Syvecs LTD

V1.1

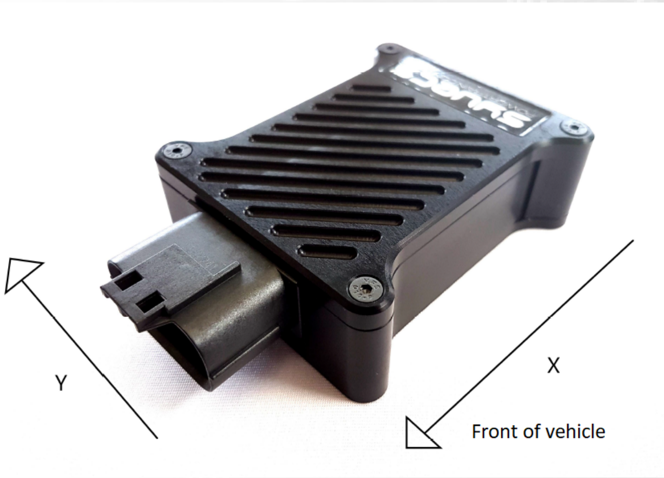
100Hz GPS IMU Module

This document is intended for use by a technical audience and describes a number of procedures that are potentially hazardous. Installations should be carried out by competent persons only.

Syvecs and the author accept no liability for any damage caused by the incorrect installation or configuration of the equipment.

Please Note that due to frequent firmware changes certain windows might not be the same as the manual illustrates. If so please contact the Syvecs Tech Team for Assistance.

Support@Syvecs.com



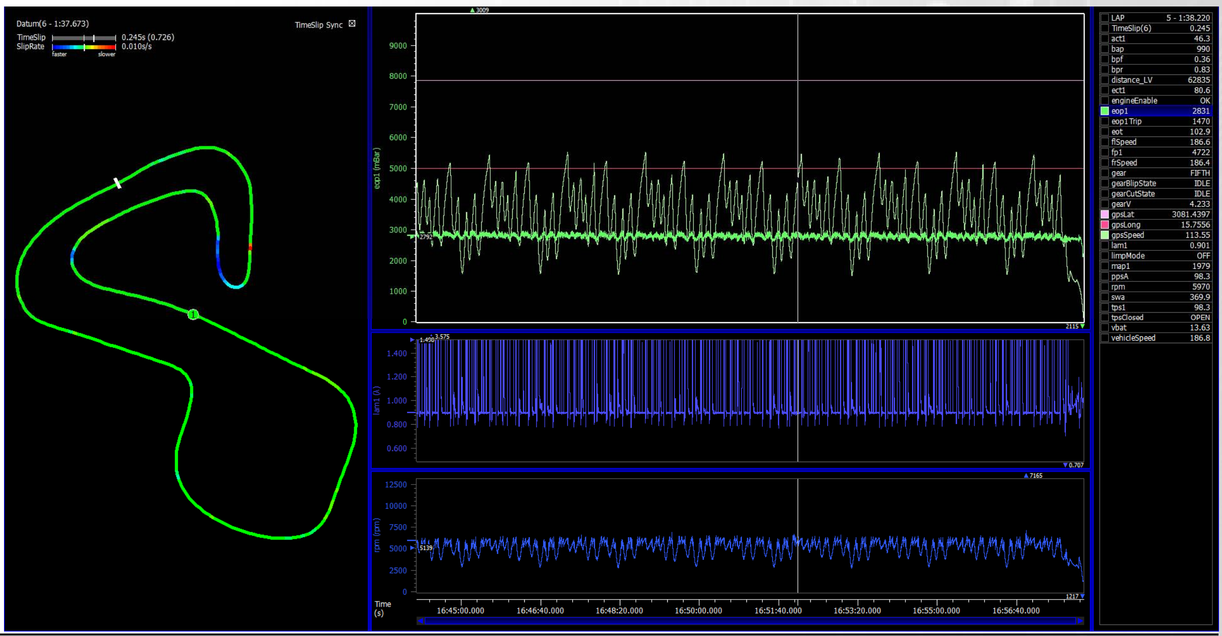
The Syvecs 100hz GPS Module is designed to provide even more control to our engine control units with accurate global positioning, acceleration forces for 6 axis and GPS Speed. Fast positioning lock with hot restarts due to internal battery storing last positioning data.

The following parameters are available from our 100Hz GPS Module

GPS Lateral Position
GPS Longitude Position
GPS Speed
GPS Course
GPS Altitude
GPS Time and Date
Number of Locked Satellites

GPS Mode Letter
GPS Fix Quality
Lateral G Force
Longitudinal G Force
Vertical G Force
Roll
Pitch
Yaw

Packaged in a lightweight CNC billet aluminium case with a waterproof 18way JAE Connector.
Mating Socket - JAE - MX23A18SF1



Wiring

Pin Number	Pin Function
3 or 4	Ground
5	CAN1 LOW - 500Kb
6	CAN0 LOW - 1mb
12	12V Supply
14	CAN1 Hi - 500kb
15	CAN0 HI - 1mb

S6Plus with PNP Kits connect GPS Can1 to S6Plus Can1 (C8/C9) - Generic S6+ ECU Speak to Support@Syvecs.com

S7Plus connect GPS Can0 to S7Plus Can2 (B2/B3) - if X10 Expander is wired to Can2 then Wire to Can1 on S7 like S6Plus above

S8 & S12 connect GPS Can0 to Either ECU Can1 or Can2

No Termination Resistor is set on the GPS Module so the GPS needs to be wired as a Node on the Canbus

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CAN Output Description - All in **Big Endian** Format apart from 0x679h &0x690h

Can0 - 1MB Speed

ID 679h & 690h - GPS Position (LSB) - Motec M1 (Base ID 0x690h

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
GPS latitude in ten-thousands of a minute of arc as a signed 32-bit value. Positive values are north of the equator, negatives are south.				GPS longitude in ten-thousands of a minute of arc as a signed 32-bit value. Positive values are east of the Greenwich Meridian, negatives are west			

ID 680h - GPS Position

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
GPS latitude in ten-thousands of a minute of arc as a signed 32-bit value. Positive values are north of the equator, negatives are south.				GPS longitude in ten-thousands of a minute of arc as a signed 32-bit value. Positive values are east of the Greenwich Meridian, negatives are west			

ID 681h - GPS Course, Speed and Altitude

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Course in hundredths of a degree as an unsigned 16-bit value A value of 0 indicates due North		Speed in centimetres per second as an unsigned 16-bit value.		Altitude in metres as a signed 16-bit value. Negative values indicate a position below mean sea level	

ID 682h - GPS Time and Date

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Day of month as an unsigned 8-bit value	Month of year as an unsigned 8-bit value	Year of century as an unsigned 8-bit value	Hour of day as an unsigned 8-bit value.	Minute of hour as an unsigned 8-bit value.	Second of minute as an unsigned 8-bit value.	Thousandths of a second as an unsigned 16-bit value	

ID 683h - Accelerometer

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Latitudinal acceleration in thousandths of a G as a signed 16-bit value. Positive values represent acceleration to the left (as when turning to the right), negative to the right (as when turning to the left).		Longitudinal acceleration in thousandths of a G as a signed 16-bit value. Positive values represent increasing forward speed, negatives decreasing.		Vertical acceleration in thousandths of a G as a signed 16-bit value. Positive values represent upwards acceleration, negative downwards.			

ID 684h - Gyroscope

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Roll in tenths of a degree per second as a signed 16-bit integer. Positive values indicate roll toward the right, negative to the left.		Pitch in tenths of a degree per second as a signed 16-bit integer. Positive values indicate upward pitch, negative downward.		Yaw in tenths of a degree per second as a signed 16-bit integer. Positive values indicate yaw to the right, negative to the left.			

ID 685h - GPS Status

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Horizontal dilution of precision in tenths of a metre.		Fix quality indicator (0=fix unavailable, 1=valid fix in SPS mode, 2=valid fix in differential GPS mode)	Number of satellites in view	GPS mode letter (N=data not valid A=autonomous mode, D=differential mode, E=estimated mode)	GPS status letter (A=data valid, V=receiver warning)

Can1 - 500kb Speed

ID F0h - GPS Position

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
GPS latitude in ten-thousands of a minute of arc as a signed 32-bit value. Positive values are north of the equator, negatives are south.				GPS longitude in ten-thousands of a minute of arc as a signed 32-bit value. Positive values are east of the Greenwich Meridian, negatives are west			

ID F1h - GPS Course, Speed and Altitude

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Course in hundredths of a degree as an unsigned 16-bit value A value of 0 indicates due North		Speed in centimetres per second as an unsigned 16-bit value.		Altitude in metres as a signed 16-bit value. Negative values indicate a position below mean sea level	

ID F2h - Accelerometer

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Latitudinal acceleration in thousandths of a G as a signed 16-bit value. Positive values represent acceleration to the left (as when turning to the right), negative to the right (as when turning to the left).		Longitudinal acceleration in thousandths of a G as a signed 16-bit value. Positive values represent increasing forward speed, negatives decreasing.		Vertical acceleration in thousandths of a G as a signed 16-bit value. Positive values represent upwards acceleration, negative downwards.			

ID F3h - Gyroscope

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Roll in tenths of a degree per second as a signed 16-bit integer. Positive values indicate roll toward the right, negative to the left.		Pitch in tenths of a degree per second as a signed 16-bit integer. Positive values indicate upward pitch, negative downward.		Yaw in tenths of a degree per second as a signed 16-bit integer. Positive values indicate yaw to the right, negative to the left.			

ID F4h - GPS Status

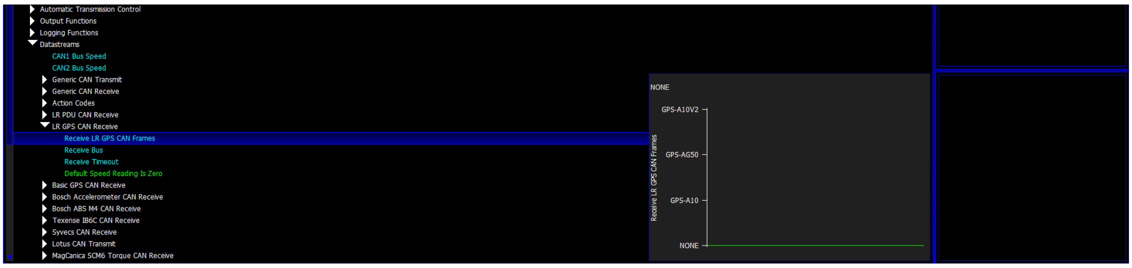
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
Horizontal dilution of precision in tenths of a metre.		Fix quality indicator (0=fix unavailable, 1=valid fix in SPS mode, 2=valid fix in differential GPS mode)	Number of satellites in view	GPS mode letter (N=data not valid A=autonomous mode, D=differential mode, E=estimated mode)	GPS status letter (A=data valid, V=receiver warning)

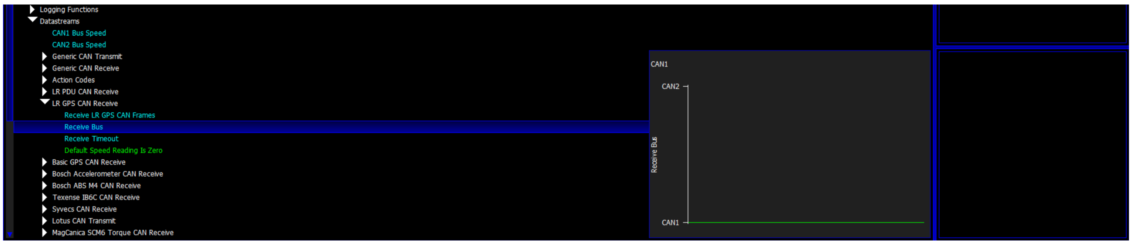
Syvecs Calibration Setup

S7, S8 & S12

The Syvecs 100hz GPS module can be connected to Can1 or Can2 on the S8/S12. With the S7Plus its best to use Can2..If CAN2 is used for an expander then see the S7-I settings below and connect CAN1 of the GPS to CAN1 of the S7Plus

To enable in Scal users need to select the GPS- AG50 as shown below in Datastream as well as the Recieve Canbus its wired to. A device - program is needed after this selection to activate





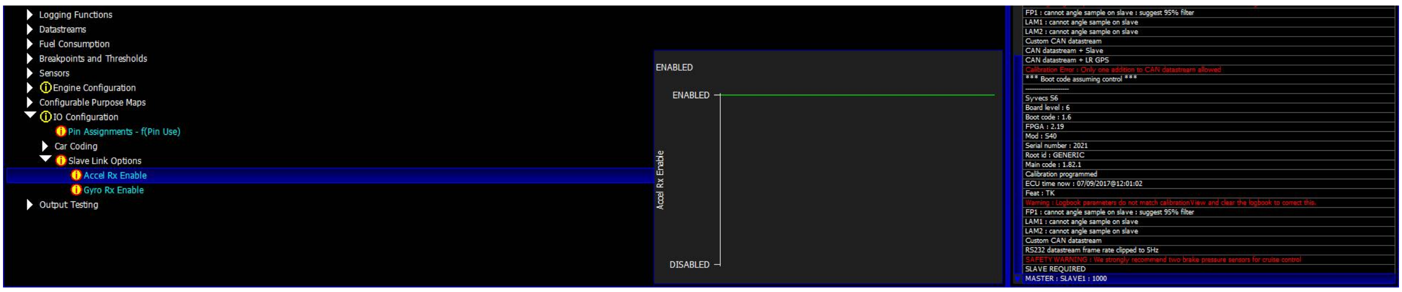
After enabling the monitoring items below will become available

gpsLat
gpsLong
gpsSpeed
gpsCourse
gpsAltitude
gpsHrzDil
gpsFixQual
gpsNumSats
gpsMode

gpsStatus
gpsSatInfo
longG
latg
roll
pitch
vertG
yaw

S6-I/ S6Plus/ S7-I

The Syvecs GPS 100hz Data is picked up automatically on the S6Plus & S6/S7-I with Firmware 1.82+ after wiring onto the Can1 (C8 & C9) which is the 500kb Canbus with a Plug in Kit. To pickup the Accelerometer info from the Gps module users will need to enable the Accel Rx and Gyro Rx under I/O Configuration and make sure none of the Acceleration sensors are defined in the Pin Assignments.



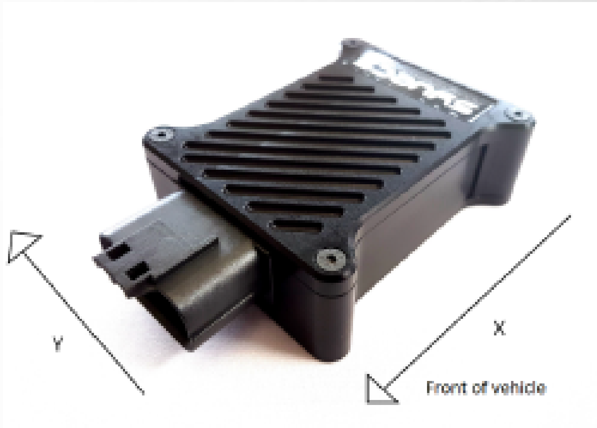
After enabling the monitoring items below will become available

gpsLat
gpsLong
gpsSpeed
gpsCourse
gpsAltitude

longG
latg
roll
pitch
vertG
yaw

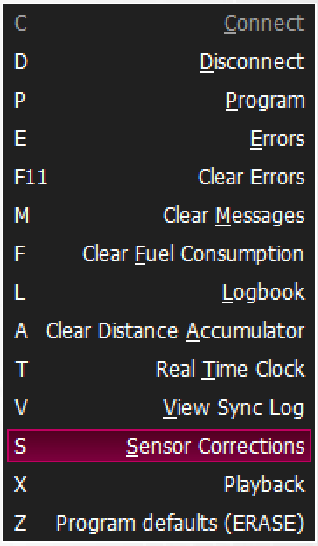
IMPORTANT: Do not bend the antenna Cables more than a 5cm radius or secure tightly with Cable ties!

The GPS Module needs to be mounted as shown below for the 6 axis of the accelerometer to report correctly.



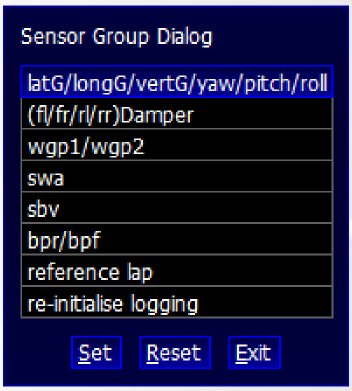
In applications where heavy vibrations are present due to solid engine mounts etc, it is advised to mount the GPS using some rubber washers to absorb some of the vibrations.

After mounting correctly you need to reset the sensor corrections in Scal for the accelerometers. This is done by clicking Device - Sensor Corrections



Then highlight the LatG/Long/VertG/Yaw/Pitch/Roll and select Reset, followed by Set

The Long G / Lat G should all read 0 now when the car is level



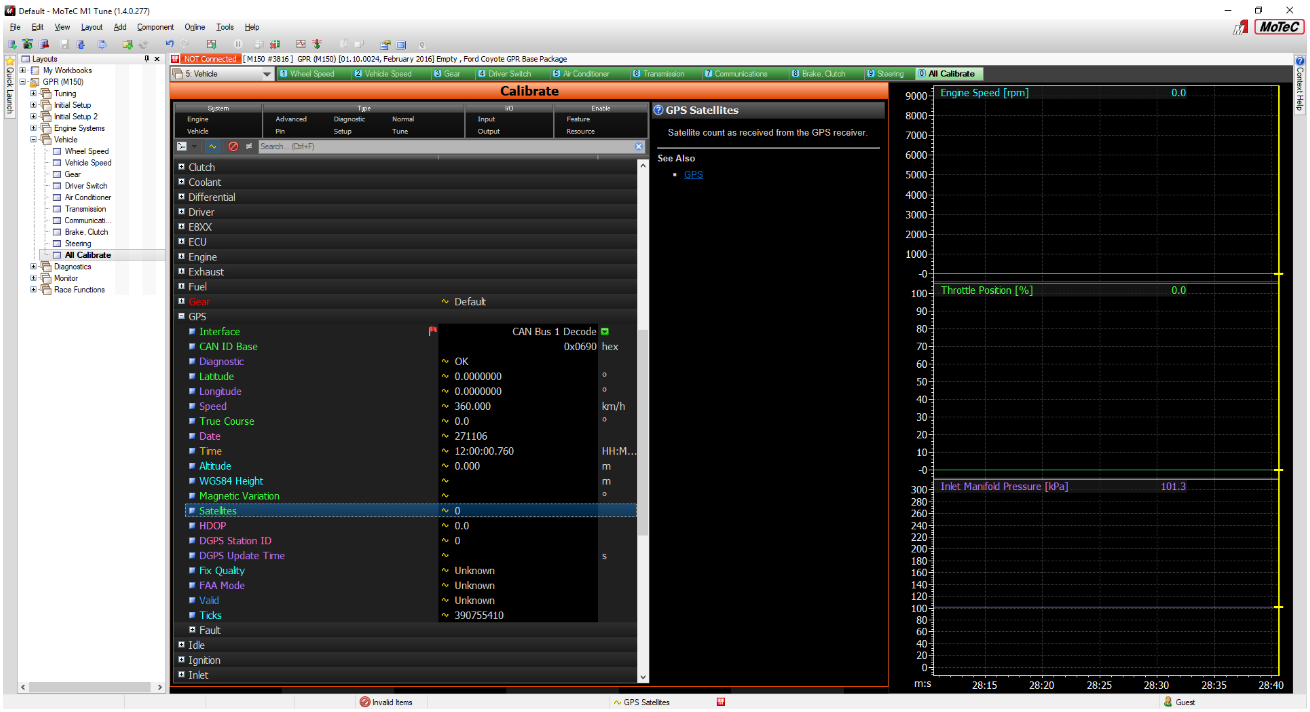
Motec Calibration Setup

M1 Series

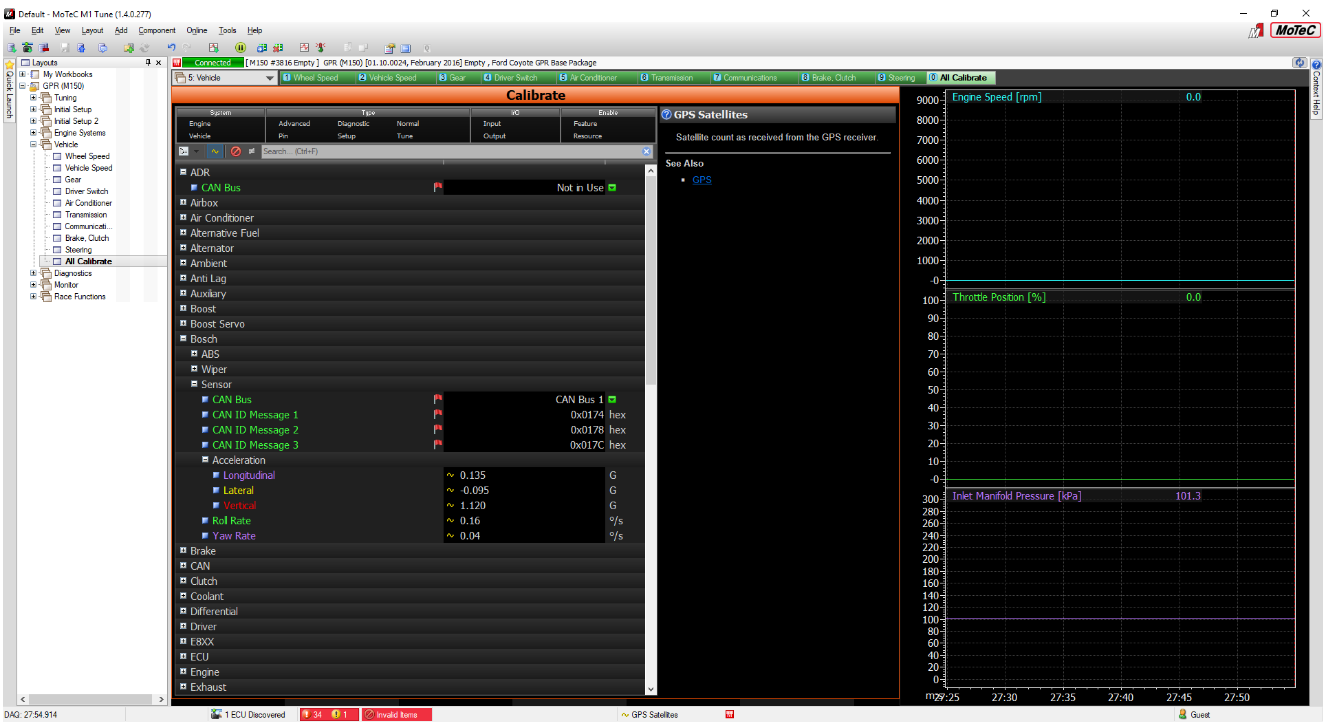
The Syvecs 100hz GPS CAN0 can be connected to Can1, Can2 or Can3 on the M1 Series of Ecu's.

M1Tune users need to head to the All Calibrate Section, select GPS

Set the Can Interface Used and Base ID at 0x690



The Gyro/IMU Information needs to come via the Bosch MM5 protocol. Select Bosch in All Calibrate and set the CAD ID Messages as below



GPS Technical Specification

- Supports global GPS, Beidou, Galileo, GLONASS
- Supports regional QZSS, SBAS
- 16 million time-frequency hypothesis testing

- -148dBm cold start sensitivity
- -165dBm tracking sensitivity
- 29 second cold start TTFF
- 3.5 second TTFF with AGPS
- 1 second hot start
- 2.0m CEP accuracy

- Multipath detection and suppression
- Jamming detection and mitigation
- AGPS Support
- Contains LNA, SAW Filter, TCXO, RTC Xtal
- Works with active and passive antenna
- On board active antenna short protection
- On board active antenna detection

IMU Technical Specification

Parameter	Test conditions	Min.	Typ.(1)	Max.	Unit
Linear acceleration measurement range			±4		gauss
Angular rate measurement range			±245		dps
Linear acceleration sensitivity	Linear acceleration FS = ±4 *g*		0.122		
Magnetic sensitivity	Magnetic FS = ±4 gauss		0.14		mgauss/ LSB
Angular rate sensitivity	Angular rate FS = ±245 dps		8.75		mdps/ LSB
Linear acceleration typical zero-g level offset accuracy(2)	FS = ±4 *g*		±90		m*g*
Zero-gauss level (3)	FS = ±4 gauss		±1		gauss
Angular rate typical zero-rate level (4)	FS = ±2000 dps		±30		dps
Magnetic disturbance field	Zero-gauss offset starts to degrade			50	gauss
Operating temperature range		-40		+85	°C