BAE SYSTEMS

GEM™ VII-X* receiver

Extending service life with delivery of satellite-based encrypted GPS

The GPS Embedded Module VII is BAE Systems' most advanced airborne GPS receiver ever built in a SEM-E form factor.

The GEM VII receiver delivers a SAASM 3.7 based GEM receiver replacement and service life extension. As GPS gets contested, mission or operational airspace access is becoming more difficult for military, commercial, and private users. Next-generation military airborne navigation systems must address the demand for increased accuracy, resiliency, integrity, and capability from domestic and international aviation communities to improve airspace access and capacity while operating missions in GPS contested battlespace. The GEM VII receiver architecture is updated with 36 hardware channels, utilizing 24 channels for simultaneous dual frequency all-in-view tracking. This is a marked improvement over legacy 5 and 12 channel variants of the GEM receiver family of products.

Evolving capabilities

The GEM VII receiver gives users the capability to interface with the BAE Systems' DIGAR™ receiver to provide unmatched anti-jamming performance for warfighters who must operate in GPS contested airspace.

The new GEM VII receiver is designed in accordance with GPS Receiver Application Module Guidelines (GRAM-S). Specifically designed to meet small package requirements, the form factor provides GRAM-S performance in a Standard Electronic Module-Size E (SEM-E) receiver. The GEM VII receiver's flexible I/O supports open systems architectures and industry-standard interfaces. Building upon a legacy that began in 1990, this receiver incorporates numerous advanced features with additional functions that are continually being added to its vast list of capabilities and configurable software options.

This is a reliable low-cost system service life extension for our GEM receiver operators as they assess navigation systems changes. BAE Systems plans to support the GEM VII receiver product line well beyond 2030.

Features

- Standard SEM-E form factor
- All-in-view satellite tracking for optimized geometry and satellite drop-out immunity
- Fault Detection and Exclusion (FDE) per DO-229 providing navigation solution integrity
- Space Force-approved SAASM (KDP-IV, OPSW 1.01) for encrypted operations
- Fast direct-Y code acquisition offers higher tolerance to both jamming and spoofing
- Ultra low-power time maintenance enhances ability for mission execution
- Stand-alone (unaided) or integrated (aided) operation provides the user with highly accurate positioning
- LOS outputs unclassified even when keyed for storage
- 65 dB J/S (receiver only performance) to protect against jamming
- Greater than 100 dB J/S (with the BAE Systems' DIGAR anti-jam) for industry-leading jamming protection

Unmatched performance in the most demanding GPS-challenged environments

System characteristics

Receiver	L1 frequency, C/A and Y code L2 frequency, Y code
Dynamics	Velocity 1,200 m/s Acceleration 10 g maximum
TTFF1	<80 seconds (prob >.95)
PLGR hot start	5 seconds (direct-Y)
Time accuracy	PPS <30 nanoseconds RMS
Position accuracy	PPS 5.6m RMS (Horizontal)
Velocity accuracy	PPS: 6.9m RMS
Altitude	>80,000 feet
Position update rate	
– Unaided	once-per-second pseudorange based, 5 Hz delta range based, 10 Hz propagated;
– INS-aided	once-per-second pseudorange based, 4-25 Hz dependent on aiding rate
– MTBF	>20,000 hours @ 45°C (MIL- HDBK-217)

Service life extension/upgrade compatibility

Obsolete	Alternative replacement
GEM II	GEM VII-2 8K DPRAM
GEM III / GEM V	Call us
GEM IV	GEM VII-6 16K DPRAM
GEM VI	GEM VII-6 32K DPRAM

* The "X" denoted in the product series ranges from number 2 to 6 pending it's intended replacement from the Legacy GEM series, see table above.

Interfaces

- 1 PPS time input and output
- Enhanced accuracy Have Quick output
- Active RF antenna support (AE1,GAS-1,FRPA, ADAP)
- Passive RF antenna support (FRPA)
- ICD-GPS-167 compatible interface (high-speed serial)
- ICD-GPS-150 instrumentation port (quantity 2)
- DS 101/102 crypto-variables
- ICD-GPS-153 PLGR Hot Start (RS-232)
- ICD-GEM-DAE, Anti-Jam Antenna Electronics (AJAE), DIGAR

Physical characteristics

Power	<3.0W
Weight	<0.8 lb
Size/volume	5.9 x 5.7 x 0.6 in.
Temperature range	-54° C to 85° C continous -62° C to 95° C storage
Service crash	35g
Random vibration	19Grms functional, 41Grms endurance

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