.

| | |
|---|---|
| **INPUT INTERFACE UNITS**<br>(Auxiliary inputs compiles to relevant sections in ITU-T G.703 & G.704) | |
| **Input Characteristics**[17] | • **GPS signal,**<br>• L1 1575.42 MHz<br>• External gain 11dB to 33 dB<br>• Simultaneous tracking of up to 8 satellites<br>• **Electrical,**<br>• *GPS-E1-B*: 2.048Mbit/s (E1), HDB3 coded; 75Ω unbalanced (120Ω balanced via TEX-P or Balun)<br>• *GPS-T1-B*: 1.544Mbps (T1) 75Ω unbalanced (100Ω balanced via TEX-P or Balun)<br>• **Frequency**<br>• Input: 64kHz, 1, 1.544, 2.048, 5, or 10MHz.<br>• Automatic detection of input frequency<br>• Sine wave input level: 0.3 to 1.5Vrms<br>• Square wave input level: 1 to 5Vpp<br>• 75Ω (120Ω via external Balun - not included)<br>• **SSM values**<br>• Extracted from incoming 2.048 Mbit/s (E1) and 1.544 Mbit/s (T1) input signals as per ITU-T G.781 recommendation<br>• A static SSM value can be assigned via management software to every input signal that does not carry SSM information<br>• Valid (i.e. locked) GPS inputs are assigned a PRC/PRS SSM quality |
| **Input Qualification** | Detection of the following criteria causes input changeover:<br>For GPS-E1-B input module:<br>LOS, LFA, AIS, ER<br>For GPS-T1-B input module:<br>LOS, COFA, AIS (Blue Alarm). |
| **INPUT SELECTION** | |
| **Input Validation** | Input validation criteria depend on input signal type.<br>See section on Input Interface Units - Input Qualification. |
| **Input Selection** | Three possible input selection modes exist:<br>• Automatic, based on user-defined priority table<br>• Automatic, based on SSM and user-defined priority table<br>• Manual |
| **Max. Output Phase Change after Input Changeover** | Phase build-out function cancels phase offsets between inputs.<br>Output phase change: typically < 10ns; exact value depends on environmental conditions. |

[16] The OSA 5581C GPS-SR accepts one or two Holdover sections/GPS modules.
[17] Unterminated E1/T1 input requires externally mounted TEX-P

| TRACKING SUBSYSTEM | |
|---|---|
| **Type** | Digital Phase Locked Loop (D-PLL). Incorporated in the GPS-x1-Y Input Interface Unit (IIU). |
| **Jitter & Wander Filtering Characteristics** | Exceeds ITU-T G.812 Type I, II, V, and VI.<br>Filter bandwidth: 20µHz to 20mHz, user programmable via the management software.<br>Gain peaking: $\leq$ 0.2dB |
| **Loop Time Constant ($\tau$)** | Variable between 100 and 100,000 seconds (corresponds to filter bandwidth between 20µHz and 20mHz) to optimise filtering characteristics; programmable via the management software.<br>Optimal value for GPS-x1-Y input module: 2'000s |
| **Noise Generation**<br>(Ideal input signal, or GPS locked, constant temperature) | <u>Observation Period</u>: <u>TDEV</u>:<br>$0.1s < \tau \leq 100s$ — 3 ns<br>$100s < \tau \leq 1'000s$ — $0.03 * \tau$ ns<br>$1'000s < \tau \leq 10'000s$ — 30 ns<br><u>Observation Period</u>: <u>MTIE</u>:<br>$0.1s < \tau \leq 1'000s$ — $0.275 \times 10^{-3} \tau + 0.025\mu s$<br>$1'000s < \tau$ — $1\times10^{-5} \tau + 0.29\mu s$ |
| **HOLDOVER OSCILLATOR[18] (OCXO 8663 B6SG)** | |
| **Frequency Stability** | $< \pm2.0 \times 10^{-12}$ /day (when locked to GPS) |
| **Holdover Stability (at 25°C)** | $< \pm1.0 \times 10^{-10}$/day*<br>$< \pm2.0 \times 10^{-8}$/year<br>*After 30 days of continuous operation |
| **Stability vs. Temperature** | $< \pm6.0 \times 10^{-10}$ pp (-5°C to +55°C) |
| **Initial Frequency Offset at Entry into Holdover Mode** | $< 1.5\times10^{-11}$ |
| **Short Term Stability (Bw=1kHz)** | $< 1.5\times10^{-11}$ (0.2s – 10s) |
| **Pulling Range (peak to peak)** | $> 6 \times 10^{-7}$ |
| **Noise Generation**<br>(when in Hold-over mode, constant temperature) | <u>Observation Period</u>: <u>TDEV (ns)</u>:<br>$0.1s < \tau \leq 25s$ — 3<br>$25s < \tau \leq 100$ s — $0.12 * \tau$<br>$100s < \tau \leq 10'000$ s — 12<br><u>Observation Period</u>: <u>MTIE (µs)</u>:<br>$0.1s < \tau \leq 7.5s$ — 0.75<br>$7.5s < \tau \leq 20s$ — $0.1 * \tau$<br>$20s < \tau \leq 400s$ — 2<br>$400s < \tau \leq 1'000s$ — $0.005 * \tau$<br>$1'000s < \tau \leq 10'000s$ — 5 |
| **In-service adjustments** | None required |
| **Life time** | > 15 years |

[18] Please refer to Table 2, page 11, for compliance to ITU recommendations.

| **HOLDOVER OSCILLATOR**[18] **(Rubidium oscillator)** | | |
|---|---|---|
| **Frequency Stability** | $< \pm 2.0 \times 10^{-12}$ /day (when locked to GPS) | |
| **Holdover Stability (at 25°C)** | $< \pm 5.0 \times 10^{-11}$ / month**<br>$< \pm 5.0 \times 10^{-10}$ / year<br>** after three months of continuous operation | |
| **Stability vs. Temperature** | $< \pm 1.0 \times 10^{-10}$ pp (-5°C - +55°C) | |
| **Initial Frequency Offset at Entry into Holdover Mode** | $4.58 \times 10^{-13}$ (theoretical value) | |
| **Short Term Stability** | $3 \times 10^{-11}$ / 1 second<br>$1 \times 10^{-11}$ / 10 second<br>$3 \times 10^{-12}$ / 100 second | |
| **Pulling Range (peak to peak)** | $> 3 \times 10^{-8}$ (G.812 type I compliant) | |
| **Noise Generation** (when in Hold-over mode, constant temperature) | Observation Period: | TDEV (ns): |
| | $0.1s < \tau \leq 25s$ | $3.2 * \tau^{-0.5}$ |
| | $25s < \tau \leq 40$ s | 2 |
| | $40s < \tau \leq 1'000$ s | $0.32 * \tau^{0.5}$ |
| | $1'000s < \tau$ | 10 |
| | Observation Period: | MTIE (µs): |
| | $0.05s < \tau \leq 280s$ | $0.3 + 0.002'5\tau$ |
| | $280s < \tau$ | $0.997 + 0.000'01\tau$ |
| **In-service adjustments** | None required | |
| **Life time** | > 7 years | |

## 6.2 Output section

Table 6: Technical data for the output section.

| **OUTPUT INTERFACE UNITS (OIUs) & RE-TIMING UNITS (RTUs)**<br>(OIU & RTU types compiles to relevant sections in ITU-T G.703 & G.704) | |
|---|---|
| **Number of Slots** | OSA 5581C GPS-SR accepts up to 4 Output Interface Units (OIU) or 3 Re-Timing Units (RTU).<br>• Each OIU provides 16 outputs.<br>• Each RTU provides re-timing of 8 traffic channels. |
| **OIU Types** | OIU-CC: 16 outputs 64kbit/s composite clock<br>OIU-2: 16 outputs 1.544Mbit/s<br>OIU-10: 16 outputs 2.048MHz<br>OIU-6: 16 outputs 2.048Mbit/s<br>OIU-5MHz: 16 outputs 5MHz<br>OIU-10MHz: 16 outputs 10MHz |
| **RTU Types** | RTU-T1: 8 channels 1.544Mbit/s (T1)<br>RTU-E1: 8 channels 2.048Mbit/s (E1) |
| **Other OIU/RTU Types** | Please contact factory for other OIU types. |
| **1 PPS (Pulse-Per-Second) specifications** | Frequency 1 PPS<br>Duration: 200ms¨<br>Polarity: True<br>Level/Impedance: ACMOS 2.5 Vpp / 39 ohms serial resistor<br>Connector type: BNC |
| **Connectors**[19] | Unbalanced ports: BNC or BT 43<br>Balanced ports: 9 pins Sub-D type or BNO<br>Selection determinant by OIU Connector Tiles |
| **Output Squelching** | **Squelch mask:** Outputs can be squelched via a squelch mask under operator control on a per output basis. Squelch mask is set via the management software.<br>**Conditional squelch** can be configured for special situations. Conditional squelch is programmable for following conditions:<br>• During the warm-up phase<br>• After a configurable delay after entering holdover mode. |

[19] The output connector tiles that are specified at the time of order determine required impedance.

## 6.3 Management section

Table 7: Technical data for the Management Section.

| MONITORING & ALARMS CONTROLLER (MAC2-R) | |
|---|---|
| **Local Terminal Port** | RS-232C on 9 pins Sub-D type connector |
| **Protocol** | TTY. |
| **Communications Parameters** | 9600 baud, 8 bits, 2 stop bits, parity: none. |
| **Event Log** | Non-volatile memory stores 128 events with date and time stamp on a FIFO (First in First Out) basis. |
| **Status Reporting** | Events & alarms are reported spontaneously to the RS-232C port, to be presented in the management software. |
| **Shelf Inventory** | Fully automatic inventory for all replaceable modules and the sub-rack itself. |
| **Alarms** | LED indicators are provided on the front panels of all modules. The following summaries of shelf alarms are provided on MAC2-R front panel:<br>• General Alarm<br>• Critical<br>• Major<br>• Minor<br>• Warning<br>• Urgent<br>• Non-urgent<br>• Receiving Attention (LED and toggle switch) |
| **Electrical Outputs** | 8 relay contacts<br>(Imax=250mA; Vmax = 50V; Pmax = 3W).<br>Contacts available from a 25 pins Sub-D type connector. |
| **Alarm Output Masks** | Alarm masks settable for each alarm output via the management software. |

| REMOTE MANAGER UNIT (RMU) | |
|---|---|
| **Local management port** | RS-232C on 9 pins Sub-D type connector |
| **Protocol on Local mngt Port** | MML Language on RS232C serial communication |
| **Remote management port** | Ethernet on RJ-45 type connector |
| **Protocol on Remote mngt port** | MML Language on TCP/IP protocol |
| **Shelf inventory** | Fully automatic inventory for all replaceable modules |
| **Alarms** | LED indicators are provided on the front panels of all modules.<br>The following summaries of shelf alarms are provided on RMU front panel:<br>General Alarm<br>Critical<br>Major<br>Minor<br>Warning<br>Urgent<br>Non-urgent<br>Receiving Attention (LED and toggle switch) |
| **Electrical Outputs** | 8 relay contacts<br>(Imax=250mA; Vmax = 50V; P max = 3W).<br>Contacts available from a 25 pins Sub-D type connector. |
| **Alarm Output Masks** | Alarm masks settable for alarms/events at display in the management software. |
| **Status Reporting** | Events & alarms are reported spontaneously to the LED and the local & remote management port to be presented in the management software. |
| **Event Log** | Non-volatile memory stores 128 events with date and time stamp on a FIFO (First in First Out) basis. |

## 6.4 Physical data

Table 8: Physical data for the OSA 5581C GPS-SR.

| | |
|---|---|
| **POWER SUPPLIES Unit (PSU)** | |
| **Configuration** | Duplicated PSUs in 1+1 hot standby protection |
| **Input Voltages** | 36 – 72 VDC floating input, or<br>65 – 132VAC, or<br>150 – 265VAC |
| **Power Consumption (Max. value; actual values depend on configuration)** | < 70W during Warm-up<br>< 60W during steady state |
| **Warm-up** | ~10 minutes before available outputs<br>~24 hours before full specification are obtained[20] |
| **ENVIRONMENTAL** | |
| **Storage Temperature** | According to ETS 300 019-2.1, Class 1.1 |
| **Transport Temperature** | According to ETS 300 019-2.2, Class 2.2 |
| **Operating Temperature Range** | According to ETS 300 019-2.3, Class 3.2 |
| **Humidity** | 5 – 95% non-condensing. |
| **EMC & SAFETY - CE Mark** | |
| **EMC** | Certified to EN50081-1 and EN50082-1 & EN50082-2<br>Susceptibility to IEC 801 parts 2, 3, 4, 5 and 6 |
| **Safety** | Conforming to EN61010-1 and EN60950 |
| **MECHANICAL** | |
| **Mounting** | ETSI ETS 300-119 300mm or 19" rack mount. |
| **Size H×W×D** | ETSI 6U: 266 x 535 x 240mm (10.47 x 21.06 x 9.45in.)<br>19" 3U: 133 x 483 x 270mm (5.24 x 19 x 10.63in.) |
| **Connector Access** | ETSI version: Front access<br>19” version: Rear access. |
| **WEIGHT** | |
| | ~ 9kg (20 lbs) excluding cables & packing. |

[20] Need at least four visual GPS satellites for the first 24 hours.

## 6.5 External passive timing extraction unit (TEX-P)

Table 9: Technical data for the External Passive Timing Extraction Unit (TEX-P).

| EXTERNAL PASSIVE TIMING EXTRACTION UNIT (TEX-P) | |
|---|---|
| **Number of circuits** | Two independent circuits |
| **Attenuation between ports “Data line IN” & “Data line OUT”** | ≤ 0.5dB, 0.1 ≤ f ≤ 3MHz |
| **Attenuation between ports “Data line IN” & “Signal OUT”** | 18dB ± 1dB, 0.1 ≤ f ≤ 3MHz |
| **Impedance of ports “Data line IN/OUT”** | 75Ω unbalanced or 120Ω balanced |
| **Impedance of ports “Signal OUT”** | 75Ω unbalanced |
| **Return loss of ports “Data line IN” (75 Ω) & “Signal OUT”** | ≤ -20dB, 0.1 ≤ f ≤ 3MHz |
| **Connectors** | Ports “Data line IN/OUT”: Solder Tags<br>Ports “Signal OUT”: CEI 1.5/5.6 coax connectors. |
| **Dimensions (H×W×D)** | 112×43.1×64.5mm (4.41×1.70×2.54in) |

# 7 Summary of OSA 5581C GPS-SR parts

Table 10: Summary of OSA 5581C GPS-SR parts.

| Name |
|---|
| ***Sub-rack*** |
| ETSI/6U Mainframe for OSA 5581C, CE approved<br>Delivered with:<br>1x Operating and Technical Manual on CD-ROM<br>1x Set of standard accessories,<br>Packing included |
| 19"/3U Mainframe for OSA 5581C, CE approved<br>Delivered with:<br>1x Operating and Technical Manual on CD-ROM<br>1x Set of standard accessories,<br>Packing included |
| ***Input & Holdover Unit (width 12TE)*** |
| GPS-E1-A Kit, including:<br>• GPS-E1-A module with Rubidium Oscillator<br>• Antenna<br>• Lightning protection kit, including<br>EMP protector<br>Capsule<br>• 10m interconnection cable |
| GPS-T1-A Kit, including:<br>• GPS-T1-A module with Rubidium Oscillator<br>• Antenna<br>• Lightning protection kit, including<br>EMP protector<br>Capsule<br>• 10m interconnection cable |
| GPS-E1-B Kit, including:<br>• GPS-E1-B module with OCXO 8663<br>• Antenna<br>• Lightning protection kit, including<br>EMP protector<br>Capsule<br>• 10m interconnection cable |
| GPS-T1-B Kit, including:<br>• GPS-T1-B module with OCXO 8663<br>• Antenna<br>• Lightning protection kit, including<br>EMP protector<br>Capsule<br>• 10m interconnection cable |
| ***Phased Stepper Switch Section (width 4TE)*** |
| PSS Bypass Board |
| PSS Phase Stepper Switch |
| ***Output Interface Unit (width 4TE)*** |
| OIU-CC 16 outputs 64Kbit/s c/c |
| OIU-2 16 outputs 1.544Mbit/s |
| OIU-6 16 outputs 2.048Mbit/s |
| OIU-10 16 outputs 2.048MHz |

| |
|---|
| OIU-1.544MHz 16 outputs 1.544MHz |
| OIU-5MHz, 16 outputs, 1Vrms |
| OIU-10MHz, 16 outputs, 1Vrms |
| ***Output Interface Unit (width 4TE)*** |
| OIU Connector Tile Set 16 x 50Ω/BNC connector |
| OIU Connector Tile Set 16 x 75Ω/BNC connector |
| OIU Connector Tile Set 16 x 75Ω /BT43 |
| OIU Connector Tile Set 16 x 75Ω / CEI 1.0/2.3 |
| OIU Connector Tile Set 16 x 75Ω / CEI 1.0/2.3 (only for 64 outputs) |
| OIU Connector Tile Set 16 x 75Ω / CEI 1.6/5.6 |
| OIU Connector Tile Set 16 x 75Ω / CEI 1.6/5.6 (only for 64 outputs) |
| OIU Connector Tile Set 16 x 100Ω / BNO connector |
| OIU Connector Tile Set 16 x 100Ω, Balanced Sub-D, 9p two output per connector |
| OIU Connector Tile Set 16 x 120Ω Balanced/Sub-D, 9p two outputs per connector. |
| OIU Connector Tile Set 16 x 133Ω / BNO connector |
| ***Re-Timing Unit (width 4TE)*** |
| RTU-T1, 8 channels, 1.544Mbit/s |
| RTU-E1, 8 channels, 2.048Mbit/s |
| RTU Connector Tile Set for RTU-E1 75Ω, BNC, 8 channels in-out |
| RTU Connector Tile Set for RTU-T1 100Ω, Sub-D 9p, 8 channels in-out |
| RTU Connector Tile Set for RTU-E1 120Ω Balanced, Sub-D 9p, 8 channels in-out |
| ***Time Code Module (width: 8TE)*** |
| NTP, Time Code Unit |
| ***Management Module (width: 4TE)*** |
| MAC2-R Management Unit with Urgent/Non-Urgent Alarms<br>RS 232 Interface and Relay outputs |
| MAC2-R (Option A) Management Unit with Urgent/Non-Urgent Alarms<br>RS 232 Interface and Relay outputs inverted. |
| RMU Management Unit with Urgent/Non-Urgent Alarms<br>RS 232 Interface and Relay outputs inverted. TCP/IP connection to SyncView© |
| RMU (Option A) Management Unit with Urgent/Non-Urgent Alarms<br>RS 232 Interface and Relay outputs. TCP/IP connection to SyncView© |
| Local Manager for the OSA 5581C GPS-SR<br>Software & User guide on CD-ROM for Windows 95/98/NT |
| ***Power Supply Units (width: 12TE)*** |
| Power Supply Unit DC/DC (36-72VDC), 75W |
| Power Supply Unit AC/DC (65 – 132VAC), 75W |
| Power Supply Unit AC/DC (150 – 265VAC), 75W |
| PSU Panel with 1×DC & 1×AC connectors |
| PSU Panel with 2× AC connectors |
| PSU Panel with 2×DC connectors |
| ***Cover Plates*** |
| Cover Plate 4TE |
| Cover Plate 8TE |
| Cover Plate 12TE |
| OIU/RTU Dummy Tiles (Set of 4x4TE tiles) |
| ***Accessories*** |

| |
|---|
| Balun: 120Ω /75Ω with Krone Connector for 120Ω-end, BNC Connector for 75Ω-end |
| TEX-P, 2 Way Passive Timing Extractor (CEI 1.5/5.6) |
| Antenna for GPS-x1-B with mounting kit (without cable) |
| GPS-E1-B with OCXO 8663 (module only) |
| GPS-T1-B with OCXO 8663 (module only) |
| GPS CellFlex cable valid for lengths up to 300m. (order per 1m)<br>Includes 2×terminating N-connectors<br>Please specify exact length |
| GPS antenna cable – RG58 (20m) |
| GPS antenna cable – RG213 (60m) |
| GPS Line Amplifier (for cable length up to 60m + 60m) |
| GPS Lightning Protection Kit, including<br>• EMP protector<br>• Capsule |
| Surge Arrester Capsule |
| Accessory kit for 5581C |
| Operating Manual for 5581C ETSI, Printed |
| Technical Documentation on CD-ROM for OSA 5581C GPS-SR |

# 8 Glossary

Table 11: Abbreviation used in this document.

| Abbreviation | Term | Definition |
|---|---|---|
| **ANSI** | | American National Standards Institute |
| **CRC** | Cyclic Redundancy Check | A method to determine errors in data strings |
| **CTO** | Compact Tracking Oscillator | An Oscilloquartz name for a compact SASE |
| **DS1** | | DS1 is an abbreviation for 1544 kbit/s signals |
| **E1** | | E1 is an abbreviation for 2048 kbit/s signals |
| **ETSI** | | European Telecommunication Standard Institute |
| **GSM** | Global System for Mobile communication | GSM is a digital mobile telephone system that is widely used in Europe and other parts of the world. |
| **GPS** | Global Positioning System | The GPS (Global Positioning System) is a "constellation" of 24 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location.<br>The GPS is also widely used as an accurate synchronisation reference. |
| **IIU** | Input Interface Unit | |
| **ITU-T** | | International Telecommunication Union - Telecommunication |
| **MAC** | Monitoring & Alarms Controller | Management interface module used in Oscilloquartz equipment |
| **MRTIE** | Maximum Relative TIE | |
| **MSC** | | Mobile Switch Center |
| **MUX** | Multiplexer | |
| **NE** | Network Element | |
| **OCXO** | Oven Controlled Crystal Oscillator | e.g. OCXO 8741 |
| **OIU** | Output Interface Unit | Term for Oscilloquartz' output interface module. |
| **OSA** | Oscilloquartz S.A. | |
| **ppm** | Parts per million | |
| **PSS** | Phase Stepper Switch | |
| **PSU** | Power Supply Unit | |
| **QL** | Quality Level | |
| **SASE** | Stand-Alone Synchronisation Equipment | A stand-alone implementation of the SSU function. |
| **SDH** | Synchronous Digital Hierarchy | A world standard transmission technology based on synchronous multiplexing |
| **SDU** | Synchronisation Distribution Unit | An output expansion shelf |
| **SSM** | Synchronisation Status Message | A coding of the reference quality level of the timing source as specified in G.707 & G.781. |
| **SSU** | Synchronisation Supply Unit | An equipment function for synchronisation reference selection, regeneration and distribution. |

| | | |
|---|---|---|
| **SyncView™** | | SyncView is Oscilloquartz' network management system (NMS). SyncView offers you considerable savings by rationalising operation and maintenance tasks. It manages your entire Oscilloquartz synchronisation network from a single point and optionally enables control at regional level. |
| **T1** | | Same as DS1: an abbreviation for 1544 kbit/s signals |
| **TDEV** | Time Deviation | |
| **TEX-P** | Passive Timing Extraction | Passive in-line device normally mounted external to the equipment, used to couple 1544 or 2048 kbit/s links to the equipment without terminating them. |
| **TIE** | Time Interval Error | Variation in time delay of a given timing signal with respect to an ideal timing signal over a particular time period. TIE is expressed as a function of the observation time *S* (seconds). |
| **TMN** | Telecommunications Management Network | |
| **UMTS** | Universal Mobile Telecommunications System | UMTS is a so-called "third-generation (3G)," broadband, packet-based transmission, offering a consistent set of services to mobile computer and phone users no matter where they are located in the world. |

# 9 Document History

Table 12: Document history for this document.

| Revision | Date | Author | Description |
|---|---|---|---|
| Rev. A | March 2000 | THTH | First version |
| Rev. B | March 2000 | THTH | Updated preface |
| Rev. C | March 2000 | THTH | Updated this page |
| Rev. D | May 2000 | THTH | Included oscillator data,<br>updated SA data,<br>included RTU connectors. |
| Rev. 05 | Oct. 2000 | THTH | Corrected “Noise generation data” |
| Rev. 06 | Oct. 2000 | THTH | Clarification of OCXO data,<br>updated part numbers,<br>included RAM |
| Rev. 07 | Nov.2000 | THTH | Various updates, e.g. the Part Numbers, inclusion of the FlexCell cable |
| Rev. 08 | Jan. 2001 | THTH | Updated part numbers |
| Rev. 09 | May 2001 | THTH | Combined all releases of the equipment |
| Rev. 10 | June 2001 | THTH | Corrected reference input modules in Table 2 and holdover data for Rb (§4.1.3.2. & §6.1.) |
| Rev. 11 | August 2002 | SIPA | Corrected environmental data (temperatures) |
| Rev. 12 | Sep 2002 | SIPA | Corrected holdover stability figures |
| Rev. 13 | Mar 2003 | SIPA | Removed pictures to reduce document size (5 to 1MB)<br>Modified references to TCU-NTP<br>Added references to TCU-IRIG-B<br>Added descriptions of SSM functionality<br>Removed references to Windows 95<br>Removed references to Bypass OIU and tile set<br>Corrected SyncView™ into SyncView™<br>Corrected other minor mistakes |

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