EPSILON CLOCK

MODEL EC20S

USER'S MANUAL

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Specifications subject to change or improvement without notice.

SPECTRACOM LIMITED WARRANTY

LIMITED WARRANTY

Spectracom warrants each new product manufactured and sold by it to be free from defects in software, material, workmanship, and construction, except for batteries, fuses, or other material normally consumed in operation that may be contained therein AND AS NOTED BELOW, for five years after shipment to the original purchaser (which period is referred to as the “warranty period”). This warranty shall not apply if the product is used contrary to the instructions in its manual or is otherwise subjected to misuse, abnormal operations, accident, lightning or transient surge, repairs or modifications not performed by Spectracom.

The GNSS receiver is warranted for one year from date of shipment and subject to the exceptions listed above. The power adapter, if supplied, is warranted for one year from date of shipment and subject to the exceptions listed above.

THE TIMEVIEW ANALOG CLOCKS ARE WARRANTED FOR ONE YEAR FROM DATE OF SHIPMENT AND SUBJECT TO THE EXCEPTIONS LISTED ABOVE.

THE TIMECODE READER/GENERATORS ARE WARRANTED FOR ONE YEAR FROM DATE OF SHIPMENT AND SUBJECT TO THE EXCEPTIONS LISTED ABOVE.

THE WIRELESS CLOCK SYSTEM TRANSMITTERS AND/OR TRANSCEIVERS AND CLOCKS ARE WARRANTED FOR TWO YEARS FROM DATE OF SHIPMENT AND SUBJECT TO THE EXCEPTIONS LISTED ABOVE.

THE EPSILON CLOCKS, BOARDS, AND SYNCHRONIZATION UNITS ARE WARRANTED FOR TWO YEARS FROM DATE OF SHIPMENT AND SUBJECT TO THE EXCEPTIONS LISTED ABOVE.

The Rubidium oscillator, if supplied, is warranted for two years from date of shipment and subject to the exceptions listed above.

All other items and pieces of equipment not specified above, including the antenna unit, antenna surge suppressor and antenna pre-amplifier are warranted for 5 years, subject to the exceptions listed above.

WARRANTY CLAIMS

Spectracom's obligation under this warranty is limited to in-factory service and repair, at Spectracom's option, of the product or the component thereof, which is found to be defective. If in Spectracom's judgment the defective condition in a Spectracom product is for a cause listed above for which Spectracom is not responsible, Spectracom will make the repairs or replacement of components and charge its then current price, which buyer agrees to pay.

Spectracom shall not have any warranty obligations if the procedure for warranty claims is not followed. Users must notify Spectracom of the claim with full information as to the claimed defect. Spectracom products shall not be returned unless a return authorization number is issued by Spectracom.

Spectracom products must be returned with the description of the claimed defect and identification of the individual to be contacted if additional information is needed. Spectracom products must be returned properly packed with transportation charges prepaid.

Shipping expense: Expenses incurred for shipping Spectracom products to and from Spectracom (including international customs fees) shall be paid for by the customer, with the following exception. For customers located within the United States, any product repaired by Spectracom under a "warranty repair" will be shipped back to the customer at Spectracom's expense unless special/faster delivery is requested by customer.

Spectracom highly recommends that prior to returning equipment for service work, our technical support department be contacted to provide trouble shooting assistance while the equipment is still installed. If equipment is returned without first contacting the support department and "no problems are found" during the repair work, an evaluation fee may be charged.

EXCEPT FOR THE LIMITED WARRANTY STATED ABOVE, SPECTRACOM DISCLAIMS ALL WARRANTIES OF ANY KIND WITH REGARD TO SPECTRACOM PRODUCTS OR OTHER MATERIALS PROVIDED BY SPECTRACOM, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Spectracom shall have no liability or responsibility to the original customer or any other party with respect to any liability, loss, or damage caused directly or indirectly by any Spectracom product, material, or software sold or provided by Spectracom, replacement parts or units, or services provided, including but not limited to any interruption of service, excess charges resulting from malfunctions of hardware or software, loss of business or anticipatory profits resulting from the use or operation of the Spectracom product or software, whatsoever or howsoever caused. In no event shall Spectracom be liable for any direct, indirect, special or consequential damages whether the claims are grounded in contract, tort (including negligence), or strict liability.

EXTENDED WARRANTY COVERAGE

Extended warranties can be purchased for additional periods beyond the standard five-year warranty for those products covered under five-year warranty. Contact Spectracom no later than the last year of the standard five-year warranty for extended coverage.

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1. TERMINOLOGY

1PPS	One Pulse Per Second
1PPS driver	Pulse signal obtained through division of the frequency driver
DHCP	Dynamic Host Configuration Protocol
Frequency driver	Frequency signal generated by the built-in oscillator
FTP	File Transfer Protocol
GALILEO	European positioning system
GLONASS	GLObalnaya NAvigatsionnaya Sputnikovaya Sistema
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HTTP	HyperText Transfer Protocol
ICMP	Internet Control Message Protocol
IERS	International Earth Rotation Service
IRIG	Inter Range Instrumentation Group
MAC	Medium Access Control
MIB	Management Information Base
NMEA	National Marine Electronics Association
NTP	Network Time Protocol
OCXO	Oven Controlled XTAL (Crystal) Oscillator
OID	Object IDentifier
Rb	Rubidium oscillator
S/A	Selective Availability
SFN	Single Frequency Network
SNMP	Simple Network Management Protocol
TELNET	TELetype Network
TRAIM	Time Receiver Autonomous Integrity Monitoring
UTC	Universal Time Coordinated

2. OVERVIEW

2.1 MAIN FEATURES

The EPSILON CLOCK MODEL EC20S is a multi-GNSS Clock, providing the best cost-effective solution for reliable, and 24-hour-a-day, uninterrupted applications. The EC20S is particularly well-suited for broadcast operators requiring high quality, reliability and availability.

The EC20S is well dedicated to digital broadcast applications using SFN (Single Frequency Network) mode. The EC20S gives the high reliability required at any step of the network, from SFN adapters to high and medium power transmitters and gap fillers.

The EPSILON CLOCK MODEL EC20S provides accurate time and frequency synchronization.

Key parameters are:

- High performance OCXO or Rubidium oscillator disciplined by a GNSS synchronization source through Epsiltime© smart predictive disciplining algorithm
- High performance holdover stability (2.10^{-10}/day – OCXO STD version)
- AC and DC power supply redundancy

- Up to 10 x 1 PPS outputs
- Up to 10 x 10 MHz outputs
- 1 PPS and 10 MHz signals are phased locked, which helps prevent phase jump and wander between time and frequency signals
- Remote monitoring via the Ethernet port thanks to built-in supervision interfaces (13 Web Interface, 14 SNMP Interface)
- Local monitoring via signalling interfaces (11.1 Visual Signalling, 11.2, ALARMS Signalling).

2.2 DIMENSIONS AND WEIGHT

Width **:** 19" (441 mm), without bracket

Height **:** 1 U (44 mm).

Depth **:** 340 mm.

Weight **:** <4.7 kg.

Compatibility : 19” rack

The EC20S unit is compatible with 19” racks and can be mounted with slides. Screws to fix the slides on the equipment sides are provides with the equipment. Use Slides Accuride, part number: DZ 2907-0020 Hub 559mm.

2.3 OPERATING ENVIRONMENT

- Operating temperature
  - With OCXO : -5 to 60°C
  - With Rubidium Oscillator : -5 to 50°C
- Storage temperature : -40 to 85°C
- Relative humidity : 95 % non-condensing
- Altitude : up to 2500m
- Pollution degree : 2

3. SAFETY PRECAUTIONS

3.1 POWER SUPPLY

- **Before switching on** the unit, ensure that it is compatible with the local mains supply. (Refer to *Setting the EC20S Into Operation*).
- The plug must be inserted into a socket with earth connection. The safety connection must not be broken by using an extension cord without earth conductor.
- Before switching on the unit, if the unit is connected to measurement or control circuits, protective earth terminal(s) shall be connected to a protective conductor.
- If measurement or control circuits are without earth-ground protection terminal(s), the mains plug shall be inserted before connections are made to measurement or control circuits.

WARNING

If the protective conductor's path to ground is broken or defeated, the danger of electrical shock to the operator may be present. Never break the connection on purpose.

Before disconnecting the unit from the main power supply, always switch it off. Failure to do may cause damage that voids your Spectracom warranty.

WARNING

This equipment must be earth grounded. Never defeat the ground connector or operate the equipment in the absence of a suitably installed earth ground connection. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.

The AC and DC power connectors of this equipment have a connection to the earthed conductor of the AC and DC supply earthing conductor through the AC and DC power cords. The AC source outlet must contain a protective earthing connection.

This equipment shall be connected directly to the AC power outlet earthing pin or DC supply system earthing electrode conductor.

This equipment shall be located in the same immediate area (such as, adjacent cabinets) as any other equipment that has a connection to the earthing conductor of the same AC or DC supply circuit earthing conductor, and also the point of earthing of the AC or DC system. The AC or DC system shall not be earthed elsewhere.

The DC supply source is to be located within the same premises as this equipment.

Switches or other disconnection devices shall not be in the earthed circuit conductor between the AC and DC source and the point of the connection of the earthing electrode conductor to the unit's AC and DC input power connectors earthing pin.

3.2 SAFETY DURING ADJUSTMENTS, MAINTENANCE AND REPAIR

When the unit is connected to the power supply, it may be dangerous to touch the terminals and parts that may be exposed when opening covers or removing components (except for plug-in components).

WARNING

The interior of this equipment does not have any user serviceable parts. Contact Spectracom Technical Support if this equipment needs to be serviced.

This unit will contain more than one power source if both the AC and DC power options are present. Turning off the rear panel power switch will not remove all power sources.

Remove all power sources by removing both the AC and DC power cords connected to the equipment.

DC power Cord connector must be unlock before removing.

This equipment has Double Pole/Neutral Line Fusing on AC power.

When it is unavoidable to open the unit for maintenance and repair, such operations should be carried out only by qualified personnel who are properly informed of the hazards involved.

Only fuses with a suitable rating and of the specified type are to be used for replacement purposes. It is prohibited to use fuses that have been tampered with, or shorted fuse-holders.

WHENEVER IT IS LIKELY THAT PROTECTION HAS BEEN IMPAIRED, THE APPARATUS MUST BE SWITCHED OFF, DISCONNECTED, AND SECURED AGAINST ANY UNINTENDED OPERATION.

4. DELIVERY INSPECTION

4.1 INVENTORY

Before installing your Spectracom product, please verify that all material ordered has been received. If there is a discrepancy, please contact Spectracom Customer Service. Customer service is available by telephone at +33 (0) 1.64.53.39.80 (France), or +1.585.321.5800 (United States). Updated contacts information are available on our web site (www.spectracomcorp.com, For France: www.spectracom.fr) and refer to the "Support" page.

CAUTION  *Electronic equipment is sensitive to Electrostatic Discharge (ESD). Observe all applicable ESD precautions and safeguards when handling the Spectracom equipment.*

NOTA: If the EC20S equipment is returned back to Spectracom, it must be shipped **in its original packing material**. Save all packaging material for this purpose.

The basic shipment includes the following items:

- EPSILON EC20S Base Unit
- One AC lead
- One DC connector kit
- User's Manual

4.2 INSPECTION

Unpack the equipment and inspect it for damage. If any equipment has been damaged in transit, please contact Spectracom Customer Service. Customer service is available by telephone at +33 (0) 1.64.53.39.80 (France), or +1.585.321.5800 (United States). Updated contacts information are available on our web site (www.spectracomcorp.com, For France: www.spectracom.fr) and refer to the "Support" page.

5. FRONT AND REAR PANELS DESCRIPTION

5.1 FRONT PANEL DESCRIPTION

Item	Name	Description
'PWR' LED	POWER LED	Indicates the status of the AC and DC power supplies. For details, see 11.1.
'SRC' LED	SOURCE LED	Indicates the current status of the enabled synchronization source (GNSS, External 1PPS/ NMEA synchronization source). For details, see 11.1.
'DST' LED	DISTRIBUTION LED	Indicates the current status of the distributed 1PPS and 10MHz signals. For details, see 11.1.
Micro-Switch	FACTORY RESET BUTTON	Reset the network configuration to factory settings. For details, see 8.1. **Note that the network settings are also reset** to the factory settings (i.e. IP address is reset to the static address 192.168.0.100).

5.2 BACK PANEL DESCRIPTION

Connector	Type	Description
AC POWER	IEC 320 – C14	AC power entry with integrated fuse.
DC POWER	XLR circular	DC power supply input.
'1PPS J_n'	50 Ω BNC	Distributed One Pulse Per Second outputs.
'10MHz J_{2n}'	50 Ω BNC	Distributed sinus frequency outputs.
'EXT' : External 1PPS	50 Ω BNC	External input for a 1PPS Synchronization source.
Ethernet 10/100 BaseT	50 Ω BNC	Network connectivity.
'GPS Antenna'	50 Ω N	Antenna inputs for GNSS receiver and remote active antenna 5VDC supply.
'ALARMS'	SUBD-9	Dry contacts for alarms and RS232 input/output for the Command Line Interface (CLI).
'NMEA'	SUBD-9	RS232 input/output for Time Of Day messages.
GROUND	⏚ ØM4 lug stud	Casing grounding.

6. PUTTING THE EC20S INTO OPERATION

The EC20S can be installed in a rack or used as-is.

6.1 PRELIMINARY CONNECTIONS

Before starting the EPSILON CLOCK MODEL EC20S, perform the following steps:

- **Leave free space of a few centimeters under the unit, in order to make easier natural air flow from bottom to top of the EPSILON CLOCK MODEL EC20S**.
- Connect a ground lead from the earth pin on the EC20S back panel to the frame of the rack. Use a Terminal Ring tongue for ØM4 lug stud. Note that 2 nuts and 2 lockwasher are already included on the rack unit. Cable: protective earth conductor must have a minimum size of 0.75mm².
- Connect the network cable (refer to 8) into the Ethernet input (RJ45 input).
- Connect the multi-GNSS antenna into the '**GPS antenna**' input to acquire the multi-GNSS synchronization source (refer to 9.1 and refer to the document **"Outdoor GPS Antenna Installation Considerations – REF TN07-101"** that you can download from our web site).
- If necessary, connect a backup synchronization source using the '**EXT**' and '**NMEA**' inputs (refer to 9.2 and 9.3).

6.2 POWERING UP

The EC20S can be powered by an AC supply, a DC supply, or both AC and DC supplies. For full redundancy, connect DC power cables to the DC connector and AC power cable to the AC connector.

WARNING

Before connecting the power supplies:

- Read carefully 3.1, 7.1 and 7.2,

- Check the polarity of the power signal before connecting it (refer to the back panel labels for the pin-out).

Connecting cables for signals and power supplies **should be secured to locks** provided for this purpose.

WARNING  *Power-up is immediate when connecting DC power with the cable, while AC power must be switched on.*

The **connection to the power supplies (AC or DC) can be checked** by the '**PWR**' LED (see 11.1).

6.3 NETWORK CONNECTION

Refer to 8 for the factory network settings.

The EC20S is factory defaulted in static mode regarding the IP address allocation mode. The EC20S is set with the default IP address 192.168.0.100.

To modify the default network settings, connect a control PC through a crossover Ethernet cable or a hub. Set the control PC IP address to an address belonging to the same sub-network 192.168.0.0 (e.g. 192.168.0.101).

On the control PC, open a web browser page at http://192.168.0.100. Click on the homepage to enter the EC20S web interface. Select the "System Setup">"Network Setup" web page. Enter the administrator password (factory defaulted to: '**pwd**'). Input the IP address allocation mode (static or DHCP) and the EC20S static address if necessary.

In case of failure to access the EC20S web homepage at http://192.168.0.100, reset the EC20S network settings to factory default settings using the '**Factory Reset**' button in front of the product (refer to 8 for the detailed procedure).

6.4 CONFIGURING THE EC20S

The EC20S can be remotely configured through an Ethernet network using:

- a HTTP navigator to access the EC20S web pages to monitor and modify the EC20S internal settings (refer to 13 to learn more about the usage of the EC20S web interface),
- a SNMP browser to access and modify the EC20S SNMP objects (refer to 14 to learn more about the usage of the EC20S SNMP interface).

For the basic EC20S configuration, a few recommendations:

- refer to 7.2 regarding the DC power supply,
- refer to 9.1 regarding the multi-GNSS synchronization source,
- refer to 9.2 and 9.3 regarding the External 1PPS/NMEA synchronization source.

6.5 START-UP SEQUENCE

For a standard configuration implementing the multi-GNSS synchronization source, after the system initialization sequence, the GNSS receiver locks to the satellites constellations (event reported by the '**SRC**' LED which switches from red to green), and once the internal oscillator warming up is complete, the oscillator is disciplined to get the '**Locked**' **conditions** (see 10.2). The whole process may take about 15 minutes.

7. POWER SUPPLY INTERFACE

7.1 AC POWER SUPPLY INPUT

The AC power supply shall be considered as the main power supply for the EC20S. It shall meet the following features:

- Use standard power cord type CEE7 VII / IEC320 C13.
- Nominal AC input voltage : 100 to 240 Volts AC / 50 to 60 Hz
- On switch : 2 fuses TT 1A L 250 V type - (example D1TD 1A 5x20 - see 16.3 for detail)

7.2 DC POWER SUPPLY INPUT

The DC power supply shall be considered as a backup power supply for the EC20S. It shall meet the following features:

- For DC power cord, use conductor type : AWG24 (0.22mm^2).
- Nominal DC input voltage conditions : 24 to 48 Volts DC
- Maximum Total Power consumption : < 55 W
- Protection against polarity reversal
- -48V and 0V DC input wires are not ground referenced
- Protected by a PolySwitch fuse (automatically rearmed)
- Threshold level for the presence detection : 20 to 25 Volts DC

NOTA: **When there is no DC power supply**, **it is strongly recommended to disable the alarms associated with this power supply device** (while the factory setting enables this alarm)**.** See 13.9.

For detailed information about this supply interface, refer to the appendix 19.3.

7.3 REDUNDANCY SYSTEM OF THE POWER SUPPLY

When a DC power supply is present, the EC20S will automatically switch from the AC power supply to the DC power supply in case of failure of the AC power supply.

When the AC power supply is present, the DC power supply is internally disconnected.

7.4 POWER SUPPLIES MONITORING

The **presence of the power supplies (AC or DC) is monitored**:

- by the '**PWR**' LED (see 11.1),
- by the ALARMS signalling (see 11.2.2),
- via the web interface (see 13.3.2.6),
- via the SNMP service (see 14.1.1, SNMP parameters 18 and 19).

8. NETWORK INTERFACE

8.1 ETHERNET PORT

- Connector type : RJ45
- Interface : 10/100 BaseT signal
- **MAC address** : Available on the sticker stuck on one of the side panels
- **Port IP address assignment** : Configurable by the user on the "Network Setup" web page (see 13.5):

  Two modes can be selected:

  - Dynamic assignment ('**Use DHCP**' = '**On**')

    Possible if a DHCP server is accessible on the network

  - Static assignment ('**Use DHCP**' = '**Off**')

    This mode is also automatically selected by the EC20S if the EC20S is not connected to the network or if no DHCP server is accessible.

The port is factory defaulted in static mode ('**Use DHCP**' = '**Off**' with the following parameters:

- Static IP address : 192.168.0.100
- Static IP mask : 255.255.255.0
- Static IP gateway : 192.168.0.254

The network configuration can be reset to factory settings (i.e. IP address is reset to the static address 192.168.0.100) at any time while pressing, for more than 2 seconds, the '**Factory Reset**' button located on the front panel between the '**PWR**' and '**SRC**' LEDs. To press the button, insert a straightened paperclip into the hole.

8.2 NETWORK SERVICES

The EC20S incorporates the following network services:

8.2.1 DHCP CLIENT

The EC20S incorporates a DHCP client using the port numbers 67 and 68 to get (if so configured) from a remote DHCP server a dynamic IP address assigned to its Ethernet port.

8.2.2 HTTP SERVER

The EC20S can be monitored via a web interface using the HTTP protocol. The EC20S incorporates a HTTP server accessible through the port number 80. For details about the web interface see 11.

8.2.3 SNMP SERVER

The EC20S can be monitored via a MIB browser using the SNMP protocol. The EC20S incorporates a SNMP server accessible through the port numbers 161 (for the get/set methods) and 162 (for the trap events). For details about the SNMP interface see 14.

8.2.4 NTP SERVER

The EC20S incorporates a basic NTP server accessible through the port number 123.

The EC20S can respond to NTP requests using the NTP protocol.

STRATUM

The **stratum** status is set **according to the SFN status** (which corresponds to the reliability / accuracy of the time transferred via NTP ; cf. 10.2):

- Stratum = 15 : when SFN status is ‘Off’.
- Stratum = 1 : when SFN status is ‘On’.

LEAP SECOND INDICATOR

The **leap indicator** is set **according to the SFN status** (which corresponds to the reliability / accuracy of the time transferred via NTP ; cf. 10.2) **and the leap second information**:

- leap indicator = 11 : when SFN status is ‘Off’.

- leap indicator = 00 : when SFN status is 'On' and no leap second shall be applied.
- leap indicator = 01 : when SFN status is 'On' and a positive leap second shall be applied.
- leap indicator = 10 : when SFN status is 'On' and a negative leap second shall be applied.

8.2.5 TELNET SERVICE

The EC20S can be remotely monitored by Spectracom, for trouble-shooting purposes, using the TELNET service incorporated in the EC20S product and accessible through the port number 23. **This service is only available for Spectracom software administrators.**

8.2.6 FTP SERVICE

The EC20S can be upgraded using the web interface. The uploading of new EC20S software release are performed using the FTP service incorporated in the EC20S product and accessible through the port numbers 20 and 21.

8.2.7 ICMP SERVICE

The EC20S incorporates the ICMP service so that it can respond to *ping* requests.

8.2.8 MONITORING THE EC20S BY MEANS OF NETWORK SERVICES

CAUTION

Spectracom recommends to use, for monitoring purpose, recent OS and inform that running older OS (Windows XP or before, Windows Server 2008 or before) might result in network services failures.

9. SYNCHRONIZATION SOURCES

9.1 MULTI-GNSS SYNCHRONIZATION SOURCE

The EC20S incorporates a multi-GNSS receiver delivering a 1PPS which can be selected as a synchronization source (GNSS source). The GNSS source can be composed with one or two satellites constellations by the user as follows (See 80, 81 and 82 for the details):

- GPS constellation only,
- GLONASS constellation only,
- Both GPS and GLONASS constellations.

The GLONASS satellites constellation is a feature subject to a license.

The GALILEO satellites constellation is only considered as a further development. It is not available in this EC20S release.

To acquire the multi-GNSS signals, a GNSS antenna shall be connected to the '**GPS antenna**' connector located on the rear panel.

The GNSS antenna connector features are the following ones:

- Connector type : Antenna female 50 Ω (type N)
- 2 x L1 GNSS C/A code
- Power supply to active antenna : 5V/80mA max
- Fold Back protection Power supply is cut in the event of a short-circuit in the antenna input

This synchronization source is defaulted to '**Enabled**' with the highest priority '**Priority 1**' by the factory settings.

Note: Disciplining parameters have been modified in order to provide more stable 1 pps and 10 MHz signals, when using combined GPS and Glonass satellites. (The best stability is still obtained, however, when using GPS only or Glonass only).

9.2 EXTERNAL 1PPS SYNCHRONIZATION SOURCE

An external 1PPS can be used as a primary or a backup synchronization source.

The external 1PPS shall be input on the '**EXT**' connector located on the rear panel according to the following features:

- TTL level
- Input impedance : 50Ω
- 50Ω BNC connector
- Active rise edge (high level duration 100µs minimum)
- Minimal Accuracy to UTC : ±50ns (1σ)

CAUTION

If the External 1PPS synchronization source doesn't have the required minimum features, the global performance of the EPSILON CLOCK MODEL EC20S will decrease drastically.

NOTA: When this synchronization source is not used, it is strongly recommended to disable it (this is the factory setting)**.** See 13.7.3 Priority Level: External 1PPS/NMEA.

CAUTION

When this synchronization source is used as a backup synchronization source *(in conjunction with an external NMEA datation source 9.3 or not), take care that, at the moment the EC20S switches from the main GNSS synchronization source to this synchronization source,* ***the SFN conditions are lost*** *until the new synchronization source is '****Locked****'. And so* ***the distribution of the synchronization signals (1PPS, 10 MHz) is suspended*** *during this time, when the '****Automatic****' mute mode is selected. To maintain the distribution of the synchronization signals during the switch of synchronization sources, the mute mode shall be set in '****Disabled****' mode. But in this case,* ***the synchronization signals will be, in any case, subject to a phase jump****. See 10.3 Synchronization Signals Distribution.*

9.3 EXTERNAL NMEA DATATION SOURCE

An external NMEA datation source can be used in conjunction with the external 1PPS synchronization source to timestamp the 1PPS.

The external NMEA datation source shall be received on the '**NMEA**' SUBD-9 connector on the rear panel:

- Connector type : 9-pin female SUB-D
- Port configuration : Asynchronous RS232C, 9600 bauds, 8 bits, 1 stop bit, no parity.
- NMEA messages format : GPRMC from NMEA 0183 V3.01

For detailed information about this output interface, refer to the appendix 19.1 and 19.1.2.

This datation source is defaulted to '**Disabled**' by the factory settings.

NOTA: When this datation source is not used, it is strongly recommended to disable it (this is the factory setting)**.** See 13.7.3 NMEA Datation for External 1PPS.

9.4 SYNCHRONIZATION SOURCES MONITORING

The **validity of the synchronization sources is monitored**:

- by the '**SRC**' LED (see 11.1),
- by the ALARMS signalling (see 11.2.2),
- via the web interface (see 13.3.2.3 and 13.3.2.5),
- via the SNMP service (see 14.1.1, SNMP parameters 14, 16 and 17).

10. OPERATIONAL TASKS

10.1 SELECTION OF THE SYNCHRONIZATION SOURCE

Two synchronization sources can be used to discipline the internal oscillator:

- The integrated multi-GNSS synchronization source (or GNSS source, see 9.1)
- An External 1PPS/NMEA synchronization source (see 9.2 and 9.3).

The GNSS source can be used as the main synchronization source and the External 1PPS/NMEA synchronization source as a backup synchronization source.

The EC20S automatically selects the synchronization source according to the following criteria:

- Whether the EC20S is set in '**Forced Holdover**' mode or not (see 13.7.3 Force Holdover),
- Whether a synchronization source is forced (see 13.7.3 Force a source as input),
- Whether the synchronization source is enabled or disabled (see 13.7.3 Priority Level),
- The status of the synchronization source (OK/Alarm, see 13.3.2.3 and 13.3.2.5),
- The priority of the synchronization source (see 13.7.3 Priority Level).

10.2 DISCIPLINING ALGORITHM – SFN CONDITIONS

The algorithm is a phase/frequency locked loop-type disciplining algorithm. The phase measures are filtered by a Kalman filter.

The status of the disciplining process can be:

- **Warming up** : Step performed after the power-up during which the internal oscillator is warming up. The oscillator control is not disciplined.
- **Tracking search** : Fast oscillator disciplining with coarse adjustment of the oscillator command. The EC20S is searching best disciplining conditions.
- **Locked** : Accurate oscillator disciplining with long-time constant filtering until the EC20S meets the **'Locked' conditions** defined as follows: the 10MHz frequency signals are cycle locked to the 1PPS synchronization source (10 000 000 cycles from the 10 MHz equals 1PPS period)* and meets a **frequency accuracy better than 10^{-9} (Δf/f)** and a **phase accuracy better than 1µs (microsecond)**.

  The **'Locked' conditions** are reached after a period depending on:

  - Whether the oscillator warming up is complete or not,
  - Whether the multi-GNSS synchronization source is '**Locked**' or not (when this source is used), this point depending on the reception quality of the GNSS receiver, depending itself on the environmental conditions of the GNSS antenna location. Refer to the diagrams in the following paragraphs.

  *note: By design, the 10MHz frequency signals are always cycle locked to the 1PPS synchronization source (10 000 000 cycles from the 10 MHz equals 1PPS period) apart from the Tracking search periods.

- **Holdover** : The oscillator disciplining has been suspended because there is no valid synchronization source to synchronize to. The oscillator control remains steady on the last valid value.

- **Forced Holdover**: The oscillator disciplining has been suspended upon user request (see 13.7.3 Force Holdover). The oscillator control remains steady on the last valid value.

- **Degraded** : Hidden status occurring when all synchronisation sources are lost (and so the oscillator disciplining is suspended) while the oscillator disciplining was in '**Locked**' status. If no synchronization source is selected before the end of a latency delay (factory programmable), an urgent alarm is raised and the oscillator disciplining transits to the '**Holdover**' status. But if a synchronization source is selected before the end of the latency delay, the oscillator disciplining resumes (no alarm will be raised).

The **SFN conditions** are defined by the SFN Status (SFN '**On**': the EC20S meets the SFN conditions; SFN '**Off**': the EC20S doesn't meet the SFN conditions) as follows:

Disciplining Status as defined just above	**SFN Status (Ref. 4)**
'Warming up'	SFN Off
'Tracking Search'	SFN Off
'Locked' (see just above for the definition of the 'Locked' conditions)	SFN On
'Holdover' coming from the 'Tracking Search' status	SFN Off
'Holdover' coming from the 'Locked' status and the phase accuracy is **below** the 'Alarm Phase Threshold' (see 13.7.3) **AND** the frequency accuracy is **below** the 'Alarm Frequency Threshold' (see 13.7.3).	SFN On
'Holdover' coming from the 'Locked' status and the phase accuracy is **above** the 'Alarm Phase Threshold' (see 13.7.3) **OR** the frequency accuracy is **above** the 'Alarm Frequency Threshold' (see 13.7.3).	SFN Off
'Forced Holdover'	SFN On

10.3 SYNCHRONIZATION SIGNALS DISTRIBUTION

The distribution of the synchronization signals (1PPS, 10MHz) depends on the mute mode (defaulted to 'Automatic' mode, see 72 and 73).

In 'Disabled' mode, the synchronization signals (1PPS, 10MHz) are **ALWAYS delivered** (once the initialization of the EC20S is complete) – but need to meet the SFN condition after start up (see 10.2). Refer to the diagrams in the following paragraphs.

In 'Automatic' mode, the synchronization signals (1PPS, 10MHz) are **delivered** (once the initialization of the EC20S is complete) **only if the EC20S meets the SFN conditions** (i.e. when SFN Status is '**On**', see 10.2).

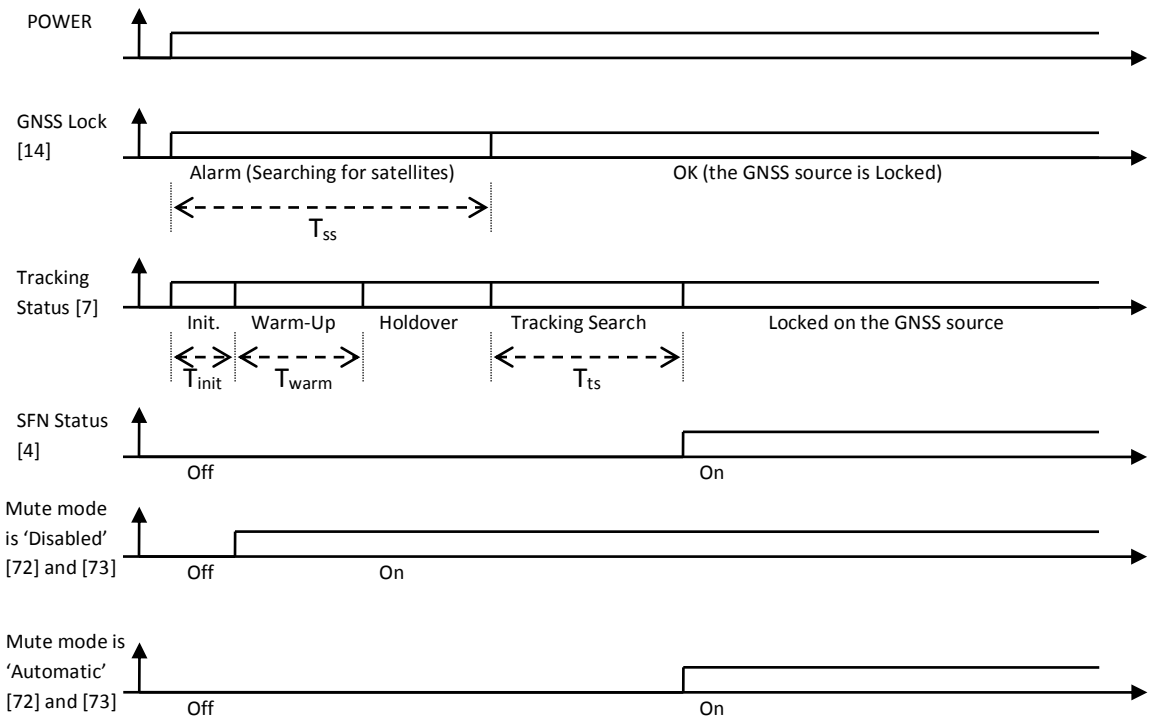
In 'On Time' mode, the synchronization signals (1PPS, 10MHz) are **delivered** (once the initialization of the EC20S is complete) **upon timeout conditions** defined by 3 parameters 74, 75 and 76 at 13.7.5.

The **presence of the distributed synchronization signals (1PPS, 10MHz) is monitored**:

- by the '**DST**' LED (see 11.1),
- by the ALARMS signalling (see 11.2.1),
- Using the web interface: see 13.3.2.7 and 13.3.3,
- Using the SNMP interface: see 14.1.1, SNMP parameters 20 and 21.

10.3.1 START-UP SEQUENCE DETAIL

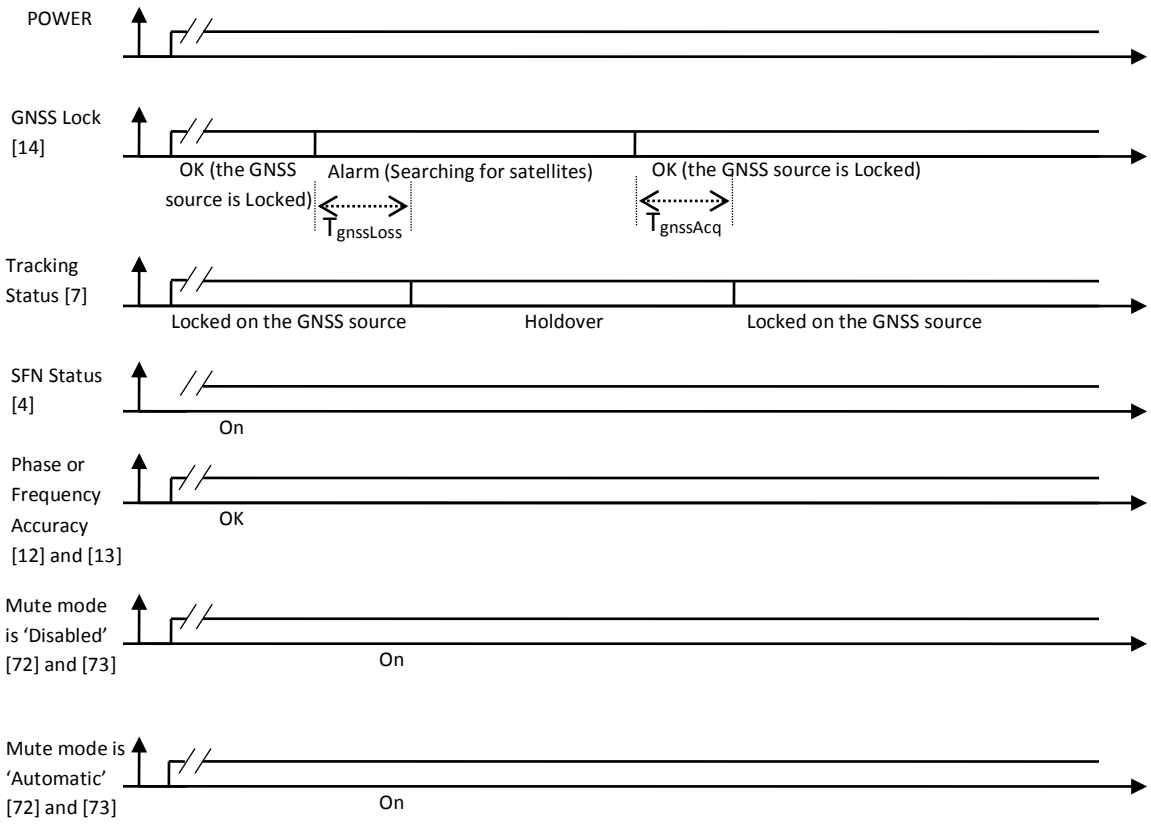
Following diagrams show the status of the EC20S product during the start-up step (in brackets, the references of the status definitions):



T_{ss}	**Search for Satellites Time**	5 minutes typical, depending on the GNSS signal reception quality.
T_{init}	**Initialization Time**	Start of EC20S software: 2 minutes typical.
T_{warm}	**Warm-Up Time**	5 minutes typical, depending on the oscillator.
T_{ts}	**Tracking Search Time**	Depending on the synchronization source quality.

10.3.2 SHORT LOSS OF THE GNSS SOURCE SEQUENCE DETAIL

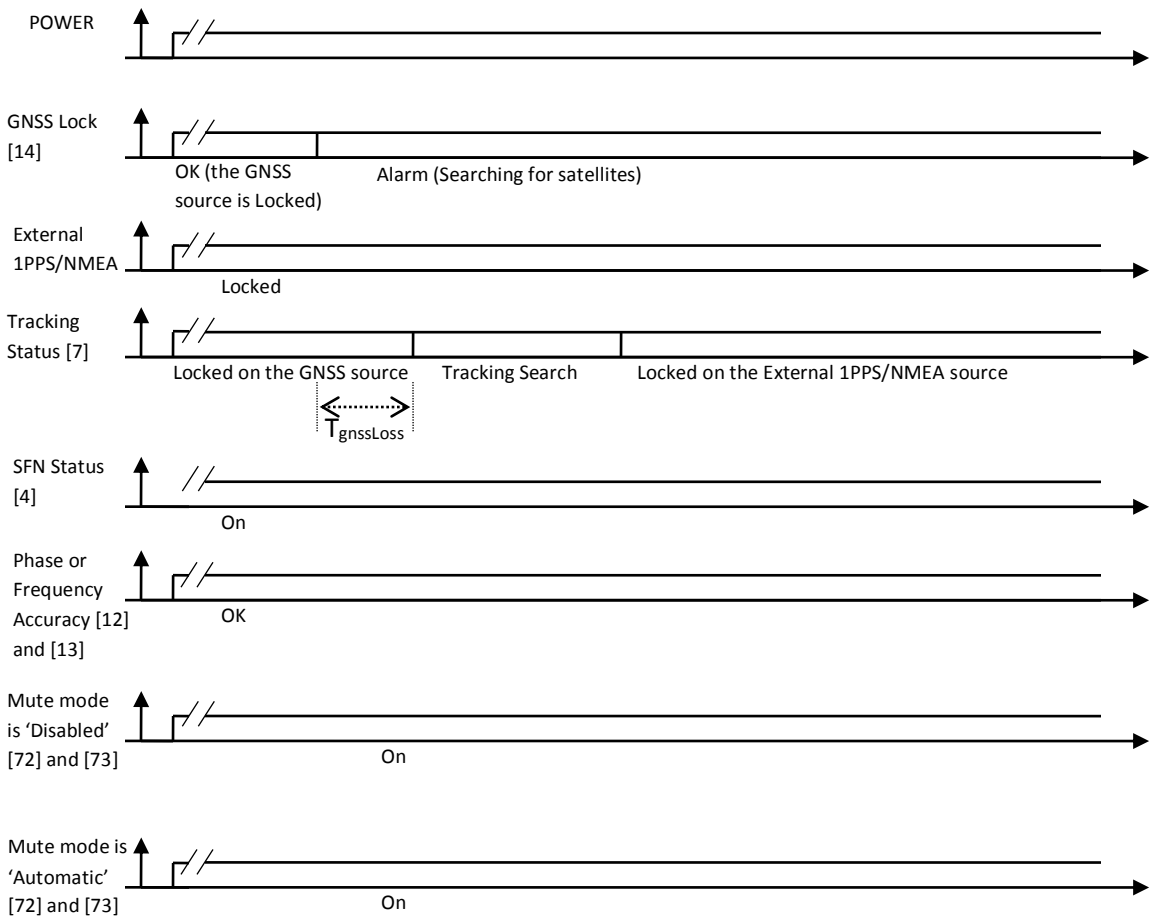
Following diagrams show the status of the EC20S product while the GNSS source is lost (in brackets, the references of the status definitions):



$T_{gnssLoss}$	**GNSS Source Loss Time**	Latency upon loss of the GNSS synchronization source: 120 seconds
$T_{gnssAcq}$	**GNSS Source Acquisition Time**	Latency upon acquisition of the synchronization source: 15 seconds

10.3.3 SOURCE CHANGE SEQUENCE DETAIL

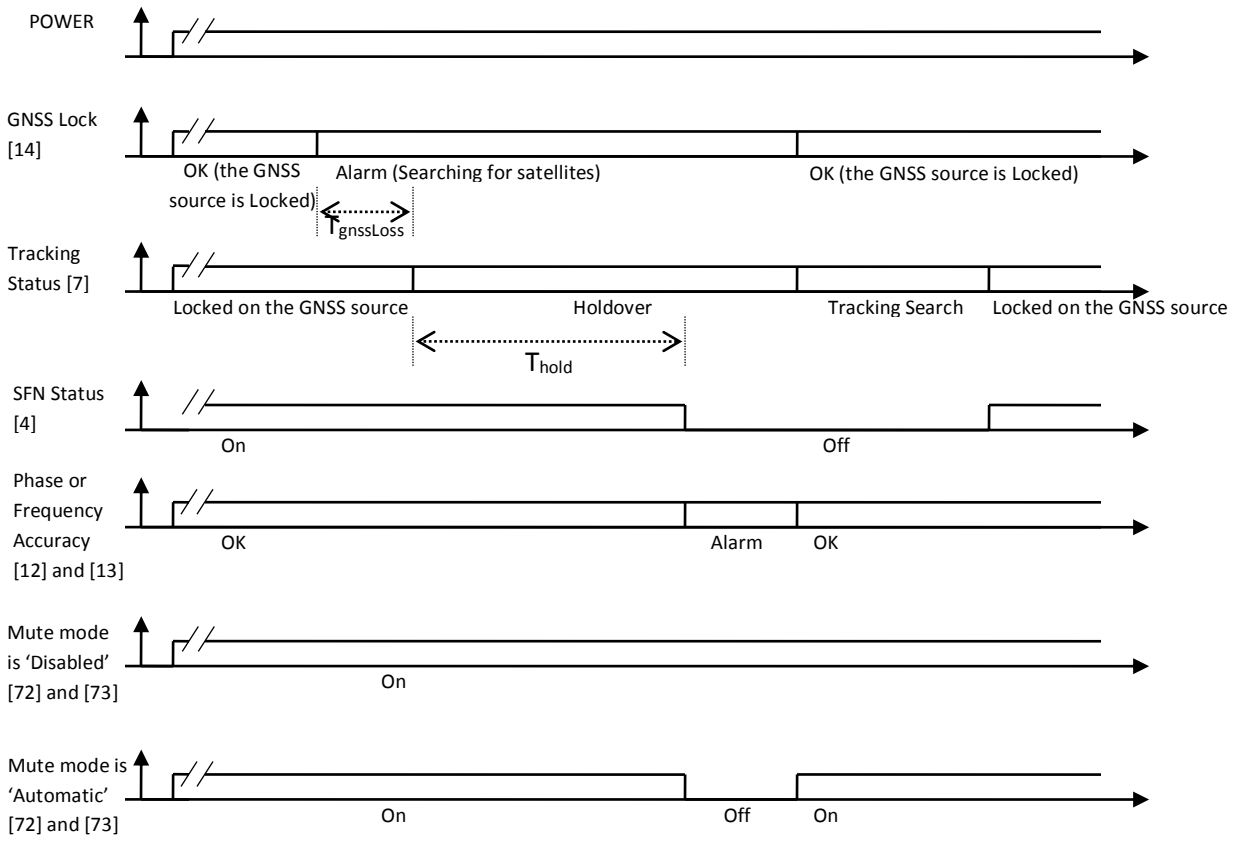
Following diagrams show the status of the EC20S product upon switching of synchronization source (in brackets, the references of the status definitions):



$T_{gnssLoss}$	**GNSS Source Loss Time**	Latency upon loss of the GNSS synchronization source: 120 seconds

10.3.4 HOLDOVER SEQUENCE DETAIL

Following diagrams show the status of the EC20S product while there is no valid synchronization source (in brackets, the references of the status definitions):



$T_{gnssLoss}$	**GNSS Source Loss Time**	Latency upon loss of the GNSS synchronization source: 120 seconds
T_{hold}	**Holdover Time**	Time before phase or frequency alarms occur. Depending on the synchronization setup.

11. SIGNALLING INTERFACES

The EC20S incorporates two signalling interfaces:

- A visual signalling, via three LEDs located on the front panel (see 11.1),
- An ALARMS signalling, via alarm signals output on the '**ALARMS**' SUBD-9 connector located on the rear panel (see 11.2).

11.1 VISUAL SIGNALLING

POWER LED – 'PWR'	
Indicates the status of the AC and DC power supplies.	
Red Blinking	Indicates Initialisation of product.
Red	Indicates general fail of product.
Yellow	Indicates the missing of one power supply.
Green	Indicates presence of all power supplies.

SOURCE LED – 'SRC'	
Indicates the current status of the enabled synchronization source (GNSS source, External 1PPS/NMEA synchronization source).	
Red	No synchronization source is present
Yellow	One or more synchronization source are not present. The unit use present source.
Green	All synchronization sources are present.

DISTRIBUTION LED – 'DST'	
Indicates the current status of the distributed 1PPS and 10MHz signals.	
Red	No distribution or error on 1PPS and 10MHz outputs.
Red Blinking	No distribution on 1PPS or 10MHz outputs (the Mute function is enabled).
Yellow	Distributions of signals are provided without accuracy.
Green Blinking	Distributions of signals are provided with accuracy. The EC20S is synchronized to the selected synchronization source.

NOTA: **In operational step, all the LEDs are 'Green'.**

Only available synchronization sources should be enabled (see 9.2 and 9.3).

Only available AC/DC power alarms should be enabled (see 7.2).

11.2 ALARMS SIGNALING

- Number of Relay contacts : 2
- Maximum switching power : 30 W, 62.5 VA (resistive load)
- Maximum switching voltage : Contacts Switch under max. load of 48VDC, 1A
- Maximum switching current : 1 A
- Connector type : 9-pin female SUB-D

For detailed information about this output interface, refer to the appendix 19.2.

This SUB-D connector may be used to provide a control switch (dry relay contact) upon alarm events. There are two relays to monitor two kinds of alarms:

- '**Urgent Alarms**' which need an **urgent intervention of the maintenance operator**,

- '**Non-Urgent Alarms**' which need a **non urgent intervention of the maintenance operator**,

According to the selected wiring for the alarm monitor, a relay can be closed or open when an '**Urgent Alarm**' or a '**Non-Urgent Alarm**' is raised. Refer to the pin-out of the SUB-D connector.

11.2.1 URGENT ALARMS

'**Urgent Alarms**':

- Internal oscillator fault,
- Internal 1PPS fault,
- The ECS0S doesn't meet the SFN conditions (see 10.2),
- A 1PPS output signals is in fault,
- A 10MHz output signal is in fault.

11.2.2 NON-URGENT ALARMS

'**Non-Urgent Alarms**':

- GNSS Module fault (see 13.3.2.2 GNSS Module Status),
- External 1PPS synchronization source fault,
- External NMEA datation source fault,
- A power supply source (AC or DC) is missing,
- A synchronization source (GNSS source, External 1PPS/NMEA source) is in fault,
- The EC20S is in '**Holdover**' or '**Forced Holdover**' mode (see 13.3.1 Tracking Status).

12. DISTRIBUTION INTERFACE

The EC20S distributes:

- 1PPS synchronization signals on the '**Jn**' BNC connectors located on the rear panel,
- 10MHz synchronization signals on the '**J2n**' BNC connectors located on the rear panel,
- Time Of Day messages on the '**NMEA**' SUBD-9 connector located on the rear panel.

12.1 1PPS OUTPUTS

- Number of outputs : 7
- Connector type : 50Ω BNC coaxial
- Level : TTL/5V, with a 50Ω load.
- 1ppS pulse width : 100µS
- Accuracy to UTC, GNSS locked : ± 25ns (1σ).
- Accuracy to UTC instantaneous (phase locked) : ± 35ns max.

Holdover (constant temperature, 24 hours GNSS locked)	**OXCO**	**Rubidium oscillator**
after 4 hours	0.8 µs	0.3 µs
after 1 day	10 µs	2 µs

12.2 10MHZ OUTPUTS

- Number of outputs : 7
- Connector type : 50Ω BNC coaxial.
- Level : 12±2dBm, with a 50Ω load.
- Type : Sinewave signal, -40dBc harmonic distortion.

12.3 NMEA OUTPUT

The '**NMEA'** output is a RS232 serial link on which Time Of Day messages are distributed.

- Connector type : 9-pin female SUB-D
- Port configuration : Asynchronous RS232C, 9600 bauds, 8 bits, 1 stop bit, no parity.
- TOD messages format : GPRMC from NMEA 0183 V3.01

For detailed information about this output interface, refer to the appendix 19.1 and 19.1.3.

13. WEB INTERFACE

To access the EC20S web interface, connect a Personal Computer (PC) to the EC20S Ethernet port and launch a HTTP navigator with the EC20S IP address.

The PC Operating System can be Windows or Linux.

The EC20S web interface has been tested with the following HTTP navigators:

- Firefox
- Internet Explorer
- Chrome

13.1 WELCOME PAGE

WELCOME TO

EC20S INTERFACE

Click to enter

Spectracom
3 Avenue du Canada
91974 Les Ulis Cedex
France

Tel : +33 (0)1 64 53 39 80
Fax : +33 (0)1 64 53 39 81
Email : sales@spectracom.fr

Web : www.spectracom.fr

Click to enter the web site. The first displayed page is the Clock Status page.

13.2 UPPER TASK BAR AND PAGE HEADER

This menu bar gives access to the following menus:

a. System Setup:

i. **Network setup** : Network connection parameters (protected by the administrator password)
ii. **SNMP setup** : SNMP parameters and traps enable (protected by the administrator password)
iii. **Logout** : Logout from the web site

b. Clock setup:

i. **Time and Synchronization Source Setup** : Setting the time and synchronization parameters (protected by the administrator password)
ii. **GNSS Setup** : GNSS reception parameters (protected by the administrator password)
iii. **Power Setup** : Enable of power supply monitoring alarm (protected by the administrator password)

c. Clock Status: Summary of status and alarms of the EC20S

d. Tools

i. **Events Logging** : Display of events history
ii. **Software Versions** : Display of current version of software parts
iii. **Software Upgrade** : Upgrading software
iv. **Admin** : Some services that reinitialize the EC20S
v. **Reboot** : Per module hardware reset

1. TIME OF DAY MESSAGE

A Time Of Day message is displayed in the header of the web pages in the following format:

<Date> <Time> <Timescale>

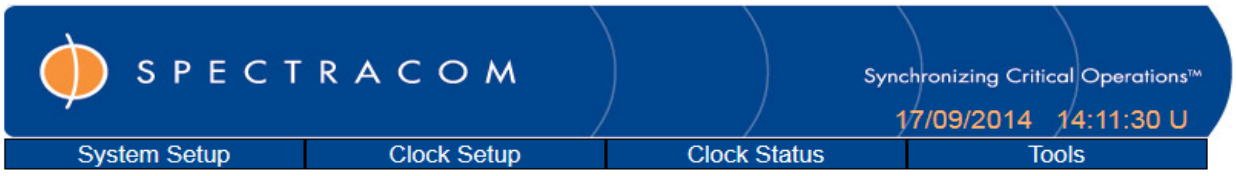
The <Date> format and the <Timescale> of the Time Of Day message can be set in the "Time and Synchronization Source Setup" menu (see 13.7.2).

2. TIMESCALE OF THE TIME OF DAY MESSAGE

The timescale associated with the Time Of Day message (displayed in the web pages header) is defined by an alphabetic character as follows:

- **U**: UTC timescale (either UTC-USNO from GPS constellation or UTC-SU from GLONASS constellation)
- **L**: Local Time = UTC timescale + programmed local time shift
- **G**: GPS timescale
- **R**: GLONASS timescale (**R**ussia) = Moscow local time = UTC timescale + 3 hours
- **E**: GALILEO timescale (of the **E**uropean positioning system)
- **M**: User-defined time (time **M**anually set in the "Time and Reference Setup" menu)
- **N**: No timescale (No available GNSS time information since the start-up)

13.3 CLOCK STATUS PAGE



Clock Status

Global Status			
EC20S Status	Ok	SFN Status	On
Synchronization Source	GNSS	Oscillator Control Voltage	4.009 V
Tracking Status	Locked	Synchronization Time	45 mn 47 s

Alarms			
Source Disciplining : OCXO		**Synchronization**	
Internal Oscillator	Ok	Phase Accuracy	Ok
Internal 1PPS	Ok	Frequency Accuracy	Ok
GNSS Source		**External Sources**	
GNSS Lock	Ok	External 1PPS	Disabled
Antenna Status	Powered	External NMEA Datation	Disabled
GNSS Module Status	Ok		
Power Supply		**Distribution**	
AC	Ok	Global 1PPS Outputs	Ok
DC	Disabled	Global 10 MHz Outputs	Ok

Output Status										
N°	1	2	3	4	5	6	7	8	9	10
1PPS	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Disabled	Disabled	Disabled
10 MHz	Ok	Ok	Ok	Ok	Ok	Ok	Ok	Disabled	Disabled	Disabled

GNSS Status from Resolution SMT receiver						
GNSS Longitude	2° 11' 30" 187ms E	**Best Satellites**				
GNSS Latitude	48° 41' 16" 982ms N	**ID**	27	22	19	18
GNSS Altitude	203.99 m	**SNR**	35	35	35	32
Self Survey	100 %	**ID**	32	14	16	1
Used Satellites	8	**SNR**	31	29	26	20
Constellations	**GPS**	**GLONASS**		**GALILEO**		
Used Satellites	8	0		0		

External NMEA Datation	
NMEA Longitude	0° 00' 00" 000ms E
NMEA Latitude	0° 00' 00" 000ms N
NMEA Altitude	0.00 m

Designed by SPECTRACOM, a trademark of the OROLIA group.

This page is automatically refreshed every 8 seconds.

13.3.1 GLOBAL STATUS

3. EC20S STATUS

Global working status of EC20S:

- OK — Neither urgent alarm nor non-urgent alarm is raised. The distribution of the synchronization signals (1PPS, 10MHz) is OK.
- Warning — A non-urgent alarm is raised (refer to 11.2.1 to know the list of the non-urgent alarms). The distribution of the synchronization signals (1PPS, 10MHz) is OK but a maintenance intervention is required.

  The EC20S goes in this status when it is set in 'Force Holdover' mode (see 13.7.3).
- Alarm — An urgent alarm is raised (refer to 11.2.2 to know the list of the urgent alarms). The distribution of the synchronization signals (1PPS, 10MHz) may be wrong.

4. SFN STATUS

Indicates whether the EC20S meets the SFN conditions or not:

- On — EC20S meets the **SFN conditions** (see 10.2).
- Off — EC20S doesn't meet the SFN conditions.

5. SYNCHRONIZATION SOURCE

Selected synchronization source for the module:

- GNSS — 1PPS signal of the integrated GNSS receiver.
- External — External 1PPS signal (BNC rear panel input).
- None — EC20S in '**Holdover**' or '**Forced Holdover**' mode.

6. OSCILLATOR CONTROL VOLTAGE

Control voltage of the internal oscillator (in volts).

Range from 0V to 8V.

Generates an Internal Oscillator alarm when the value reaches 0V or 8V, meaning that the EC20S is no longer able to drive the Internal Oscillator.

7. TRACKING STATUS

Disciplining algorithm status:

- Warming up — The EC20S internal oscillator is warming up.
- Tracking search — The EC20S receiver is searching best disciplining conditions.
- Locked — The EC20S receiver meets the **'Locked' conditions** (see 10.2).
- Holdover — The oscillator disciplining has been suspended because there is no valid synchronization source to synchronize to.
- Forced Holdover — The oscillator disciplining has been suspended upon user request (see 13.7.3 Force Holdover).

8. SYNCHRONIZATION TIME

Time during which the EC20S is synchronized to a valid synchronization source. Unity: second.

13.3.2 ALARMS

13.3.2.1 SOURCE DISCIPLINING : <TYPE OF OSCILLATOR>

9. TYPE OF OSCILLATOR

Type of the built-in oscillator:

- Unknown — The built-in oscillator is not detected.
- OCXO — The built-in oscillator is an OCXO oscillator.
- Rubidium — The built-in oscillator is a Rubidium oscillator.

10. INTERNAL OSCILLATOR

Monitored status of the 10MHz generated by internal oscillator:

- OK — Frequency driver operational.
- Alarm — Frequency driver failure.

11. INTERNAL 1PPS

Monitored status of internal 1PPS generated from oscillator frequency:

- OK — 1PPS driver operational.

- Alarm 1PPS driver failure.

13.3.2.2 SYNCHRONIZATION

12. PHASE ACCURACY

Status of the estimated phase accuracy during a holdover period:

- OK The phase accuracy is below the Alarm Phase Threshold (see 13.7.3).
- Alarm The phase accuracy is above the Alarm Phase Threshold (see 13.7.3).

13. FREQUENCY ACCURACY

Status of the estimated frequency accuracy during a holdover period:

- OK The frequency accuracy is below the Alarm Frequency Threshold (see 13.7.3).
- Alarm The frequency accuracy is above the Alarm Frequency Threshold (see 13.7.3).

13.3.2.3 GNSS SOURCE

14. GNSS LOCK

Performance of the 1PPS signal of the GNSS receiver:

- OK 1PPS signal of the GNSS receiver can be used as 1PPS reference signal for disciplining operation.
- Alarm 1PPS signal of the GNSS receiver can't be used as 1PPS reference signal for disciplining operation.

15. ANTENNA STATUS

State of the connection to the GNSS antenna:

- Unpowered GNSS antenna is disconnected or incorrectly powered. Use of an antenna splitter produces this message. No alarm generated for this reason.
- Powered GNSS antenna is connected and correctly powered.
- Shorted GNSS antenna is in short-circuit status.

13.3.2.4 GNSS MODULE STATUS

Working state of the GNSS receiver:

- OK — The GNSS receiver is working well.
- Alarm — Problem with the GNSS receiver. The communication with the GNSS receiver is interrupted or the 1PPS signal is not delivered by the GNSS receiver.

13.3.2.5 EXTERNAL SOURCES

16. EXTERNAL 1PPS

Status of the external 1PPS source:

- OK — The External 1PPS source is valid.
- Alarm — The External 1PPS source is not valid.
- Disabled — The External 1PPS source is disabled by the user (See 13.7.3 Synchronization Setup).

17. EXTERNAL NMEA DATATION

Status of the external NMEA datation source:

- OK — The NMEA datation source is valid.
- Alarm — The NMEA datation source is not valid.
- Disabled — The NMEA datation is disabled by the user (See 13.7.3 Synchronization Setup).

13.3.2.6 POWER SUPPLY

18. AC

Status of AC power:

- OK — AC power is present.
- Alarm — AC power is missing.
- Disabled — AC power alarm is disabled by the user (See 13.9 Power Setup).

19. DC

Status of DC power:

- OK — DC power is present.
- Alarm — DC power is missing.
- Disabled — DC power alarm is disabled by the user (See 13.9 Power Setup).

13.3.2.7 DISTRIBUTION

20. GLOBAL 10 MHZ OUTPUTS

Monitoring of the frequency output signals delivered by the EC20S:

- OK — Every 10MHz output delivers a valid signal.
- Alarm — At least one 10MHz output doesn't deliver a valid signal.
- Mute — The 10Mhz output doesn't deliver any signal; shut off for frequency accuracy alarm (see 13.7.3) or time conditions (see 13.7.5).

21. GLOBAL 1PPS OUTPUTS

Monitoring of the 1PPS output signals delivered by the EC20S:

- OK — Every 1PPS output delivers a valid signal.
- Alarm — At least one 1PPS output doesn't deliver a valid signal.
- Mute — The 1PPS output doesn't deliver any signal; shut off for phase accuracy alarm (see 13.7.3) or time conditions (see 13.7.5).

13.3.3 OUTPUT STATUS

State of the signals delivered by the EC20S:

- OK — The 10MHz/1PPS output delivers a valid signal.
- Alarm — The 10MHz/1PPS output delivers an invalid signal.
- Mute — The 10MHz/1PPS output doesn't deliver any signal.
- Disabled — The 10MHz/1PPS output is not available in the EC20S device model.

13.3.4 GNSS STATUS

22. GNSS RECEIVER MODEL

The GNSS receiver model implemented in the EC20S equipment is displayed in the “GNSS Status” header.

23. GNSS LONGITUDE

Current longitude of the GNSS antenna.

24. GNSS LATITUDE

Current latitude of the GNSS antenna.

25. GNSS ALTITUDE

Current altitude of the GNSS antenna.

26. SELF SURVEY

Not applicable in ‘**Stationary**’ and ‘**Mobile**’ GNSS modes (see 78).

In ‘**Automatic**’ GNSS mode, the Self Survey status reports the progression of the period during which the accurate position of the stationary GNSS antenna is computed by the EC20S (see 78). The following information can be seen:

- x% < 100% — The calculation of the accurate GNSS antenna position is in progress.
- 100% — The calculation of the accurate GNSS antenna position is complete.

27. USED SATELLITES

Number of GNSS channels used by the GNSS receiver to compute the time and/or the position.

28. CONSTELLATIONS

Satellites constellations:

- GPS — Global Positioning System (USA positioning system).
- GLONASS — GLObalnaya NAvigatsionnaya Sputnikovaya Sistema (Russian positioning system).
- GALILEO — European positioning system.

29. USED SATELLITES

Number of GNSS channels, per satellites constellation, used by the GNSS receiver to compute the time and/or the position.

30. BEST SATELLITES

ID / SNR**:**

Satellite channel identifier and SNR (Signal over Noise Ratio) of the 8 best satellite channels tracked by the GNSS receiver.

13.3.4.1 EXTERNAL NMEA DATATION

31. NMEA LONGITUDE

Current longitude of the NMEA input.

32. NMEA LATITUDE

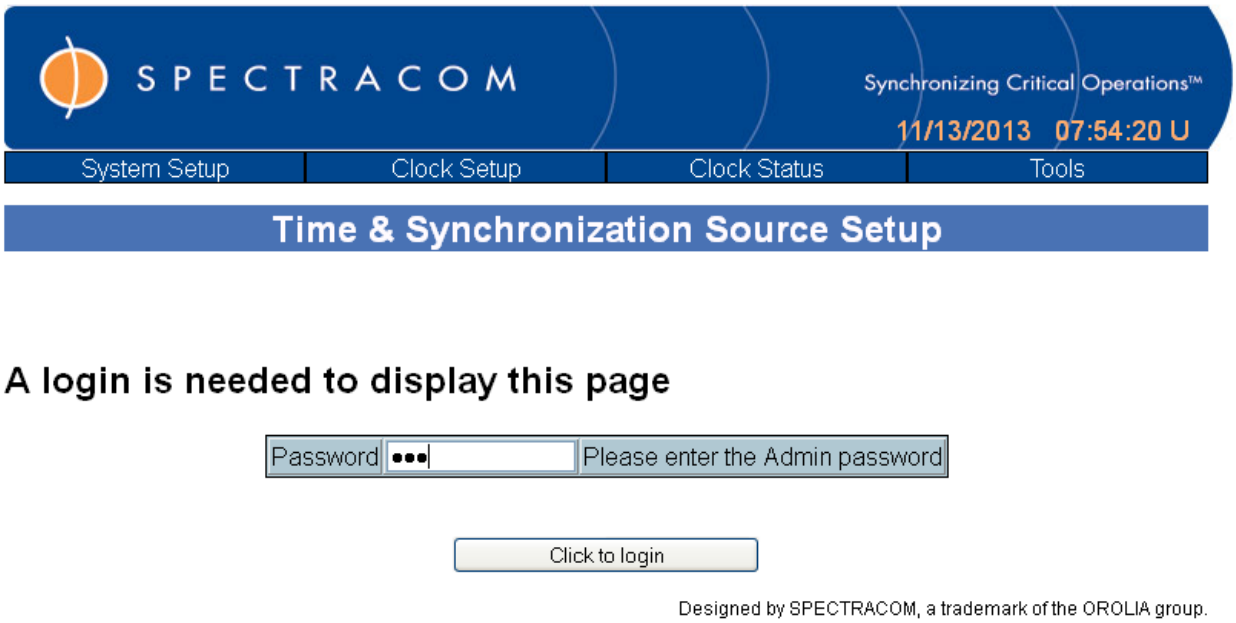
Current latitude of the NMEA input.

33. NMEA ALTITUDE

Current altitude of the NMEA input.

13.4 ADMINISTRATOR PASSWORD PAGE

An administrator password (called '**Admin**' password) is necessary to access the setup pages. The **default password** is '**pwd**'. It can be modified in the "Admin" page (see 13.13).



WARNING

If the user doesn't remember the password, the EC20S product must come back to Spectracom to reset the device to its default password.

13.5 NETWORK SETUP PAGE

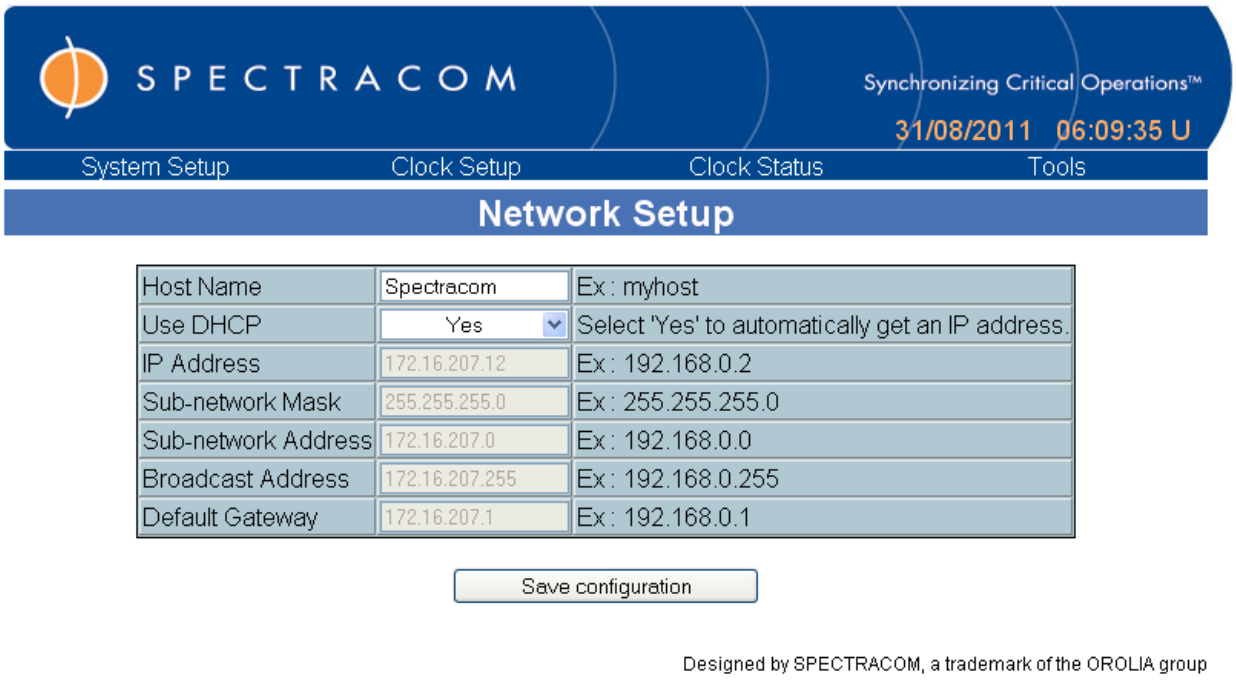
This page allows the user to modify the Network settings.

34. HOST NAME

Unique name of the EC20S in the network. This functionality depends on the DNS server type. NOTA: The header of the EC20S Application Window is built as follows: <Host name> - EC20S.

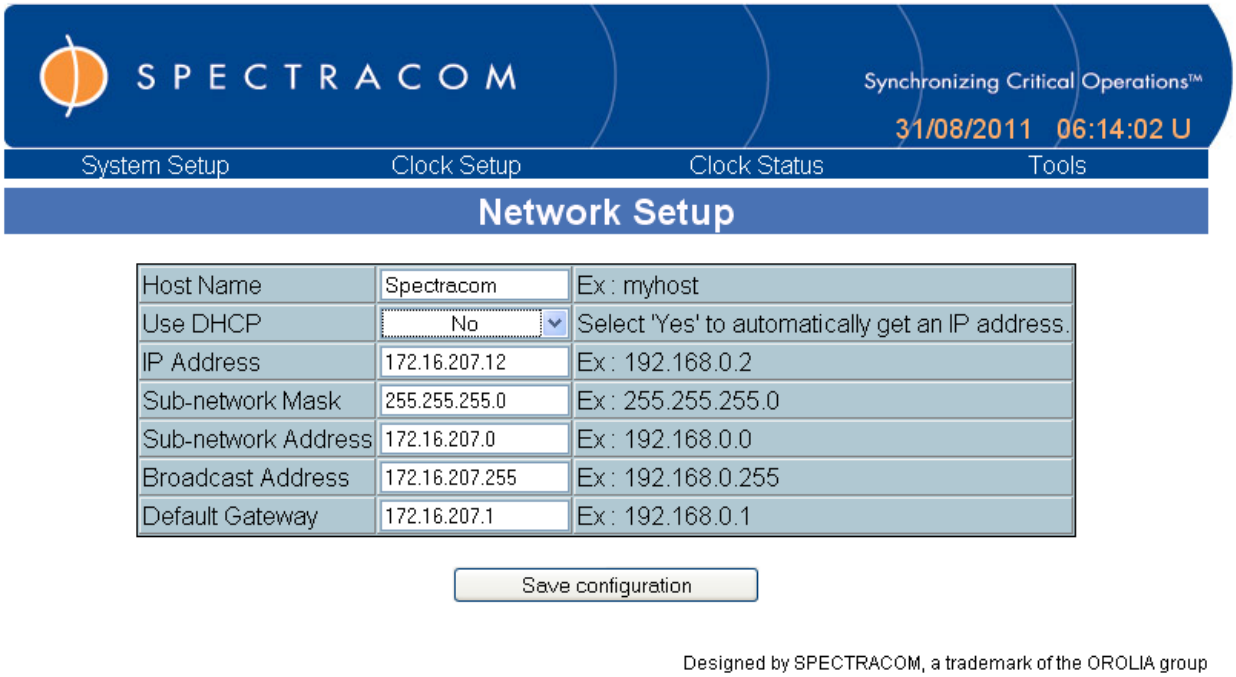
35. USE DHCP (DYNAMIC HOST CONFIGURATION PROTOCOL)

Yes A Dynamic Host Configuration Protocol service is available. In this case, a dynamic IP address is automatically allocated to the EC20S by the DHCP server according to the EC20S MAC address. The other input fields do not apply.



When the DHCP service is required (‘**Use DHCP**’=’**Yes**’), if the EC20S starts without network connection, the static IP address is set. After the network connection is restored, a 1 or 2 minutes delay occurs before a dynamic IP address is assigned.

No No Dynamic Host Configuration Protocol service is available. In this case, the static IP address is allocated to the EC20S and the other input fields are applied to configure the network access.

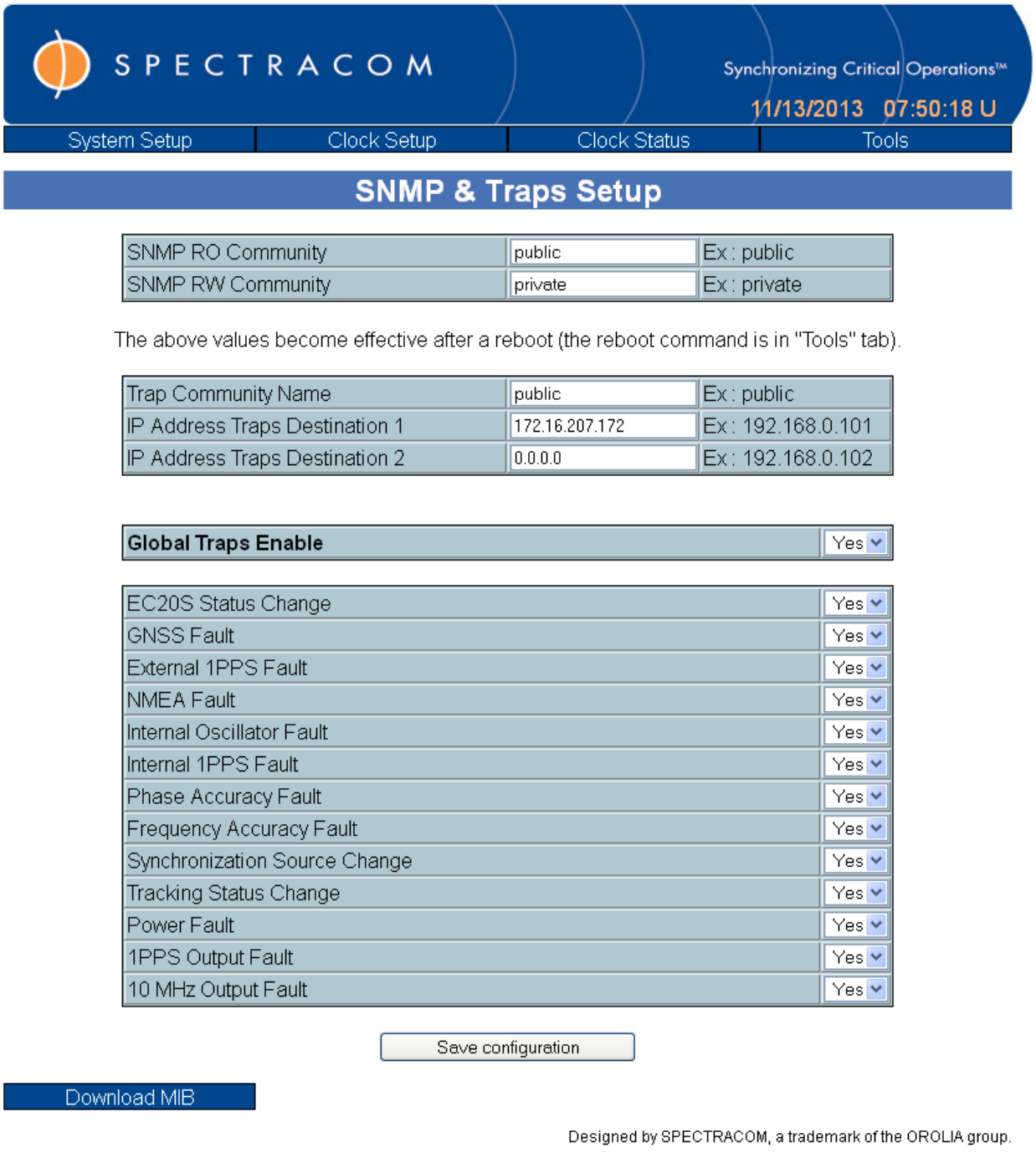


36. IP ADDRESS, SUB-NETWORK MASK, SUB-NETWORK ADDRESS, BROADCAST ADDRESS, DEFAULT GATEWAY:

When the DHCP service is not required (‘**Use DHCP**’=’**No**’), these input fields are applied to configure the network access.

NOTA: **The network configuration can be reset to factory settings** at any time while pressing, more than 2 seconds, the ‘**Factory Reset**’ button located on the front panel between the ‘**PWR**’ and ‘**SRC**’ LEDs. To press the button, insert a straightened paperclip into the hole.

13.6 SNMP & TRAPS SETUP PAGE



In this page, the operator can enable/disable the SNMP traps generation and program the Read Only (RO) and the Read Write (RW) SNMP communities. The SNMP traps report an event (an alarm, the end of an alarm or a new setup) by sending a trap message.

37. SNMP RO COMMUNITY

Read Only community (for GET SNMP commands). Defaulted to '**public**'.

38. SNMP RW COMMUNITY

Read Write community (for SET SNMP commands). Defaulted to '**private**'. RO and RW communities will become effective after a software reboot of the EC20S device (see Tools menu).

39. TRAP COMMUNITY

Trap community (for trap events). Needed to easily identify a family of monitored devices. Defaulted to '**public**'.

40. IP ADDRESS TRAPS DESTINATION 1

Primary SNMP manager address where traps will be sent. Clear this field to disable the traps transmission to this address.

41. IP ADDRESS TRAPS DESTINATION 2

Secondary SNMP manager address where EC20S traps will be sent. Clear this field to disable the traps transmission to this address.

42. GLOBAL TRAPS ENABLE

- Yes — Traps are sent according to individual enabling.
- No — No trap is generated.

43. EC20S FAULT

- Yes — Generates a trap when the EC20S goes on default (according to "Global Status").
- No — No trap is generated.

44. GNSS FAULT

- Yes — Generates a trap when the GNSS receiver fails or unlocks (according to "GNSS Locked").
- No — No trap is generated.

45. EXTERNAL 1PPS FAULT

- Yes — Generates a trap when the External 1PPS is lost (while enabled).
- No — No trap is generated.

46. NMEA FAULT

- Yes — Generates a trap when the NMEA input is lost (while enabled).
- No — No trap is generated.

47. INTERNAL OSCILLATOR FAULT

- Yes — Generates a trap when the frequency driver goes on alarm (generally the oscillator goes on default).
- No — No trap is generated.

48. INTERNAL 1PPS FAULT

- Yes — Generates a trap when the 1PPS driver goes on alarm.
- No — No trap is generated.

49. PHASE ACCURACY FAULT

- Yes — Generates a trap when estimated phase of the output signal exceeds the phase limit.
- No — No trap is generated.

50. FREQUENCY ACCURACY FAULT

- Yes — Generates a trap when estimated frequency of the output signal exceeds the phase limit.
- No — No trap is generated.

51. SYNCHRONIZATION SOURCE CHANGE

- Yes — Generates a trap when the source of synchronization changes.
- No — No trap is generated.

52. TRACKING STATUS

- Yes — Generates a trap when the tracking status changes.
- No — No trap is generated.

53. POWER FAULT

- Yes — Generates a trap when any enabled power source alarm is detected.
- No — No trap is generated.

54. 1PPS OUTPUT FAULT

- Yes — Generates a trap when one of the 1PPS output signal fails.
- No — No trap is generated.

55. 10 MHZ OUTPUT FAULT

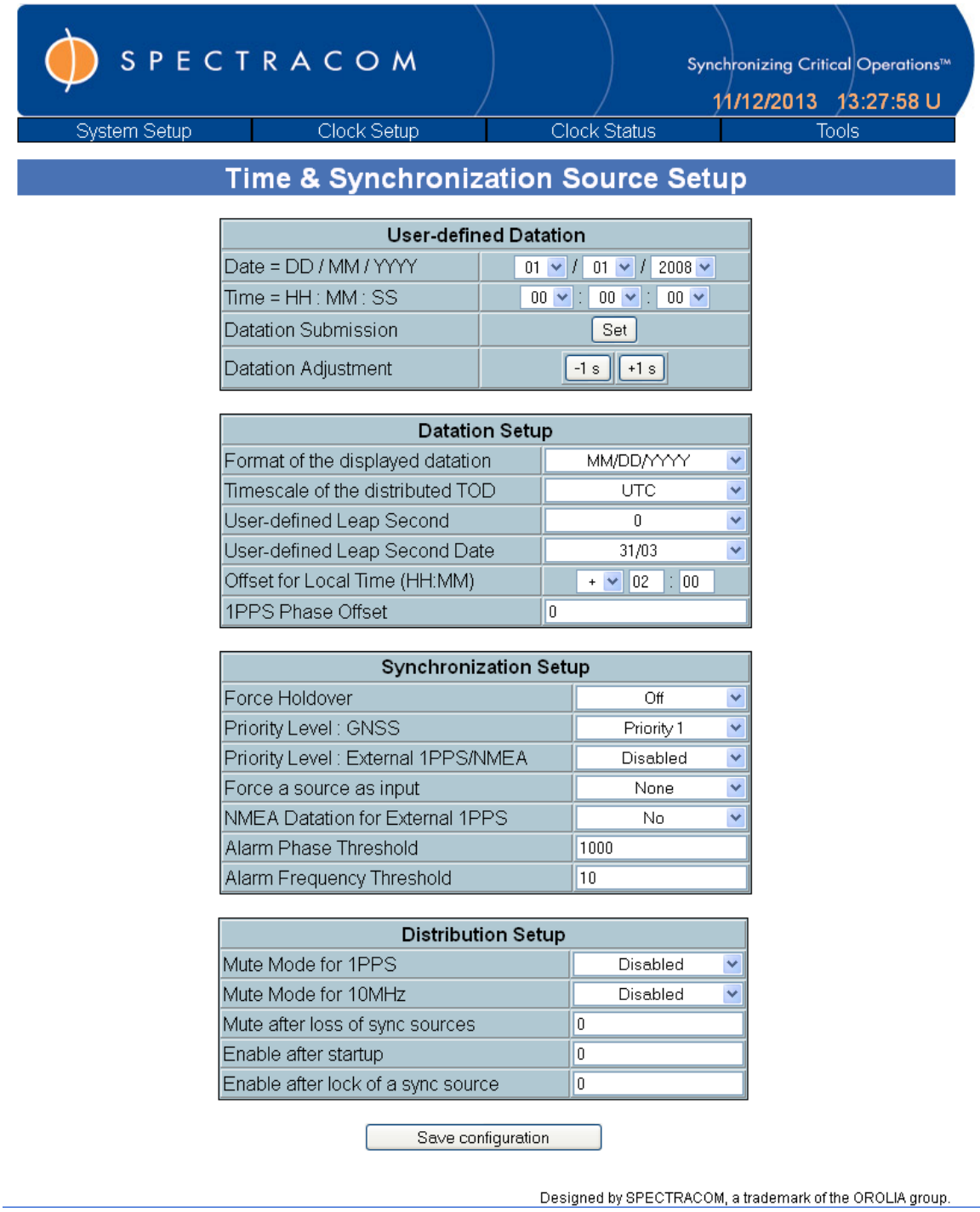
- Yes — Generates a trap when one of the 10 MHz output signal fails.
- No — No trap is generated.

56. DOWNLOAD MIB LINK

Right click on the '**Download MIB**' link to download the MIB description file. A left click only displays the MIB description file.

13.7 TIME & SYNCHRONIZATION SOURCE SETUP PAGE

This page is used for setting time computation and display parameters, synchronization source parameters, and distribution parameters.



13.7.1 USER-DEFINED DATATION

57. DATE, TIME AND DATATION SUBMISSION BUTTON

Time can be set by the user when the EC20S is in '**Forced Holdover**' mode or when the EC20S has not been synchronized yet to a datation source (GNSS source, External NMEA datation source).

58. DATATION ADJUSTMENT

Adjust the time by 1 second when the EC20S is in '**Forced Holdover**' mode or when the EC20S has not been synchronized yet to a datation source (GNSS source, External NMEA datation source). Helpful to adjust the time manually set by the user.

13.7.2 DATATION SETUP

59. FORMAT OF THE DISPLAYED DATATION

Format of the displayed Time of Day messages:

- DD/MM/AAAA day / month / year
- MM/DD/AAAA month / day / year
- DD/AAAA day of the year / year

60. TIMESCALE OF THE DISTRIBUTED TOD

Timescales applied to the distributed Time of Day messages (i.e. for ToD displayed on the web pages 13.2 and ToD delivered on the 'NMEA' output by the NMEA 0183 v3.01 GPRMC messages 12.3):

- UTC UTC timescale (either UTC-USNO from GPS constellation or UTC-SU from GLONASS constellation).
- Local Local Time = UTC timescale + programmed local time shift.
- GPS GPS timescale.
- GLONASS GLONASS timescale (Russia) = Moscow local time = UTC timescale + 3 hours
- GALILEO GALILEO timescale (of the European positioning system).

For ToD messages on the web pages, see 13.2 Upper Task Bar and Page Header description.

61. USER-DEFINED LEAP SECOND

Leap second adjustment set by the user, hence ensuring it will be applied even in case of GNSS loss. Direction in which the leap second shall be applied:

- 0 Non leap second pending
- –1 Positive leap second pending
- +1 Negative leap second pending

62. USER-DEFINED LEAP SECOND DATE

Leap second date set by the user, hence ensuring it will be applied even in case of GNSS loss. Date when to apply the leap second:

- 31/03 31/03
- 30/06 30/06
- 30/09 30/09
- 31/12 31/12

63. OFFSET FOR LOCAL TIME (HH:MM)

Time shift between the local time and the UTC time. Unity: hours and minutes.

64. 1PPS PHASE OFFSET

Phase shift applied to the 1PPS output. Unity: Nanosecond. Range = [–500 milliseconds, +500 milliseconds]. Default is 0.

13.7.3 SYNCHRONIZATION SETUP

65. FORCE HOLDOVER

Keep the oscillator control voltage at a fixed value even if a synchronization reference is available:

- On Force the EC20S into the '**Holdover**' mode (the oscillator disciplining is suspended). **The EC20S goes in 'Warning' status when it is set in this mode.**
- Off Normal disciplining mode (the oscillator disciplining is in progress)

66. PRIORITY LEVEL: GNSS

Priority of the GNSS synchronization source:

- Priority 1 Highest priority
- Priority 2 Medium priority
- Priority 3 Lowest priority
- Disabled Disable the source; this source is no longer part of the synchronization sources; no corresponding alarm.

67. PRIORITY LEVEL: EXTERNAL 1PPS/NMEA

Priority of the External 1PPS/NMEA synchronization source:

- Priority 1 Highest priority
- Priority 2 Medium priority
- Priority 3 Lowest priority
- Disabled Disable the source; this source is no longer part of the synchronization sources; no corresponding alarm.

68. FORCE A SOURCE AS INPUT

Force the EC20S to be synchronized to the selected source even if other synchronization sources with a highest priority are available and, **CAUTION**, even if the selected source is in '**Alarm**' state (for debug purposes only):

- None No synchronization source
- GNSS GNSS synchronization source
- External 1PPS/NMEA External 1PPS/NMEA synchronization source

69. NMEA DATATION FOR EXTERNAL 1PPS:

External NMEA datation to timestamp the External 1PPS synchronization source:

- Yes
- No

70. ALARM PHASE THRESHOLD

Threshold for the Phase Accuracy, used during a holdover period, to determine whether the 1PPS signals are still valid (the estimated phase accuracy is below the threshold) or not (the estimated phase accuracy is above the threshold). See 13.3.2.2. Unity: nanosecond. Range=[0, 100000]. Default is 10.

Specific value: **If the field is zeroed**: No alarm is generated – The Threshold function is disabled and the OID ec20S-STA-PHASE-ERROR (MIB VARIABLE) remains set to 1.

71. ALARM FREQUENCY THRESHOLD

Threshold for the Frequency Accuracy, used during a holdover period, to determine whether the 10MHz signals are still valid (the estimated frequency accuracy is below the threshold) or not (the estimated frequency accuracy is above the threshold). See 13.3.2.2. Unity: None ($\Delta f/f * 10^{-9}$). Range=[0, 1000] * 10^{-9}. Default is 1000 * 10^{-9}.

Specific value: **If the field is zeroed**: Frequency alarm is immediately generated (meaning that synchronization is lost). The OID ec20S-STA-FREQ-ERROR (MIB VARIABLE) remains set to 0.

13.7.4 DISTRIBUTION SETUP

72. MUTE MODE FOR 1PPS

The mute mode for the output 1PPS signals:

- Disabled — Output 1PPS signals are always distributed whatever their quality is.
- Automatic — Output 1PPS signals are muted upon SFN conditions when SFN Status is '**Off**' (see 10.2).
- On Time — Output 1PPS signals are muted upon time conditions (see 13.7.5).
- Until Stable — Output 1PPS signals are muted until they are stable (i.e. after their frequency have been adjusted a first time).
- Until 1st Sync — Output 1PPS signals are muted until the EC20S meets the SFN conditions. Once the EC20S have met the SFN conditions for the first time, the output 1PPS signals are always distributed whatever their quality is.

73. MUTE MODE FOR 10MHZ

The mute mode for the output 1PPS signals:

- Disabled — Output 10MHz signals are always distributed whatever their quality is.
- Automatic — Output 10MHz signals are muted upon SFN conditions when SFN Status is '**Off**' (see 10.2).
- On Time — Output 10MHz signals are muted upon time conditions (see 13.7.5).
- Until Stable — Output 10MHz signals are muted until they are stable (i.e. after their frequency have been adjusted a first time).
- Until 1st Sync — Output 10MHz signals are muted until the EC20S meets the SFN conditions. Once the EC20S have met the SFN conditions for the first time, the output 10MHz signals are always distributed whatever their quality is.

13.7.5 DISTRIBUTION STATUS FOR "ON TIME" MUTE MODE

When this mute mode is selected (see 13.7.4), the 3 conditions defined below (74, 75 and 76) are evaluated all together to determine whether the output synchronization signals (1PPS, 10MHz) are distributed or not. Setting the special value '0' to a mute mode inhibits this mode.

74. MUTE AFTER LOSS OF SYNC SOURCES

This delay starts upon the loss of all the synchronization sources. The distributed synchronization signals (1PPS, 10MHz) are muted once this delay has elapsed. Unity: second.

75. ENABLE AFTER STARTUP

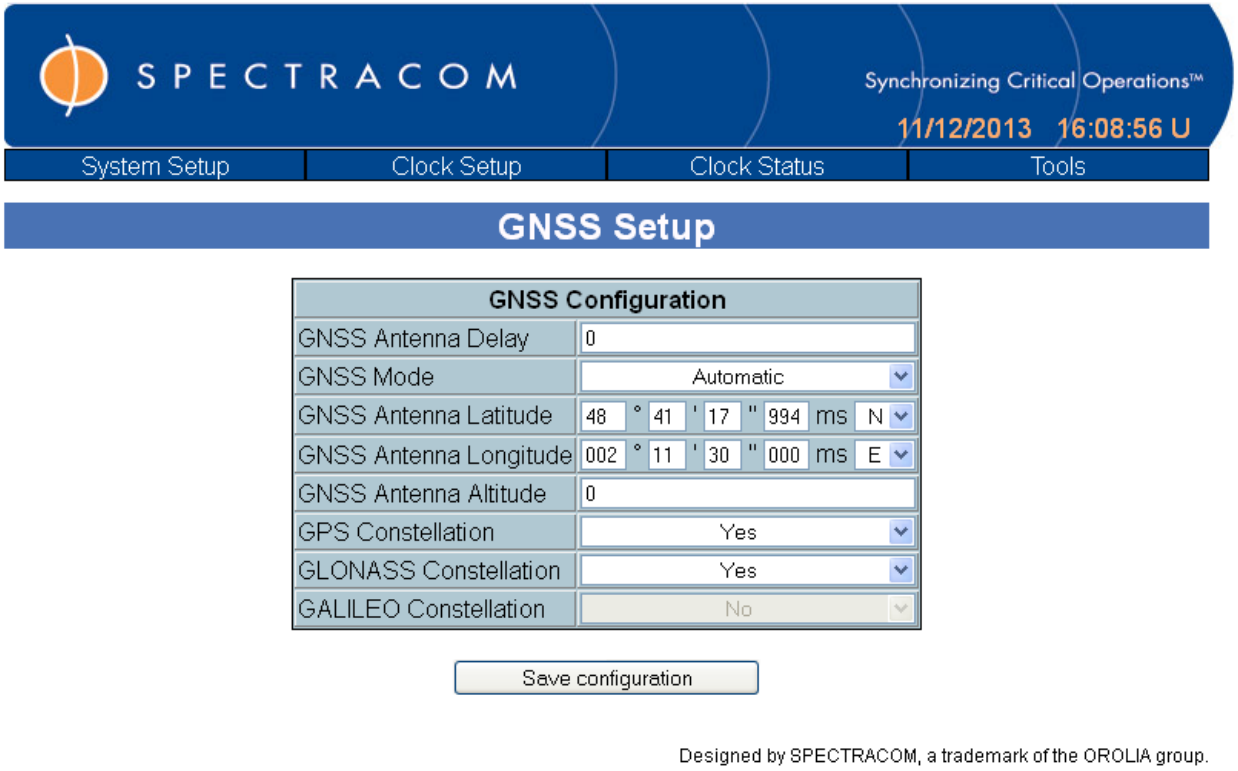
This delay starts upon the start-up of the EC20S. The synchronization signals (1PPS, 10MHz) are muted during this delay and are distributed once this delay has elapsed. Unity: second.

76. ENABLE AFTER LOCK OF A SYNC SOURCE

This delay starts upon the selection of a valid synchronization source (if no synchronization source was selected before). The synchronization signals (1PPS, 10MHz) are distributed once this delay has elapsed. Unity: second.

13.8 GNSS SETUP PAGE

On this page, the operator set the GNSS receiver parameters.



77. GNSS ANTENNA DELAY

Time shift that compensates the propagation delay of the GNSS signal through the antenna cable. To be computed according to the type and the length of cable. Unity: nanosecond.

78. GNSS MODE

Defines the way to determine the GNSS antenna position:

- Automatic — The GNSS antenna is stationary and its position is automatically computed by the EC20S. The EC20S gets the current antenna position from the GNSS receiver every second for one hour. A current position is selected as valid if the GNSS receiver is tracking a minimum of 4 satellite channels. The progression of the one hour period is displayed by the “Self Survey” status of the “Clock Status” web page. Once the one hour period is complete, the antenna position is determined while computing the average of all the recorded antenna positions. The accurate position so determined is then set in the GNSS receiver which

then transits to 0D reception mode. That means that the GNSS receiver tracks only one satellite channel and then improves the accuracy of the time.

- Stationary — The GNSS antenna is stationary and its accurate position is input by the user. The accurate position so input is then set in the GNSS receiver which then transits to 0D reception mode. That means that the GNSS receiver tracks only one satellite channel and then improves the accuracy of the time.

- Mobile — The GNSS antenna is not stationary. The GNSS receiver computes and delivers the antenna position every second so that the EC20S (with the GNSS antenna) can be moved. In this case, the GNSS receiver doesn't transit to the 0D reception mode.

79. GNSS LATITUDE, GNSS LONGITUDE, GNSS ALTITUDE

Geographical coordinates of the stationary GNSS antenna position that is applied in the GNSS Stationary mode (see above GNSS Mode).

Unity: Latitude and Longitude in degrees-minutes-seconds-milliseconds (for the web interface) and milliseconds only (for the SNMP interface). Altitude in meters (for both web and SNMP interface).

80. GPS CONSTELLATION

Defines whether the GPS satellites constellation is part of the GNSS synchronization source or not:

- Yes — The GPS satellites constellation is part of the GNSS synchronization source.

- No — The GPS satellites constellation is not part of the GNSS synchronization source.

81. GLONASS CONSTELLATION

Defines whether the GLONASS satellites constellation is part of the GNSS synchronization source or not.

- Yes — The GLONASS satellites constellation is part of the GNSS synchronization source.

- No — The GLONASS satellites constellation is not part of the GNSS synchronization source.

If the input field is greyed, that means that your EC20S device doesn't include the GLONASS license.

82. GALILEO CONSTELLATION

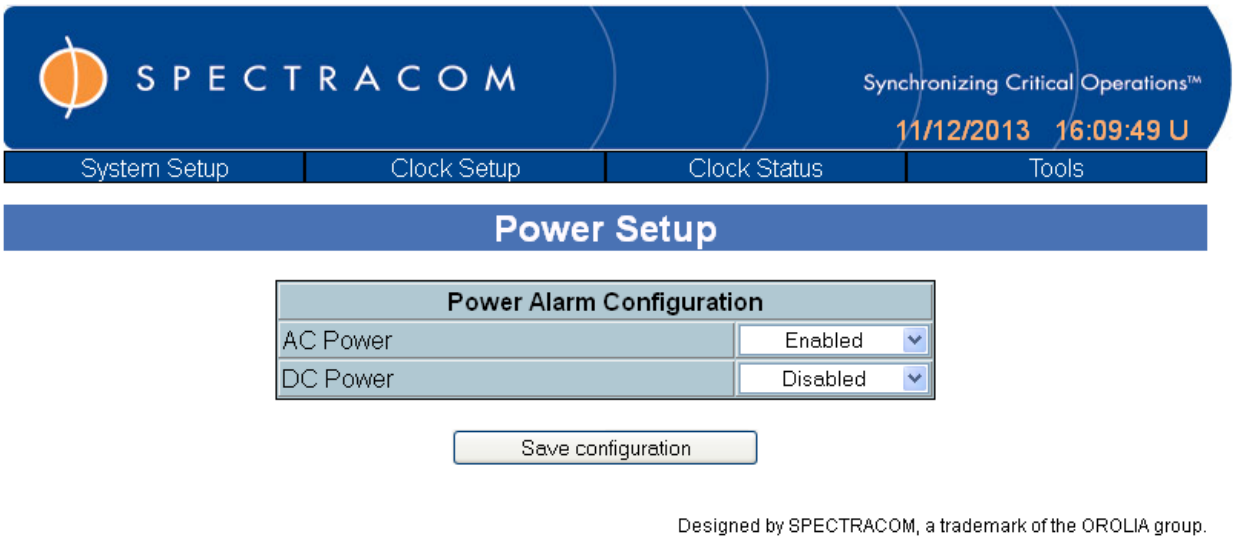
Defines whether the GALILEO satellites constellation is part of the GNSS synchronization source or not:

- Yes — The GALILEO satellites constellation is part of the GNSS synchronization source.
- No — The GALILEO satellites constellation is not part of the GNSS synchronization source.

If the input field is greyed, that means that your EC20S device doesn't include the GALILEO license.

13.9 POWER SETUP PAGE

According to actual power supply connection, the operator must set which power alarm (AC or DC, left and right) should be enabled.



83. AC POWER

Check AC power supply:

- Enable: Generates an alarm if AC power supply is not available.
- Disable: No alarm generated.

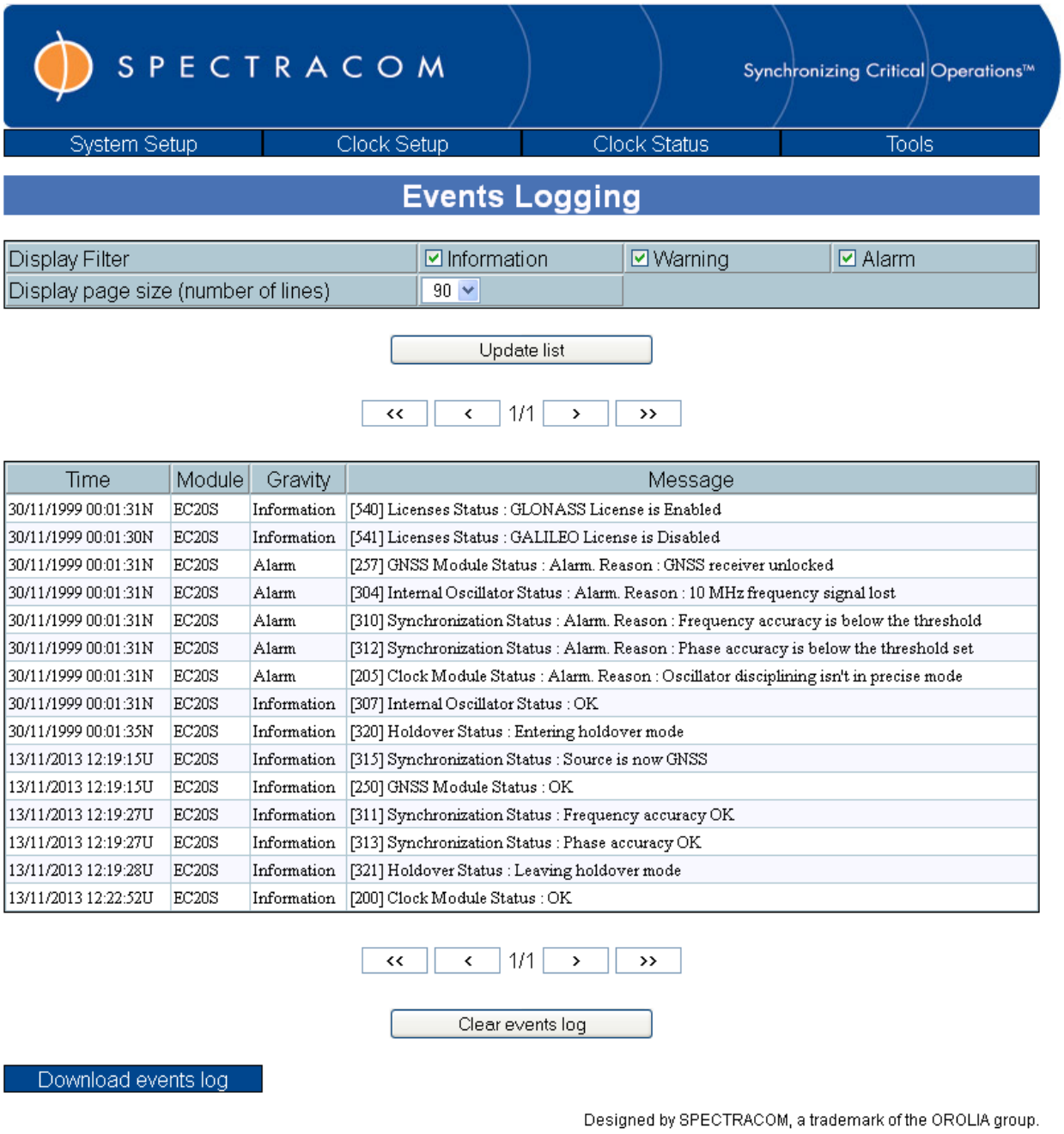
84. DC POWER

Check DC power supply:

- Enable: Generates an alarm if DC power supply is not available.
- Disable: No alarm generated.

13.10 EVENTS LOGGING

This page displays the events log recorded by the EC20S in a chronological order.



13.10.1 EVENT ORIGIN

The **Module** column of the events log indicates the event origin:

- **EC20S** General EC20S event (event coming from the Management Board which is the EC20S main board),
- **CLOCK RIGHT** Event coming from the right clock,
- **CLOCK LEFT** Event coming from the left clock.

13.10.2 EVENT GRAVITY

The events are classified according to a **gravity criterion**:

- **Alarm** The event reports a temporary or permanent dysfunction of a major function and can affect the normal functioning of the EC20S.
- **Warning** The event reports a temporary or permanent dysfunction of a minor or redundant function and therefore doesn't affect the normal functioning of the EC20S.
- **Information** The event reports the end of an alarm or a warning event, or a user action.

Alarm and Warning events refer to status displayed on the Clock Status web page.

13.10.3 EVENTS LOG FILTERING

The events log can be filtered and displayed according to the gravity criterion by the mean of the Display Filter.

Display Filter To select the filtering criteria to be applied to the events log.

Max lines To define the number of events per page to be displayed.

"<","<<",">", ">>" Press these buttons to navigate through the whole events log.

"Update List" Press this button to refresh the display of the events log.

13.10.4 CLEAR EVENTS LOG

Click on the '**Clear events log**' button to clear the events log buffer.

13.10.5 DOWNLOAD EVENTS LOG

Right click on the '**Download events log**' link to download the events log. A left click only displays the whole events log.

13.11 SOFTWARE VERSION

This page displays the version number of key software and firmware components.

EC20S Version

Mother board	
Archive version	13.02
System version	01.01a
Firmware version	02.00

Resolution SMT GG GNSS receiver	
Firmware version	1.8.0

Designed by SPECTRACOM, a trademark of the OROLIA group.

85. MOTHER BOARD SOFTWARE COMPONENTS VERSION

Archive version: Version of the EC20S software.

System version: Version of the EC20S system.

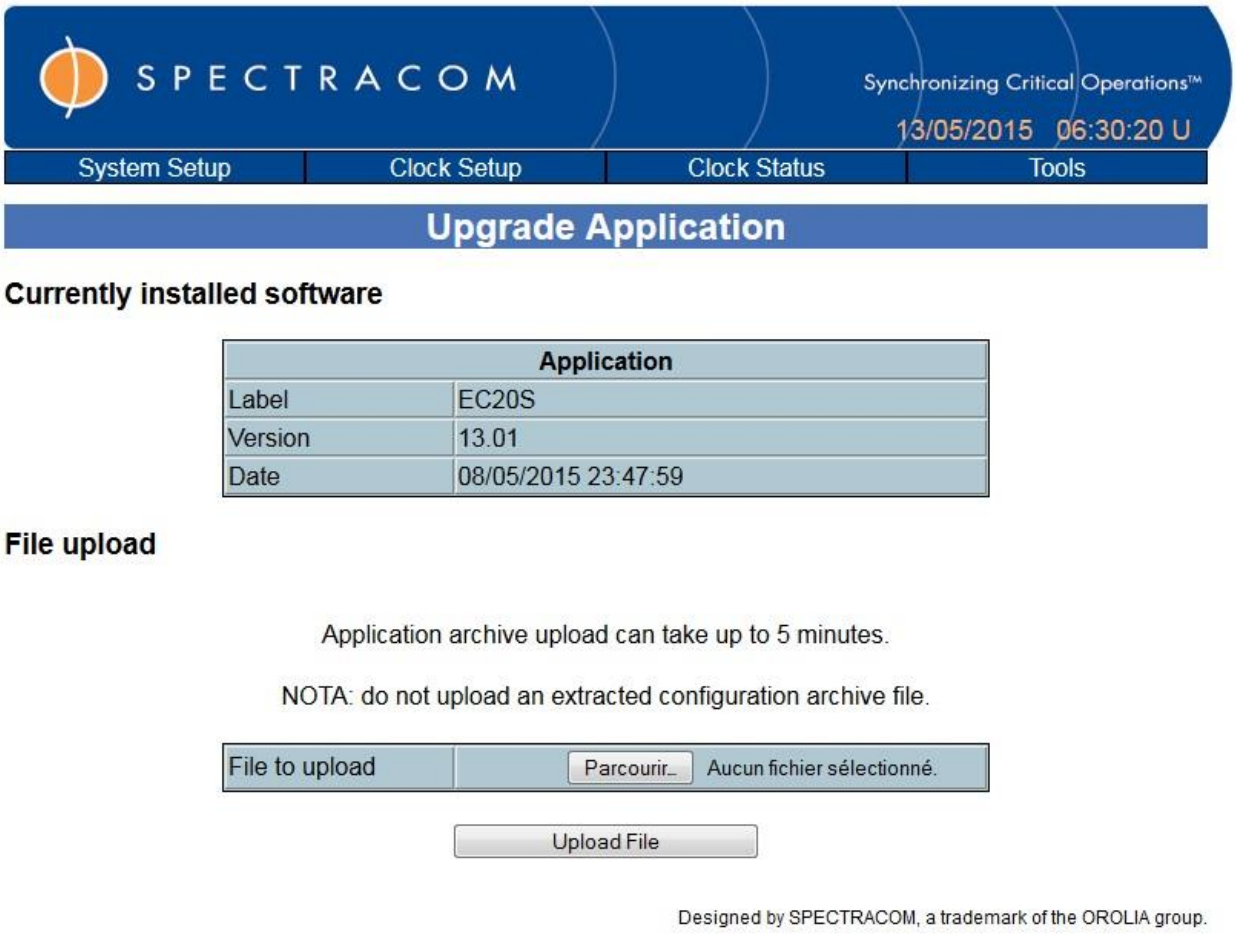
Firmware version: Version of the firmware of the EC20S FPGA.

86. GNSS FIRMWARE VERSION

Firmware version of the built-in GNSS receiver.

13.12 SOFTWARE UPGRADE

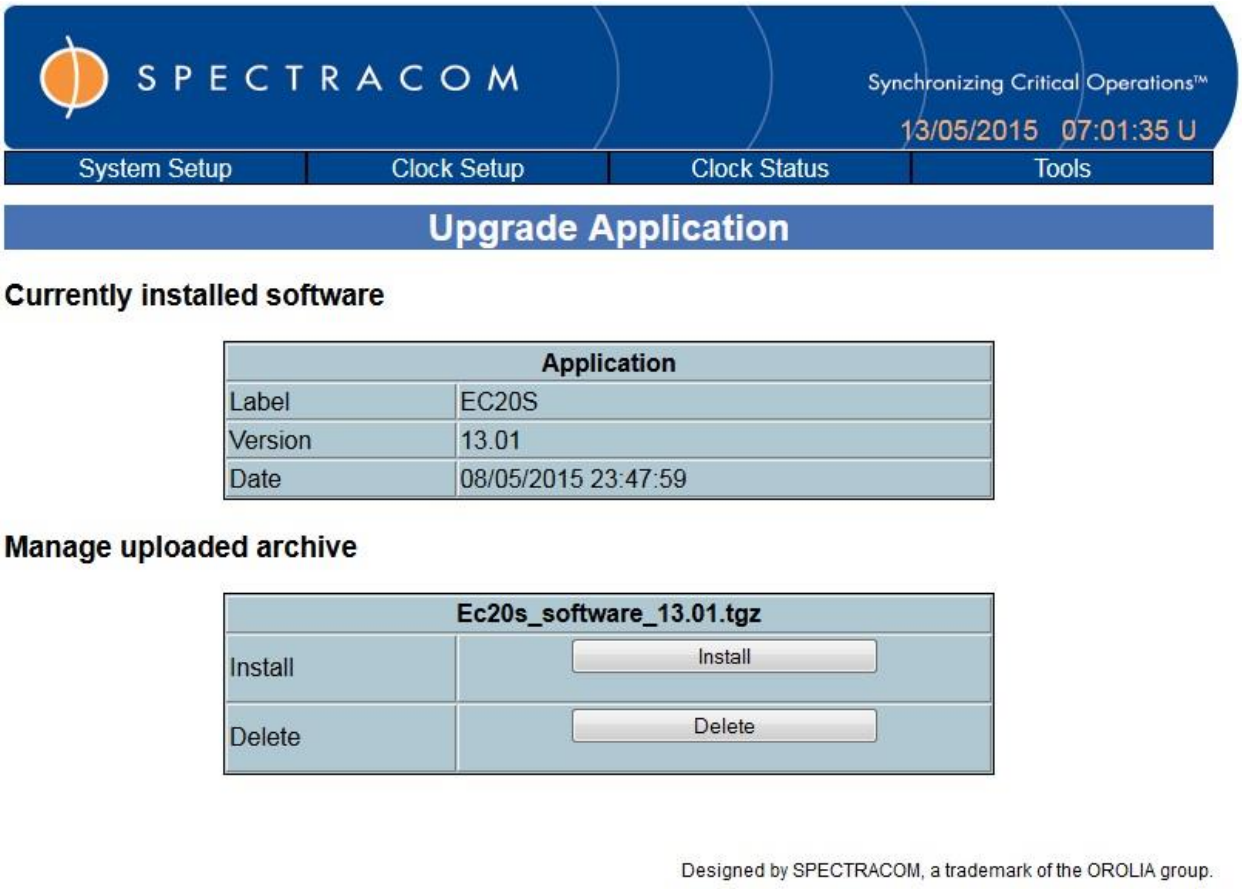
This page allows to upgrade the EC20S software.



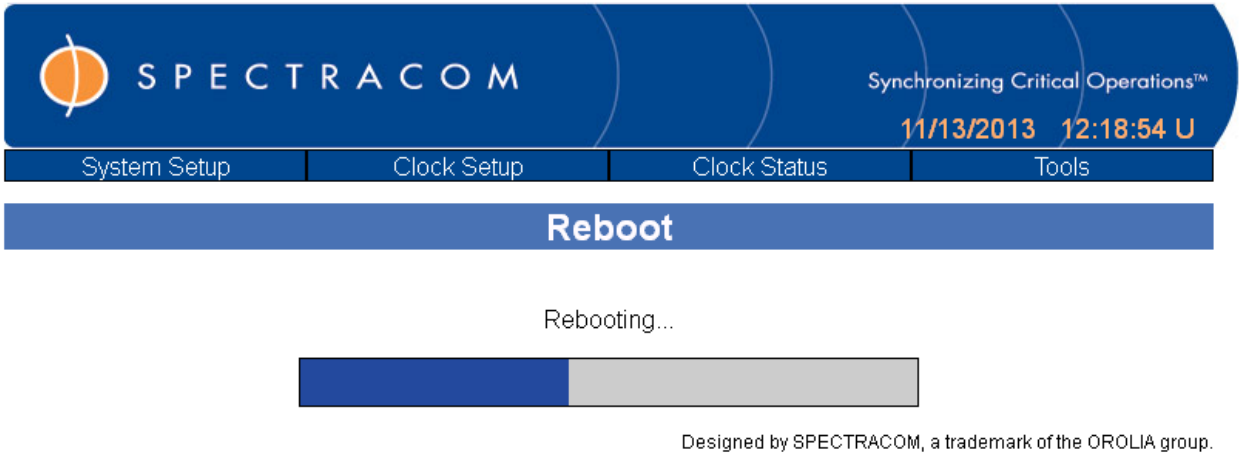
WARNING ***Extracted configuration archive file (see 13.13.3) shall not be uploaded****. These files only aim at providing trouble-shooting support data.*

To upgrade the EC20S software, follow these steps:

- Select the software archive to upload (usually a .tgz file provided by the manufacturer) with the browser button.
- Click on the '**Upload File**' button to start the uploading.
- Uploading is complete when the below screen is displayed:

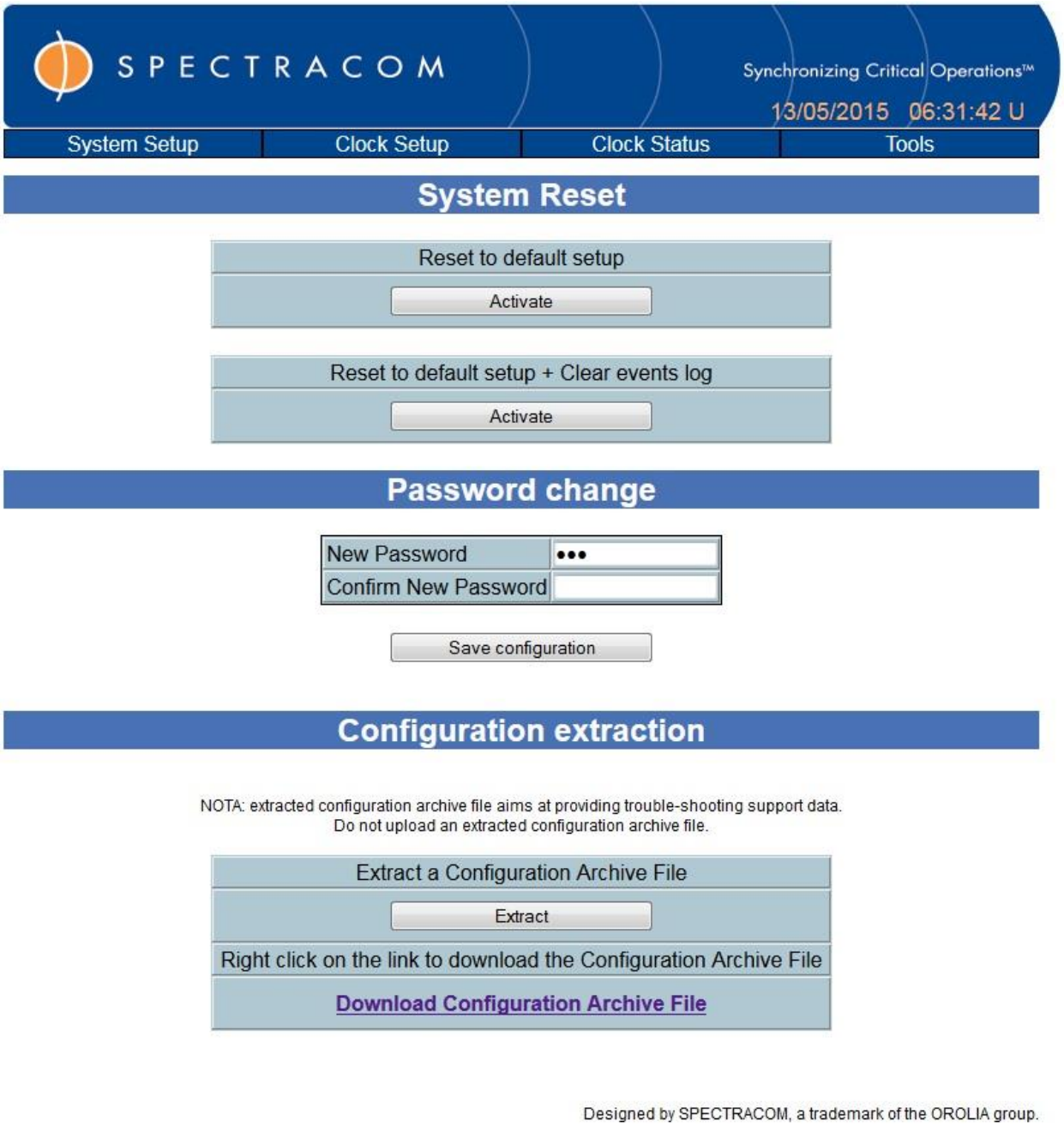


Then start the next software installation on the EC20S target while clicking on the '**Install**' button.



Once the new software is installed, the EC20S automatically reboots.

13.13 ADMIN PAGE



13.13.1 SYSTEM RESET

To reinitialize the EC20S operational settings, two ways are possible:

87. RESET TO DEFAULT SETUP

Click on the '**Activate**' button to reset the EC20S current settings to the factory settings.

Note that the network settings are not reset.

WARNING

***ALL** the setup **parameters** (except the network parameters) **are reset** to their factory setting.*

*Resetting to default setup **may disturb the 1PPS and 10MHz distribution !***

- **Reset to default setup + Clear events log**:

  Click on the '**Activate**' button to reset the EC20S current settings to the factory settings and clear the events log.

  Note that the network settings are not reset.

13.13.2 PASSWORD CHANGE

To change the Admin password, the password that is required to access the setup pages.

88. NEW PASSWORD

To enter a new password.

89. CONFIRM NEW PASSWORD

To enter the password a second time to check the user input.

Click on the '**Save configuration**' button to save the new password. Password change closes the session.

13.13.3 CONFIGURATION EXTRACTION

To extract the EC20S settings in a configuration archive file.

Click on the '**Extract**' button to copy the EC20S settings in the configuration archive file *Ec20s_configuration_archive_file.tgz*.

Right click on the '**Download Configuration Archive File**' button to download the configuration archive file *Ec20s_configuration_archive_file.tgz* from the EC20S device.

WARNING

Extracted configuration archive file aims at providing trouble-shooting support data. It doesn't aim at restoring an EC20S configuration.

Extracted configuration archive files shall not be uploaded from the Software Upgrade web page (13.12).

13.14 REBOOT

If the unit can't be accessed via a network service (web pages, SNMP, NTP) any more, the operator can order a '**Network**' reboot to restart the network services (telnet, FTP, SNMP, NTP).

If the unit seems to be out of order, despite a '**Network**' reboot, the operator can order a '**Software**' or a '**Hardware**' reboot.

A '**Hardware**' reboot:

- erases the memory components,
- restarts the EC20S software,
- **stops the signals distribution (1PPS, 10MHz)**.

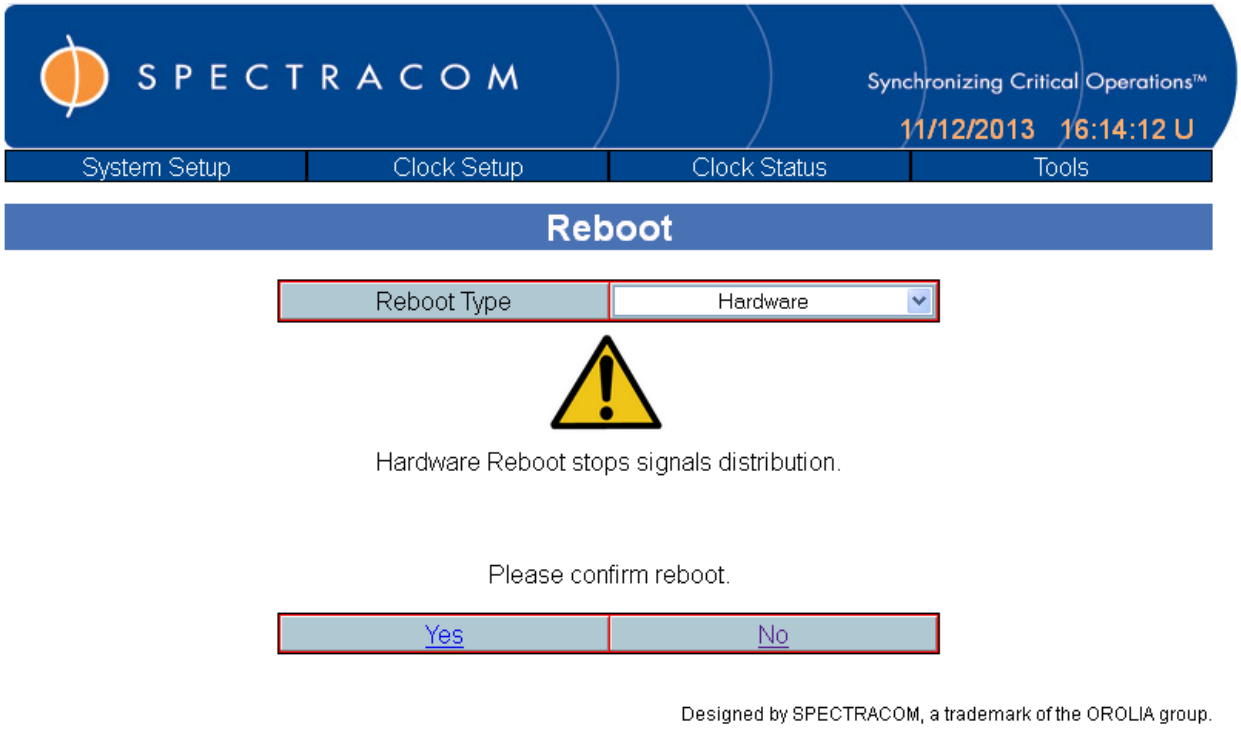
WARNING

Hardware reboot stops signals distribution.

Take care about your choice.

A '**Software**' reboot:

- restarts the EC20S software,
- doesn't stop the signals distribution (1PPS, 10MHz).



To order a reboot, select the type of reboot and click on '**Yes**' to confirm the reboot.

14. SNMP INTERFACE

To access the EC20S SNMP interface, connect a Personal Computer (PC) to the EC20S Ethernet port and launch a SNMP browser with the EC20S IP address.

The PC Operating System can be Windows or Linux.

14.1 MIB DESCRIPTION

The MIB description file defines the SNMP objects through which the EC20S device can be remotely monitored using the SNMP protocol. **The MIB description file can be downloaded** in the "SNMP & Traps setup" web page (see 13.6). The EC20S implements the **v2c release of the SNMP protocol**. The MIB includes the following SNMP objects:

14.1.1 SNMP STATUS PARAMETERS

Status parameters can only be read (using the GET method). These parameters have a read-only access authenticated by the read-only community (which is defaulted to '**public**').

Refer to the MIB Description file to get detailed information about each parameter (unity, values definition, values range) under the 'DESCRIPTION' section.

CLOCK STATUS OID	**Description (Ref.)**
ec20s-STA-HARDWARE-OK	3
ec20s-STA-DATETIME	1
ec20s-STA-TIMEREF	2
ec20s-STA-SYNCSOURCE	5
ec20s-STA-SYNCTIME	8
ec20s-STA-1PPSOUT	21
ec20s-STA-1PPSOUT-FAILURE	Obsolete
ec20s-STA-10MHZOUT	20
ec20s-STA-10MHZOUT-FAILURE	Obsolete
ec20s-STA-FREQ-ERROR	91
ec20s-STA-FREQ-ALARM	13

ec20s-STA-PHASE-ERROR	0
ec20s-STA-PHASE-ALARM	12
ec20s-STA-REFEXT-PRESENCE	16
ec20s-STA-NMEA-VALIDITY	17
ec20s-STA-HOLDOVER	7
ec20s-STA-DCPOWER-OK	19
ec20s-STA-ACPOWER-OK	18
ec20s-STA-OPT-IRIG-OUT	Obsolete
ec20s-STA-OPT-STANAG-OUT	Obsolete
ec20s-STA—OPT-2MHZ-OUT	Obsolete
ec20s-STA—SFN	4
ec20s-STA-TYPE-OSCILLATEUR	9

90. PHASE ERROR

Phase error estimated by the Kalman filter (kdt) implemented by the disciplining algorithm.

91. FREQUENCY ERROR

Frequency error estimated by the Kalman filter (kdf) implemented by the disciplining algorithm.

GPS STATUS OID	**Description (Ref.)**
ec20s-GPS-LOCKED	14
ec20s-GPS-SAT-LOCKED	Deprecated
ec20s-GPS-SAT-ID1	30
ec20s-GPS-SAT-SNR1	30
ec20s-GPS-SAT-ID2	30
ec20s-GPS-SAT-SNR2	30
ec20s-GPS-SAT-ID3	30
ec20s-GPS-SAT-SNR3	30

ec20s-GPS-SAT-ID4	30
ec20s-GPS-SAT-SNR4	30
ec20s-GPS-SAT-ID5	30
ec20s-GPS-SAT-SNR5	30
ec20s-GPS-SAT-ID6	30
ec20s-GPS-SAT-SNR6	30
ec20s-GPS-SAT-ID7	30
ec20s-GPS-SAT-SNR7	30
ec20s-GPS-SAT-ID8	30
ec20s-GPS-SAT-SNR8	30
ec20s-GPS-SAT-ANTENNA-MODE	78
ec20s-GPS-RECEPTION-MODE	92
ec20s-GPS-ANTENNA-STATUS	15
ec20s-GPS-LATITUDE	24
ec20s-GPS-LONGITUDE	23
ec20s-GPS-ALTITUDE	25

92. GNSS RECEPTION MODE

Reception mode (or Tacking mode) of the GNSS receiver:

- 0D: The GNSS receiver tracks only one satellite channel. This is the mode in which the GNSS receiver transits once it has computed the accurate position of the GNSS antenna (in '**Automatic**' GNSS mode, see 78), or once the user has input the accurate position of the GNSS antenna (in '**Stationary**' GNSS mode, see 78).
- 2D: The GNSS receiver tracks three satellite channels (in '**Mobile**' GNSS mode, see 78).
- 3D: The GNSS receiver tracks at least four satellite channels (in '**Mobile**' GNSS mode, see 78).

NTP STATUS OID	**Description (Ref.)**
ec20s-NTP-MAC-ADDRESS	93

ec20s-NTP-STRATUM-LEVEL	94

93. EC20S MAC ADDRESS

MAC address of the EC20S.

94. NTP STRATUM LEVEL

Stratum level got from the NTP service of the EC20S.

GNSS STATUS OID	Description (Ref.)
ec20s-GNSS-STA-MODEL	22
ec20s-GNSS-FW-VERSION	86
ec20s-GNSS-STA-SAT-USED-ALL	27
ec20s-GNSS-STA-SAT-USED-GPS	29
ec20s-GNSS-STA-SAT-USED-GLONASS	29
ec20s-GNSS-STA-SAT-USED-GALILEO	29

14.1.2 SNMP CONFIGURATION PARAMETERS

Configuration parameters can be read (using the GET method) and modified (using the SET method). These parameters have a read-write access authenticated by the read-write community (which is defaulted to '**private**').

Refer to the MIB Description file to get detailed information about each parameter (unity, values definition, values range, factory setting) under the 'DESCRIPTION' section.

TRAPS CONFIGURATION OID	Description (Ref.)
ec20s-TRAPS-DESTINATION-1	40
ec20s-TRAPS-DESTINATION-2	41
ec20s-TRAPS-COMMUNITY	39
ec20s-TRAPS-ENABLE	42

EC20S CONFIGURATION OID	Description (Ref.)
ec20s-CFG-FREQ-ALARM-LIMIT	71
ec20s-CFG-PHASE-ALARM-LIMIT	70
ec20s-CFG-DATE-FORMAT	59
ec20s-CFG-1PPS-MUTE-AUTO	72
ec20s-CFG-10MHZ-MUTE-AUTO	73
ec20s-CFG-MUTE-LOST-SOURCES-TIME	74
ec20s-CFG-MUTE-POWER-ON-TIME	75
ec20s-CFG-MUTE-ACQ-SOURCE-TIME	76
ec20s-CFG-RESTART-INETD	95
ec20s-CFG-RESTART-NTP	96
ec20s-CFG-RESTART-WEB	97
ec20s-CFG-RESTART-EC20S	98

95. RESTART INETD

1: the EC20S restarts the inetd network services (telnet, FTP, uptime).

96. RESTART NTP

1: the EC20S restarts the NTP network service.

97. RESTART WEB

1: the EC20S restarts the web pages network service (HTTP).

98. RESTART EC20S

1: the EC20S unit restarts.

GNSS CONFIGURATION OID	Description (Ref.)
ec20s-GNSS-CFG-ANTENNA-MODE	78
ec20s-GNSS-CFG-ANTENNA-LATITUDE	79
ec20s-GNSS-CFG-ANTENNA-LONGITUDE	79
ec20s-GNSS-CFG-ANTENNA-ALTITUDE	79
ec20s-GNSS-CFG-GPS-CONSTELLATION-MODE	80
ec20s-GNSS-CFG-GLONASS-CONSTELLATION-MODE	81
ec20s-GNSS-CFG-GALILEO-CONSTELLATION-MODE	82

14.1.3 SNMP TRAPS

Trap events are asynchronous SNMP messages sent by the EC20S upon changes of some configuration parameters or when an alarm is raised or cancelled. These parameters have an accessible-for-notify access authenticated by the Trap community (which is defaulted to '**public**').

Traps are sent by the EC20S to destination addresses which can be set via the "SNMP Setup" web page or via the SNMP protocol (see 14.1.2 TRAPS CONFIGURATION or 14.1.2 SNMP CONFIGURATION PARAMETERS).

Traps are sent by the EC20S if the Traps transmission is enabled. The Traps transmission can be enabled/disabled via the "SNMP Setup" web page. Each trap event can also be enabled/disabled via the same web page.

Refer to the MIB Description file to get detailed information about each trap (values definition, values range) under the 'DESCRIPTION' section.

TRAP OID	Description (Ref.)
ec20sGeneralHardwareFault	43
ec20sGpsFault	44
ec20sExternalPpsFault	45
ec20sNmeaFault	46

ec20sInternalOscFault	47
ec20sInternalppsFault	48
ec20sPhaseAccuracyFault	49
ec20sFreqAccuracyFault	50
ec20sSyncSourceChangeAlarm	51
ec20sEnteringHoldoverModeAlarm	99
ec20sPowerFault	53
ec20sOptionIrig	Obsolete
ec20sOptionStanag	Obsolete
ec20sOption2MHz	Obsolete
ec20sOutputPPSFault	54
ec20sOutput10MHzFault	55

99. HOLDOVER MODE TRANSITIONS

0: the EC20S exits the '**Holdover**' mode.

1: the EC20S enters the '**Holdover**' mode.

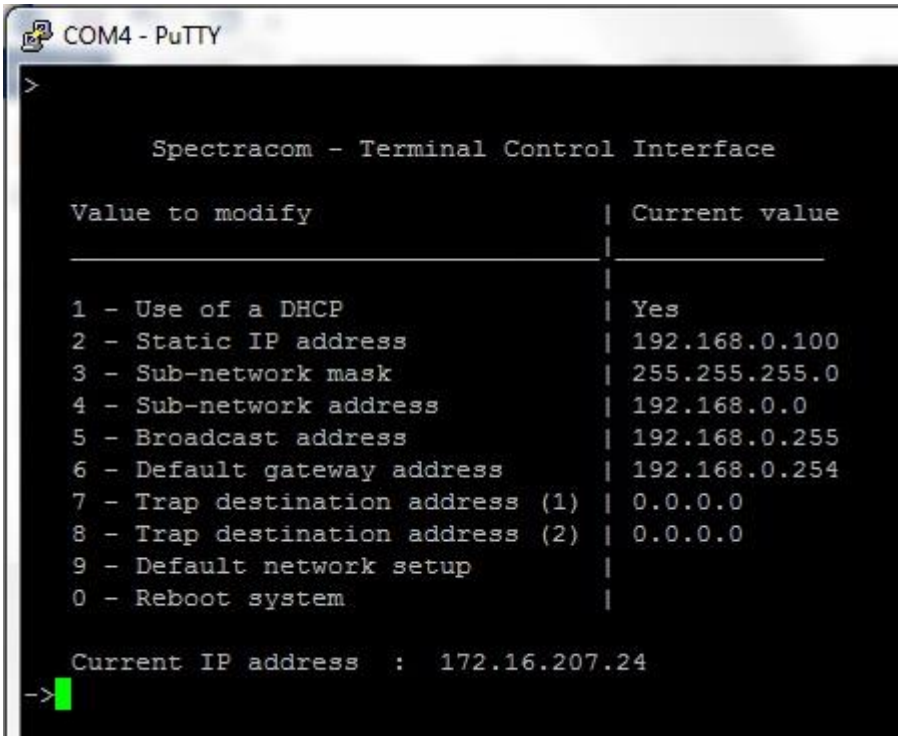
15. COMMAND LINE INTERFACE (CLI)

Some commands are available using a Command Line Interface accessible by the connector **'ALARMS'** of the rear panel.

Open a RS232 serial session with the following settings:

- Speed : 9600
- Parity : None
- Data size : 8 bits
- Stop bit : 1

Type 'Return' and the following menu is displayed:



15.1 NETWORK SETTINGS

NOTA: Network addresses and network masks shall be input using the format: xxx.yyy.zzz.www (xxx: decimal value in range [0,255] ; yyy: decimal value in range [0,255] ; zzz: decimal value in range [0,255] ; www: decimal value in range [0,255]).

Menu description:

1 – Use of DHCP

DHCP service can be disabled (n = No) or enabled (y = Yes).

2 – Static IP address

To set the static IP address of the EC20S.

3 – Sub-network mask

To set the sub-network mask of the EC20S.

4 – Sub-network address

To set the sub-network address of the EC20S.

5 – Broadcast address

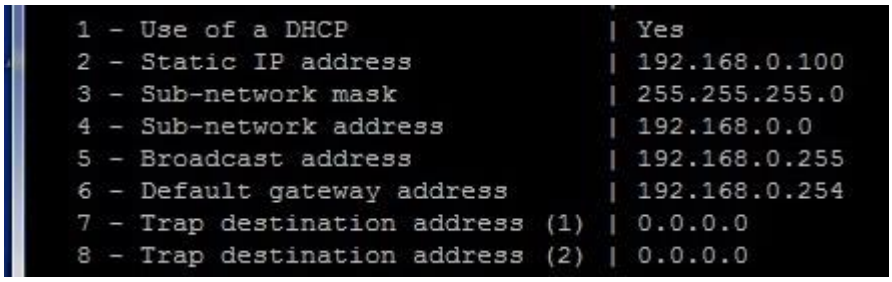
To set the broadcast address of the EC20S.

6 – Default gateway address

To set the broadcast address of the EC20S.

9 – Default network setup

To reset the network settings to the default settings:



NOTA: To validate the network settings, the EC20S shall be restarted using the menu:

0 – Reboot system

15.2 SNMP SETTINGS

NOTA: Network addresses and network masks shall be input using the format: xxx.yyy.zzz.www (xxx: decimal value in range [0,255] ; yyy: decimal value in range [0,255] ; zzz: decimal value in range [0,255] ; www: decimal value in range [0,255]).

Menu description:

7 – Trap destination address (1)

First IP address where the SNMP traps shall be transmitted.

8 – Trap destination address (2)

Second IP address where the SNMP traps shall be transmitted.

15.3 EC20S RESTART

The EC20S can be restarted using the menu:

0 – Reboot system

16. LEAP SECOND APPLICATION

The EC20S can apply a leap second to its UTC timescale as follows:

- In 'Operator' mode. The operator defines the leap second direction and the application date using the web interface (cf. 61 and 62).
- In 'Automatic' mode. The EC20S gets the leap second direction and the application date from the GNSS receiver.

Once a leap second is defined (in 'Operator' mode or in 'Automatic' mode), the NTP server updates its **leap indicator** (cf. 8.2.4).

In case of a positive leap second, at the time the leap second shall be applied, the time distributed by the Time Of Day messages on the **'NMEA'** output has the following sequence:

… 23:59:58 …

… 23:59:59 …

… 23:59:**60** …

… 00:00:00 …

… 00:00:01 …

In case of a negative leap second, at the time the leap second shall be applied, the time distributed by the Time Of Day messages on the '**NMEA'** output has the following sequence:

… 23:59:57 …

… 23:59:**58** …

… 00:00:**00** …

… 00:00:01 …

17. TECHNICAL FEATURES

The following technical features are minimum performance values. Enhanced performance options are available.

17.1 PHASE LOCK-IN AT POWER-UP

17.1.1 WARMING-UP

- Warm-up time for the local oscillator before tracking search : 5 minutes
- A subsequent fast tracking search brings the oscillator frequency close to the reference input signal frequency

17.1.2 LOCK-IN TIME WITH GNSS SIGNAL

- Output wander compatible with EN 300 462-4-1 (4.1) fig. 1 within 600 seconds after the '**Warming-up**' step
- Optimum stabilization after 2 hours
- Total locking time after power-up : < 30 minutes if it is not the first power-up

17.1.3 PHASE NOISE

- Typical, static conditions:

Frequency	**OXCO**	**Rubidium oscillator**
10Hz	-120dBc/Hz	-110dBc/Hz

100Hz	-135dBc/Hz	-130dBc/Hz
1kHz	-145dBc/Hz	-140dBc/Hz
10kHz	-150dBc/Hz	-145dBc/Hz
100kHz	-150dBc/Hz	-145dBc/Hz

17.1.4 HOLDOVER MODE

If all the enabled synchronization sources are unavailable, the EC20S transits into the '**Holdover**' mode in which it maintains the generation of the Time of Day messages and the synchronization output signals (1PPS, 10MHz).

- According to EN 300462 – 4 – 1 (§9.2) (Transmission and Multiplexing (TM) - Generic requirements for synchronization networks).
- **Stability**
  - With an OCXO : < ± $2x10^{-10}$/day
  - With a Rubidium oscillator : < ± $5x10^{-11}$/day

17.1.5 SHORT TERM STABILITY (ALLAN VARIANCE)

Time interval	**OXCO**	**Rubidium oscillator**
1 second	$1x10^{-11}$	$3x10^{-11}$
10 seconds	$3x10^{-11}$	$1x10^{-11}$
100 seconds	$3x10^{-11}$	$3x10^{-12}$

17.2 TEMPERATURE STABILITY

- With an OCXO

  Peak to peak, from 0 to 60°C : $1x10^{-9}$

- With a Rubidium Oscillator

  Peak to peak, from 0 to 50°C : $1x10^{-10}$

17.3 ELECTROMAGNETIC COMPATIBILITY

Complies with the requirements of the standards:

- EN 300386 V1.3.1 ed 2001:

  Electromagnetic compatibility and radio spectrum matters (ERM) – telecommunication network equipment - electromagnetic compatibility (EMC) requirements.

- EN 61000-6-1: ed 2001:

  Generic standards - Immunity for residential, commercial and light-industrial environments.

- EN 55022 ed 1998+ A2 ed 2003 Class A:

  Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement.

17.4 SAFETY

- EN 60950-1 : 04/2006 / A11 : 2009 / A1 : 2010 / A12 : 2011 CEI 60950-1 : 2005 / A1 : 2009 - Safety of Information Technology Equipment.

18. MAINTENANCE

18.1 PERIODIC VERIFICATION AND CALIBRATION

The EC20S operates and calibrates itself fully automatically. It does not require maintenance for a period of 10 years.

18.2 UPDATING THE SOFTWARE VERSION

See corresponding web pages to perform EC20S upgrades.

18.3 SPARE PARTS

Fuses 5x20 1A D1TD/HA20 : Manufacturer CEHESS/SHURTER, manufacturer part number 7030.3320

DC connector kit (female plug). : Manufacturer NEUTRIK, manufacturer part number NC3FXY

18.4 TROUBLESHOOTING

Some EC20S faults and anomalies can be diagnosed from:

- the visual signaling provided by the front panel LEDs (see 11.1),
- the ALARMS signaling provided by the alarm signals (see 11.2),
- status information available on the web interface (see 11),
- the events log available on the “Events Logging” web page (see 13.10),
- status information available from the SNMP interface (see 14).

18.5 CUSTOMER SUPPORT INFORMATION

In case of failures, please contact Spectracom Customer Service. Customer service is available by telephone at +33 (0) 1.64.53.39.80 (France), or +1.585.321.5800 (United States). Updated contacts information are available on our web site (www.spectracomcorp.com, For France: www.spectracom.fr) and refer to the “Support” page.

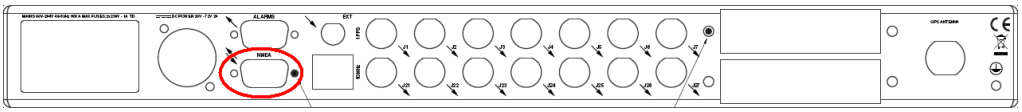
To speed up the diagnosis of EC20S faults, please send us the current EC20S configuration (see 13.13.3) and the events log (see 13.10.5). Thank you for your cooperation.

19. APPENDIX

19.1 NMEA CONNECTOR

19.1.1 PIN-OUT

Type of connector: SUB-D9 Female



The pin-out of the connector is described in the following table:

1	NC	**6**	NMEA_RS485_A
2	NMEA_OUT	**7**	NMEA_RS485_B
3	NMEA_IN	**8**	OTHER_RS485_A
4	GND	**9**	OTHER_RS485_B
5	GND		

The inputs/outputs of the SUB-D connector are defined in the following table:

NC	Not Connected
GND	Ground
NMEA_IN	Receive line input of the NMEA message. RS232 compatible level
NMEA_OUT	Transmit line output of the NMEA message. RS232 compatible level
NMEA_RS485_A **NMEA_RS485_B**	Transmit line output of the NMEA message. RS485 compatible level
OTHER_RS485_A **OTHER_RS485_B**	Receive line input of the NMEA message. RS485 compatible level

19.1.2 NMEA MESSAGE INPUT

Connector: connector SUB-D9

Input signal characteristic required:

Data and port parameters : ASCII characters, 9600 bauds, 8 bits, 1 stop bit, no parity.

Protocol : <Message> <CR> <LF>

Format : $GPRMC,hhmmss.ss,S,llll.ll,a,yyyyy.yy,a,x.x,x.x,ddmmyy,x.x,a*hh

- RMC = Recommended Minimum Specific GNSS/TRANSIT Data
- hhmmss.ss = UTC of emitter position fix. Must be date the last EXT_1PPS
- S = status of the emitter (A = OK, V=warning).
- llll.ll = Latitude of emitter, not used by the EPSILON CLOCK MODEL EC20S
- a = N or S (North or South) of emitter, not used by the EPSILON CLOCK MODEL EC20S
- yyyyy.yy = Longitude of emitter, not used by the EPSILON CLOCK MODEL EC20S
- a = E or W (East or West) of emitter, not used by the EPSILON CLOCK MODEL EC20S
- x.x = not used by the EPSILON CLOCK MODEL EC20S
- x.x = not used by the EPSILON CLOCK MODEL EC20S
- ddmmyy = UTC date
- x.x = not used by the EPSILON CLOCK MODEL EC20S
- a = not used by the EPSILON CLOCK MODEL EC20S
- *hh = Checksum

NOTA*:* When the status sent is V and /or the checksum sent is incorrect, the NMEA message is not used by the EPSILON CLOCK MODEL EC20S.

19.1.3 NMEA MESSAGE OUTPUT

Data and port parameters: ASCII, 9600 bps, 8 bits, 1 stop bit, no parity.

Protocol: <Message> <CR> <LF>

Format: $GPRMC,hhmmss.ss,S,llll.ll,a,yyyyy.yy,a,x.x,x.x,ddmmyy,x.x,a*hh

- RMC = Recommended Minimum Specific GNSS/TRANSIT Data
- hhmmss.ss = UTC of position fix
- S = status of the EPSILON CLOCK MODEL EC20S (A = OK, V=warning)

  IF the datation source is not valid THEN S='V'

  ELSE (the datation source is valid) THEN

  IF the EC20S is in '**Forced Holdover**' mode (Ref. 65) THEN S='A'

  ELSE (the EC20S is NOT in '**Forced Holdover**' mode)

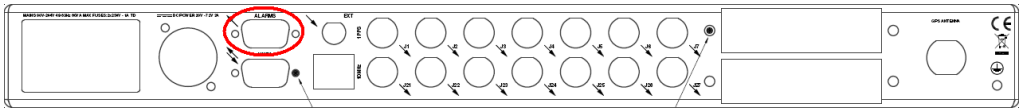
  IF the EC2OS Status (Ref. 3) is in '**OK**' or '**Warning**' state THEN S='A'

  ELSE (the EC2OS Status is in '**Alarm**' state) S='V'

- llll.ll = Latitude of fix
- a = N or S (North or South)
- yyyyy.yy = Longitude of fix
- a = E or W (East or West)
- x.x = not used, set to 0
- x.x = not used, set to 0
- ddmmyy = UTC date
- x.x = not used, Set to 0
- a = Set to E
- *hh = Checksum

19.2 ALARM & RS232 SERIAL PORT CONNECTOR

Type of Connector: SUB-D9 Female



The pin-out of the connector is described in the following table:

1	RL_URG_C	**6**	RL_URG_T
2	CTRL OUT	**7**	RL_URG_R
3	CTRL IN	**8**	RL_NON-URG_R
4	RL_NON-URG_C	**9**	RL_NON-URG_T
5	GND		

The inputs/outputs of the SUB-D connector are defined in the following table:

GND	Ground
CTRL IN & OUT	Can be used to connect a Serial Terminal port to manage Network configuration without Network RJ45 port.
RL_URG_C	Urgent Alarm – Common contact
RL_URG_T	Urgent Alarm – Active opened contact
RL_URG_R	Urgent Alarm – Active closed contact
RL_NON-URG_C	Non-Urgent Alarm – Common contact
RL_NON-URG_T	Non-Urgent Alarm – Active opened contact
RL_NON-URG_R	Non-Urgent Alarm – Active closed contact

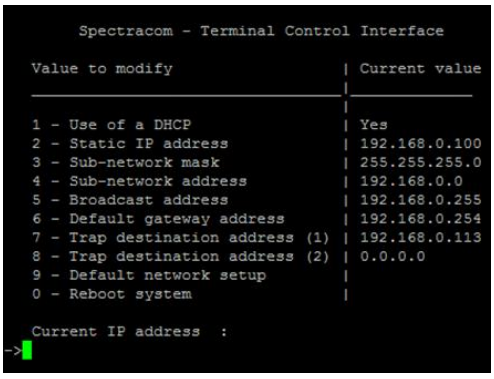
To get a closed contact when an Urgent Alarm (see 11.2.1) is raised, 1 and 7 pins shall be used.

To get a closed contact when a Non-Urgent Alarm (see 11.2.2) is raised, 4 and 8 pins shall be used.

To get an opened contact when an Urgent Alarm (see 11.2.1) is raised, 1 and 6 pins shall be used.

To get an opened contact when a Non-Urgent Alarm (see 11.2.2) is raised, 4 and 9 pins shall be used.

Additional RS232 Serial port function: Accepts commands to locally configure the IP network parameters for initial connectivity - Character structure: ASCII, 9600 baud, 1 start, 8 data, 1 stop, no parity. Please, use only a dedicated cable with Pin 2,3 and 5 to use this feature independently – separated from Alarm contacts.



19.3 DC CONNECTOR

Type of Connector : XLR Male

Use a XLR Female connector to supply the product.

1	Positive Pin
2	Negative Pin
3	GROUND

This DC input is isolated, so a positive or negative power supply can be used.

	Positive Case	Negative Case
Pin 1	+24V	0V
Pin 2	0V	-48V
Pin 3	GROUND	GROUND

REVISION HISTORY

Revision Level	Date	Description
A0	08/10/08	First Release
A1	09/12/08	Web Page Updated
A2	09/09/09	Mute Mode, Events logging, Configuration Save added
Rev1	07/01/13	NTP and DC Connector
Rev2	12/02/14	Multi-GNSS source
Rev3	25/09/14	Information of the type of embedded oscillator + NTP Stratum Management
Rev4	06/03/2015	NTP Stratum values modified
Rev 5	20/03/2015	Mute “Disable” mode has changed Additional RS232 port description
Rev 6	11/06/2015	Mute modes description –Leap Second management indication

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