NaviGEO / NaviMoon
Spaceborne GNSS Receiver
cutting dependence on costly Earth infrastructure

SpacePNT+

NaviGEO and NaviMoon are SpacePNT's super-high-sensitivity GNSS receiver solutions delivering autonomously outstanding positioning and timing accuracy in real-time for GTO/GEO/HEO/Moon missions, cutting the dependence on costly Earth infrastructure for orbit determination

Key features

- NaviGEO's dual antennas covers the need for launchers and kick stages from LEO to GEO and beyond, no matter the spacecraft's attitude
- NaviGEO and NaviMoon's super-high sensitivity architecture and algorithms allow acquiring and tracking the GNSS signals way above the GNSS constellations

Highly reliable architecture

- Implements a tightly coupled orbital forces model to filter the noisy measurements, to combat the poor dilution of precision, and to propagate the navigation solution even when few or no observables are available
- Supports multiple GNSS and multiple frequencies
- Supports cold/warm redundancy with 2 units
- Based on the use of high performance rad-tolerant COTS EEE components and radiation tolerant HW/SW/FW architecture including latch-up protections and ECC (inherited from SpacePNT's flagship NaviLEO™ receiver)

Upgradable and scalable

- Full in-flight FW/SW upgradability (including FPGA)
- One unique platform solution for launchers, LEO, GTO, GEO, HEO, and even Moon missions
- Optional external LNA allows the use of passive antenna(s) and provides additional filtering
- Highly customizable with many options including internal or external clocks, passive/active antenna(s), etc.)

Applications

- GTO / GEO / MTO / Cislunar orbit missions
- One unique platform solution for launchers, kick-stages, LEO, GTO, GEO, HEO, Moon missions and more

Key performance characteristics	
Real-time pos. accuracy	From < 1 m (3D rms) in LEO to < 100 m (3D rms) in cislunar orbit[1]
Warm TTFF	From < 60 s in LEO to < 30 min in cislunar orbit[2]
Sensitivity	18 dB-Hz acquisition and 15 dB-Hz tracking (NaviMoon)
Lifetime	Upgradable on option for TID compatible with 12 years GEO mission lifetime
Qualification levels	See next page
Technical	
Signals and frequencies	GPS L1 & L5 Galileo E1 & E5a
Number of channels	32 or 48 on option
Number of antenna inputs	1 or 2 on option (internal LNA supports both active/passive ant.)
PPS signal	6x RS-422 pairs (on 2 connectors) GPS/Galileo synchronized
TM/TC	2x (N+R), UART (RS-422) CAN on option PUS-CCSDS compliant
Update rate	1 Hz
Physical	
Power and voltage (depending on configuration)	10 W typ. at 5 V regulated (4.8 - 5.2 V) 13 W typ. at 28 V (isolated input option)
Mass	<1500 g (without antenna)
Size	234 x 121 x 66.3 mm^2
Mechanical interface	Flat baseplate
External LNA box option	
Mass	< 350 g
Size	107 x 26.5 x 57 mm^3
Power	<0.5 W Supplied from GNSS receiver

[1] target accuracy will be demonstrated as part of the ESA/SSTL Lunar Pathfinder mission in elliptical lunar frozen orbit
[2] starting from a coarse PVT solution (~100 km and 30 m/s vel errors)

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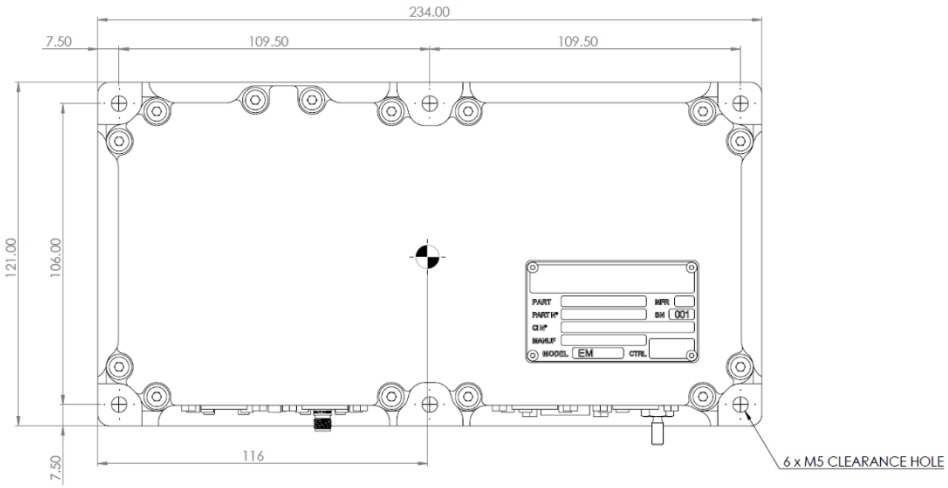
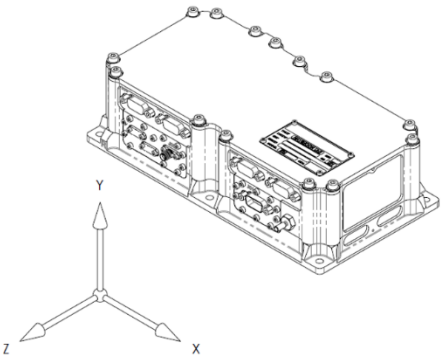
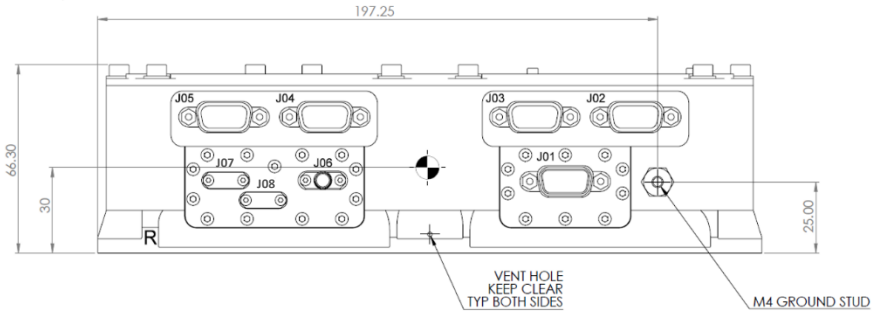
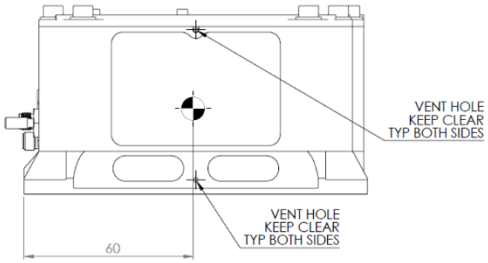
NaviGEO / NaviMoon external dimensions [mm]









Qualification levels		
First eigenmode frequency		>1000 Hz
Sine vibration (1 sweep per axis at 2 oct/min)	5-20 Hz 20-100 Hz	10 mm 20 g
Random vibration (60 s/axis, GRMS = 20 g)	20 Hz 20-100 Hz 100-300 Hz 300-2000 Hz 2000 Hz	0.052 g^2/Hz +6 dB/oct. 0.32 g^2/Hz -6 dB/oct 0.052 g^2/Hz
Shock (3 axes)	10 Hz 1200 Hz 10000 Hz	20 g SRS 1000 g SRS 1000 g SRS
Thermal vacuum (10^{-5} mbar, 2 hours dwelling at min/max temperatures)	Non-operat. (1 cycle) Operational (7 cycles)	-40°C to 70°C -25°C to 55°C
EMC (Based on MIL-STD-461G)		CE102 (10 k-10 MHz) CE106 (1 M-18 GHz) RE102 (10 k-18 GHz) RS103 (30 M-18 GHz)

Electrical interfaces		
J01	D-sub 9 m	power supply input
J02	D-sub 9 f	TM/TC nominal
J03	D-sub 9 f	TM/TC redundant
J04	D-sub 9 f	PPS nominal
J05	D-sub 9 f	PPS redundant
J06	SMA	antenna input
J07	SMA	2nd antenna input (option)
J08	SMA	10 MHz input (option)

Non-contractual document, subject to change