

# GPS Frequency and Time Transfer

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- Very low phase noise -110dBc/Hz @ 1Hz
  - Atomic referenced stability and accuracy
  - Aging  $\pm 0.5$ ppb
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The E8000-TT uses the one way all in view mode, where each site is compared to an average of GPS time, derived by letting the receiver generate an average of all the satellites tracked. If the constellation is nearly the same at each site, then the result of the average is likely to be very close at each site.

Two or more E8000-TT units will provide remarkably accurate time transfer over medium baselines, up to several hundred kilometres.

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## Features

- Ultra high performance reference
- Multiple output options
- Noise floor -157dBc/Hz

## Benefits

- Stability to 0.002ppb
  - Ultra low jitter
  - 100 x less drift than OCXOs
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## Applications

- High performance audio systems
- High stability low phase noise and low jitter systems

Specification	E8000-TT
<b>Type</b>	<b>OCXO Rack</b>
<b>Output</b>	
Frequency	10MHz +7dBm
Level	±2dBm 500hms
Number	1 to 12
Connector	BNC
<b>Accuracy at Shipment</b>	5.00E-11
<b>Frequency Stability</b>	
1s	8.00E-13
10s	4.00E-13
100s	5.00E-12
1 Hour	2.00E-12
<b>Aging</b>	
1 Day	3.00E-12
1 Month	4.00E-11
1 Year	5.00E-10
<b>Phase Noise</b> dBc/Hz in 1Hz BW	
1Hz	-110dBc/Hz -
10Hz	140dBc/Hz -
100Hz	145dBc/Hz -
1kHz	155dBc/Hz -
10KHz	157dBc/Hz
<b>Harmonics</b>	<-30dBc
<b>Spurious</b>	<80dBc
<b>Start Up (Warm) Time</b>	<30 Minutes
<b>Retrace</b>	3.00E-11
<b>1PPS</b>	
Accuracy	<±12ns
Holdover	<±50ns
Fixed Time Difference before calibration	<±50ns
Fixed Time Difference after calibration	±5ns
Time Difference Variation 10 minute average	<±10ns
Time Difference Variation 1 hour average	<±6ns
<b>Power Supply</b>	
AC	90 - 240Vac
DC	External Input Option
<b>Power Consumption @ 25°C</b>	
Warm Up	18W
Stabilized	6W
<b>Temperature</b>	
Operating	-20°C to +50°C -
Storage	40°C to +70°C
Humidity	90% (Non Condensing)
Frequency Offset over operating temperature range	3.00E-10
<b>Magnetic Field</b>	
Sensitivity (Guass)	2.00E-11
Atmospheric Pressure (mbar)	1.00E-13
Approx MTBF Stationary	100000 hours
<b>Mechanical</b>	
Colour	Aluminium 44 x
Dimension	483 x 240mm
Dimension Packed	100 x 560 x 340mm
Weight	3kg
<b>GPS Antenna</b>	
Gain	28dB @ 3.3V
Noise Figure	0.8dB 2.7-5
Voltage	Vdc TNC
Connector	female

The E8000-TT uses a commercial GPS timing receiver. This performs a self survey when moved to a new location, and stores the averaged position. The stored position is used when the unit is reset, and remains valid provided the unit is not moved.

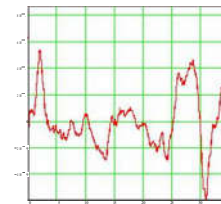
With a valid stored position, the GPS receiver switches into over determined clock mode, and uses all satellites in view to provide the best possible estimate of GPS time, output as the rising edge of a pulse every second (1PPS).

The 1PPS output from the GPS receiver is phase modulated with a saw tooth with a peak amplitude of about 12ns. This is due to the finite clock resolution used in the GPS receiver.

The E8000-TT uses a Kalman filter to a) correct the local clock, which is an OCXO, and b) to smooth the 1PPS and remove the saw tooth modulation. The eventual 1PPS output from the E8000-TT has short term phase jitter of less than 1ns RMS.

When using short or medium baseline time transfer, both receivers will largely share the same constellation, and will therefore see the same offset from UTC.

The 1PPS output from the E8000-TT receiver can be offset by up to ±500ms in 1ns steps.



Smoothed version of data 1 hour moving average