



## KEY FEATURES

SGE-41 24 Channel SAASM GPS Engine

Supports Digital Antenna Electronics Interface (up to 16 beam-formers)

Supports legacy antenna interfaces – active or passive FRPA, AE-1, GAS-1, ADAP

Enhanced Carrier Phase Tracking

Software compliant with RTCA DO-178B

SPS/PPS firewall and switch

Fault Detection and Exclusion per RTCA DO-229B

Supports JPALS Requirements

High-performance, Oven Controlled Crystal Oscillator



## Serial Embedded GPS Receiver (SEGR) Solution for RF and DAE Embedded Applications

The Trimble® SEGR is a family of Embedded GPS Receivers (EGR) that support airborne and other high accuracy applications. The SEGR family is comprised of the Force™ 27 and Force™ 28. They share common performance and key characteristics to our flagship embedded GPS receiver, the Force 524D, but in a significantly smaller form-factor.

The SEGR incorporates the same SGE-41 24 channel SAASM found in the Force 524D, capable of simultaneous tracking twelve L1, twelve L2 or a combination of Y-Code and C/A code channels.

The GPS receiver includes a massive correlator bank to enable Fast Direct Y-Code acquisition operation even in jamming environments. Its advanced digital signal processing, software architecture, and Oven Controlled Crystal Oscillator (OCXO), provide precise measurement data even under high dynamics and adverse RF environments.

The SEGR has performance equivalent to the Force 524D EGR – the industry standard for carrier phase and velocity. The SEGR retains interface compatibility with both legacy antenna and advanced Digital Antenna Electronics (DAE). The host platform can select the RF or DAE interface. In the DAE mode, the SEGR is capable of controlling up to 16 independent beams, thereby significantly enhancing AJ immunity.

The SEGR supports certification for airborne applications, including CNS/ATM, NAVWAR, and precision approach/landing (JPALS). The software is common to Force 524D; it is compliant to DO-178B, Level C. It incorporates an SPS/PPS Firewall and Switch to support SPS operation in civil controlled airspace. Fault Detection and Exclusion (FDE) and Step Detector functions are implemented in accordance with RTCA DO-229B to ensure the integrity of the GPS solution.

The Trimble Force 27 and Force 28 GPS receivers have been granted security approval by the GPS Directorate.

The SEGR can be integrated as a stand-alone GPS receiver or embedded with inertial navigation systems or other sensors. The SEGR provides a single logistics solution for RF and DAE applications.

**SPS (non-SAASM) Version Available for Export**

**Features**

- 24-channel continuous tracking; L1 & L2 frequency; C/A-, P-, and Y-Code
- SPS/PPS Firewall and Switch for civil airspace operation
- Fault Detection and Exclusion and Step Detector per RTCA DO-229B
- Enroute, Terminal, Oceanic, and Non-Precision Approach flight phases supported per TSO C-129a
- Fast Direct Y-Code acquisition
- SPS differential GPS per RTCM-104 Version 2.1
- Stand-alone (unaided) or integrated (aided) operation
- Code loop aiding (1–50 Hz aiding rate)
- Selectable unfiltered or filtered position/velocity/time (PVT) solution
- Field reprogrammable

**Performance Specifications (Authorized Users)**

**Dynamics**

Altitude: –701 to +22,860 m (–2,300 to +75,000 ft) MSL  
 Velocity: ±1,200 m/sec per axis  
 Acceleration: ±100 m/sec<sup>2</sup> per axis

**Performance**

Autonomous: PPS position accuracy: 16 m SEP  
 PPS velocity accuracy: 0.1 m/sec, RMS per axis  
 PPS time accuracy: 100 nsec, 1 sigma wrt UTC  
 DGPS: Position accuracy: 5 m SEP  
 Velocity accuracy: 0.1 m/sec, RMS per axis  
 Anti-Jam: See Specifications for details.

**Interfaces**

RF Antenna Input: L1 & L2 frequencies; +0 to +35 dB ±5 dB;  
 +5 Vdc ±5%, 100 mA max provided on coaxial  
 cable center conductor, switchable by Host  
 Primary Power: +5.2 Vdc ±3% & +3.3 Vdc ±3%; 6 W max,  
 4 W typical  
 Auxiliary Power: +2.5 to +5.0 Vdc  
 Host Control Interface: Auxiliary Serial Interface (RS-422)  
 Instrumentation Port: RS-422  
 Hot Start/DGPS Port: RS-232  
 Input/Output Protocols: ICD-TMAS-167, ICD-TMAS-153C,  
 ICD-GPS-150, TIPY, NMEA-0183  
 Input Protocols: RTCM-104 Version 2.1 for differential  
 operation  
 Precise Timing Interfaces: 1PPS IN/OUT, HAVEQUICK OUT,  
 TIME MARK IN/OUT, Data Capture

*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. Specifications subject to change without notice.*

Approved for public release under case# 12-162.

**Physical Characteristics**

Dimensions: 3.915" x 4.920" x 0.620"  
 Weight: 0.5 lbs  
 Host Connector: Airborne P/N RM-252-080-311-5570  
 Host RF Contact: AEP P/N 7110-1511-050  
 Wedgelocks: Calmark P/N A265-2.80 T2 L

**Environmental Specifications**

Operating temp: –54°C to +85°C; +85°C to +100°C,  
 30-minute linear excursion up to +100°C  
 Storage temp: –62°C to +95°C  
 Vibration: See Specifications for details.  
 Shock: Service Shock: 35 g, half-sine, 3 m/sec  
 Catapult Shock: 15 g, half-sine, 40 m/sec  
 Altitude: Operating: –2,300 to +75,000 ft MSL  
 Non-operating: 80,000 ft MSL for 2 minutes  
 Humidity: Up to 100% relative humidity, non-condensing  
 EMC: MIL-STD-461E: CE106, CS103, CS104  
 (antenna ports)  
 Predicted Reliability: >16,700 hours, AUF Environment at 45°C  
 ESD Protection: MIL-STD-1686, Class 3 (Human Body Model)

**Part Numbers:**

Force 27 82601-10-Uxxx, 82601-10-Cxxx  
 Force 27 SPS 79050-00  
 Force 28 85720-10-Uxxx, 85720-10-Cxxx  
 Force 28 SPS 79340-00

**Available Documentation:**

Specifications: TMAS-GPS-F27  
 TMAS-GPS-F27-SPS  
 TMAS-GPS-F28  
 TMAS-GPS-F28-SPS  
 ICDs: ICD-TMAS-167  
 ICD-TMAS-153C

*Specifications subject to change without notice.*

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