Established 1981
Advanced Test Equipment Rentals
www.atecorp.com 800-404-ATEC (2832)

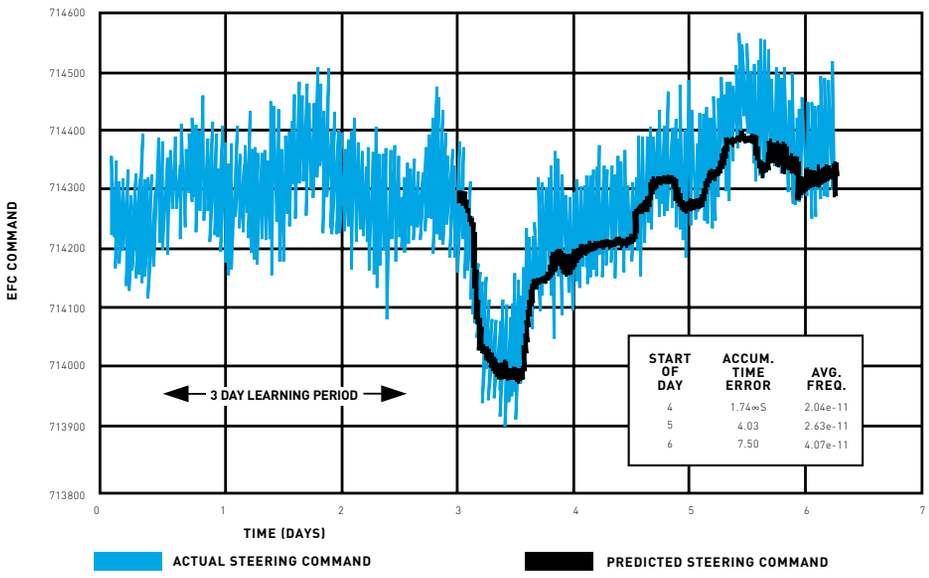

FIG.2 SmartClock operation

SMARTCLOCK TECHNOLOGY

Integrated with the quartz oscillator, SmartClock greatly enhances the performance of the 58503B GPS time and frequency reference receiver under both locked and unlocked conditions. In the locked condition, it has all the desirable short-term stability attributes of a state-of-the-art quartz oscillator, but it is drift free. In the event the GPS reference is lost, the combination of the quartz oscillator and SmartClock delivers performance which approaches the performance of rubidium oscillators.

Figure 2 gives typical data illustrating the operation of SmartClock. All data is taken with the unit locked to GPS. During the first three days, SmartClock uses the GPS reference to "learn" the aging behavior of the quartz oscillator. This information, along with the temperature compensation that is taught to SmartClock when the unit is tested at the factory, is used to steer the oscillator. The light, shaded line shows the actual digital steering commands sent to the oscillator to keep it synchronized with GPS time.

The heavy, solid line shows a plot of the steering commands computed using the SmartClock algorithm starting with Day 4. The dominant effects during the predicting period are changes due to external temperature. If the GPS signal had not been present, the oscillator would have been steered in holdover by SmartClock using the corrections that it had determined from the learning period.

Holdover performance can be computed from the difference between the actual steered performance and the predicted performance. The data for the first three days in holdover are shown in Figure 2.

ENHANCED GPS

Enhanced GPS includes digital filtering designed to remove most of the effects of SA (Selective Availability) on the timing performance of the 58503B.

Enhanced GPS is based on extensive study of the spectrum of SA, a method superior to simple averaging techniques. Enhanced GPS couples SA data with clock instability models to derive optimum digital filters which minimize the effects of SA. The benefits of Enhanced GPS apply only to stationary 58503B GPS time and frequency reference receivers.

When a Symmetricom GPS receiver is initially turned on and locked to the GPS satellite system, it will achieve GPS lock within 30 minutes of operation. It has a 95% probability of meeting unlocked (holdover) specifications after 48 hours of GPS operation, followed by 24 hours of learning. The longer the GPS receiver (and its quartz oscillator) operates, the better its stability and unlocked (holdover) performance becomes.

SATSTAT PROGRAM

The Symmetricom 58503B comes with a Microsoft® Windows 3.1 program called "SatStat" which displays important internal parameters. SatStat operates on any PC which can run Windows 3.1 programs and which has a serial interface available.

SatStat provides several useful functions. It continuously polls the RS-232 interface and displays receiver information most likely to be of interest. This includes satellites being tracked along with their elevation and azimuth, receiver state (locked, holdover, etc.), antenna coordinates, time and frequency figures of merit and other data. In addition, a clock window is provided to display time of day in real time. Finally, SatStat allows you to easily change many receiver parameters, such as antenna delay, by simply picking the item from a pop-up menu and entering a new value. With SatStat and a PC, you can monitor and control many aspects of the receiver status without developing software.

OPTIONAL 16-CHARACTER FRONT PANEL DISPLAY

Available options include a built-in front panel display. The standard 58503B GPS time and frequency reference receiver does not include a display. While a display is not necessary, it may be convenient to track the receiver's progress during installation and startup by monitoring the satellites being tracked, location, time, and other parameters.

OPTIONAL 1 PP2S OUTPUT (EVEN-SECOND OOUTPUT)

An even-second (1 PP2S) output is available as an option to the 58503B. The even-second output option provides one pulse every other second, synchronized to the even seconds in GPS time. This is the reference time used in CDMA base stations. GPS even-second pulses from the 1 PP2S option are used to synchronize the Agilent 8921A (Option 600) and the Agilent 8935A cellular base station test sets. Synchronizing the test set from an independent source permits remote base station testing and independent base station frequency and time reference accuracy checks.

ANTENNA AND CABLING INFORMATION

The 58532A GPS L1 Reference antenna is recommended to ensure specified performance of the 58503B. For optimum performance, the antenna should be installed in a location which gives it a clear view of the entire sky.

TYPE

- Active antenna
- Power supplied to the antenna by the 58503B — 5 volts nominal, 50 mA max

ANTENNA CONNECTOR (58503B)

- Type — N jack (female).

ANTENNA CABLE

- 58521A cables are recommended. These cables are LMR 400 with Type-N connectors (male) on both ends. A variety of lengths are available.

ADDITIONAL ACCESSORIES

- 58502A broadband distribution amplifier; provides 12-Channel broadband (0.1 to 10 MHz) sine wave distribution.
- 58535A/36A/17A GPS L1 signal distribution amplifiers/splitters allows multiple receivers (2, 4, or 8) to share a single antenna.
- 58529A GPS line amplifier with L1 bandpass filter; provides the gain to overcome cable loss and protection against noise and interference signals.
- 58530A GPS L1 bandpass filter; provides protection against noise and interference signals
- 58538A/ 58539A lightning arrestors; provides protection against nearby lightning strikes.

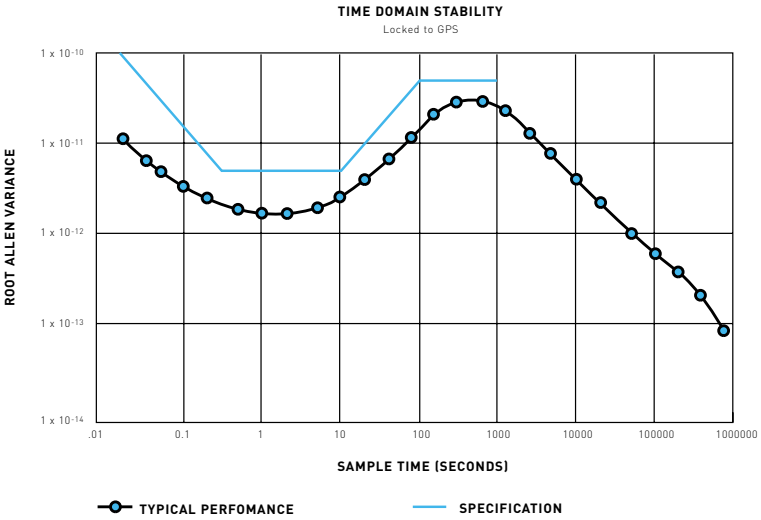

FIG.3 Time Domain Stability

58503B SPECIFICATIONS AND CHARACTERISTICS

GPS RECEIVER FEATURES

GENERAL SPECIFICATIONS

- Eight channel, parallel tracking GPS engine
- C/A Code, L1 Carrier
- SmartClock/ Enhanced GPS
- Optional DC power operation available

10 MHz Output Specifications (with SA on)

LOCKED

- Frequency Accuracy: Better than 1×10^{-12}, for a one day average, 0 °C to 50 °C.

UNLOCKED

- Holdover aging: $<1 \times 10^{-10}$ per day average frequency change in 24 hours of unlocked operation. (See Notes 1 and 2.)

PHASE NOISE (LOCKED)

- Offset From Signal (Hz) — SSB Phase Noise (dBc)

Offset From Signal (Hz)	SSB Phase Noise (dBc)
1	-85
10	-125
100	-135
1000	-140
10000	-145

TIME DOMAIN STABILITY (LOCKED)

(See Figure 3)

- Averaging Time Seconds — Root Allan Variance

Averaging Time Seconds	Root Allan Variance
0.01	1.5×10^{-10}
0.1	1.5×10^{-11}
1	5×10^{-12}
10	5×10^{-12}
100	5×10^{-11}
1000	5×10^{-11}

SUPPLEMENTAL INFORMATION

- Waveform — Sine wave
- Amplitude — >1.7 volts p-p (+8 to +10 dBm) into a 50 Ω load
- Harmonic Distortion — <–25 dBc (Typical)
- Non-harmonic signals — <–80 dBc (Typical)
- Source impedance — 50Ω (nominal)
- Coupling — AC
- Connector — BNC

1 PPS Output/1 PP2S Output (Option 002) Specifications (with SA on)

LOCKED

Jitter of leading edge: <750 ps rms with at least one satellite in view.

TIME ACCURACY

20ns typical (1 Sigma) SA off with respect to UTC (USNO MC) and all systematic offsets have been removed, calibrated, and locked to GPS.

UNLOCKED

Accumulated time error: <8.6 µs accumulated in 24 hours of unlocked operation. (See Notes 1 and 2.)

SUPPLEMENTAL INFORMATION

- Pulse Width 26 µs
- Amplitude >2.4 volts into 50 W load. (TTL compatible)
- Connector BNC
- Rise time 40 ns typical

ADDITIONAL FEATURES

ALARM OUTPUT

TTL open collector with internal pull-up resistor. Circuit can sink up to 10 ma. Provides a logic output to allow monitoring of normal (H) and abnormal (L) operation externally and remotely. BNC connector.

FRONT PANEL INDICATORS (LEDs)

- Power
- GPS Lock
- Holdover Mode
- Alarm

REMOTE INTERFACE

- RS-232C DTE configuration — Complete remote control and interrogation of all instrument functions and parameters.
- Factory defaults — Baud rate 9600, 8 data bits, 1 start bit, 1 stop bit, no parity. Other settings are programmable.
- Connector — 25-pin female rectangular D subminiature on rear panel.
- Time code output is available to a computer immediately preceding the 1 PPS signal for the current second.

NOTE 1

This specification has a 95% probability, and is based on the availability of four or more GPS satellites during three days of locked operation with a fixed antenna location. The temperature must remain within a 10 ºC range between 10 ºC and 40 ºC.

NOTE 2

When a quartz oscillator has not been operated for a period of time, or if it has been subjected to severe thermal or mechanical shock as might be encountered during product shipment, the oscillator may take some time to stabilize. In most cases, the oscillator will drift and then stabilize at or below its specified rate within a few days after being turned on. In isolated cases, depending upon the amount of time the oscillator has been off and the environmental conditions it has experienced, the oscillator may take up to one week to reach its specified aging rate and to operate without significant frequency "jumps."

When a Symmetricom GPS receiver is initially turned on and locked to the GPS satellite system, it will achieve GPS lock within 30 minutes of operation. It has a 95% probability of meeting unlocked (holdover) specifications after 48 hours of GPS operation, followed by 24 hours of learning. The longer the GPS receiver (and its quartz oscillator) operates, the better its stability and unlocked (holdover) performance becomes.

ENVIRONMENTAL SPECIFICATIONS

TIME AND FREQUENCY REFERENCE RECEIVER (58503B)

Operating	0° C to +50° C
Storage	-40° C to +80° C

ANTENNA (58532A)

Operating	-40° C to +85° C
Storage	-45° C to +90° C

Additional Information

POWER REQUIREMENTS

- AC power (standard)

AUTO RANGING

- 100 -127 Vac, nominal
- 220 - 240 Vac, nominal

RANGES

- 90 - 132 Vac
- 198 - 264 Vac
- 47 - 63 Hz

Option AWQ (replaces AC power operation with DC power operation)

AUTO RANGING

- 24 - 48 Vdc, nominal

RANGE

- 20 - 60 Vdc, greater than +23 Vdc required to start

INPUT POWER (all options)

- <35 watts (nominal)

DIMENSIONS

- 88.5 mm H x 212.6 mm W x 348.3 mm D
  Half-rack module.

SYMMETRICOM, INC.
2300 Orchard Parkway
San Jose, California
95131-1017
tel : 408.433.0910
fax : 408.428.7896
info@symmetricom.com
www.symmetricom.com

SYMMETRICOM EMEA
150 Wharfedale Road
Winnersh Triangle, Nr. Wokingham
Berkshire
RG41 5RB, United Kingdom
tel : 44.1189.699799
fax : 44.1189.277520
info@symmetricom.com

SYMMETRICOM LATIN AMERICA
1560 Sawgrass Corporate Parkway
4th Floor
Sunrise, Florida
33323
tel : 954.331.4592
fax : 954.331.4601
info@symmetricom.com

SYMMETRICOM ASIA ACIFIC
Unit 1005, Jubilee Centre
42–46 Gloucester Road
Wan Chai
Hong Kong
tel : 852.2529.7180
fax : 852.2529.7190
info@symmetricom.com

©2002 Symmetricom. Symmetricom and the Symmetricom logo are registered trademarks of Symmetricom, Inc. All specifications subject to change without notice. DS/58503B/D/0902/PDF