Symmetricom®

Mark V

GPS P(Y) Code Time and Frequency Receiver with SAASM

KEY FEATURES

- 10 Nanoseconds rms Accuracy to UTC
- Uses the Precise Positioning Service (PPS)
- Dual Frequency
- Receiver Autonomous Integrity Monitoring (RAIM)
- Versatile and Modular Architecture
- SAASM PPS GPS Receiver

Symmetricom's Mark V™ offers ultra-precise timing performance by using the GPS Precise Positioning Service (PPS) that takes full advantage of the accuracy and anti-spoofing capabilities of the P(Y) code. The Mark V corrects for Selective Availability and uses Y-code augmented with Receiver Autonomous Integrity Monitoring (RAIM) to protect against satellite/system anomalies and spoofing. In addition, it incorporates the latest Selective Availability Anti-Spoofing (SAASM) technology. U.S. Department of Defense and Government customers obtain the most reliable GPS-based timing possible with accuracy better than 10 nanoseconds to UTC.

The superior performance levels achieved by the Mark V are the result of a complete strategy based on accurate position determination, dual frequency GPS tracking, system integrity monitoring, multi-satellite ensembling techniques, and a high-stability ovenized oscillator.

Standard timing outputs from the Mark V include a 1 PPS accurate to less than 10 nanoseconds rms to GPS/UTC, analog IRIG-B

time code, and serial I/O time strings. Using the keypad or RS-232 port, users have control over a variety of time formats, configurations, and output options, including GPS and oscillator status and controls.

The very modular backplane architecture of the Mark V supports multiple time and frequency output options to address specific needs. These plug-in output modules can be incorporated at any time and significantly increase the clock adaptability to changing mission requirements. See the Options section for a list of the currently supported options. The base models support up to four single-height plug-in modules. Using the optional 3.5″ high chassis, up to ten single-height modules can be accommodated.

The features of the Mark V make it the instrument of choice for critical mission applications such as

- C^{4}I
- Range Timing
- Satellite Communication Stations
- T1/E1 Primary Reference Sources
- Network Synchronization

Mark V GPS P(Y) Code Time and Frequency Receiver

Mark V Specifications

RECEIVER/GENERAL

- Receiver input: L1/L2, P(Y) code (PPS), SAASM
- Tracking: Twelve parallel, dual-frequency channels
- Crypto key input: DS-102. Compatible with KYK-13, KOI-18, AN/CYZ-10.
  Black/red key support. Front panel connector.
- Security: SAASM GPS receiver
- Position update rate: Once per second
- Time to first fix: 1.5 minutes nominally
- Antenna/preamplifier: L1 1575 MHz and L2 1227 MHz microstrip with 40 dB gain, all-weather, outdoor mounting.
- Lead-in cable: 50' (15 m) of RG-59/U supplied with the system
  Longer cable runs can be accommodated optionally by:
  Lower-loss cable
  Fiber optic cable
  In-line amplifier

TIMING OUTPUTS

- 1 PPS output: TTL into 50Ω, rising edge on time
  20-microsecond pulse width
  Rear panel BNC
- IRIG B output: 1 kHz amplitude modulated carrier
  3 Vpp high, into 600Ω
  Rear panel BNC
- Serial I/O: Bidirectional port at RS-232 levels
  Full user-selectable protocol
  DB9 connector

ADDITIONAL STANDARD FEATURES

- External frequency measurement

Frequencies:	1, 5, or 10 MHz
Resolution:	6×10^{-11} at 1 second intervals
Accuracy:	1×10^{-12}

- Time interval/event timing

Resolution:	30 ns, single shot
Accuracy:	100 ns ±30 ns

- Loss of lock alarm: Open collector type alarm output

PERFORMANCE (AUTHORIZED USERS)

- Dynamics

Velocity:	0-400 m/sec (800 knots)
Acceleration:	4 g

- PPS position accuracy (WGS84)

  3-D, 10 meters SEP in dynamic model 3-D
  3 meters 2d rms in static mode after completing
   24-hour initialization position averaging

- Altitude

PPS:	-400 to 21,500 meters (70,000')
SPS:	-400 to 18,200 meters (60,000')

- Timing accuracy, 1 PPS

To GPS:	<10 ns rms (<100 ns peak)

- Internal oscillator: 10MHz high-stability OCXO
- Accuracy: $<2\times10^{-13}$ when tracking satellites
- Stability: 1×10^{-11} at 1 second
  1×10^{-11} at 100 seconds
  $<2\times10^{-13}$ at one day
- Stability when not tracking satellites: 3.5×10^{-11}/° C

FRONT PANEL CONTROLS

- Alphanumeric front panel display

  Initialization parameters, time of year, as well as alarms/status messages can be viewed on the 2-line, 32 character LCD

- Keypad: 0-9; up, down, left and right arrows; CLR, FUNC/ENTR, TIME, STATUS, POSITION
- Front-panel time display: LCD type, 10 characters, 1 line; default is time-of-year

MECHANICAL/ENVIRONMENTAL

- Receiver

Size:	1.75" x 17.0" x 17.0" (4.4 cm x 43.2 cm x 43.2 cm)
Power:	95-260 Vac, <40 watts, 47-440 Hz
Operating temperature:	0°C to +50°C
Storage temperature:	-40°C to +85°C
Humidity:	To 95% noncondensing

- Antenna

Operating temperature:	-55°C to +85°C
Storage temperature:	-55°C to +85°C

OPTIONS

- Telecommunication interface: Primary Reference Source 1.544 Mbps (T1) or 2.048 Mbps (E1), Status/Alarm
- 1, 5, or 10 MHz frequency outputs
- Multiple time code outputs
- Selectable output pulse rates
- N.8 data rate outputs
- Low phase noise frequency outputs
- Oscillator upgrades: Rubidium, High stability Rubidium
- External oscillator control
- Network time server
- Network interface card for telnet remote control
- Precision time and time interval interface (PTTI)
- Have Quick II
- Parallel BCD
- 3.5" height, 10-option bay chassis
- AC/DC power input

  95-260 Vac/18-36 Vdc
  95-260 Vac/36-72 Vdc
  110 or 220 Vac/10.5-32 Vdc

- IEEE-488 interface
- Fiber optic antenna link (up to 2 km)

Note: U.S. Government policy restricts the sale of Precise Positioning Service (PPS) equipment to those authorized by the U.S. Department of Defense. Non-U.S. authorized users must purchase PPS equipment through the Foreign Military Sales (FMS) process. Made in the U.S.A.