

58533A

GPS Time and Frequency Reference Receiver



The 58533A is a cost-effective source of highly accurate time and frequency signals referenced to the global positioning system (GPS). A general-purpose product that is easily integrated into system equipment, the 58533A is a compact unit that requires only 10 watts of power after warmup. All connections to the parent system are easily accessible from the front panel. The 58533A is also suitable for use in laboratories and manufacturing facilities when low-cost precision and synchronized timing references are required.

The 58533A GPS time and frequency reference receiver features:

- Eight-channel, parallel tracking GPS engine
- C/A Code, L1 Carrier
- GPS T-RAIM satellite error detection
- +15 Vdc and +5 Vdc power operation
- NMEA command set
- $\leq 1 \times 10^{-11}$ frequency accuracy when locked to GPS
- $\leq 2 \times 10^{-8}$ per day average frequency change when not locked to GPS
- ≤ 110 ns time accuracy with respect to UTC (USNO MC)
- Compatible with 58531A GPS timing receiver analysis and control software

To meet the evolving demand for smaller wireless and telecom equipment, the 58533A has been packaged in an extremely compact box. With a size of only 50 mm H × 100 mm W × 125 mm L, and a weight of 308 grams, the box can be easily and conveniently mounted to an existing PC board, to a system rack or in an electronics enclosure.

An RS-232C serial port provides system-level interface. Through the use of the NMEA command set or the 58531A GPS timing receiver analysis and control software (described on page 3), you can monitor the 58533A's operation.

The product also features a number of GPS satellite health monitoring and reporting functions. One of the many features offered in the 58533A is the Time Receiver Autonomous Integrity Monitor (T-RAIM) algorithm, which ensures that corrupt satellite data is ignored so it has no affect on the 58533A's timing accuracy.



Figure 1. 58533A as viewed without cover.

Standard Configuration

10 MHz and 1PPS

In its standard configuration, the 58533A produces a 10 MHz and a one-pulse-per-second (1PPS) timing output. Phase coherency is maintained between the frequency and timing outputs—a feature essential in many timing applications.

When the crystal oscillator is locked to the GPS signal, the frequency accuracy of the 10 MHz signal is better than 1×10^{-11} for a one-day average, and the 1PPS signal is synchronized to universal coordinated time, UTC (USNO MC) within 110 ns rms (95% probability).

Custom Configurations

Symmetricom may be able to customize the 58533A to your specifications, depending on volume and the complexity of the modification. Contact your local Symmetricom representative to discuss how your specific needs can be met.

Antenna and Accessories

Symmetricom recommends the use of Symmetricom GPS antenna system accessories with the 58533A to ensure specified performance. A complete line of low-cost, durable, easy-to-install GPS accessories is available. These include the 58532A GPS L1 reference antenna and the 58538A and 58539A lightning arrestors. Also available is the 58529A GPS L1 line amplifier with bandpass filter which provides the gain to overcome cable loss as well as protection against noise and interfering signals. For systems needing protection from noise and interfering signals but not GPS signal gain, choose the 58530A GPS L1 bandpass filter.

Other accessories include a selection of RF cables and a family of active GPS L1 signal splitters to allow more than one receiver to be connected to an antenna. The 58535A 1:2 GPS L1 distribution amplifier/splitter allows 2 receivers to share one antenna. The 58536A 1:4 GPS L1 distribution amplifier/splitter allows 4 receivers to share one antenna.

Symmetricom GPS antenna system accessories are sold separately from the 58533A.

58531A GPS Timing Receiver Analysis and Control Software Version 1.2

Evaluation of the 58533A is made easy with version 1.2 of the 58531A GPS timing receiver analysis and control software. The PC Windows[®] based program (for Windows NT or Windows 95) interfaces with the 58533A, and processes and displays information received from it. The program has tools to help in analyzing the receiver data, and can log the information to a file for analysis using other tools.

The 58531A program includes these features:

- Conveniently configure the software and 58533A
- Receive real-time information updates
- Control and query the 58533A via menu-driven commands
- Generate a data log file for analysis
- Generate an error log file for analysis
- Plot instant or average position in real-time
- Plot satellite history, such as signal strength (C/N), elevation, and dilution of precision (DOP)
- Calculate and display average or maximum C/N and associated elevation and azimuth angles

Version 1.2 is compatible with the 58533A and 58540A GPS receivers and the 58534A GPS timing antenna.

58531A software is sold separately from the GPS receivers.

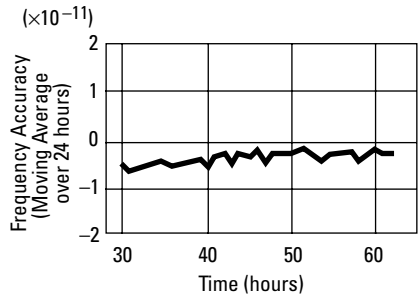
Specifications and Characteristics of the 58533A GPS Time and Frequency Reference Receiver

10 MHz Output

LOCKED (SEE NOTE 1)

Frequency Accuracy

Better than 1×10^{-11} , for one day average.



See typical power-on characteristics below.

UNLOCKED

Aging

$\leq 2 \times 10^{-8}$ per day average frequency change during unlocked operation, typical

TEMPERATURE STABILITY

$\leq 2.5 \times 10^{-7}$, typical
0°C to +55°C (base temperature of +25°C)

FREQUENCY DOMAIN STABILITY

Phase Noise

(Locked)

OFFSET FROM SIGNAL (Hz)	SSB PHASE NOISE (dBc/Hz)
10	≤ -110
100	≤ -115
1000	≤ -120
10000	≤ -125
1000000	≤ -130

Time Domain Stability

(Locked)

Root Allan Variance = 1×10^{-9} at 1 second average time

SUPPLEMENTAL INFORMATION

Waveform	Sine wave
Amplitude	1 volt p-p $\pm 10\%$ into a 50 Ω load
Harmonic distortion	≤ -20 dBc
Non-harmonic signals	≤ -70 dBc
Source impedance	50 Ω (nominal)
Coupling	ac
Connector	BNC

Note 1. Locking Conditions: One hour after power on. Temperature change not to exceed $\pm 3^\circ\text{C}$ per hour.

1 PPS Output

LOCKED	
Pulse-to-pulse jitter of leading edge	
POSITION HOLD mode	≤ 40 ns (typical)
SURVEY mode	≤ 110 ns (typical)
Time Accuracy (absolute)	≤ 110 ns with respect to UTC (USNO MC)—95% probability when unit is properly installed, calibrated, and locked to GPS.
SUPPLEMENTAL INFORMATION	
Pulse Width	20 μs, nominal
Amplitude	TTL level into 50 Ω load
Rise Time	5 ns max
Connector	BNC
Coupling	dc

Additional Features

ALARM OUTPUT	Provides for monitoring operation remotely. The ALARM output is available between pins 4 (ALARM) and 5 (GND) of the remote interface connector. The ALARM output will be asserted TRUE (RS-232C level) under any of the following conditions: 1) power-on self test fails, 2) antenna power failure, 3) unstable 10 MHz output, or 4) unlocked internal PLL clock.
T-RAIM SATELLITE ERROR DETECTION	Time Receiver Autonomous Integrity Monitor (T-RAIM) detects poor performing satellites and excludes their data from the position and time calculations. This is done independent of the health information broadcast by the satellite.
EXTERNAL RESET INPUT	Allows an asserted TRUE (RS-232C level) input to reset the receiver. The External Reset input is available to a computer between pins 6 (EXT. RESET) and 5 (GND) of the remote interface.
FRONT PANEL INDICATOR	Alarm LED illuminates red when an alarm condition is present.

REMOTE INTERFACE

RS-232C (DTE) configuration protocol	a) 58531A GPS timing receiver analysis and control software (sold separately) b) NMEA compatible
Communications settings (factory default)	baud rate=9600, 8 data bits, 1 stop bit, no parity, no flow control
Connector	9-pin male rectangular D subminiature on front panel ALARM output and EXTERNAL RESET input available to a computer via this connector.
D-sub Connector	9-Pin

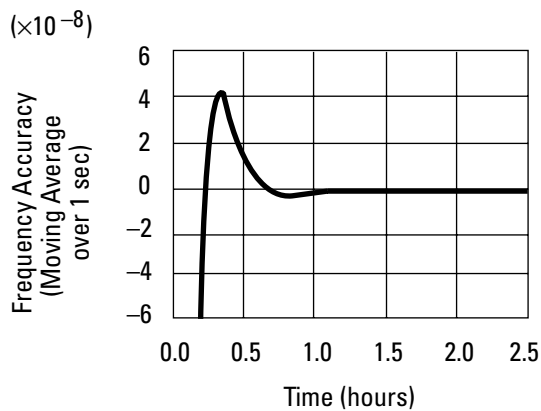
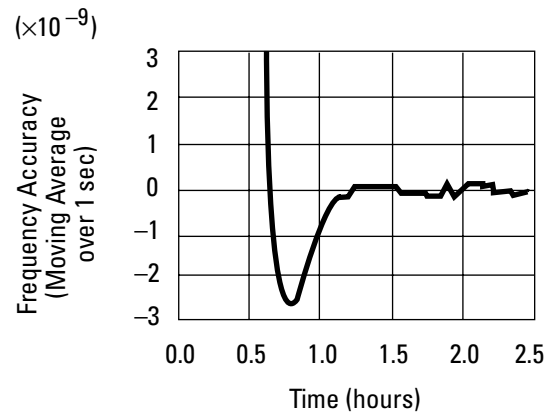
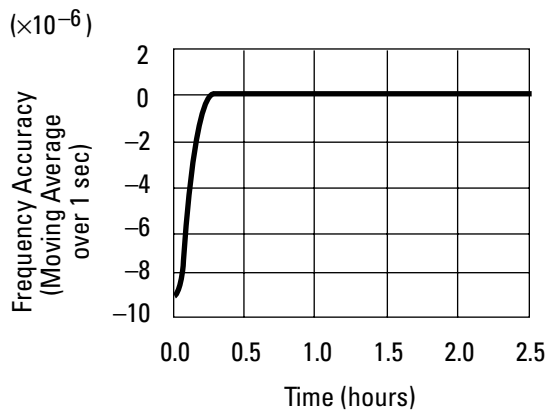
PIN No.	SIGNAL	Tx/Rx	SIGNAL LEVEL
1	N/C		
2	RxD	Rx	RS-232C
3	TxD	Tx	RS-232C
4	ALARM	Tx	RS-232C
5	GND		
6	Ext. Rest	Rx	RS-232C
7	N/C		
8	N/C		
9	N/C		

Environmental Specifications

TEMPERATURE	
Operating	−0°C to +55°C
Storage	−30°C to +85°C
OPERATING HUMIDITY	
10% to 95%, non-condensing	

Additional Information

POWER REQUIREMENTS									
dc power (standard)	+15 Vdc nominal, ±5% 300 mA								
max	+5 Vdc nominal, ±5% 400 mA max								
TYPICAL POWER-ON CHARACTERISTICS									
Total Power:									
Power on/warmup	<10.5 watts (nominal)								
Operating	5.5 watts (nominal)								
Power-on warmup time	30 minutes (typical)								
Power connector	(Amp 172158-1) Pinouts								
<table><tr><th>PIN NO.</th><th>SIGNAL</th></tr><tr><td>1</td><td>+15 Vdc</td></tr><tr><td>2</td><td>+5 Vdc</td></tr><tr><td>3</td><td>GND</td></tr></table>		PIN NO.	SIGNAL	1	+15 Vdc	2	+5 Vdc	3	GND
PIN NO.	SIGNAL								
1	+15 Vdc								
2	+5 Vdc								
3	GND								
WEIGHT AND SIZE									
Dimensions	50 mm H × 100 mm W × 125 mm L								
Weight	308 g								
MATING POWER CONNECTOR									
Shell	Amp 172166-1								
Pins	Amp 770985-1								



Antenna and Cabling Information

The 58532A GPS L1 reference antenna assembly is recommended to ensure specified performance.

TYPE	Active antenna
POWER SUPPLIED TO ANTENNA BY 58533A	5 volts nominal. 50 mA max. (Assuming external +5V supply is at its nominal value. Note that output source resistance is 15 Ω .)
ANTENNA CONNECTOR (58533A)	TNC
ANTENNA CABLE	58520A cables are LMR-400 with a type-N connector on one end to mate to the 58532A, and a type-TNC connector on the other end to mate to the 58533A. Cables are available in a variety of lengths.

Additional GPS Accessories

58529A line amplifier with L1 bandpass filter
58530A GPS L1 bandpass filter
58538A, 58539A lightning arrestors
58535A (1:2) and 58536A (1:4) GPS L1 signal distribution amplifiers

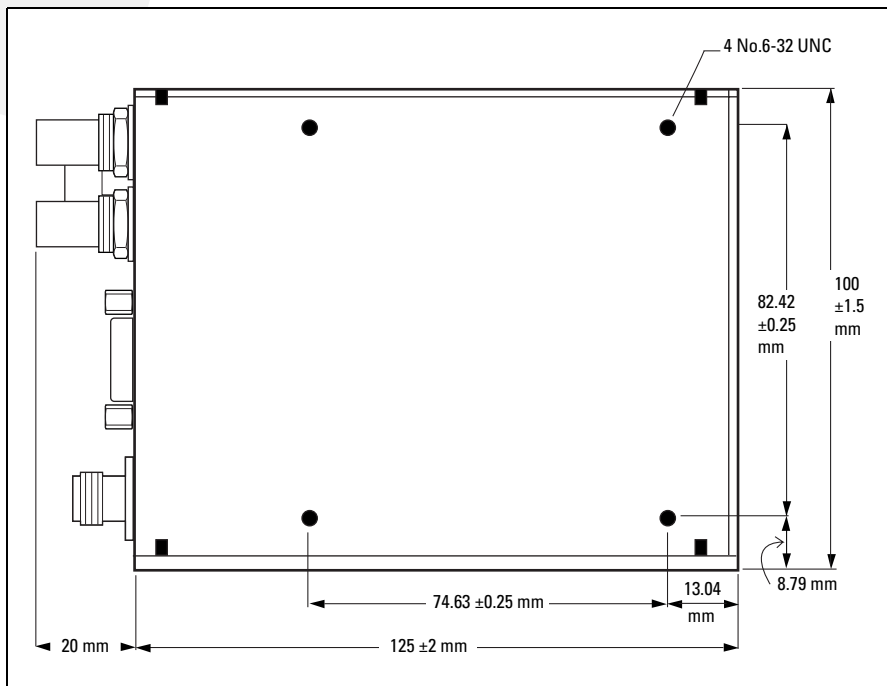


Figure 1. 58533A drawing of mount holes.

Note. Maximum length of mounting screws is 15 mm.

For more information

Dependable Accessories for your GPS Installation—Brochure

GPS Antenna Systems—Quick Configuration Guide



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