

# Epsilon Clock

## Model EC31M



- High performance GPS master clock
- Remote management by SNMP/HTTP
- Acquisition of Time Reference: GPS, 1PPS, IRIG-B
- 2 x Ethernet, independent ports
- 2 x 1PPS TTL outputs
- 2 x 10 MHz sine wave outputs
- 1 IRIG-B output
- Time of Day output for date-stamping up to 4 external events
- RoHS Compliant

The Epsilon Clock™ Model EC31M is a GPS master clock designed to integrate with IP networks. The Model EC31M's versatility makes it ideally suited for military time and frequency applications. With two physically independent Ethernet ports, control and traceability of the synchronization system over your network LAN and/or WAN are guaranteed. The Model EC31M synchronizes all network devices that have an NTP client and are connected via Ethernet. It offers one IRIG-B timecode output, two 1PPS outputs, and two 10 MHz outputs, allowing it to synchronize a variety of equipment. It also has a dating output which precisely date-stamps up to 4 external events.

If its GPS signal is lost for any reason, the Model EC31M automatically synchronizes to other time references according to their availability and by order of priority. These include an external 1PPS (combined with an NMEA message) and IRIG-B. These signals continue to serve as references for disciplining the internal oscillator. OCXO and Rubidium precision oscillators are available for improved microprocessor-controlled accuracy and reliability in holdover mode (should all external references be lost). The oscillator, in conjunction with the EpsilTime™ smart predictive slaving algorithm, mitigates the effects of inherent GPS noise and complies with the most stringent holdover mode requirements.

The Epsilon Clock Model EC31M includes a high-performance, low phase noise OCXO or Rubidium oscillator. This internal oscillator, slaved to the GPS source or external 1PPS source, yields a high level of timing accuracy ( $\pm 25$  ns at  $1\sigma$ ).

The Model EC31M offers advanced monitoring and network management functions that can be controlled locally through the serial port, or remotely through the embedded SNMP protocol. When connected to a network with a DHCP or BOOTP type address server, the assignment of the IP address is automatic. Also included is a router that provides automatic routing to linked networks through gateways.

## Specifications

### Frequency Output (10 MHz):

	High Performance Low Phase Noise Rubidium	High Performance OCXO
<b>Accuracy</b> (Average over 24 hours when GPS locked)	$< \pm 1 \times 10^{-12}$	$< \pm 2 \times 10^{-12}$
<b>Medium Term Stability</b> (without GPS, constant temperature, after 3 months of continuous operation)	$5 \times 10^{-11}$ /month	$2 \times 10^{-10}$ /day
<b>Short Term Stability</b> (Allan Variance)	@ 1s @ 10s @ 100s	$1 \times 10^{-11}$ $3 \times 10^{-11}$ $3 \times 10^{-11}$
<b>Temperature Stability</b> (peak to peak)	$< \pm 1 \times 10^{-10}$ (from 0 to 50° C)	$< \pm 1 \times 10^{-9}$ (from 0 to 60° C)
<b>Phase Noise</b> (typical, static conditions)		
@ 10 Hz	-110 dBc / Hz	-120 dBc / Hz
@ 100 Hz	-130 dBc / Hz	-135 dBc / Hz
@ 1 kHz	-140 dBc / Hz	-145 dBc / Hz
@ 10 kHz	-145 dBc / Hz	-150 dBc / Hz
@ 100 kHz	-145 dBc / Hz	-150 dBc / Hz
<b>Signal Waveform Typical Level</b>	2 x 10 MHz, Sine wave 12 dBm $\pm$ 2 dB / 50 $\Omega$ (BNC)	
<b>Harmonics</b>	$< -35$ dBc	
<b>Subharmonics</b>	$< -100$ dBc	
<b>Spurious f0 <math>\pm</math> 100 kHz</b>	$< -110$ dBc	

### Time Output (1 PPS):

<b>Accuracy to UTC (GPS locked)</b>	$\pm 25$ ns at 1 $\sigma$	
<b>Accuracy to 1PPS External reference source</b>	$\pm 50$ ns at 1 $\sigma$	
<b>Accuracy to Time marker issue of IRIG B signal type B002</b>	$\pm 1$ $\mu$ s at 1 $\sigma$	
<b>Holdover Mode After 1 Day</b> (at constant temperature, after 24 hours of GPS lock)	2 $\mu$ s	10 $\mu$ s
<b>Signal Waveform and Level</b>	2 x 1PPS, TTL / 50 $\Omega$ (BNC)	

### Input Sources:

<b>GPS Input/Output for Antenna</b>	L1 GPS C/A code / 5 V @ 80 mA (TNC)
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### Other Inputs/Outputs:

<b>1PPS External reference</b>	TTL / 50 $\Omega$ (BNC)
<b>Time of Day input</b>	NMEA 0183, RS232 (SubD 9-pin connector)
<b>Time of Day output</b>	NMEA 0183, RS232 (SubD 9-pin connector)
<b>Time Code input</b>	1 x IRIG-B002 / TTL / 50 $\Omega$ (BNC)
<b>Time Code output</b>	1 x IRIG-B002 / TTL / 50 $\Omega$ (BNC)
<b>Time Server</b>	2 x NTP, independent ports (RJ 45)

### Power:

<b>AC supply</b>	90 to 264 V / 48 to 63 Hz (CEE 22 connector)
<b>DC supply required</b>	18–36 V (Mini Din connector); option 36–72 V
<b>Typical power consumption at 25° C</b>	35 W (up to 60 W during warmup)

### Physical

**Size:** 19" 2U unit (483 x 385 x 88 mm)

**Weight:** < 5 kg

### Environmental

**Operating Temperature:** -5° to 60° C (OCXO) / -5° to 50° C (Rubidium)

**Storage Temperature:** -40° to 85° C

**Relative Humidity:** 95% RH @ 40° C, non-condensing

**CE Compliance:** EN 50082 / EN 55022

**Safety:** EN 60950

**RoHS Compliant**

### Acquisition Of Time Reference

**GPS receiver optimized for Time & Frequency applications (TNC on rear panel):**

- 12 channel reception on L1 (1575 MHz) C/A code
- Continuous Time Integrity Monitoring (T-RAIM)
- Automatic self survey with robust OD fixed mode
- Antenna propagation delay compensation

**External 1PPS source combined with NMEA message (SubD 9-pin connector on front panel)**

**IRIG-B input**

### Frequency And Time Distribution (Rear Panel)

- 2x 1PPS TTL
- 2x 10 MHz sine wave
- 1x IRIG-B output
- 2x NTP: ports are independent; different MAC addresses, no connections allowed between the two ports.
- Supports NTP V3 (RFC 1305), NTP V4, SNTP (RFC 1769) combined with RS232C ports to configure the Internet address (SubD 9-pin connector)
- 1 Time of Day (NMEA message) output (SubD 9-pin connector) on RS232C port (SubD 9-pin connector)
- 1 Dating output (SubD 9-pin connector); datation of 4 independent TTL external events (BNC connectors): RS232C port with ASCII proprietary protocol

### Control

- Status exchanged with SNMP V1 and V2 protocol on one Ethernet port (MIB objects and trap)
- Selection of all settings including antenna cable delay, choice of time scale (UTC or GPS) are user programmable.
- Status are displayed on the front panel with three LEDs.
- Internet address on each NTP port configurable with its own RS232C port.