

GNSS RECEIVER FOR MACHINE CONTROL SYSTEMS



The FR1000 is Futura's premiere multi-GNSS, multi-frequency position and heading receiver designed specifically for the machine control market.

The FR1000 supports antenna separations up to 10 meters, offering heading accuracy to 0.01 degrees RMS in addition to RTK position accuracy.

The F46 GNSS antenna is designed to support millimeter-level accuracy for machine control applications. The F46 offers support for GPS, GLONASS, BeiDou, Galileo, and QZSS GNSS signals. F46 is a multi-GNSS precision antenna and is ideal for various applications including RTK positioning and navigation, precise guidance, and machine control.

Key Features

- Athena[®] RTK Engine
- Extremely accurate heading with baselines up to 10m
- Multi-frequency GPS/GLONASS/BeiDou/Galileo/QZSS/IRNSS
- Integrated Ethernet, CAN, internal 400MHz radio, Serial, Bluetooth, and Wi-Fi
- Powerful WebUI accessed via Wi-Fi plus 12 multi-color LEDs
- Integrated IMU delivers fast start-up times and maintains heading during temporary GNSS outage
- Fully rugged IP69K, and MIL-STD-810G compliant solution for the harshest environments

Futura GNSS Antenna

Signals Received: GPS L1/L2/L5, GLONASS G1/G2, BeiDou B1/B2/B3, SBAS, L-band, Galileo E1/E5a and b, and QZSS

GNSS Frequency: 1.165 to 1.278 GHz
1.525 to 1.615 GHz

LNA Gain: 30 dBn

LNA Noise: 2.0 dB, typical

L-Band Sensor

L-Band

Frequency: 1.525 - 1.585 GHz operation

L-Band LNA Gain: 30 dB

Power

Input Voltage: 3.3 to 15 VDC

Input Current: 25 mA, typical

Mechanical

Enclosure: Aluminum base with Lexan[™] plastic cap

Dimensions: 1.8 H x 6.0 D (in)

Weight: .50 kg (1.1 lbs)

Mount: 5/8 inch female thread

RF Connector: N-Type (straight)

Environmental

Shock/Vibration: EP455

Phase Center

Variation: Less than 0.07 in at GPS L1, for elevations above 15 degrees

FR1000 - GNSS Receiver Specifications

Receiver Type: GNSS Position & Heading RTK Receiver
Signals Received: GPS, GLONASS, BeiDou, Galileo, QZSS, and IRNSS
Channels: 1059
GPS Sensitivity: -142 dBm
SBAS Tracking: 3-channel, parallel tracking
Update Rate: 10 Hz standard, 20 Hz optional
Timing (1 PPS)
Accuracy: 20 ns
Rate of Turn: 100°/s maximum
Cold Start: 40 s (no almanac or RTC)
Warm Start: 20 s typical (almanac and RTC)
Hot Start: 5 s typical (almanac, RTC and position)
Heading Fix: 10 s typical (Hot Start)
Antenna Input Impedance: 50 Ω
Maximum Speed: 1,850 mph (999 kts)
Maximum Altitude: (60,000 ft)
Differential Options: SBAS, RTK

Accuracy

Positioning:	RMS (67%)	2DRMS (95%)
Autonomous, no SA: ²	3.93 ft	8.2 ft
SBAS: ²	0.82 ft	1.64 ft
Atlas: ^{2,3}	0.13 ft	0.26 ft
RTK: ¹	0.39 in	0.78 in

Heading (RMS): < 0.2° @ 1.64 ft antenna separation
< 0.1° @ 3.28 ft antenna separation
< 0.05° @ 6.56 ft antenna separation
< 0.02° @ 16.4 ft antenna separation
< 0.01° @ 32.8 ft antenna separation

Pitch/Roll (RMS): 1°
Heave (RMS): 11.8 in (DGPS)³, 3.93 in (RTK)³

L-Band Receiver Specifications

Receiver Type: Single Channel
Channels: 1530 to 1560 MHz
Sensitivity: -130 dBm
Channel Spacing: 5 kHz
Satellite Selection: Manual or Automatic
Reacquisition Time: 15 sec (typical)

1. Depends on multipath environment, number of satellites in view, satellite geometry, no SA, and ionospheric activity
2. Depends on multipath environment, number of satellites in view, WAAS coverage and satellite geometry
3. Requires a subscription
4. Depends on multipath environment, number of satellites in view, satellite geometry, baseline length (for differential services), and ionospheric activity
5. CMR and CMR+ do not cover proprietary messages outside of the typical standard

Communications

Ports: 1x full-duplex RS-232/RS-422, 1x full-duplex RS232, 2x CAN, 1x Ethernet
Baud Rates: 4800 - 115200
Radio Interfaces: Bluetooth 2.0 (Class 2), Wi-Fi 2.4 GHz, UHF (400 MHz)
Correction I/O Protocol: RTCM v2.3, RTCM v3.2, CMR6, CMR+⁶,
Data I/O Protocol: NMEA 0183, Hemisphere GNSS binary
Timing Output: 1 PPS, CMOS, active high, rising edge sync, 10 kΩ, 10 pF load
Event Marker Input: CMOS, active low, falling edge sync, 10 kΩ, 10 pF load

Power

Input Voltage: 9-36 VDC
Power Consumption: 10.8W Maximum (All signals)
Current Consumption: 1.2A Maximum
Power Isolation: No
Reverse Polarity Protection: Yes

Environmental

Operating Temperature: (-40°F to +158°F)
Storage Temperature: (-40°F to +185°F)
Humidity: 95% non-condensing
Mechanical Shock: 50G, 11ms half sine pulse (MIL-STD-810G w/ Change 1 Method 516.7 Procedure 1)
Vibration: 7.7Grms (MIL-STD-810G w/Change 1 Method 514.7 Category 24)
EMC: CE (ISO14982/EN13309/ISO13766/IEC60945), Radio Equipment Directive 2014/53/EU, E-Mark, RCM IP69K
Enclosure: IP69K

Mechanical

Dimensions:
No Plate: 9.1 L x 6.5 W x 3.1 H (in)
With Plate: 9.1 L x 8.4 W x 3.3 H (in)

Status Indications (LED):

Power, Primary Antenna, Secondary Antenna, Heading, Quality, Bluetooth, Wi-Fi, CAN1, CAN2, Ethernet, Radio

Power/Data Connector: 23-pin multi-purpose

Aiding Devices Gyro:

Provides smooth heading, fast heading reacquisition and reliable < 0.5° per min heading for periods up to 3 min. when loss of GNSS has occurred.

Tilt Sensors: Provide pitch/roll data and assist in fast start-up and reacquisition of heading solution.



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