

SSTL SGR-05

Space GPS Receiver



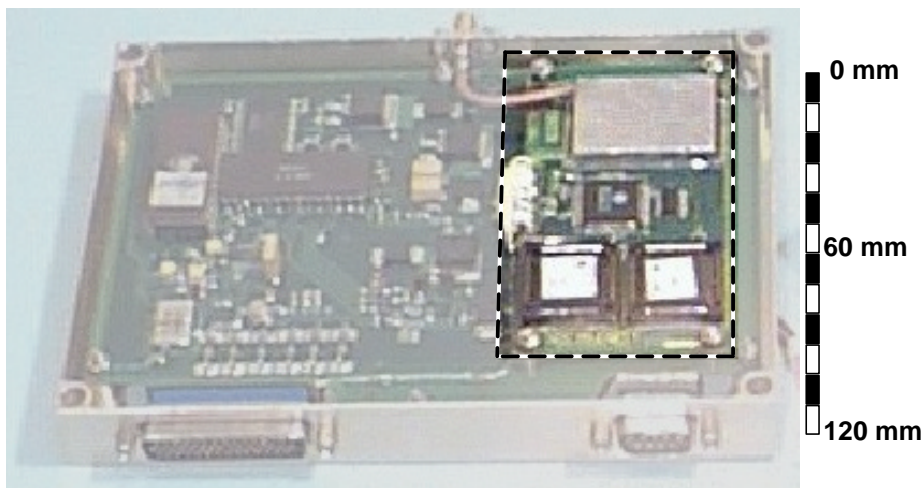
The SGR-05 is a spacecraft orbit determination and timing sub-system designed for miniature applications. The SGR-05 provide GPS standard time, position, velocity measurements in a compact and low power unit at low cost.

Description

The Global Positioning System (GPS) consists of a constellation of 24 satellites at an altitude of 20,000 km and can be used for positioning on land, at sea, in air or in space. The SGR receives and decodes the L-Band signals from four or more GPS satellites and through ranging techniques is able to calculate the position of the spacecraft to an accuracy of the order of 15 metres. It can also be used to determine accurate velocity and time.

The SGR-05 is based on the Mitel Orion GPS Receiver, and consists of solely the GPS receiver core components, so is suitable for integration into host modules.

Surrey Satellite Technology Ltd (SSTL) is a leading manufacturer of small satellites and sub-systems. SSTL has built and launched 20 satellites since UoSAT-1 in 1980. The SGR combines SSTL's knowledge of spacecraft sensors and systems with the latest advances in terrestrial GPS technology to offer a sophisticated spacecraft navigation system.



SGR-05 for SNAP-1, housed in the ADCS module

Features

- **SGR chipset** is based on high performance commercial MITEL Semiconductors GPS chipset and ARM60B 32 bit RISC processor
- **Radiation** susceptibility of parts has been evaluated in a joint SSTL/ESA programme.
- **Code** stored in Flash memory to enable rapid booting and future functional upgrades
- **Windows** program provided to monitor and control the SGR and to view and process logged data from the SGR.
- **Testing and PA** plans available. Environmental and Acceptance Testing and PA plans can be tailored to suit customer.
- **Performance** Typically onboard orbit knowledge can be obtained to within several metres from data over 24 hours. SSTL can provide expert advice on orbit determination solutions using the SGR.

Specifications

- Up to 12 channels receiving L1 C/A code
- 1 antenna
- Time (UTC): 1 μ s
- Position (2 σ): 15 m
- Velocity (2 σ): 1.5 ms⁻¹
- Dynamic Capability: 8 kms⁻¹, 2 g
- Time to First Fix (TTFF): Typically 90 s warm start; 7 minutes cold start.
- Interfaces: UART channels, 5V power and Pulse-per-second.

Qualification

- SGR-05 demonstrated on SNAP-1 (2000)
- SGR-10 Flown on TMSAT-1 (1998), Tsinghua-1 (2000), TiungSat (2000)
- SGR-20 Flown on UoSAT-12 (launched April 1999)
- SGR Selected for AISat, UKDMC, TopSat, BilenSat,
- SGR Selected for ESA's PROBA mission and International Space Station (ISS) application

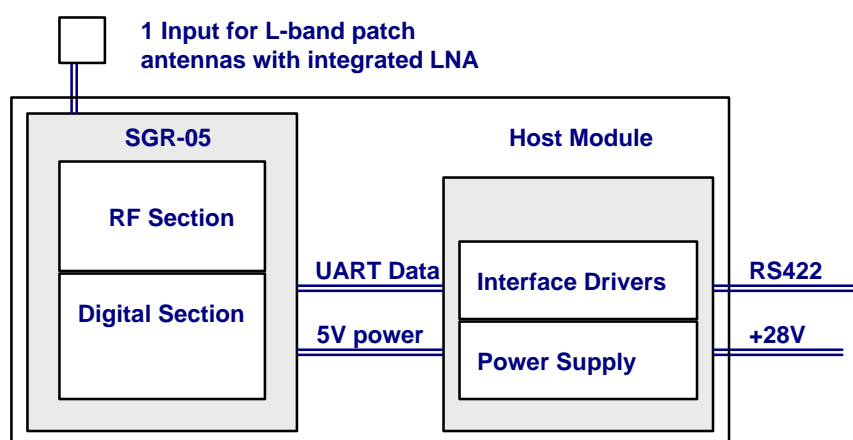
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Application

- Unlike SSTL's SGR-10 and SGR-20, the SGR-05 is not a complete sub-system solution, but must be integrated into a host module. This enables, for example, the close integration of the GPS receiver with the ACS module and enables the absolute minimisation of the resources. The host is responsible for mechanical housing, EMC, interfaces, power supply, although SSTL is able to provide practical integration advice.
- SSTL provides patch antennas and Low Noise Amplifiers (LNAs). The LNAs may be integrated or separate from antennas.
- Programmable binary data interface to tailor data rates according to application.
- Pulse per second output can provide means to synchronise host satellite clocks to within one microsecond of UTC.



Block Diagram of SGR-05 with typical host application

Other SSTL GPS Receivers

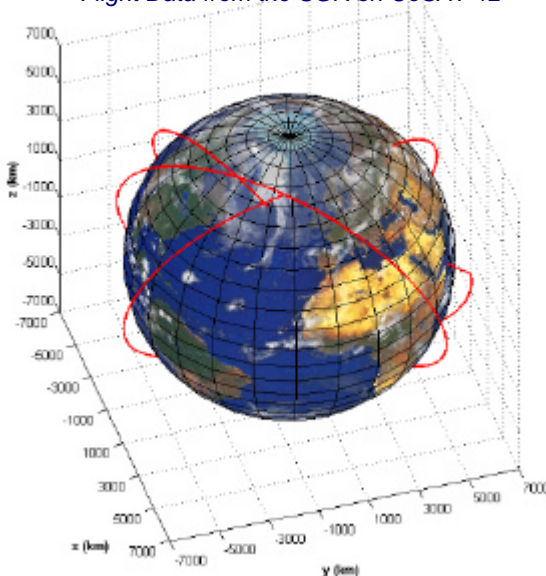
A datasheet exists for the SGR-10 / 20 series receiver. These are complete packaged receivers with power supplies, interface drivers and mechanical housing suitable for flight.

- **SGR-10** Dual antenna, position, velocity and timing
- **SGR-20** Four antennas, position, velocity, timing and attitude determination.

Other SSTL Products

- Complete satellite missions including turnkey systems and know-how transfer
- Units for C&DH, Power, Comms & AOCs sub-systems and various Payloads
- Space technology design, analysis and manufacture services

Flight Data from the SGR on UoSAT-12



Environmental (Acceptance Level)

- The SGR-05 is suitable for the following acceptance levels, (subject to appropriate integration in host application):
- Random Vibration: 15 g
- Thermal: -25 °C to +50 °C
- EMC: as per MIL-STD-462D
- Radiation: - Cumulative dose >10 kRad (Si)

Physical Characteristics

- 100 x 60 x 15 mm
- SGR-05 Mass: 50 g

Power Supply

- SGR-05 Power Consumption: 2 W (5 V)
- +28 V option available

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