EPSILONCLOCK

MODEL EC22S

DUAL GPS RECEIVER

USER'S MANUAL

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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.

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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.

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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.

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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.

Table of Contents

1 Introduction

This manual contains information and warnings that must be understood and followed by the customer to ensure reliable operation and long service life. It is applicable to EPSILON CLOCK Model EC22S with software versions 1.04b or higher.

1.1 Safety Precautions

- **Before switching on** the unit, ensure that it is compatible with the local mains supply. (Refer to *Setting the EC22S 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.*

1.2 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).

The unit must be disconnected from all power sources before carrying out any adjustments, replacements, maintenance, or repair.

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.

For special hot plugging removal, please follow the instructions *Maintenance*.

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

1.3 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), +33 (0) 1.64.53.94.29 (France direct), or +1.585.321.5800 (United States).

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

NOTE: If equipment is returned 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 EC22S Base Unit with two Clock modules
- Two 48 VDC Bulgin power plugs
- Two AC leads
- User's Manual

1.4 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), +33 (0) 1.64.53.94.29 (France direct), or +1.585.321.5800 (United States).

1.5 General Description

The EPSILON CLOCK 22S is a fully redundant GPS Clock, providing the best cost-effective solution for reliable, and 24-hour-a-day, uninterrupted applications. The EC22S is particularly well-suited for broadcast operators requiring high quality, reliability, and availability.

The Spectracom ECC22S is well dedicated to digital broadcast applications using SFN (Single Frequency Network) mode. The EC22S 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 22S provides accurate time and frequency synchronization.

Key parameters are:

- Total redundancy — dual High performance OCXO disciplined by GPS through Epsiltime© smart predictive slaving algorithm

- Smart switching with glitch-less Clock switchover and very low phase jump, in case of Clock failure

- High performance holdover stability (2.10^{-10}/day)

- AC and 48VDC power supply redundancy

- Hot-plugging servicing

- Up to 8 x 1 PPS outputs

- Up to 8 x 10 MHz outputs

- 1 PPS and 10 MHz signal are phased locked, which helps prevent phase jump and wander between time and frequency signals

- Remote management by SNMP/HTTP, through Ethernet port

The quality of the internally generated reference Clock is related to the OCXO performance and the high performance tracking algorithm:

	Accuracy in GPS slaving	Holdover stability	Holdover short-term stability
OCXO	$< \pm 2\text{x}10^{-12}$ (24h)	$< \pm 2\text{x}10^{-10}$ /day	$< \pm 3\text{x}10^{-11}$ /100 sec

Table 1 - 1. Frequency accuracy and stability.

1.6 Integrated Remote Control Interface

The EC22S contains an Ethernet IP interface so that it can be fully controlled from a remote location.

The EC22S includes its own HTTP web server so that a simple navigator is sufficient to configure and retrieve status from the equipment. Application and system software release is also possible through this interface.

Moreover, network supervision can be achieved with SNMP protocol, especially traps sent to a programmable IP address.

1.7 Front and Rear Panels
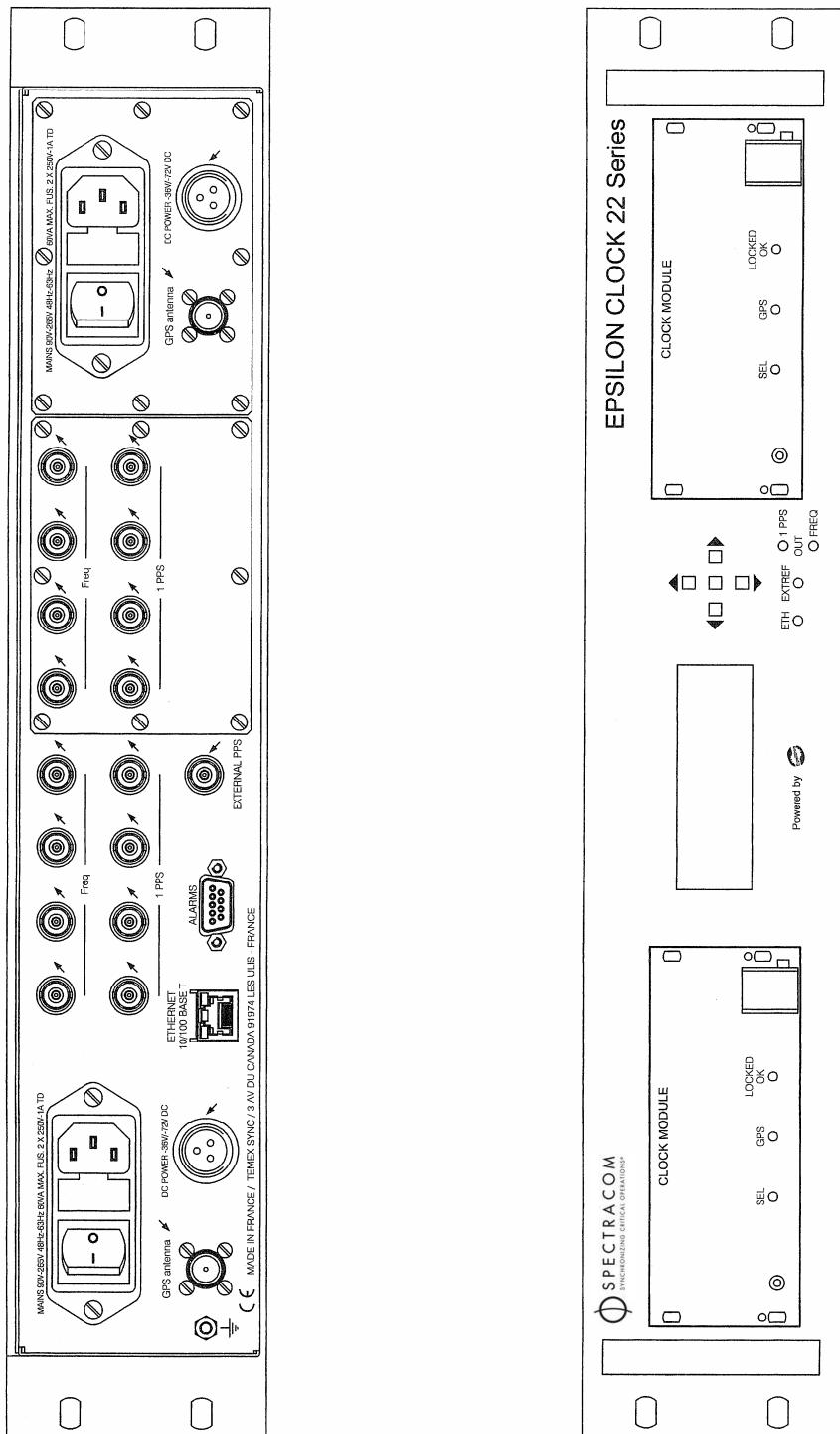
Figure 1 - 1.EC22S front panel and back panel.

Functions of the EC22S include:

- Clock generation (including GPS reception, internal oscillator, power converters) on the two Clock modules

- Clock switching for right/left selection of distributed Clock

- Clock distribution and monitoring

- Management

1.7.1 EC22S Front Panel LEDs

1.7.1.1 Clock Module LEDs

SEL	
Green	Indicates the current selected module providing distributed frequency. Green on the Master module, off on the Slave module.

GPS	
Green/ Red	Indicates the current status of the GPS reception. Green for reception OK, red for alarm.

LOCKED/OK	
Green/ Red	Indicates the current status of the tracking algorithm. Red during warm-up, tracking start, and green after locking to a reference input. Orange indicates non-urgent alarm

1.7.1.2 Front Panel LEDs

ETH	
Green	Indicator of Ethernet connection. Green indicates good physical connection with network. LED is off if Eternet network is not connected.

EXTREF	
Green/ Red	Alarm indicator on External 1PPS input. Red if input enabled and in alarm, green if input enabled and OK.

OUT FRQ	
Green/ Red	Indicates the current status of the 4 (or 8) x distributed frequency outputs. Red if one or more channels are not present. Should always be green.

OUT 1PPS	
Green/ Red	Indicates the current status of the 4 (or 8) x distributed 1PPS. Red if one or more channels are not present. Should always be green.

On normal operation, all LEDs should be green. Only available reference input sources should be enabled. Only available power alarms should be enabled.

1.7.2 EC22S Back Panel Connectors

AC POWER (90 to 230 VAC)	
Schaffner	AC power entry with integrated fuse

DC POWER (-48 VDC)	
Bulgin circular	Nominal -48 VDC power supply input. One Input and DC/DC converter per Clock module provides redundancy

Freq (4 + option 4)	
50 Ω BNC	Distributed sinus frequency outputs

1PPS (4 + option 4)	
50 Ω BNC	Distributed One Pulse Per Second outputs

Ethernet 10/100 BaseT	
RJ45	Network connectivity.

GPS Antenna	
50 Ω TNC	Antenna inputs for GPS receiver and remote active antenna 5VDC supply

EXTERNAL PPS	
50 Ω BNC	External 1PPS reference input

ALARMS	
SubD 9	Dry contacts

GROUND	
⏚	Casing grounding.

1.8 Dimensions and Weight

Width: 19" (441 mm), without bracket
Height: 2 U (88 mm).
Depth: 400 mm + 40 mm (front panel handles).
Weight: <6.5 kg.
Compatiblity: 19" rack

1.9 Operating Environment

- Operating temperature: 0 to 50°C
- Storage temperature: -40 to 85°C
- Relative humidity: 95 % non-condensing
- Electromagnetic compatibility: in accordance with EN30386/EN55022/EN60950

1.10 Power Supply

1.10.1 DC Power Supply Input

- Nominal DC input voltage: -48 Volts
- Normal variation: -40 to - 57 Volts
- Transitory variation: -37 to - 72 Volts
- Nominal DC input voltage conditions: -48 Volts DC
- Maximum Total Power consumption: < 55 W

- Two independent input, two connectors
- Protection against polarity reversal
- -48V and 0V DC input wires are not ground referenced
- Every module protected by a PolySwitch fuse (automatically rearmed)
- Detection of power input presence on each connector, information available on LCD display or with remote control software, threshold level of detection between -35 and -40 Volts

1.10.2 AC Power Supply Input

- Nominal AC input voltage: 90 to 264 Volts AC / 48 to 63 Hz
- Two independent power input, two connectors/switches
- On each switch: 2 fuses: D1TD 2A 5x20
- Detection of power input presence on each AC/DC converter, information available with remote control software

1.10.3 Redundancy

Power supply redundancy exists at two levels: between AC and DC and between Left and Right module converters.

If the AC Input power supply is present, DC input is internally disconnected. If AC input fails, DC input switches over to supply the equipment.

There is one AC converter and one DC converter on each Clock module. The power supply for distribution and management is a combination of sources from both modules.

1.11 Terminology

GPS	Global Positioning System
OCXO	Oven Controlled XTAL (Crystal) Oscillator
Rb	Rubidium oscillator
S/A	Selective Availability
TRAIM	Time Receiver Autonomous Integrity Monitoring
UTC	Universal Time Coordinated
1PPS	One Pulse Per Second
1 PPS driver	Pulse signal obtained through division of the frequency driver
Holdover	If the reference input signal is lost, the EPSILON CLOCK® maintains the generation of information and of time and frequency signals.
Reliability	Concerns the positioning mode of the antenna. In automatic mode, the EPSILON CLOCK® calculates the position of the antenna and, after testing the result, imposes the reliable position on the internal GPS receiver. The receiver therefore functions in GPS 0D reception mode. The EPSILON CLOCK® is synchronized by following at least one satellite.
Frequency driver	Frequency signal generated by the built-in oscillator.
Reference input	Time and frequency source used by the EPSILON CLOCK®.
IERS	International Earth Rotation Service.

2 Technical Features

2.1 Timing Reference Generation and Characteristics

The following characteristics are minimum values. Enhanced performance options are available.

2.1.1 Clock Generation

2.1.1.1   Clock Type

- Type of local oscillator: OCXO High Perfromance
- Clock generated from GPS reference
- Loop filter type: Kalman predictive algorithm

2.1.1.2   Holdover Mode

- According to EN 300 462-4-1 (9.2)
- Stability $< \pm 2 \times 10^{-10}$/day.

2.1.1.3   Short Term Stability (Allan Variance)

- 1s: 1×10^{-11}
- 10s: 3×10^{-11}
- 100s: 3×10^{-11}

2.1.1.4   Temperature Stability

Peak to peak, from 0 to 60°C: 1×10^{-9}

2.1.2 GPS Reception

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

2.1.3 1PPS external synchronization Input

- TTL level
- Input impedance: 50Ω
- 50Ω BNC connector

2.1.4 Phase Lock-in at Power-up

2.1.4.1   Warming-up

- Warm-up time for the local oscillator before tracking search: 10 minutes
- A subsequent fast tracking search brings the oscillator frequency close to the reference input signal frequency

2.1.4.2   Lock-in Time with GPS signal

- Output wander compatible with EN 300 462-4-1 (4.1) fig. 1 in: 600 s max after warming-up
- Optimum stabilization after 2 hours
- Total locking time after power-up: < 30 minutes if not a first time power-up

2.1.5 10MHz output

- Number of outputs: 8.
- Port type: 50Ω BNC coaxial.
- Level: 12+/-2dBm, with a 50Ω load.
- Sinewave signal, -35dBc harmonic distortion

2.1.5.1   Phase Noise

Typical, static conditions:

10Hz	-120dBc/Hz
100Hz	-130dBc/Hz
1kHz	-140dBc/Hz
10kHz	-145dBc/Hz
100kHz	-145dBc/Hz

2.1.6 1PPS Output

- Number of outputs: 8
- One female 50Ω BNC coaxial connector per output
- Accuracy to UTC, GPS locked: +/- 25ns (1σ)
- Accuracy to UTC instantaneous (phase locked): +/- 35ns max (peak to peak)
- Phase jump on switching (phase locked): +/- 70ns max (peak to peak)

Holdover (constant temperature, 24 hours GPS locked)	
after 4 hours	0.8 µs
after 1 day	12 µs

- Port type: 50Ω coaxial.
- Level: TTL/5V, with a 50Ω load.

2.2 Auxilliary Connector Signals

2.2.1 Alarm Connector

- Relay contact
- Maximum switching power: 30 W, 62.5 VA (resistive load)
- Maximum switching voltage: 110 VDC, 125 VAC
- Maximum switching current: 1 A
- Connector: 9-pin female SubD

2.2.2 RS232

RS232 output for Time Of Day (TOD) information.

- ASCII mode: asynchronous RS232C, 9600 bauds, 8 bits, 1 stop bit, no parity
- NMEA mode: asynchronous RS232C, 4800 bauds, 8 bits, 1 stop bit, no parity
- 9-pin SubD female connector

The RS232 output in ASCII mode message is:

- Protocol: <Message> <CR> <LF>

- Format, selected with same command than front panel one on http server:

o	Day/Month/Year	Hour: Minute: Second Source	e.g.:	20/03/1996_21:02:05U
o	Month/Day/Year	Hour: Minute: Second Source	e.g.:	03/20/1996_18:14:38L
o	Day of Year/Year	Hour: Minute: Second Source	e.g.:	317/1996_18:16:20L

The "Source" byte holds one ASCII character which codes the reference of the selected time scale:

N   No reference (when EC22S is not yet locked on GPS)

U   UTC reference

G   GPS reference

L   Local time

M   Manual (only authorised in "Force holdover" mode or when the EC22S is not lock on a reference source)

- Output period: 1 message per second.

- Output synchronization: sent at 300 ms ±100 ms after the 1pps output signal.

2.3 Network Connectivity

2.3.1 Ethernet Interface

- RJ45 connector
- 10/100 BaseT signal

2.3.2 IP Address Assignment

- DHCP automatic assignment
- Or fixed IP address

2.3.3 IP Address Exclusion

The IP address sub-set: 10.253.253.0 cannot be assigned either manually or through DHCP to the EC22S interface because it will interfere with the mini IP network inside EC22S.

2.3.4 Protocols

Transfer Control Protocol and Internet Protocol (TCP/IP),

IP address setting: DHCP protocol.

The EC22S includes a web pages server with HTTP protocol for configuration and status.

Configuration and status parameters are manageable through SNMP protocol. The MIB includes a sub-set of configuration and status parameters. SNMP traps are sent to the network on event trigger.

2.4 Control PC for Web Interface

OS: Windows or Linux
Internet Browser: tested with Firefox 1.5 and Microsoft IE 6.

2.5 EMC

Complies with the requirements of the standards:

EN 300386 V1.3.1 ed 2001

EN 61000-6-1: ed 2001

EN55022 ed 1998+ A2 ed 2003 Class A

3 Putting the EC22S Into Operation

The EC22S can be installed in a rack or used as-is.

- Leave free space of a few centimeters under the unit, in order to facilitate natural air flow from bottom to top of the EPSILON CLOCK MODEL EC22S.

- Connecting cables for signals and power supply should be secured to locks provided for this purpose.

- Connect the GPS antenna (refer to *GPS Antenna Installation*).

- Connect a ground lead from the earth pin on the EC22S back panel to the frame of the rack.

3.1 Left and Right Clock Modules

The two Clock modules may be differentiated as left and right Clock modules. Left and right are as seen from the operator's point of view, standing in front of the EC22S front panel.

3.2 Powering Up

The EC22S can be powered from an AC source, from a DC source, or from both. Each side (Left or right) should be connected to at least one source to power the corresponding Clock module.

For full redundancy, connect two DC power cables to the -48VDC connectors and two AC power cables to the AC connectors. Check the polarity of the power signal before connecting it (refer herein and to back panel labels for the pin-out).

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

During power-up, check the initialization sequence process (OS boot) on the LCD display. At the same time, all LEDs should indicate orange, then green and red, then take their functional colors:

- "GPS Receiver", "Locked-OK" LEDs should be red on the Clock modules. The "SEL" LED on the Clock modules should be green on the Master module and off on the Slave module.

- "Ref Out" LEDs should be red below the touch pad.

For a standard configuration (GPS reference), after the system initialization sequence, the GPS receiver locks to the satellites (GPS LED on Clock modules switches from red to green), the internal oscillator warms-up, and the oscillator tracking operation gets locked (Locked-OK LED on the Clock modules switches from red to green). The whole process may take about 15 minutes.

3.3 Network Connection

Factory setting for the IP address is 192.168.0.100 in static mode.

Check the currently allocated IP address displayed on the front panel LCD display (Network Status). If no IP is allocated, no display is available.

Connect the control PC through a crossover Ethernet cable or a hub. Set the PC IP address to an address belonging to the same sub-network (e.g. 192.168.0.101).

On the PC, open a web browser page at http://192.168.0.100. Click to enter the web interface. Go to "System Setup">"Network Setup" web page. Type in password (factory set at: "pwd"). Modify the mode of IP address allocation (static or DHCP) and the static address as necessary.

If the EC22S is already DHCP configured and if no DHCP server is available, you cannot connect a PC to access EC22S network configuration pages. It is then possible to reset the IP address and mode to the factory setting using the "Configuration>Reset IP address" menu on the front panel LCD/touch pad.

3.4 Configure the EPSILON CLOCK Model EC22S

The EC22S is configured through an Ethernet network with a web browser.

After boot sequence, open a browser at the EC22S IP address (http://192.168.0.100) and input the setup parameters. Enable GPS or External Reference source as a minimum.

During installation, you may check the quality of the GPS reception on the Clock status web page. The GPS status tables show the number and quality of received satellites. The minimum number of received satellites should be four (out of 12).

For a standard configuration (two GPS sources), if no external reference is available, disable the External reference in the "Time and Reference Setup" page with priority level setting to "disabled".

Depending on the available power sources, enable or disable the Power Alarms in the "Power Setup menu".

4 Operation

4.1 General Information

4.1.1 Control of operating functions

4.1.1.1 EC22S Control

The EC22S may be controlled through a web interface (Ethernet/RJ45) with a remote PC or through the keypad/LCD display for some complementary configuration.

4.1.1.2 Front Panel LCD Display and Keypad Control

The front panel is managed by the PC board for local control. It allows for minimum configuration when no Ethernet connection is set (e.g. DHCP mode without DHCP server), and for left and right monitoring of AC and DC input power.

4.1.1.3 PC Management

The overall management of the EC22S is achieved by a sub-compact PC board running under Linux. It exchanges status with the two Clock modules and manages Distribution and Clock switching.

On one side, it is connected to the public IP network, and on the internal side to a micro-IP network including the two Clock modules. The internal network uses 10.253.253.0 IP address subset. This subset cannot be used on the network side.

4.1.2 Network Configuration

The IP address of the EC22S cab be assigned through DHCP protocol or manually. The assignment mode is programmable through the web interface and reset through the LCD/keypad interface.

The assignment mode is saved when switching off.

The currently assigned IP address can be read on the LCD display.

4.1.2.1 DHCP IP Assignment

If DHCP mode is selected, the address is assigned only by a DHCP server on the network.

If there is no DHCP server on the network, the IP address can be reset to the 192.168.0.100 fixed factory setting through the LCD/keypad interface in order to connect a PC that is set accordingly.

4.1.2.2   Web Interface IP Assignment

When the unit is connected to a PC, configuration is made in the corresponding "System Setup>NetworkSetup" web page. If DHCP is chosen, the address is assigned at start-up by a DHCP server on the network. If no DHCP is chosen, the address is entered manually in the IP address field.

4.1.3 Redundancy

4.1.3.1   Redundant Functions

Two Clock modules provide redundancy for important functions of the EC22S. They include Clock generation, GPS reception, AC power supply converter, and DC/DC power converter.

4.1.3.2   Redundancy on AC and DC Power Supply

The EC22S incorporates two -48VDC inputs and two 95/230VAC inputs.

On each Clock module, there is one AC/DC and one DC/DC converters which supply power for the whole equipment (Clock switching, Distribution, Management) through a wire OR with the other Clock module. That means that the AC switch located on the same side of the equipment than the Clock module must be "on" to power the module. In the same manner, the DC plug located on the same side must be connected to power the corresponding module.

On one Clock module, either AC or DC power or both may be used to supply the EC22S. Priority is given to AC input.

If one power supply or a Clock function fails, the corresponding Clock module may be switched off and removed for repair while the other one remains active and maintains Distribution.

4.1.3.3   Redundancy on Clock Generation

Both Clock modules are equivalent as Clock and 1PPS generator. The Clock module that is the source of the distributed signals is designated "Master". It is locked on the input reference (GPS or auxiliary external 1PPS reference).

The second Clock module is designated "Slave" and is locked on the "Master" module.

4.1.4 Clock Generation on Clock Modules

4.1.4.1   Reference Sources and Selection

On every Clock module, reference sources for oscillator tracking include 1PPS from the integrated GPS receiver (1 per module) and External 1PPS reference from BNC input (1 common connector).

Automatic selection of the source is made according to Enable, Source Forcing, Priority Configuration Parameters, and Reference Source Alarm status.

4.1.4.2   Tracking algorithm

The algorithm is a phase/frequency locked loop-type tracking algorithm. The phase measurement filter uses Kalman computation.

The tracking process involves several states:

- Warm-up period after power-up during which the oscillator control is stationary.

- Fast tracking for coarse oscillator control adjustment on tracking algorithm start-up.

- Accurate tracking with long-time constant filtering when the reference signal is present. The oscillator is locked on the reference ("Locked-OK" LEDs switch to green on Clock module front panel).

- Holdover when reference signal is absent (e.g., GPS loss of satellites, during input switchover). Oscillator control remains steady on the last valid value.

- Degraded state: Hidden state in which tracking was accurate and lost its reference input. Before declaring urgent alarm on the EC22S, a delay of a few minutes (factory programmable) is used to confirm the loss of the reference source and the switch to the holdover state with alarm triggering.

4.1.5 Clock Switchover

The two Clock modules generate and maintain a local Clock and 1PPS. When necessary (lost reference, module breakdown), the Clock may get its distribution from the Slave module, which becomes the Master module.

There is no right/left preference for Master module selection. The rule is that no switchover is performed as long as the Master is able to supply an accurate frequency and 1PPS.

Phase jump is minimized while switching from Master to Slave.

4.1.6 Distribution Monitoring

All channels are monitored so that a drop of signal at the output is detected and an alarm (Outputs Frequency and 1PPS) is generated.

4.1.7 GPS Reception

An integrated module takes care of the GPS reception. All related configuration parameters and reception status are available through the web interface.

The operator may choose among three operating modes:

- **Manual or fixed**: The operator sets manually the accurate coordinates for the receiver. The receiver can then start immediately in an accurate timing reception mode. This mode needs only one satellite.

- **Automatic**: The receiver starts computing its polar coordinates and after 1 hour switches to the accurate timing mode. The first step requires the reception of 4 satellites to compute the coordinates.

- **Mobile**: The receiver expects the antenna to move permanently and evaluates coordinates continuously. It is not then able to switch to the most accurate timing mode.

4.1.8 Equipment Start-up

At start-up, after OS initialization, the software retrieves the last configuration and starts programmable hardware. Distributed signals are generated with a degraded performance first and with required performance after oscillator locking.

4.1.9 Clock Module Hot Plugging

A Clock module can be unplugged and inserted while the EC22S distributes frequency and 1PPS signals. At least one Clock module is needed to supply power and generate a Clock signal.

The operator must first check that the module to be extracted is a Slave module. If not, the operator should force-switch it to Slave and then extract the module.

CAUTION: In order to execute a safe extraction, a procedure must be executed. On the LCD/keypad interface, go to the "Extraction" item:

Extracting the Slave module brings minimum disturbance on the distributed signal.

If the Clock module to be extracted is powered by AC input, for safety reasons, switch off the corresponding AC input.

If the operator pulls out the Master Clock without switching off the AC power), Clock switchover will execute and normal distribution operation will resume.

4.2 Front Panel Control

4.2.1 Navigation with Keypad and LCD Display

Four direction micro-switches and one central "enter" key drive navigation through the menus.

The cursor moves using the arrows keys and the selected field is shown with brackets [ ].

Vertical scrolling is necessary if the size of text exceeds the screen capacity (a down arrow symbol shows if this is the case).

To modify a programmable field, use the direction keys to reach that field, then click "enter", then select "content" with the left/right key.

To go back to the main menu screen, bring the cursor to the "Back" field and click "enter".

4.2.2 Screens

4.2.2.1 Main screen

```
30/05/2007 11:08:48U

[Clock Status]

-Setup-

-Extraction-
```
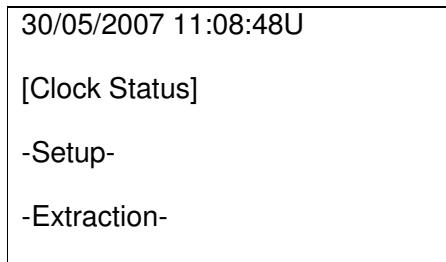
Select the desired operation in the main menu screen with the up/down keys and then click the "enter" key to enter the operation screen.

Time is displayed according to the "Time Reference" parameter.

U stands for UTC referenced, L for Local (UTC + Local Time Offset), G for GPS, N for None (time never initialized), and M for Manual (no GPS and manually set).

4.2.2.2 Clock Status screen

	Left	Right
	Left	Right
M/S	Master	Slave
AC	Alarm	Alarm
DC	OK	OK
		[Back]

Useful additional information is displayed on the front panel when an operator wants to check presence of power supplies (AC and DC), with a reminder of which Clock module is the source of the distributed signal (Master).

Unlike the web display, the LCD display power alarms are never disabled, so that an operator can always check the power supply connection.

4.2.2.3 Network Status screen

```
IP: 172.16.207.33

GW: 172.16.207.254

MK: 255.0.0.0

                    [Back]
```

The screen displays the currently allocated IP address, coming from a DHCP server or as set in static parameters.

4.2.2.4 Setup screen

```
-Distribution mode-

-Reset IP address-

                [Back]
```

4.2.2.5 Distribution mode screen

```
Distribution mode:

.Automatic.

            [Back]
```

Distribution mode setup manages which Clock module is the Master Clock.

With the Up/Down arrows, bring the cursor to the "Automatic" field. Then click the "enter" key to select the required mode with the Left/Right arrows.

You can select from "Automatic, Left forced, Right forced" modes. When in "Automatic" (normal mode), hardware and software select which Clock is the Master Clock. During servicing, an operator may want to use one particular side as the Master and extract the other one. In this case, the Master is forced.

4.2.2.6   Reset IP address screen

```
Reset IP address:

IP: 192.168.0.100

[Reset]

                           [Back]
```
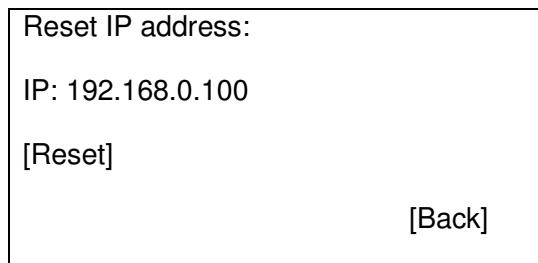
This function may be useful in case the equipment is in DHCP mode and connected to a network with no DHCP server. Executing "Reset" programs the EC22S to the default 192.168.0.100 IP address. You can then connect a PC with a crossed RJ45 cable and modify the IP address using the web page (System setup>Network setup).

4.2.2.7   Extraction screen

```
Slave on Right Side

Safe to be extracted

-Halt-

                      [Back]
```
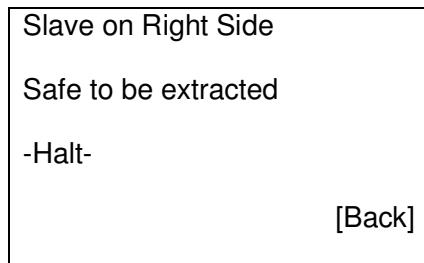
The Extraction screen relates to the extraction of a Clock module for repair and guides the operator through the process.

For an extraction, be careful to:

• Extract the Slave Clock only. If a Master Clock is extracted while distributing, a glitch may occur on the distributed signals

• Switch off the AC power on the side of the Clock module to be extracted. While it will not harm the equipment if done incorrectly, repeated removal with AC power applied may damage the hardware over time.

The first message displays the status: the Slave Clock is safe to be extracted. If the Clock that will be extracted is designated as the Master, go to the "Distribution mode" setup screen and select "Forced" for the Clock that will remain in the equipment.

Go back to this screen and proceed with [Halt] to stop the module software. Move the cursor to the "Halt" field. Click the "enter" key. A "Halt in progress" message is shown during software shut-down operations The "Halt" screen is then displayed.

4.2.2.8   Halt screen

```
┌─────────────────────────────┐
│ Switch off Left             │
│                             │
│ power and extract           │
│                             │
│ Left Clock                  │
│                             │
│                     [Back]  │
│                             │
└─────────────────────────────┘
```
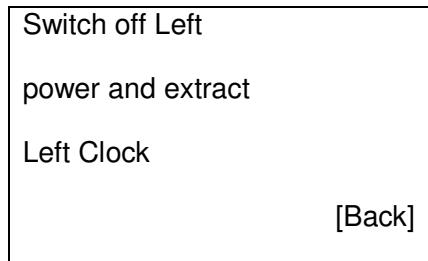
NOTE: Halting the machine before shutting it down helps prevent damage to the unit and provides for smooth operation. Spectracom strongly recommends always halting the unit before shutdown.

4.3 Alarm-Time Connector

This SubD9 connector may be used to provide a control switch (dry relay contact) for any alarm display. There are two relays: Alarm and Warning. According to the selected wiring for the alarm monitor (pins 1-6 or pins 1-7), a relay can be closed when the alarm is on, or open (refer to the pin-out of the SubD connector).

An RS232 signal provides a means to get time in a printable format (Time of Day in ASCII format or NMEA format).

5 Web Interface

5.1 General Description

When connecting to the EC22S IP address with a web browser (HTTP protocol), the user can check the EC22S status, modify setup parameters, and perform software updates.

- Status web pages are free to access for any user.

- Set-up pages require a password: "pwd" is the factory default.

- The protocol used for accessing the EC22S is HTTP.

5.2 Web Pages

5.2.1 Welcome Page

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

5.2.2 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 password)

        ii. SNMP setup: SNMP parameters and traps enable (protected by password)

       iii. Logout: Logout from the web site

    b. Clock setup

         i. Time and Reference Setup: Setting the time and synchronization parameters (protected by password).

        ii. GPS Setup: GPS reception parameters (protected by password)

       iii. Power Setup: Enable of power supply monitoring alarm (protected by password)

    c. Clock Status: Summary of status and alarms of the EC22S

    d. Tools

         i. Events Logging: Display of events history

        ii. Versions: Display of current version of software parts

       iii. Software upgrade: Upgrading software

       iv. Reboot: Per module hardware reset

Header time information is provided by the EC22S. A letter is displayed near the time message, according to the setting of the display mode and source reception (GPS) availability:

U: UTC time reference

G: GPS time reference

L: UTC time corrected by programmed offset

N: No time reference (no GPS information since start-up)

M: Manual reference (time has been set manually in "Time and Reference Setup menu")

5.2.3 Clock Status page

SPECTRACOM

Synchronizing Critical Operations™
05/11/2007 12:55:21 U

System Setup	Clock Setup	Clock Status	Tools

Clock Status

Global Status	Alarm
SFN Status for Master Clock	Off

Clock Modules

	Left	Right
Master/Slave	Master	Slave
Clock Module Status	Alarm	Warning
Synchronisation Source	GPS	None
Oscillator Control Voltage (V)	4.094	4.148
Tracking Status	Tracking Search	Holdover

Alarms

GPS

	Left	Right
GPS lock	Ok	Alarm
Antenna	Powered	Unpowered
GPS module	Ok	Ok

Reference Sources

	Left	Right
External 1pps	Disabled	Disabled
Optional reference	Disabled	Disabled

Internal

	Left	Right
Internal Oscillator	Ok	Ok
Internal 1pps	Ok	Ok

Synchronization

	Left	Right
Phase Accuracy	Ok	Alarm
Frequency Accuracy	Ok	Alarm

Power Supply

	Left	Right
AC	Ok	Ok
DC	Alarm	Alarm

Outputs

Frequency	Ok
1pps	Ok
Optional Outputs	Disabled

GPS Status Left						
GPS Longitude	0° 00' 00" 000ms E		ID	21	24	30	31
GPS Latitude	0° 00' 00" 000ms N		SNR	43	43	42	42
GPS Altitude	0.00 m		ID	6	16	7	5
Self Survey	Pending		SNR	41	41	40	38
Nb of locked Satellites	10						

GPS Status Right						
GPS Longitude	0° 00' 00" 000ms E		ID	0	0	0	0
GPS Latitude	0° 00' 00" 000ms N		SNR	0	0	0	0
GPS Altitude	0.00 m		ID	0	0	0	0
Self Survey	Pending		SNR	0	0	0	0
Nb of locked Satellites	0						

This page is automatically refreshed every 10 seconds.

The "Alarm" label indicates an urgent alarm during which the distributed signal does not comply with its specifications for some reason: no signal, tracking not locked, no reference source.

"Warning" means that the detected problem does not affect the distributed signal quality but the operator should take action to solve the problem. For example, a single failed Clock does not prevent signal from being distributed. The remaining Clock will switch over.

Common status
'Global Status': Global working status of EC22S

    a. Ok (Green):   All functions run as expected, no alarm in EC22S

    b. Warning (Orange):   EC22S distributes valid signals referenced to a valid input (GPS or External), but alarms remain (on Slave Clock module, on second reference input). Maintenance is required.

    c. Alarm (Red):   EC22S does not distribute a valid signal (GPS input loss, any other important failure).

'SFN status for Master Clock' (Gray): Indicates wether Master Clock is in SFN mode or not

    a. On: Master Clock is in SFN mode; means that the 10MHz frequency signal is cycle locked to the 1PPS signal (10 000 000 cycles from the 10 MHz equals 1PPS period) and provides a frequency accuracy better than 1×10^{-8} and a phase accuracy better than 1μs

    b. Off :   Master Clock is not in SFN mode

Clock Modules status
'Master/Slave' (Gray): Clock module distribution status

    a. Master: The Clock module is currently supplying the distributed signals.

b. Slave: The Clock module is available as spare and should be synchronized on the Master module.

c. Unknown: Communication breakdown between Management module and Clock module

'Clock Module Status': Global status of the corresponding Clock module

a. Ok (Green):   Signal is generated according to configuration, synchronized on valid reference input

b. Warning (Orange):   Signal generation supplies valid signal locked to a valid reference input, but presence of alarm on other reference input, or second power supply if enabled

c. Alarm (Red):   Quality of generated signal against reference input is not guaranteed

d. Missing (Red):   Communication breakdown between Management module and Clock module

'Synchronization source' (Gray): Selected synchronization source for the module

a. GPS: 1PPS signal of the GPS receiver

b. External: External 1PPS signal (BNC rear panel input)

c. Master Clock: 1PPS signal delivered by the Master Clock module (only for Slave Clock module)

d. None: EC22S in *Holdover* or *Forced Holdover* mode

'Oscillator control voltage (V)':   Control voltage of the internal oscillator (in volts)

a. Ranges from 0V to 8V

b. Generates an Internal Oscillator alarm when the value reaches 0V or 8V, meaning that the EC22S is no longer able to drive the Internal Oscillator.

'Tracking Status': Slaving algorithm status

a. Warming up: The EC22S internal oscillator is warming up

b. Tracking search: The EC22S receiver is searching best slaving conditions

c. Locked: The EC22S receiver has reached the best slaving conditions

    d. Holdover: The slaving has been suspended because of loss of synchronization conditions

    e. Forced Holdover: The slaving has been suspended on user request

Alarms

'GPS Lock': Performance of the 1PPS signal of the GPS receiver

    a.   OK (Green):   1PPS signal of the GPS receiver can be used as 1PPS reference signal for slaving operation

    b.   Alarm (Red):   1PPS signal of the GPS receiver can't be used as 1PPS reference signal for slaving operation

'Antenna' (Gray): State of the connection to the GPS antenna

    a.   Unpowered: GPS antenna is disconnected or incorrectly powered. Use of an antenna splitter produces this message. No alarm generated for this reason.

    b.   Powered: GPS antenna is connected and correctly powered

    c.   Shorted: GPS antenna is in short-circuit

'GPS module': Working state of the GPS receiver

    a.   OK (Green):   The GPS receiver is working well

    b.   Alarm (Red):   Problem with the GPS receiver. Communication breakdown with the GPS receiver or 1PPS signal not delivered by the GPS receiver.

'Internal oscillator': Monitored status of the 10MHz generated by internal oscillator

    a.   OK (Green):   Frequency driver operational

    b.   Alarm (Red):   Frequency driver failure

'Internal 1PPS':   Monitored status of internal 1PPS generated from oscillator frequency

    a.   OK (Green):   1PPS driver operational

    b.   Alarm (Red):   1PPS driver failure

'External 1PPS': Status of the external 1PPS synchronization source

    a. OK (Green):   Synchronization source is available

    b. Alarm (Red):   Synchronization source is not available

    c. Disabled (Gray):   Synchronization source not allowed by operator (Clock setup page) or not available in this EC22S receiver version

'Optional reference': State of the optional synchronization source

    a. OK (Green):   Synchronization source is available

    b. Alarm (Red):   Synchronization source is not available

    c. Disabled (Gray):   Synchronization source not allowed by user or not available in this EC22S receiver version

'Phase Accuracy': Estimated phase accuracy has crossed the limit (see Clock setup page) during a holdover sequence.

    a. OK (Green):   Phase limit not exceeded

    b. Alarm (Red):   Phase limit exceeded.

'Frequency Accuracy': Estimated frequency accuracy has crossed the limit (see Clock setup page) during a holdover sequence

    a. OK (Green):   Frequency limit not exceeded

    b. Alarm (Red):   Frequency limit exceeded.

'AC': status of AC power

    a. OK (Green):   AC power on

    b. Alarm (Red):   AC power off

    c. Disabled (Gray):   Power alarm not allowed by operator (see Power setup page)

'DC': state of DC power

    a. OK (Green):   DC power on

    b. Alarm (Red):   DC power off

    c. Disabled (Gray):   Power alarm not allowed by operator (see Power setup page)

'Frequency': Monitoring of the frequency output signals delivered by the EC22S

    a. OK (Green):   The signal is delivered at all outputs

    b. Alarm (Red):   The signal is not delivered at one of the outputs

    c. Squelched (Gray): The signal is not delivered; shut off for phase or frequency
                                accuracy alarm reason

'1PPS: Monitoring of the 1PPS output signals delivered by the EC22S

    a. OK (Green):   The signal is delivered at all the outputs

    b. Alarm (Red):   The signal is not delivered at one of the outputs

    c. Squelched (Gray):   The signal is not delivered; shut off for phase or frequency
                                accuracy alarm reason

'Optional Outputs': State of the optional signals delivered by the EC22S

    a. OK (Green):   The signal is delivered at the output

    b. Alarm (Red):   The signal is not delivered at the output

    c. Squelched (Red):   The signal is not delivered at the output

    d. Disabled (Gray):   The signal is not available in this EC22S revision

GPS Status Right/Left board

'GPS Latitude':   Current latitude of the GPS antenna

'GPS Longitude': Current longitude of the GPS antenna

 'GPS Altitude':   Current altitude of the GPS antenna

'Self Survey': Not applicable in 'Manual' and 'Mobile' modes. In 'Automatic' mode, the self survey phase allows the GPS receiver to average continuously the geographical position of the GPS antenna for a period of one hour to get a precise GPS antenna position. The following values are then possible:

    a. Pending: The calculation of precise GPS antenna position is not done.

    b. In progress: The calculation of precise GPS antenna position is in progress.

    c. Done: The calculation of precise GPS antenna position is done.

 'Nb of locked Satellites': Number of locked GPS channels (out of a maximum of 12)

 'ID / SNR': Satellite number and SNR (Signal over Noise Ratio) of the 8 best satellites channels tracked by the GPS receiver.

5.2.4 Admin Password page

A password is necessary to access the setup pages. The default password is "pwd". It can be modifiied in the Network Setup page.

5.2.5 Network Setup page

This page allows the user to modify the Network connection parameters.

1) Host name: Unique name of the EC22S in the network. This functionality depends on the DNS server type.

2) Use DHCP: Dynamic Host Configuration Protocol:

      a.   Yes: The Dynamic Host Configuration Protocol function available. In this case, the IP address of the EC22S is automatically allocated by the network DHCP server according to the EC22S MAC address. Following fields do not apply.

      b.   No: The Dynamic Host Configuration Protocol function isn't available. A static IP address is used. In this case, the operator must fill in the fields that follow.

3) IP Address, Sub-network mask, Sub-network address, Broadcast address, Default Gateway: Fields allowing configuration of the network access when the DHCP is set to No

4) Change password: Field for password modification. This password is required when accessing setup pages

When set in Use DHCP mode, if the EC22S starts without network connection, the IP address is not set. After the network connection is restored, a 1 or 2 minute delay occurs before the IP address is assigned.

5.2.6 SNMP Setup page

In this page, the operator can enable the SNMP traps generation and program RO and RW community names.. The SNMP traps report an event (alarm or configuration modification) by sending a trap message to a destination.

1) SNMP RO Community: SNMP parameter for get request.

2) SNMP RW Community: SNMP parameter for set request. *RO and RW communities will become effective after reboot of management board (Tools menu).*

3) Trap Community: SNMP parameter is sent in trap messages and helps identify the managed equipment family, public by default.

4) Traps destination 1:   Primary SNMP manager address where traps are sent. Clear field to deactivate.

5) Traps destination 2:   Secondary SNMP manager address where traps are sent.

6) Global Traps Enable: If "Yes", traps are sent according to individual enabling; if "No", no trap are sent.

7) Global Traps Enable: If "Yes", traps are sent according to individual enabling; If "No", no traps are sent.

8) Clock Fault:

     a. Yes: Generates a trap when the EC22S goes on default (according to "Global Status")

     b. No: No trap generated.

9) GPS fault:

     a. Yes: Generates a trap when the gps receiver fails or unlocks (according to "GPS Lock")).

     b. No: No trap generated.

10) External 1PPS Fault:

     a. Yes: Generates a trap when the External 1PPS is lost (while enabled)

     b. No: No trap generated.

11) Optional Reference source Fault:

     a. Yes: Generates a trap when the Optional reference source is lost and this reference is enabled.

     b. No: No trap generated.

12) Internal oscillator Fault:

     a. Yes: Generates a trap when the frequency driver goes on alarm (generally the OCXO goes on default).

     b. No: no trap generated.

13) Internal 1PPS Fault:

     a. Yes: Generates a trap when the 1PPS driver goes on alarm.

     b. No: No trap generated.

14) Phase Accuracy Fault:

     a. Yes: Generates a trap when estimated phase of the output signal exceeds the phase limit.

     b. No: No trap generated

15) Frequency Accuracy Fault:

     a. Yes: Generates a trap when estimated frequency of the output signal exceeds the phase limit.

     b. No: No trap generated

16) Power Fault:

   a. Yes: Generates a trap when any enabled power source alarm is detected.

   b.   No: No trap generated

17) Clock Mater/Slave:

   a. Yes: Generates a trap when left/right Master Clock switchover is performed.

   b.   No: No trap generated

18) Output Fault:

   a. Yes: Generates a trap when one of the output signals fails.

   b.   No: No trap generated

19) Download MIB: Link for downloading zipped MIB text file

5.2.7 Time & Reference Setup page

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

Parameters are set identically on both Master and Slave Clock modules:

1) Date and Time and "Set Manual Time " button: Time manual setting allowed only when the EC22S is in forced holdover mode or when the EC22S has not yet been synchronized on a GPS reference source.

2) Adjust Manual Time: Adjust the time by 1 second when the EC22S is in forced holdover mode or when the EBO II is not yet synchronized on a reference source. Helpful for fine adjusting manually set time.

3) Date format: Selection of display format:

    a. DD/MM/AAAA: day / month / year

    b. MM/DD/AAAA: month / day / year

    c. DD/AAAA: day of the year / year

4) Time reference: Choice of reference time scale

    a. UTC: Universal time scale

    b. GPS: Time given by GPS (almost equivalent to UTC)

    c. Local: UTC time corrected by a programmable offset

An information letter is displayed after the time message on the header of the web page (see Upper Task Bar and Päge Header description).

5) Local Time Offset: Allows computation of local time from UTC time.

6) TOD output format: Choice of the Time Of Day RS232 output message:

    a. NMEA: NMEA 0183 message output type GPRMC

    b. ASCII : Time of Day in accordance with the Date format

7) Leap second: Programs in advance the leap second correction, hence ensuring it will be applied even in case of GPS loss

    a. Leap second : Direction of the application

        i. 0: non leap second pending

        ii. −1: positive leap second pending

        iii. +1: negative leap second pending

    b. Leap second date: Date of application

        i. : 31/03

        ii. : 30/06

        iii. : 30/09

        iv. : 31/12

8) 1PPS phase offset: Phase shift implemented on 1PPS output, from −500ms to +500ms, entered in ns.

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

    a. On: Force holdover

    b. Off: Normal slaving mode

10) Priority level: GPS: Programs the priority of the GPS reference source.

    a. Priority 1: Highest priority

    b. Priority 2: Medium priority

    c. Priority 3: Lowest priority

    d. Disable: Disable the source; this source is not supervised; no corresponding alarm

11) Priority level: External 1PPS: Programs the priority of the External 10Mhz/1PPS reference source.

    a. Priority 1: Highest priority

    b. Priority 2: Medium priority

    c. Priority 3: Lowest priority

    d. Disable: Disable the source; this source is not supervised; no corresponding alarm

12) Priority level: Optional reference: Programs the priority of the External optional reference source.

    a. Priority 1: Highest priority

    b. Priority 2: Medium priority

    c. Priority 1:   Lowest priority

    d. Disable: Disable the source; this source is not supervised

13) Force a source as input: Force the EC22S to be synchronized on a reference source even if other sources with a highest priority are available, for debug purposes:

    a. GPS

    b. External 1PPS

    c. Optional reference

14) Distribution source mode: Set selection mode of the Master Clock for distribution (maintenance and debug purposes):

    a. Automatic (Master Clock is selected automatically by hardware and software)

    b. Forced Left (left Clock is always Master Clock)

    c. Forced Right (right Clock is always Master Clock)

(Should normally be set to "Automatic")

15) Squelched auto mode: If enabled, squelching is applied to distributed signals on phase or frequency alarms triggering

    a. Enable: Output signal is squelched on phase or frequency alarm

    b. Disable: Signal always available at the output

5.2.8   GPS Setup page

On this page, the operator set the GPS receiver (Left and Right) parameters.

1) Antenna delay: Time shift compensating the propagation delay of the GPS signal in the antenna cable (in nanosecond). To be computed according to type and length of cable.

2) GPS Mode: Defines the receiver operating mode regarding the position processing:

a. Automatic: The GPS receiver averages during 1 hour the antenna position supplied by the receiver in order to make it reliable. After this period and providing that a minimum of 4 satellites are detected, the position is set. This 1 hour position reliability process is initialised every time the board is switched on and is hold as long as a minimum of 4 satellites is continuously detected. The EC22S must be fixed.

b. Manual: The GPS receiver can provide reference information with only 3 satellites available. The user is required to precisely enter the geographic position of the antenna into corresponding fields.

c. Mobile: The GPS receiver computes its position continuously so that the EC22S (with GPS antenna) can be moved.

3) Latitude, Longitude, Altitude: Data defining the geographic position of the GPS antenna applied in time processing while in manual mode.

5.2.9 Power Setup page

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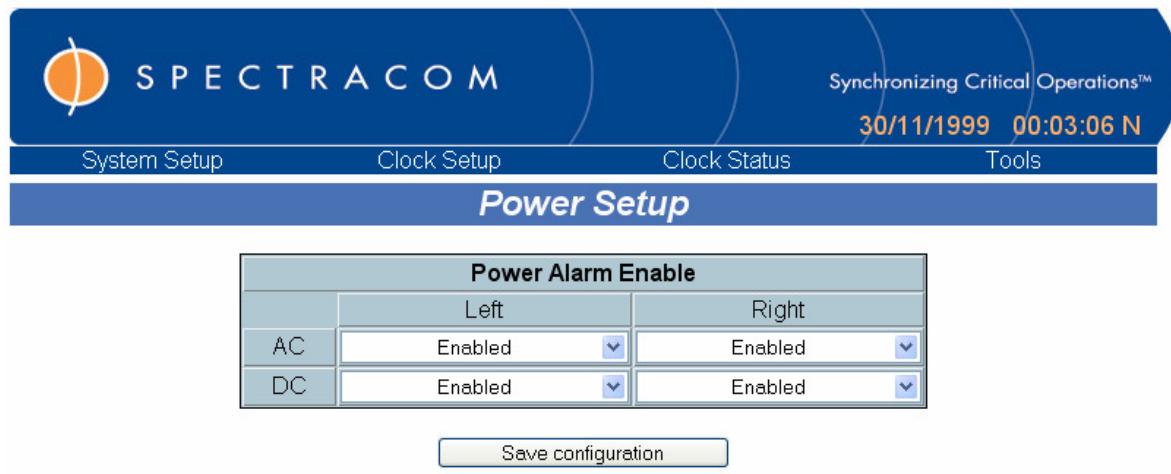
5.2.10 Events logging

This page displays the recording of events (alarms, warning, information) detected inside the EC22S.

Alarm and warning refer to status displayed on the Clock Status web page. Information relates to configuration or state change.

Display Filter:	Select the required type of displayed event on the log panel.

Max lines: Defines the number of events per page to be displayed.

"<>" Button: Navigation through the whole content.

"Update List" button: Refresh display

"Clear Logs" button: Clear the log buffer

Module: Origin of event. EC22S origin relates to general event; Clock RIGHT or LEFT relates to specific Clock event.

5.2.11 Versions

This page displays the version number of key elements of EC22S software and firmware.

5.2.12 Software Upgrade

Software and firmware upgrade is performed with this "Upgrade Application" page. Firmware refers to FPGA components content.

Two steps are necessary: First Upload a New Release from the web client to the EC22S, and then Activate New Release.

Before starting the upload of a new version, select the file to be downloaded (usually a .tgz file provided by the manufacturer) . Click on the "Upload" button to proceed.

- Upload New Release: First step of upgrade. A tgz compressed file is sent to the EC22S and stored. Last uploaded release is shown in the Pending version field.

- Activate New Release: Second step of upgrade. Pending version is the last downloaded version for upgrade. Current version is the running version.

- When clicking on "Activate" button, upgrading module is restarted. Distributed signal is impacted.

- Once activated, Current Version and Pending Version will show the same reference.

- Delete pending version with "Remove" button, except if same as Current version.

5.2.13 Reboot

If a module malfunction occurs, the operator can order a soft reboot. If the module is not reachable, the requested reboot will not be processed.

Click on Yes to confirm the reboot.
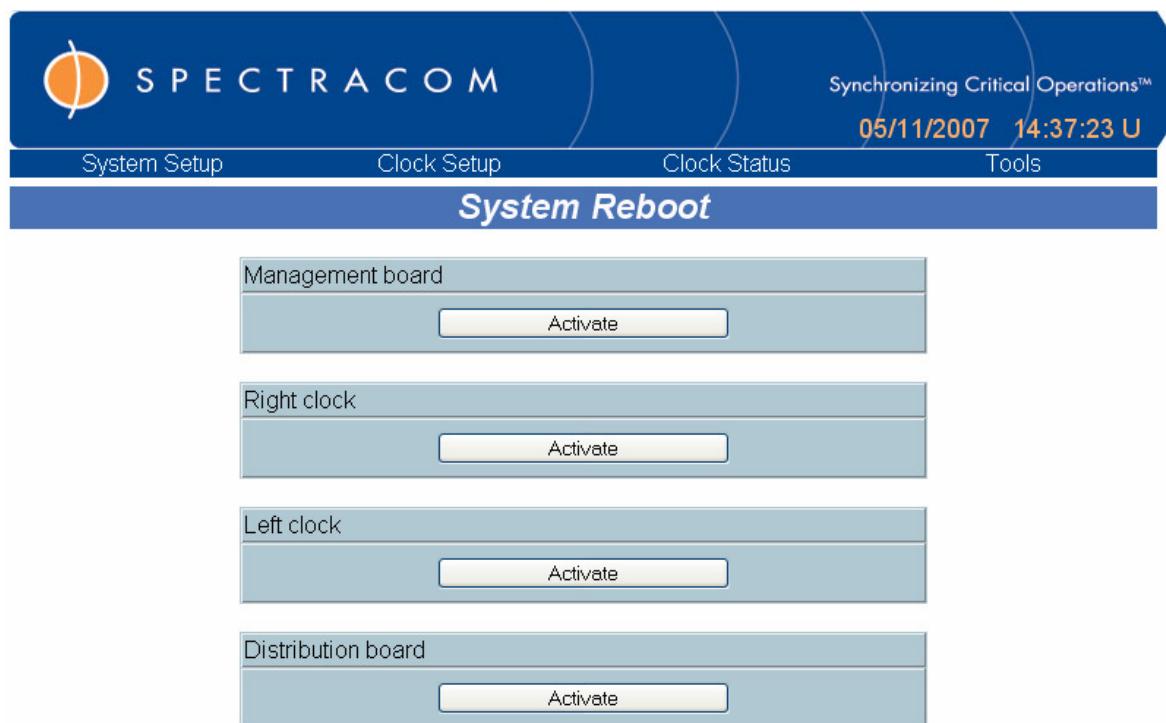
6 SNMP Control

6.1 MIB Content

MIB is made of elements related to:

- Configuration parameters that can be read (GET procedure) and written (SET procedure),

- Status information, similar to the status displayed on the web page, that can be read (GET procedure)

EC22S Base Unit + Clock Status :

- Global status(GET)
- Power supply AC L/R (GET)
- Power supply DC L/R (GET)
- Outputs Freq (GET)
- Outputs 1pps (GET)
-
- CLOCK Status (GET)
- CLOCK SFN Status (GET)
- CLOCK Master/Slave (GET)
- CLOCK Ref Source L/R (GET)
- CLOCK Master/Slave R
- CLOCK GPS Nb Satellites (GET)
- CLOCK GPS Module Status (GET)
- CLOCK GPS Lock Status (GET)
- CLOCK GPS Antenna Status (GET)
- CLOCK External Ref Source (GET)
- CLOCK Optional Ref Source (GET)
- CLOCK Internal 1pps L/R (GET + Trap)
- CLOCK Internal Oscillator L/R (GET + Trap)
- CLOCK Phase Accuracy L/R (GET + Trap)
- CLOCK Frequency Accuracy L/R (GET + Trap)
-
- CLOCK L/R Status (Trap)
- CLOCK L/R GPS (Trap)

- CLOCK L/R External 1pps Reference (Trap)

- CLOCK L/R Optional Reference(Trap)

- CLOCK L/R Internal 1pps (Trap)

- CLOCK L/R Internal Oscillator (Trap)

- CLOCK L/R Phase Accuracy (Trap)

- CLOCK L/R Frequency Accuracy (Trap)

-

- Power supply AC L/R (Trap)

- Power supply DC L/R (Trap)

- Master/Slave Switchover (Trap)

- Outputs Freq (Trap)

- Outputs 1pps (Trap)

Setup :

- Master/Slave Clock Distribution Mode (Set + Get)

- Squelch mode (Set+Get)

- Trap Destination 1 (Set + Get)

- Trap Destination 2 (Set + Get)

- Trap Community (Set + Get)

- Global Trap Enable (Set + Get)

-

- Force Holdover (Set + Get)

- Priority GPS (Set + Get)

- Priority External 1pps/10MHz (Set + Get)

- Priority Optional Ref (Set + Get)

6.2 SNMP TRAPS

Traps are generated on events related to alarm and warning activation and deactivation, as well as configuration modification. The two trap destinations are programmable and traps are individually enabled in the SNMP Setup web page.

7 Maintenance

7.1 Periodic Verification and Calibration

The EC22S is fully automatic functioning and self-calibrated. It does not require maintenance for a period of 10 years.

7.2 Updating the Software Version

See corresponding web pages to perform the upgrade.

7.3 Spare Parts

Fuses 5x20 2A D1TD: Manufacturer CEHESS/SHURTER, manufacturer part number 7040.3120

DC connector kit: Manufacturer BULGIN, manufacturer part number PX0410/03S (female plug), SA3349/1 (x3 female contacts).

7.4 Troubleshooting

Symptoms can be diagnosed from front panel LEDs and using information from the web interface.

7.4.1 Searching for Alarm Origin

7.4.1.1 Clock Modules LED Indicators

SEL LED is activated green on the Master Clock module, off on the Slave Clock module,

GPS alarm: Shows the validity of the Ref source generated by the associated GPS receiver. Red on alarm and green otherwise.

LOCKED - OK: General alarm, green when tracking algorithm is locked, all enabled reference sources are available, all enabled power supply are available, red otherwise and when any system alarm is on.

During startup sequence, LEDs show several patterns (all orange - green+red, green and red) before setting to red for GPS and LOCKED-OK. If LEDs remain orange, boot has failed on the Clock module. Try to restart with the power switch (AC and DC) or through the web page reboot procedure.

7.4.1.2 EC22S Base Unit LED Indicators

ETH: Green when communication between EC22S and Ethernet network is established, off if no connection, useful to check that the Ethernet interface is up and connected to a switch or a PC

EXTREF: Red if alarm detected on the External PPS reference source, green if reference is OK, off if reference disabled,

OUT 1PPS: Red if loss of signal on at least one PPS output, green if output is present,

OUT FREQ: Red if loss of signal on at least one FREQ output, green if output is present.

7.4.1.3   Web Interface status analysis

7.4.1.3.1   *Method*

The purpose of the method is to determine what object has failed: Input reference source or hardware failure. Then, in case of hardware failure, the user must determine if the failure comes from a Clock module or from some other component in the EC22S.

A failed Clock module can be replaced while the equipment is running.

The Web interface status windows give some information on the input reference sources, on the distributed output signals, on the frequency generation in the Clock module, on the signal distribution, and on the management board.

7.4.1.3.2   *Clock Status*

The Clock status page can tell if the tracking algorithm is locked and if a signal is sent to the distribution function (EC22S base unit). Any abnormal detected function leads to the Clock module replacement.

7.4.1.3.3   *GPS Status*

The GPS receiver is an autonomous module connected to the Clock module.

The GPS should be able to decode at least 4 satellites to be used as a timing reference. Possible situations could be a low received level on the antenna input, a disconnected antenna, a shorted antenna, no PPS generation inside the GPS receiver, and no management link between the Clock module and the GPS receiver.

After checking the antenna installation, if the receiver is still in a failure status, the whole Clock module should be replaced.

7.4.1.3.4   *EC22S Status*

The status includes Switchover/distribution function status. The Autotest results screen gives information on the management function.

7.4.2 What Can Be Done

7.4.2.1   Clock Module Exchange Procedure

When a diagnostic shows a Clock module failure, it is possible, in the field, to exchange a failed Clock module for a new one:

- With the web interface ("Time & Reference Setup" menu, Distribution Parameters), force the distribution source to Left or Right, whichever module is OK.

- Go to the assistant menu on the front panel LCD/touchpad ("Extraction" item on the top menu). Confirmation is given on which side Clock module can be extracted.

- Pressing "Enter" on "Halt" field stops software activity on the Clock to be extracted (all LEDs goes orange). The operator is asked to switch off AC power (only on the extraction side). Switch off AC power.

- Unfasten the 4 screws of the Clock module front panel and pull on the handle to extract the module. At the halfway mark of module extraction, disconnect the earth connection by pulling off the "faston" tab located behind the Clock module front panel.

- When inserting new module, just plug it into the slot, connect the earth tab, fasten the 4 screws, and switch on. At the end of the start up period (monitor status of module on web page), reprogram the selection mode of the distributed source to "Automatic".

7.4.2.2   Other failures

No other maintenance can be performed in the field. Other repairs require the unit to be shipped back to Spectracom.

8 Appendix

8.1 Pin-Out of EC22S connectors

8.1.1 RJ45 - Ethernet

	Pin	Signal	Description
RJ45 channel n	1	TX+	Transmission signal plus
	2	TX-	Transmission signal minus
	3	RX+	Reception signal plus
	4		
	5		
	6	RX-	Reception signal minus
	7		
	8		

Table 8 - 1 RJ45-Ethernet connector .

8.1.2 DC Power Supply –48VDC

Assignment for both left and right connectors:
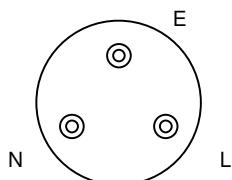
	Pin	Signal	Description
Bulgin 400 series	L	-48V	DC power supply, −36 Volts to −72 Volts
	N	0V	Power supply return
	E	CASEGND	Case grounding

Table 8 - 2. DC power supply connectors POWER –48VDC.

The above view is the rear panel view as seen by the operator.

8.1.3 BNC – Outputs Freq (1 to 8)

50Ω, 12dBm outputs of the 10 MHz sinus distributed signals.

8.1.4 BNC – External Ref Input

50Ω, TTL level input of the 1PPS (1 pulse per second) reference input.

8.1.5 TNC - GPS Antenna

50Ω input from the GPS antenna GPS.

8.1.6 Alarms
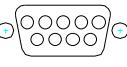
Pin	Signal	Description
1	Common 1	Urgent Alarm common contact
2	TX TOD	Transmission of Time Of Day message
3	RX TOD	Not used
4	Common 2	Warning common contact
5	GND	Electrical ground
6	Active Closed 1	Urgent Alarm active closed contact
7	Active Open 1	Urgent Alarm active opened contact
8	Active Closed 2	Warning active closed contact
9	Active Open 2	Warning active opened contact

Table 8 - 3. connector ALARMS.

If one wants to get a closed contact when Urgent Alarm is active, 1-6 should be used.

If one wants to get a closed contact when Non Urgent Alarm is active, 4-8 should be used.

If one wants to get an opened contact when Urgent Alarm is active, 1-7 should be used.

If one wants to get an opened contact when Non Urgent Alarm is active, 4-9 should be used.

8.2 GPS Antenna Installation

Before choosing the GPS Antenna and the connecting cable between the GPS Antenna and the EPSILON SSU, perform the following steps:

- Choose the antenna location
- Evaluate the overall gain
- Choose the antenna and cable type

8.2.1 GPS Antenna Location

Choose a location with an unobstructed view of the sky. The EC22S will determine its location automatically once locked to the appropriate number of satellites. The minimum number of tracked GPS satellites is four. A vertical observation cone with an open view

of the sky, at an angle higher than or equal to 65° (optimum at 85°), is recommended per the following example:
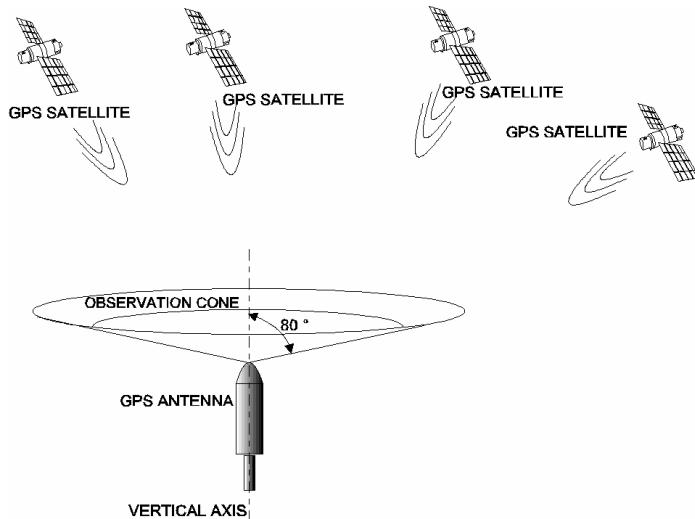

Figure 8 - 1. GPS Antenna Locations.

NOTE: The open view angles are given according to the criteria of a complete GPS constellation of 24 satellites, evenly distributed i around the Earth.

8.2.2 Gain calculation

To ensure the correct reception of the GPS signal, the overall system of antenna / cable / protection (and line amplifier / splitter if used) requires a relative gain of 15 to 30 dB.

Example:

GPS Signals

GPS antenna placed in direct view of the sky

G1 = 35 dB typical

50 m of KX4 cable (-30 dB typical / 100 m)
G2 = - 15 dB

Lightning protection
G3 = -1 dB

EPSILON SSU
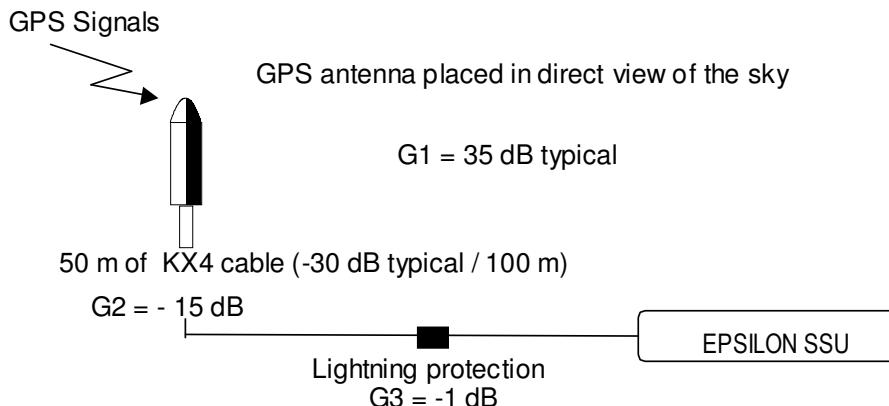
Figure 8 - 2. Gain calculation.

G1 + G2 + G3 = 35 dB - 15 dB - 1 dB =   19 dB
Thus:15 dB < G1 + G2 + G3=19 dB < 30 dB

For full detailed operation description download application note TF2 : "GPS antenna installation guide" from our web site (http://www.spectracomcorp.com).

REVISION HISTORY

Revision Level	ECN Number	Description
A-B	----	Previous Temex Sync issues.
C	**----**	First iteration of this Spectracom documentation, converted from Temex Sync documentation.