



## CONDOR GPS MODULE FAMILY

### KEY BENEFITS

- Cost-competitive to chipset implementations with all costs considered.
- Lowers development risk, cost and time
- Custom form factors to suit specific integration requirements
- Shortens time-to-market for new navigation products

### THE SMART ALTERNATIVE TO A GPS CHIPSET

Trimble's Condor family of GPS modules represents the smart alternative to GPS chipsets for many consumer and commercial positioning applications. Trimble offers Condor modules in multiple form factors and flexible interface options. The modules in the Condor family share several common characteristics: top-tier positioning performance, the best components, and the highest production quality standards.

On the surface, a chipset implementation may appear to be the optimal choice for a GPS positioning solution. However, GPS chipset implementations are fraught with risk, can delay time-to-market (TTM) and can have significant hidden costs beyond just the bill of material.

Chipset implementations typically require multiple design iterations to achieve maximum performance under all operating conditions. In the production environment, chipset implementations accrue costs associated with testing, yield, re-work and warranty.

Condor GPS modules help you bring innovative products to market faster to capture greater market share. As a completely qualified positioning solution with full warranty, Condor modules harbor none of the development risk or hidden costs associated with GPS chipset implementations. Select a Condor GPS module and leverage Trimble's 30+ years of experience in positioning solutions.



C1011

At 10 mm x 11 mm, the diminutive Condor C1011 packs powerful positioning performance in a size well-suited to portable navigation products.



C1722

The Condor C1722 is a full-featured module in the 17 mm x 22 mm form factor. It offers a USB interface, antenna open and short detection, and support for both passive and active antennas.



C1216

The Condor C1216 packs a lot of functionality into its 12 mm x 16 mm form factor.



C1919A

The Condor C1919 has the 19 mm x 19 mm SMT format common with the Copernicus II GPS modules from Trimble.



C2626

Continuing Trimble's tradition of advancing technology while preserving our customer's investment, the C2626 copies the popular Lassen iQ form factor.

# CONDOR GPS MODULE FAMILY

The Condor GPS family includes multiple modules with different form factors and interface options. All the modules in the family offer top tier positioning performance. The features and specifications listed below are typical for all Condor GPS modules in the family.

## KEY FEATURES

- GPS L1 Frequency C/A code receiver
- NMEA output and input
- SBAS (WAAS, EGNOS, MSAS) capable
- aGPS capable
- Update rate up to 5 Hz
- PPS timing output
- Multiple form factors and interface options

## PERFORMANCE SPECIFICATIONS

GPS performance statistics are clear view, stationary, autonomous (no aiding), 50% figures. Sensitivity based on signals measured at the antenna.

Update Rate	1 Hz (default), up to 5 Hz
Accuracy	
Position	2 m
Altitude	<3 m
PPS	±25 ns
Acquisition	
Re-Acquisition	2 s
Hot Start	2 s
Warm Start	35 s
Cold Start	38 s
Sensitivity	
Tracking	-160 dBm
Acquisition	-146 dBm
Dynamics	
Acceleration	2 g
Velocity	515 m/s (COCOM Limit)

## ELECTRICAL INTERFACE CHARACTERISTICS

Serial Interface	
UART	2.8 V TTL level
Protocol	NMEA
Messages	GGA, GSA, GSV, RMC (default)
Baud Rate	9600, 8-N-1
PPS Interface	
Level	2.8 V TTL level
Pulse Width	Configurable 4 µs
Main Power	
DC Levels	3.0 V to 3.6 V
Consumption	<37 mA typical @ 20 °C
Backup Power	
DC Levels	2.0 V to 3.6 V
Consumption	5 µA typical @ 20 °C

## ENVIRONMENTAL SPECIFICATIONS

Temperature	
Operating	-40 °C to + 85 °C
Storage	-40 °C to +105 °C
Humidity	5% to 95% non-condensing @ 60 °C
Vibration	
5 Hz to 20 Hz	0.008 g <sup>3</sup> /Hz
20 Hz to 100 Hz	0.05 g <sup>3</sup> /Hz
100 Hz to 900 Hz	-3 dB/octave

## PHYSICAL CHARACTERISTICS

Dimensions	
C1011	10 mm x 11 mm x 2 mm
C1216	16 mm x 12.2 mm x 2.13 mm
C1722	17 mm x 22.4 mm x 2.13 mm
C1919	19 mm x 19 mm x 2.54 mm
C2626	26 mm x 26 mm x 6 mm
Connectors	
C1011	38-pad surface-mount LGA
C1216	24-pin surface-mounted edge castellations
C1722	28-pin surface-mounted edge castellations
C1919	28-pin surface-mount edge castellations
C2626	8-pin interface header H.FL antenna connector

## ORDERING INFORMATION

Model	Part Number	LNA	RTC	USB	Antenna Detection	Packaging Options			Starter Kit Part Number
C1011	68674-00					20-piece tray	100-piece reel	500-piece reel	70897-05
C1216	68676-10	✓	✓	✓	✓	50-piece tray	500-piece reel		N/A
C1722	68675-00	✓	✓	✓	✓	36-piece tray	500-piece reel		N/A
C1919A	67650-10	✓	✓			20-piece tray	100-piece reel	500-piece reel	70291-10
C1919C	67650-20	✓				20-piece tray	100-piece reel	500-piece reel	70291-10
C2626	70896-00	✓	✓		✓	250 - piece box			70897-05

**LNA:** An onboard LNA compatible with both active and passive antenna implementations.

**RTC:** Includes an onboard 32 kHz crystal for the RTC. Modules without an onboard crystal support either an off-board crystal or a connection to the host RTC crystal.

**Antenna Detection:** Capable of reporting antenna faults (open or short conditions) when integrated with an active antenna.

**Starter Kit:** This kit includes all the tools necessary to test and evaluate the Condor GPS receiver, including: Condor GPS receiver in a rugged enclosure suitable for testing and data collection; a GPS antenna. Software Tool Kit is available from the Trimble Support page.

*Specifications subject to change without notice.*



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## Product Comparison



TRIMBLE EMBEDDED PRODUCT FEATURES AND REQUIREMENTS	CONDOR C1919A 67650-10	CONDOR C1919C 67650-20	CONDOR C1011 68674-00, 68674-05	CONDOR C2626 70896-00	CONDOR C1216 68676-10, 68676-20, 68676-30	CONDOR C1722 68675-00	LASSEN IQ 46240-25	COPERNICUS II 63530-00, 63530-10, 67415-00
<b>POWER REQUIREMENTS</b>								
V <sub>CC</sub> min	3 V	3 V	3 V	3 V	3 V	3 V	3 V	2.7 V
V <sub>CC</sub> max	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V	3.6 V	3.3 V
V <sub>CC</sub> typ	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3 V
V <sub>BAT</sub> min	2 V	2 V	2 V	2 V	2 V	2 V	2.5 V	2.7 V
V <sub>BAT</sub> max	V <sub>CC</sub>	V <sub>CC</sub>	V <sub>CC</sub>	V <sub>CC</sub>	V <sub>CC</sub>	V <sub>CC</sub>	V <sub>CC</sub> – 10%	3.3 V
Typical supply current: (Excludes antenna current, except for C1011)	37 mA	37 mA	33 mA	<35 mA	<35 mA	<35 mA	27 mA	44 mA
Typical RTC current	5 µA	5 µA	5 µA	5 µA	6 µA	5 µA	20 µA	7 µA
<b>START UP TIMES</b>								
Reacquisition	2 s	2 s	2 s	2 s	2 s	2 s	<3 s	2 s
Hot start	2 s	2 s	2 s	2 s	2 s	2 s	<12 s	3 s
Warm Start	<35 s	<35 s	<35 s	<35 s	<35 s	<35 s	<38 s	35 s
Cold Start	<38 s	<38 s	<38 s	<38 s	<38 s	<38 s	<55 s	38 s
<b>ACCURACY</b>								
Autonomous position @ 50% CEP	<2.5 m	<2.5 m	<2.5 m	<2.5 m	<2.5 m	<2.5 m	<5 m	<2.5 m
Autonomous position @ 90% CEP	<5.0 m	<5.0 m	<5.0 m	<5.0 m	<5.0 m	<5.0 m	<8 m	<5.0 m
Autonomous altitude @ 50% CEP	<5 m	<5 m	<5 m	<5 m	<5 m	<5 m	<10 m	<5 m
Autonomous altitude @ 90% CEP	<8 m	<8 m	<8 m	<8 m	<8 m	<8 m	<16 m	<8 m
SBAS position @ 50% CEP	<2 m	<2 m	<2 m	<2 m	<2 m	<2 m	NA	<2 m
SBAS position @ 90% CEP	<4 m	<4 m	<4 m	<4 m	<4 m	<4 m	NA	<4 m
SBAS altitude @ 50% CEP	<3 m	<3 m	<3 m	<3 m	<3 m	<3 m	NA	<3 m
SBAS altitude @ 90% CEP	<5 m	<5 m	<5 m	<5 m	<5 m	<5 m	NA	<5 m
Velocity	0.06 m/s	0.06 m/s	0.06 m/s	0.06 m/s	0.06 m/s	0.06 m/s	0.06 m/s	0.06 m/s
<b>TIMING OUTPUT</b>								
PPS	2.8 V TTL	2.8 V TTL	2.8 V TTL	2.8 V TTL	2.8 V TTL	2.8 V TTL	3.3 V TTL	3.0 V TTL
PPS accuracy to UTC (1 sigma)	±25 ns	±25 ns	±25 ns	±25 ns	±25 ns	±25 ns	±50 ns	±60 ns
PPS pulse width	4.2 µs	4.2 µs	4.2 µs	4.2 µs	4.2 µs	4.2 µs	80 µs	4.2 µs
<b>SENSITIVITY</b>								
Standard acquisition	–146 dBm	–146 dBm	–146 dBm	–146 dBm	–146 dBm	–146 dBm	–130 dBm	–142 dB
Enhanced acquisition	NA	NA	NA	NA	NA	NA	–136 dBm	–144 dBm (–148 dBm with current ephemeris)
Tracking	–160 dBm	–160 dBm	–160 dBm	–160 dBm	–160 dBm	–160 dBm	–142 dBm	–160 dBm
<b>GPS OUTPUT</b>								
1 Hz	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
up to 5 Hz	Yes	Yes	Yes	Yes	Yes	Yes	No	No

## Product Comparison



TRIMBLE EMBEDDED PRODUCT FEATURES AND REQUIREMENTS	CONDOR C1919A 67650-10	CONDOR C1919C 67650-20	CONDOR C1011 68674-00, 68674-05	CONDOR C2626 70896-00	CONDOR C1216 68676-10, 68676-20, 68676-30	CONDOR C1722 68675-00	LASSEN IQ 46240-25	COPERNICUS II 63530-00, 63530-10, 67415-00
<b>PROTOCOLS</b>								
TSIP	No	No	No	No	No	No	Yes	Yes
NMEA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TAIP	No	No	No	No	No	No	Yes	Yes
RTCM	No	No	No	No	Yes	No	Yes	No
<b>GENERAL</b>								
SBAS	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
AGPS	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
DGPS	No	No	No	No	Yes	No	Yes	No
COCOM Velocity	<515 m/s	<515 m/s	<515 m/s	<515 m/s	<515 m/s	<515 m/s	<515 m/s	<515 m/s
Acceleration	2 G	2 G	2 G	2 G	2 G	2 G		2 G
On board reset controller	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flash programmable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>ANTENNAS</b>								
Supports external active antenna	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Supports passive antenna	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
External LNA for passive required	No	No	Yes	No	No	No	NA	No
Open/Short Detection built in	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Internal LNA gain	19 dB	19 dB	NA	19 dB	19 dB	19 dB		20 dB
<b>LOAD OPTIONS</b>								
32kHz Clock onboard	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
<b>INTERFACES</b>								
Serial	1	1	1	1 (2 ports joined)	1	1	2	2
USB	No	No	No	No	1	1	No	No
<b>MECHANICAL</b>								
	19.0 x 19.0 x 2.54 mm	19.0 x 19.0 x 2.54 mm	10.0 x 11.0 x 2.01 mm	26.0 x 26.0 x 6.0 mm	16.0 x 12.2 x 2.13 mm	17.0 x 22.4 x 2.13 mm	26.0 x 26.0 x 6.0 mm	19.0 x 19.0 x 2.54 mm
<b>SHIELD</b>								
	Yes	Yes	-05 only	Yes	-20 only	No	Yes	Yes



## RES SMT 360™ Multi-GNSS Timing Module

### KEY FEATURES

- Multi-Constellation
- Simultaneous GPS / GLONASS or GPS / Beidou tracking
- Ideal for populated urban and indoor environments with limited sky-view
- PPS and PP2S outputs, synchronized to GNSS / UTC within 15ns (1 sigma)
- Extended temperature range (-40°C / +85°C)

### Miniature Multi-GNSS Timing Module with Super-Sized Features

#### Ideal for Low Signal Environment

Trimble® designed the RES SMT 360™ Timing Module to work in the most demanding weak signal environments, including femtocells and in-building systems.

With its robust performance in low signal environments, users can save on expensive cabling and externally mounted antennas. In addition, the RES SMT 360™ timing module accepts aiding data for environments requiring the highest levels of enhanced sensitivity.

#### Timing Signal Outputs

The RES SMT 360™ timing module outputs a precise 1 pulse-per-second (1PPS) and an even second pulse to maximize your network performance and synchronize systems at a global level.



### Standard Timing Features

The RES SMT 360™ timing module includes many of Trimble's standard timing features, including Time-Receiver Autonomous Integrity Monitoring (T-RAIM) algorithm, automatic self-survey, and GNSS disciplining of the oscillator to provide an accurate frequency reference

### Carrier Board and Starter Kit Options

The RES SMT 360™ timing module can be loaded directly onto the customer's application board.

The Starter Kit provides everything you need to evaluate the RES SMT 360™ timing module, including the RES SMT 360™ on a carrier board, AC/DC power converter, antenna and USB interface cable.



# RES SMT 360™ Multi-GNSS TIMING MODULE

## GENERAL SPECIFICATIONS

Receiving Signal.....GPS, GLONASS, Galileo<sup>1</sup>, Beidou  
Supports GNSS incl. .... QZSS  
Positioning System.....SPS, Timing  
1 PPS Timing Accuracy .....15 ns (1 sigma)  
Update Rate.....1 Hz  
Typical Min Acq Sensitivity.....-148dBm cold start  
Typical Min Tracking Sensitivity ..... -160dBm  
Time to First Fix<sup>2</sup>.....<46s (50%), <50s (90%) cold start  
Typical Time to Re-acquisition..... <2s (90%)

## INTERFACE CHARACTERISTICS

Connections. . . . .28 surface-mount edge castellations  
Serial Port.....2 serial port  
PPS / Even Second.....CMOS-compatible  
LVTTTL-level pulse, once per second  
Protocols.....TSIP, NMEA 0183

<sup>1</sup> Hardware ready: a firmware update is required to enable the Galileo constellation.

<sup>2</sup> The performance criteria and times given for TTFF & reacquisition are with GPS satellites in the constellation set.

## PINOUT ASSIGNMENTS

RES SMT 360 PINOUTS

GND	1	28	GND
GND	2	27	VCC
RFIN	3	26	GND
GND	4	25	RESET
OPEN	5	24	GND
SHORT	6	23	RESERVED
RESERVED	7	22	TXDB
RESERVED	8	21	RXDB
RESERVED	9	20	GND
RESERVED	10	19	PPS
RESERVED	11	18	GND
RESERVED	12	17	TXDA
RESERVED	13	16	RXDA
GND	14	15	GND

## PHYSICAL CHARACTERISTICS

Enclosure.....Metal Shield  
Dimensions .....19 mm W x 19 mm L x 2.54 mm H  
(0.75" W x 0.75" L x 0.1" H)  
Weight.....1.8 grams (0.06 ounce) including shield

## ELECTRICAL CHARACTERISTICS

Supply Voltage Range.....3.3VDC to ±5%  
Power Consumption.....0.5W max.

## ENVIRONMENTAL SPECIFICATIONS

Operating Temperature.....-40°C to +85°C  
Operating Humidity.....5%-95% RH non-condensing (+60°C)  
Storage Temperature.....-50°C to +105°C

## GENERAL INFORMATION & ACCESSORIES

Module.....available in 20 piece trays for evaluation  
Production quantities on tape on reel (500 pieces)

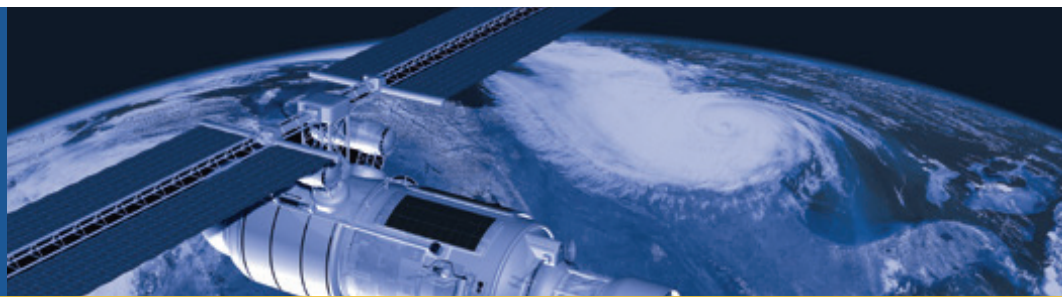
Reference Board.....GNSS module mounted on a carrier board with I/O and RF connectors, including RF circuitry with the antenna open detection, as well as antenna short detection and protection.

Starter Kit .....Includes Reference Board mounted on interface motherboard in a durable metal enclosure, AC/DC power converter, Bullet 360 antenna, USB interface cable, TSIP and NMEA protocols

Antenna..... Bullet 360



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## ACUTIME GG MULTI-GNSS SMART ANTENNA

### KEY FEATURES

- Multi-Constellation
- Improved Sensitivity
- Reduced TTFF (Time-To-First-Fix)
- Stratum 1 time source
- Timing pulse synchronized to within 15 nanoseconds (one sigma) of GNSS/UTC
- Weatherproof and corrosion resistant housing



*The Acutime GG is the premier time source for synchronization of wireless networks.*

### ADVANCED MULTI-GNSS SMART ANTENNA FOR PRECISE TIMING AND SYNCHRONIZATION

The Trimble® Acutime™ Multi-GNSS (GPS, GLONASS) smart antenna is the 3rd generation Acutime product of integrated GNSS technology in a rugged and weatherproof self contained unit. The Acutime GG is an integrated pipe thread-mounted multi-GNSS receiver, antenna and power supply solution in a single environmentally sealed easy to install enclosure.

### Demonstrated Performance

The Acutime Multi-GNSS smart antenna design continues the Trimble line of GPS smart antennas, which have been in production since 1991. This multi-GNSS smart antenna is optimized for precise timing and network synchronization needs, including broadband wireless applications. It provides a cost-effective and independent timing source (within the firewall) for any application, such as fault detection systems and synchronization of wireless networks.

### Power Efficiency

The ACutime GG Multi-GNSS smart antenna requires less than 1 Watt to operate. Once power is applied, the Acutime GG smart antenna automatically tracks satellites and surveys its position to within meters. It then switches to overdetermined

time mode and generates a pulse-per-second (PPS) output synchronized to UTC within 15 nanoseconds (one sigma), outputting a time tag for each pulse. The Acutime GG smart antenna's T-RAIM (Time-Receiver Autonomous Integrity Monitor) algorithm ensures PPS integrity.

Designed for long-term reliability, the Acutime GG smart antenna is corrosion-resistant and weatherproof, and has a rounded top that facilitates run-off from the elements.

### Physical Interface

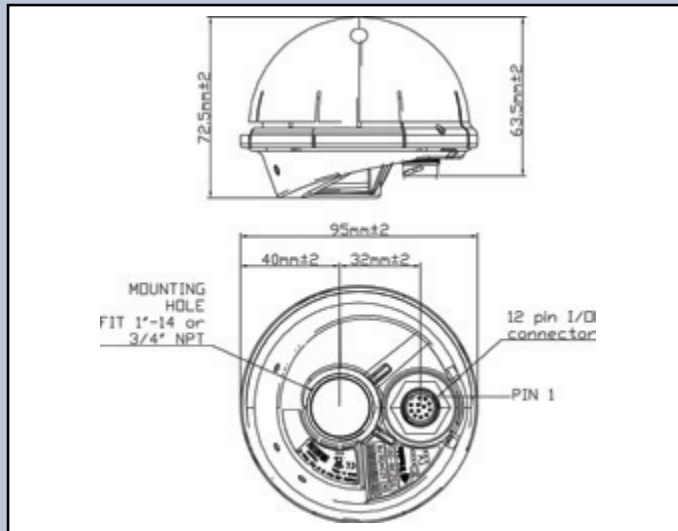
The RS-422 interface is ideal for long cable runs required by buildings or towers. Standard cables are available in lengths up to 400 feet. Custom lengths up to 1800 feet may be ordered.

### Getting Started

The Acutime GG Starter Kit makes it easy to evaluate the exceptional performance of this multi-GNSS smart antenna and integrate state-of-the-art technology into your system. The Starter Kit includes the Acutime GG smart antenna (RS-422), a 100' interface cable, user guide, RS-422 to USB converter, and a Microsoft® Windows® software tool for monitoring and communication.

## PHYSICAL CHARACTERISTICS

Dimensions ..... 3.74" D, 2.85" H (95 mm x 72.5 mm)  
 Weight ..... 5.4 oz (154 g)  
 Connector ..... 12-pin round, waterproof  
 Mounting ..... 1"-14" straight thread or 3/4" pipe thread  
 Mechanical drawing



## ENVIRONMENTAL SPECIFICATIONS

Operating temp: ..... -40 °C to +85 °C  
 Storage temp: ..... -55 °C to +105 °C  
 Vibration: 0.008 g2/Hz ..... 5 Hz to 20 Hz  
 0.05 g2/Hz ..... 20 Hz to 100 Hz  
 -3dB/octave ..... 100 Hz to 900 Hz  
 Operating humidity: ..... 95% RH, non-condensing @ 60 °C  
 EMC: ..... CE, FCC Class B  
 Ingress Protection: ..... IP 67

## PERFORMANCE SPECIFICATIONS

General: ..... Commercial GNSS Signal continuous tracking receiver, static overdetermined clock mode (default)  
 Update Rate ..... 1 Hz  
 Accuracy Horizontal Position ..... <6 meters (50%) <9 meters (90%)  
 Accuracy Altitude Position ..... <11 meters (50%) <18 meters (90%)  
 Velocity ..... 0.06 m/sec  
 Time to First Fix (no stored position) ..... <46 sec. (50%) <50 sec. (90%)  
 Time to First PPS (stationary with stored position, e.g., recovery after power outage): ..... <14 sec. (50%) <18 sec. (90%)  
 Re-acquisition after 60-second signal loss: ..... <2 sec. (90%)  
 Dynamics  
 Velocity ..... 500 m/sec maximum  
 Acceleration ..... 4 g (39.2 m/sec<sup>2</sup>)  
 Jerk ..... 20 m/sec<sup>3</sup>

## PPS output

Physical Interface ..... RS-422  
 Width ..... 10 microseconds (default); user-programmable from 10 microseconds to 500 milliseconds  
 On-Time Edge ..... Rising edge on-time (default); user-programmable rising or falling  
 Resolution ..... <32 nanoseconds (quantization error reported through TSIP)  
 Accuracy (one sigma): ..... UTC 15 nanoseconds (static) UTC 90 nanoseconds (dynamic, TDOP ≤ 3)  
 Minimum pulse width ..... 10 microsecond, rising edge on-time  
 Reporting mechanism ..... TSIP packet

## ELECTRICAL SPECIFICATIONS

Prime power ..... +5 V DC\* to +36 V DC, reverse polarity protection  
 Power consumption ..... 50 mA @ 12 volts, 0.6 watts (typical), <1 watt max  
 \* reduced cable length @ +5 V DC to +12 V DC

## SERIAL PROTOCOLS

Port	Interface	Protocols	Defaults
TxB (primary)	RS-422	TSIP, NMEA	TSIP @ 115.2K, 8-odd-1
RxB (primary)	RS-422	TSIP	TSIP @ 115.2K, 8-odd-1
TxA (secondary)	RS-422	TSIP	TSIP @ 115.2K, 8-odd-1
RxA (secondary)	RS-422		

All ports support baud rates of 4,800 – 115,200; 8 data bits; even, odd, no parity.

NMEA messages: ..... GGA, GLL, VTG, GSV, GSA, ZDA, RMC

## ORDERING INFORMATION & ACCESSORIES

Please go to [www.trimble.com/timing](http://www.trimble.com/timing) for the latest documentation & tools, part numbers and ordering information

Trimble has relied on representation made by its suppliers in certifying this product as RoHS compliant.

Specifications subject to change without notice

Trimble Navigation Limited is not responsible for the operation or failure of operation of GNSS satellites or the availability of GNSS satellite signals.



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## Bullet™ GG Multi-GNSS Antenna

### KEY FEATURES

- GPS & GLONASS
- Extended temperature range (-40°C / +90°C)
- Weatherproof housing
- Filtering for RF Jamming environments
- Available in 3.3V (TNC) or 5V (TNC or F)
- RoHS-II Compliant



### Multi-Constellation

The Trimble® Bullet GG antenna provides a perfect solution for manufacturers who need a fixed-site, rooftop multi-GNSS antenna. The Bullet GG supports GPS and GLONASS constellations. The antenna is also a high-quality solution for adding GNSS RF signals for marine GNSS navigation systems.

### Put it anywhere

The antenna is housed in weatherproof packaging designed to withstand exposure to shock, excessive vibration, extreme temperatures, rain, snow and sunlight

The dome is all plastic, and the threaded socket in the base of the antenna. The socket accepts either a 1"-14" straight threat (typical marine antenna mount) or a 3/4" pipe thread.

The F-type or TNC antenna connector is located inside the threaded socket, which allows the antenna cable to be routed inside a mounting pole and protects the cable connection for added reliability.

### Strong Performance

The Bullet GG antenna is an active GPS & GLONASS antenna with 32dB preamp (5V DC), 30dB preamp (3.3 VDC). The high-gain preamp allows the Bullet GG antenna to be used with up to 75 feet of RG-58 or RG-59 cable. The Bullet GG filtering improves impunity to other RF signals for reliable performance in hostile RF jamming environments.

### Proven reliability

For over 20 years, Trimble has sold GPS antennas renowned for their survivability in tough environments. The Bullet GG antenna is the fifth generation of the proven Bullet antenna family and offers all the reliability and performance benefits that are required for GNSS installations.

In unforgiving environments, an antenna failure could be disastrous. Don't risk it. select a proven GNSS antenna – the Trimble Bullet GG antenna

# Bullet™ GG – GPS & GLONASS Antenna

## ENVIRONMENTAL SPECIFICATIONS

Operating Temperature.....-40°C to +90°C  
 Storage Temperature.....-40°C to +90°C  
 Vibration..... 10 – 200 Hz Log sweep  
 3g (Sweep time 30 minutes) 3 axes  
 Shock.....50g vertical, 30g all axes  
 Humidity Soak.....+60°C @ 95% RH, 96 hours  
 Corrosion Salt Resistant.....5% Salt spray tested, 96 hours

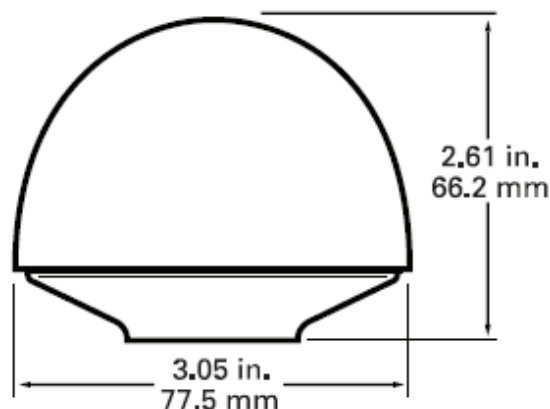
## PHYSICAL CHARACTERISTICS – 3.3V & 5V DC ANTENNAS

Dimensions.....3.05" D x 2.61" H (77.5mm x 66.2mm)  
 Weight.....6.0oz (170grams)  
 Enclosure.....Off-white plastic  
 Connector.....F-type & TNC (5V) – TNC (3.3V only)  
 Mounting.....1" – 14" thread or ¾" pipe thread

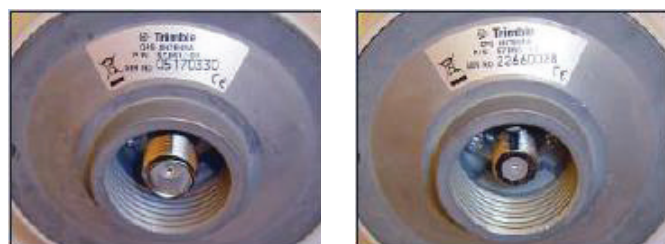
## TECHNICAL / PERFORMANCE SPECIFICATIONS

Feature	3.3V	5.0V
Prime Power	3.3V DV (±10%)	5.0V DV (±10%)
Power Consumption	<20mA	30mA maximum
Gain	30dB @ 25°C	32dB ± 3dB
Output Impedance	50Ω	50Ω
Frequency	1588 ± 3MHz	1588 ± 3MHz
Polarization	RHCP	RHCP
VSWR	2.0 maximum	2.0 maximum
Axial ratio	90°: 4.0dB max 10°: 6dB max	90°: 4.0dB max 10°: 6dB max
Noise	3.3dB max (25°C ± 5°C)	3.3dB max (25°C ± 5°C)
Pass-band width	50 MHz	
Out of Band rejection	fo=1575.42MHz ~ 1602MHz fo ±50 MHz: 30 dB min fo ±100 MHz: 35 dB min	
Blocking 1dB Compression Point	100MHz to 1.5GHz >+15dBm 1.5GHz to 1.575GHz Linear decrease from +15dBm to -40dBm over frequency range 1.575GHz to 1.65GHz Linear increase from -40dBm to +15dBm over frequency range 1.65GHz to 3GHz >+15dBm	
Azimuth coverage	360° (omni-directional)	360° (omni-directional)
Elevation coverage	0°-90° elevation (hemispherical)	0°-90° elevation (hemispherical)

## MECHANICAL



## CONNECTORS



## ORDERING INFORMATION AND ACCESSORIES

Please go to [www.trimble.com/timing](http://www.trimble.com/timing) for the latest documentation and tools, part numbers and ordering information.

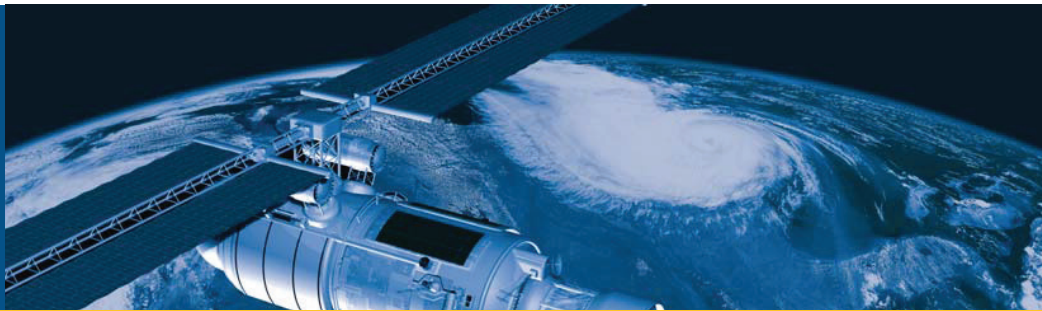
*Trimble has relied on representations made by its suppliers in certifying this product as RoHS-II compliant.*

*Specifications subject to change without notice.*

*Trimble Navigation Limited is not responsible for the operation or failure of operation of GNSS satellites or the availability of GNSS satellite signal.*



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## THUNDERBOLT E GPS DISCIPLINED CLOCK

### KEY FEATURES

- Double-ovenized quartz oscillator provides stable 10 MHz and 1 PPS output to maximize bandwidth
- Combined GPS receiver and 10 MHz oscillator on one board
- High volume manufacturing provides reliable low-cost products
- Meets holdover specifications of 8  $\mu$ s over 24 hours



### PRECISE GPS CLOCK FOR WIRELESS INFRASTRUCTURE

The Trimble® Thunderbolt® E GPS Disciplined Clock is Trimble's latest offering for GPS synchronization devices targeting the wireless infrastructure. This fifth-generation GPS clock combines a 12-channel GPS receiver, control circuitry, and a high-quality double-ovenized oscillator on a single board, providing increased integrity and reliability at a lower size and cost.

The Thunderbolt E's level of integration makes it a perfect solution for precise timing applications in the wireless industry. Among its uses are synchronizing the E911 positioning infrastructure, and providing precise time and frequency for WiMax and LTE-TDD applications, along with digital broadcast applications.

The architecture is comparable to systems currently used to maintain the tough CDMA, WiMax, and LTE-TDD holdover specification. The Thunderbolt E is available in its enclosure, or as an OEM board.

The Thunderbolt E GPS clock outputs a 10 MHz reference signal and a 1 PPS signal with an over-determined solution synchronized to GPS or UTC time. The PPS output accommodates applications requiring sub-microsecond timing.

The Trimble T-RAIM (Time-Receiver Autonomous Integrity Monitor) algorithm is used to monitor satellites to ensure signal integrity.

Matching the Thunderbolt E GPS Clock with the Trimble Bullet™ antenna creates a system that provides reliable performance in hostile R/F environments. The system can be easily calibrated for different cable lengths.

The high level of integration and volume production techniques make the Thunderbolt E GPS Disciplined Clock an extremely cost-competitive timing solution for volume synchronization applications.

General . . . . . L1 frequency, CA/code (SPS), 12-channel  
continuous tracking receiver

Date: 06/09/10 Time: 10:48:51 Data Points 1 thru 86400 of 86400 Tau=1.0000000e+000 File: TBoltE\_31502276\_01\_01.dat

# FREQUENCY STABILITY

TBoltE\_31502276\_01\_01.dat

Tau	Sigma
1	1.40e-11
2	1.44e-11
4	1.10e-11
8	9.94e-12
16	1.18e-11
32	1.56e-11
64	1.93e-11
128	1.90e-11
256	1.20e-11
512	7.17e-12
1024	3.68e-12
2048	1.74e-12
4096	8.33e-13
8192	4.58e-13

Allan Deviation,  $\sigma_{\tau}$

Averaging Time,  $\tau$ , Seconds

## ENVIRONMENTAL SPECIFICATIONS

## INTERFACE SPECIFICATIONS

## 1 PPS Interface Specification

- 10 MHz .....BNC connector.

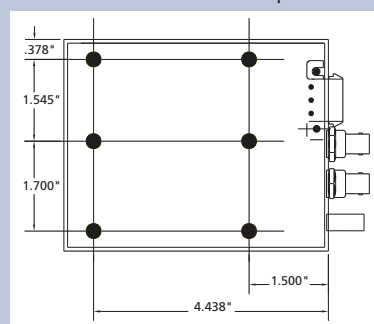
Waveform is sinusoidal 7 dBm  $\pm 2$  into 50  $\Omega$

$$5 \text{ dBm} = 1.125 \text{ V}_{pp}$$
$$7 \text{ dBm} = 1.416 \text{ V}_{pp}$$
$$9 \text{ dBm} = 1.783 \text{ V}_{pp}$$

Serial interface ..... RS-232 through a DB-9/M connector

RF antenna connector ..... BNC

Serial protocol . . . . . Trimble Standard Interface Protocol (TSIP) binary  
protocol @ 9600, 8-None-1



Power consumption ..... 12 watts cold: 8 watts steady state

Dimensions . . . . . 5 in L x 4 in W x 2 in H (127 mm x 102 mm x 40 mm)

Mounting ..... Six mounting holes for M3 screws. Max. depth 3/8"

Weight ..... 0.628 lb (0.285 kg)

Power connector ..... Molex 39-30-1020

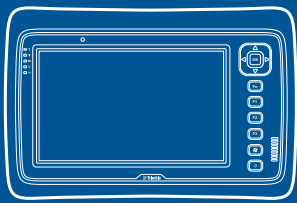
Please go to [www.trimble.com/timing](http://www.trimble.com/timing) for the latest documentation, software, tools, part numbers and ordering information.

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# Yuma 2

## Rugged Tablet Computer

### KEY FEATURES

Outdoor direct sunlight readable color display

7 inch multi-touch capacitive touchscreen

Microsoft® Windows 7 Professional operating system

1.6 GHz Intel Atom dual-core processor

4 GB DDR3 DRAM

GPS Receiver with 1-2 meter or 2-4 meter accuracy options

5 MP Camera with autofocus, geo-tagging and LED flash; captures photos and videos.

Accelerometer for screen rotation and electronic compass

Certified Trusted Processing Module (to allow encryption)

3.75G GSM and CDMA (Verizon) data connectivity option

Bluetooth® 4.0 and W-Fi b/g/n

Certified Rugged Performance Rating of IP65 and MIL-STD-810G

Fully rugged construction with Gorilla® Glass panel

Configurable options to best match data collection needs

Standard and Extended battery options



The Trimble® Yuma® 2 rugged tablet computer is designed for ease of use and high performance mobility features with everything users expect from a tablet computer — along with the confidence that it will perform at optimum capability no matter where the workplace may be.

#### Outdoor Readable Display

The Yuma 2 features a new dual technology display created specifically for easy and outstanding sunlight readability. No matter how bright or direct the glare, the Yuma 2 provides a clear, easy-to-read workspace. The full-color, seven inch screen resides under a Gorilla® Glass panel that is just as tough as the rest of the tablet.

#### Capacitive Touch Screen

With the multi-touch capacitive touchscreen, users can type with fingers, stylus or capacitive gloves and can control the size of the keyboard on the display for ease of use. Controlled zoom can optimize the user experience with maps and detailed information. The display can be used in landscape or portrait mode and is configurable to hold the orientation or to alter it in response to the accelerometer.

#### Offering either Enhanced 1-2 Meter GPS or standard 2-4 Meter GPS

Choose 2-4 meter standard GPS or 1-2 meter Enhanced GPS capability for data collection in the field that cannot be beat by any other rugged tablet. No fumbling with an extra antenna connection — the Yuma 2 offers GPS acquisition even in multi-path environments without compromising its IP65 rugged exterior — the antenna is integrated into the tablet form factor. It does include an antenna connector for even more accurate GPS data collection. Workers can collect data quickly and efficiently with start-up times of less than 33 seconds from a cold start and less than 3 seconds in a warm start, making data acquisition part of a standard workflow.

#### Distributed Asset Management

Today's fast-paced business world relies on assets distributed across wide geographical areas and the Yuma 2 is designed for this reality. The 5 megapixel camera provides video and photo capture with geo-tagging. When used with either the standard, or Enhanced GPS solutions, there's a Yuma 2 model that meets with your data collection needs for distributed asset management, work order management, fleet logistics and more.

#### For Professionals in the Field

Unlike consumer products or tablets that have been given an exterior shell to make them "rugged," the Trimble Yuma 2 is built rugged from the inside out, with IP65 protection from dust and water, and with military-grade MIL-STD-810G certification for temperature, altitude, humidity extremes, vibration and shock.

Using the Microsoft Windows 7 Professional operating system and 4 GB of DDR3 DRAM, the Yuma 2 allows mobile users to work with the same documents and data as they do in the office. Connectivity via Bluetooth, Wi-Fi and optional 3.75G GSM cellular data module enables manageable and efficient workflows wherever your mobile workforce goes. The Yuma 2 tablet computer includes a dual-core 1.6 GHz Intel Atom processor to run software applications fast and reliably.

The Yuma 2 includes two USB host ports, HDMI output and a matched set of batteries that can be hot-swapped out in the field. There are six keys including three user-programmable function buttons and a 5-way directional keypad.

For security, the Yuma 2 provides a built-in, certified Trusted Processing Module (TPM) encryption module to allow security programming for Wi-Fi and direct connect authentication, making it FIPS 140-2 compliant. A Kensington security port provides your workers with the ability to physically secure the Yuma 2 using a variety of Kensington computer security products.

#### Built for Work in the Real World

In the field, on the job site, on the road, or in the office, the Yuma 2 rugged tablet computer has the features you need to get important work done no matter where that work takes you.



# Yuma 2 Rugged Tablet Computer

## STANDARD FEATURES

- Transflective technology (TFT) direct sunlight readable color display
- Microsoft® Windows 7 Professional operating system
- Intel Atom N2600 dual-core 1.6 GHz processor
- 4 GB DDR3 DRAM volatile memory
- 64 or 128 GB solid state drive
- Multi-touch capacitive touchscreen
- Rugged design certified to IP65 and MIL-STD-810G
- 3.5 mm audio jack and integrated microphone and speaker
- Outward facing autofocus 5 MP camera with LED Flash, photo and video recording capable
- Integrated Bluetooth® 4.0
- Integrated Wi-Fi b/g/n
  - Wi-Fi Alliance Certified
  - CCX (Version 4)
- GPS receiver, Enhanced 1-2 meter accuracy or 2 - 4 meter accuracy with SBAS
- Kensington security slot
- Accelerometer and Electronic Compass
- 3.75 G WWAN data connectivity optional
- Status LEDs for power, battery charging, Wi-Fi and 3G Data
- 12-month manufacturer warranty

## STANDARD SOFTWARE

- Microsoft® Windows 7 Professional
- Internet Explorer
- Camera software with geo-tagging
- Trimble® GPS Information receiver control software

## STANDARD ACCESSORIES

- Standard battery set (5+ hour)\*
- International AC Charging Kit with 4 adapters
- Capacitive Stylus with Tether
- Hand Strap
- Display Cleaning Microfiber Cloth

## OPTIONAL ACCESSORIES

- Extended Battery Set (10+ hour)\*
- Office Docking Station
- Vehicle Charger 12 - 32 VDC input
- Tactical Vehicle Hard Mount (Dashboard)
- Light Duty Vehicle Soft Mount (Window)
- Screen Protectors with Microfiber Cloth
- Carrying Case
- USB to Serial Adapter
- GPS Adapter with SMA port
- External GPS Antenna Kit w/ Adapter
- Capacitive Touch Gloves
- Rugged USB keyboard
- Pole Mount

## ENVIRONMENTAL SPECIFICATIONS

Certified IP65 and MIL-STD-801G.

**Water:** Survives driving rain and water spray, IEC-60529 IP-6X Jetting water, any direction. Water Jet 0.25 in dia @ 8.2 ft-9.8 ft. 3.3 gallons/min. (Water Jet 6.3 mm dia. @ 2.5 m-3 m, 12.5 Liter/min)

**Dust:** Protected against dust: IEC 60529, IPX5 dust chamber under pressure.

**Drops:** Survives multiple 4 ft drops (1.22m) MIL-STD-810G, Method 516.6 Procedure IV, Transit Drop.

**Operating Temperatures:** -20° to +60° C (-4° to +144° F) MIL-STD-810G, Method 502.5 Procedure II & III (Low Temp, Operating); Method 501.5, Procedure II (High Temp Operating)

**Storage Temperatures:** -40° F to 158° F (-40° C to +70° C) MIL-STD-810G, Method 502.5 Procedure I (Low Temp Storage), Method 501.5, Procedure I (High Temp Storage)

**Temperature Shock:** Cycles between -22° F to 144° F (-30 °C to +60° C) MIL-STD-810G, Method 503.5, Procedure I-C (Operating Temp Shock).

**Humidity:** Cycles between -22° F to 144° F (-30° C to +60° C) at 90% RH, MIL-STD-810G, Method 507.5, Procedure II (Humidity Aggravated Cycle)

**Altitude:** Operational at 15,000 ft (4,572 m) at 73° F (23° C), MIL-STD-810G, Method 500.5, (Altitude) Procedure I, II & III

**Vibration:** General minimum integrity and loose cargo tests. MIL-STD-810G, Method 514.6, Procedure I Procedure II, Category 5 (Vibration: Truck/Trailer-Loose Cargo, Annex C, figure 514.6C-4, Table 514.6C-1, one hour).

**Solar Exposure:** MIL-STD-810G, Method 505.5, Procedure II, Solar Exposure

**Chemical Exposure:** Resistant to mild alkaline and acid cleaning solutions, fuel hydrocarbons, alcohols and common vehicle and factory machine lubricants.

## PHYSICAL

Size (LxWxH) ..... 9.6 in x 6.3 in x 1.5 in  
(246 mm x 160 mm x 40 mm)

Weight ..... 2.6 lb (1.2 kg) with standard batteries  
..... 3.0 lb (1.4 kg) with extended batteries

Colors ..... Yellow, Gray, and Gray with Yellow border

Keys ..... Six keys (Logon, Power, Function, 3 user-programmable function keys) and 5-way directional keypad

## YUMA 2 PRODUCT MODELS

Win 7 Model	SSD	3.75 G WWAN	GPS	IP Rating
C	64 GB		2-4 m	IP65
CL	128 GB		2-4 m	IP65
CX	64 GB	Yes	2-4 m	IP65
CLX	128 GB	Yes	2-4 m	IP65
GL	128 GB		1-2 m	IP65
GLX	128 GB	Yes	1-2 m	IP65

## HARDWARE SPECIFICATIONS

**Processor:** 1.6 GHz Intel Atom N2600 dual-core processor

**Memory:** 4 GB DDR3 DRAM volatile memory

**Storage:** 64 GB or 128 GB SSD (Enhanced GPS: 128 GB SSD only)

**Display:** 7" 1024 x 600 hybrid reflective and transmissive (transflective) with capacitive touch screen

### Battery\*:

- Smart batteries with LED power indicators.
- **Standard battery:** Two 7.5v, 3000 mAh, 21.6 Wh
- **Optional Extended battery:** Two 7.5v, 6000 mAh, 43.2 Wh

**I/O:** 3.5 mm audio jack, USB Host (2), HDMI, docking station I/O plate, DC input power

**GPS Receiver:** 1-2 meter accuracy (with SBAS) or 2-4 meter accuracy (with SBAS)

**Radios:** Bluetooth 4.0; Wi-Fi b/g/n

**WWAN:** Penta-band GSM 3.75 Data only module

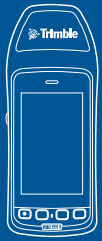
\*(Battery life affected by power settings, usage patterns and environmental conditions. Standard battery life approx. 5 hrs; extended battery life approx. 10 hours)

## CERTIFICATIONS:

FCC, CE, UL 60950, IC (Canada), RoHS complaint. SAIPE, RSS 210, CSA, RSS CSA C22.2, IEC 60950, A-Tick, C-Tick Mark for Australia and New Zealand.



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# Juno T41

## Rugged Handheld Computer



The flexible, fully-rugged Juno T41 is available in a wide variety of configurations. Build the handheld computer you need: Android or Microsoft Windows operating systems, Barcode Imager, Ultra-High Frequency RFID, Smartphone or GPS collector (or combinations). Every Juno T41 is a reliable small workhorse computer designed to last for years in any environment.

### KEY FEATURES & MODELS

#### Juno T41 C, X, M: Basic Model with Smartphone option

Fully Rugged design with IP65 or IP68; Mil-ST-810G

Choice of Operating Systems: Windows Embedded Handheld (WEHH) 6.5 or Android 4.1 "JellyBean"

Processor: 800 MHz or 1GHz TI OMAP 3

RAM: 512 MB

Multi-touch User Interface with capacitive stylus compatibility

8 MP camera with dual LED flash and geo-tagging/Audio/Video

2-4 Meter integrated GPS receiver w/SBAS

Bluetooth and Wi-Fi 802.11 b/g/n; CCX certified

4.3" WVGA Sunlight-readable Corning® Gorilla® Glass Display

Accelerometer and Electronic Compass

Full-Day Battery Life

Raw GPS Data Available for post-processing to enable sub-meter performance

3.75G cellular data, text & voice optional

Camera Barcode Scanning Application

Software Development Kit to customize workflow

#### Juno T41 S: 1D/2D Barcode Imager

White light illumination and red LED-based aimer for ease of use

High-motion tolerance for quick scanning responsiveness

Omni-directional reading capabilities for real world use conditions

Rapid Scanning Capability for high read rates no matter the angle or orientation

Access to other valuable tools such as:

- Multicode reading
- Data editing
- Image capture
- Illumination, aiming, presentation modes

#### Juno T41 R: Ultra-High Frequency RFID

Rapid-Read, high-accuracy performance on multiple tags with multiple orientations, even in crowded conditions

Read-Range: 3.5+ (12'+) Meters for 5 cm<sup>2</sup> (2") UHF tags in unobstructed space

Integrated antenna with the ability to transmit up to +30 dBm (1 Watt) power for demanding applications

Configurable performance settings and use-case parameters in the pre-loaded Trimble SearchLight application

Supports EPCglobal Gen 2 (ISO 18000-6C) protocol

Automatically configured and ready for use around the world:

FCC Certified (North America): 902-928 MHz bands

ETSI Certified (EU): 865.6-867.6 MHz bands

ACMA Certified (AU/NZ): 920-926 MHz bands

Easy-to Use Software Development Kit (SDK) and Application Programming Interfaces (APIs) to customize all settings including read range, power consumption and other features

#### Juno T41 G: Real-Time Enhanced GPS: Accuracy 1-2 Meters in Real Time<sup>1</sup>

Reliable Performance in Reduced Signal Environments

Real-time GPS accuracy of 1-2 meters<sup>2</sup> with SBAS

Dramatic performance improvement with GPS Accuracy Algorithm Enabled<sup>5</sup>

Small, portable & ergonomic form-factor

Note: X models contain C functionality and options

Note: S and G models contain C and/or X functionality and options

# Juno T41

## Rugged Handheld Computer



### EMPOWERING THE MOBILE WORKER

The Juno T41 rugged handheld computer is designed to be long-lasting, from the battery to the processor, and to work through mishaps that would sideline lesser products. The Juno T41 handheld is built to MIL-STD- 810G standards and all are available in your choice of IP65 or IP68 ratings to survive hostile conditions in the field: it can withstand driving rain and liquid immersion, corrosive environments, dust, shock, drops, vibration, prolonged UV exposure and extreme temperatures and altitudes.

All Juno T41 handhelds come in your choice of either Windows Embedded Handheld (WEHH) v 6.5 or Android 4.1 "Jelly Bean" operating systems.

The Juno T41 features an 800 MHz to 1 GHz processor, 512 MB of RAM and up to 32 GB of storage. The 4.3" high resolution Corning® Gorilla® Glass panel capacitive touchscreen is sunlight-readable and beautifully clear. Multi-touch support allows complex selections and controlled zoom to optimize the user experience with maps and detailed information. A capacitive stylus is available as an optional accessory.

Physical connection to other electronic devices is supported via the Juno T41 handheld's custom connector that provides easy connectivity to a USB device, a 9-pin Serial device or a battery charger.

### MODEL OPTIONS – BUILD YOUR IDEAL JUNO T41

#### BASIC AND SMARTPHONE: THE "C" AND "X" CONFIGURATIONS

Tough, powerful and packed with features that take it far beyond "basic," the Juno T41 is designed to replace BYOD smartphones with an 8 MP integrated camera, SMS text and 3.75 cellular data transfer capabilities on GSM networks worldwide. The 800 GHz or 1 GHz processor and 512 MB RAM will run your software fast and reliably. Choose either Android 4.1 or Microsoft WEHH 6.5 operating systems.

#### 1D/2D BARCODE IMAGER: THE "S" CONFIGURATION

TrimbleScan Technology gives your solution an edge by reading an array of traditional barcodes as well as 1D and 2D matrix codes, captures signatures and images. All of these features are customizable using the Trimble "Scan Agent" application. Enterprises can also use the T41 Software Development Kit (SDK) to optimize for specific customer needs.

Omni-directional reading capabilities along with high motion tolerance allows rapid, accurate barcode imaging no matter what the angle or orientation the unit is to the barcodes. Read as many as 200 barcodes per second with 100% accuracy.

Even if the unit is dropped on the concrete... it's going to provide accurate information, without missing a beat.

#### ULTRA-HIGH FREQUENCY SUPPORT: THE "R" CONFIGURATION

The Juno T41 R integrates the Trimble ThingMagic Mercury6e-Micro (M6e-Micro) RFID reader into its small, compact form factor. Using EPCglobal Gen 2 RFID technology, the T41 R rapidly reads tags at different frequencies almost simultaneously, for accurate reads in real world conditions.

The Juno T41R can read a single square 5 cm<sup>2</sup> (2 square inch) UHF RFID tag more than 3.5 meters (11+ feet) away from the unit in unobstructed space. In more challenging environments with higher

levels of interference, it reads 5 cm<sup>2</sup> tags consistently between 1-2 meters. The application reports the tagged asset in order of signal strength.

The Juno T41R is location aware, ready for use in different regions around the world. The FCC Certified and ACMA Certified T41R supports the 902 to 928 MHz and 920 to 926 MHz frequency bands, respectively, and is ready for use in the United States, Canada, Australia and New Zealand. The ETSI Certified T41R uses the 865.6 to 867.6 MHz range and is ready to use in European RFID frequencies.

In short, there is more powerful and compact RFID reader currently on the market today... and nothing as rugged.

### REAL-TIME ENHANCED GPS ACCURACY: THE "G" CONFIGURATION

Pair enhanced GPS with any other Juno T41 technology including the basic handheld computer, RFID, smartphone, or 1D/2D Imager to get extra value out of your existing workflows. The T41 G provides dramatic improvements in performance compared to other T41 models without the Enhanced GPS, allowing data collection in real-time at 1-2 meter accuracy, while gathering Raw Data Output for post-processing applications.

The Juno T41 G supports the GPS L1 band, along with offering reliable performance in reduced signal environments. Mobile workers who have to move from place to place to collect GPS data on far-flung assets won't have to waste time waiting for a warm-up: the Juno T41 G boasts an average cold start of less than 33 seconds, and an Assisted-GPS start of less than 3 seconds. DGPS by SBAS (WAAS, EGNOS & MSAS) or RTCM. The Juno T41 G is designed to work optimally with Trimble Positioning Services VRS.

Assets are everywhere now... map accurately and reliably no matter where your workers have to go.

### BUILT FOR WORK IN THE REAL WORLD

Your business isn't limited to inside the four walls. No matter your industry, if your people spend work hours outdoors, a rugged handheld is a cost-effective piece of equipment. Integrate the Juno T41 with the right set of features and functionality into your organization and take your applications to the next level.

### MODEL CONFIGURATIONS BY FORM FACTOR:

The images below depict the available physical form factors of the Trimble Juno T41 computers.



Models in this form factor:	Models in this form factor:	Models in this form factor:
Juno T41 C	Juno T41 CG	Juno T41 CS
Juno T41 X	Juno T41 XG	Juno T41 XS
Juno T41 M (military)		Juno T41 XGS
		Juno T41 CR
		Juno T41 XR
		Juno T41 XGR



<sup>1</sup>Requires SBAS and T41 GPS Accuracy Algorithm. May vary due to atmospheric conditions, multipath, obstructions signal geometry and number of satellites tracked. The GPS Accuracy Algorithm is a Carrier Smoothing Algorithm. Testing done in Open Sky & Light Cover.

<sup>2</sup>WAAS available in North America only; EGNOS available in Europe only; MSAS available in Japan only.



# Juno T41

## Rugged Handheld Computer

### TECHNICAL INFORMATION

#### S, G, R FEATURES

##### 1D/2D Barcode Imager

- White light illumination and red LED-based aimer for ease of use
- High-motion tolerance to deliver quick imaging responsiveness
- Omni-directional reading capabilities for real world use conditions
- Rapid Scanning Capability for high read rates no matter what the bar code angle or orientation is in relation to the unit
  - o 1D supported symbologies:  
EAN/UPC, GS1 Databar (limited expanded & omni-directional), Code 39, Code 128, UCC/EAN 128, ISBN, ISBT, Interleaved/Matrix/Industrial and Standard 2 of 5, Codabar, Code 93/93i, Code 11, MSI, Plessey, Telepen, postal codes (Australian Post, BPO, Canada Post, Dutch Post, Japan Post, PostNet, Sweden Post)
  - o 2D supported symbologies:  
Data Matrix, PDF417, Micro PDF 417, Codablock, Maxicode, QR, Aztec
- Access to other valuable tools such as:
  - o Multicode reading
  - o data editing
  - o image capture
  - o scanning barcodes on mobile phone screens
  - o illumination, aiming, presentation modes

##### Real-Time Enhanced GPS

- 1-2 meter Real-time accuracy with no post-processing or subscription fees required
- Trimble Positioning Services VRS Capable
- Supports GPS L1 band
- Raw Data Output available for post-processing applications
- Average cold start < 33 seconds; Average Warm Start < 3 seconds
- Reliable performance in reduced signal environments

##### Ultra-High Frequency RFID

- Integrated ThingMagic M6e-Micro module
- Integrated orientation insensitive antenna for fast and accurate tag reads
- Power transmission up to +30 dBm (1 Watt) power
- Choice of 865-868 MHz or 902-928 MHz
- Supports EPCglobal Gen 2 (ISO 18000-6C) protocol

#### C, X AND ALL OTHER MODEL FEATURES

- Processor: 800 MHz or 1 GHz, Texas Instruments DM3730
- RAM: 512 MB
- Flash Storage: 8, 16 or 32 GB
- 4.3" WVGA sunlight-readable Corning® Gorilla® Glass display
- Light sensor to auto-adjust display brightness
- Capacitive multi-touch interface
- Integrated 3.75G cellular data, text and voice capability
- 8 megapixel camera with geo-tagging and dual LED flash
- Bluetooth® 2.1 with Enhanced Data Rate
- Wi-Fi (802.11 b/g/n)
- GPS Receiver CCX certified options: 2 to 4 meter accuracy or 1 to 2 meter accuracy (SBAS Capable: WAAS & EGNOS)
- MCX port for optional External GPS Antenna
- Electronic Compass

- Accelerometer
- Robust Custom Port with USB 2.0 Full Speed Protocol
- Conversion Cables available for 9-pin Serial or USB host
- MicroSD memory card slot (supports SDHC up to 32 GB)
- Integrated speaker and microphone
- 3.5 mm Headset Jack with Audio Capability

#### OPERATING SYSTEMS

- Windows Embedded Handheld 6.5
  - o Language Support: Chinese (Simplified), English, French, German, Italian, Japanese, Korean, Portuguese, Russian or Spanish
- Android 4.1 "Jelly Bean"
- **Windows Embedded Handheld 6.5 Standard Software:**
  - Trimble SatViewer (GPS interface application)
  - Trimble CellStart (WWAN configuration application)
  - Microsoft® Office Mobile® 2010 (Word Mobile, Excel Mobile, PowerPoint Mobile, Outlook Mobile)
  - Internet Explorer Mobile 6
  - Microsoft My Phone with SMS Text Messaging
  - Camera control application
  - 1D/2D Barcode reader camera application
  - Flashlight mode control application
  - Calculator
  - Calendar
  - Microsoft Pictures & Videos
  - Windows Media Player
  - Windows Live Messenger
  - Microsoft Task Manager & Notes
  - Adobe Reader LE 2.5

##### Android 4.1 "Jelly Bean" Standard Software:

- With language support (All Android default languages)
- App Launcher: Trimble Outdoors Navigator
- Email
- Phone & SMS Text Messaging
- 1D/2D Barcode reader camera application
- Picture & Video Gallery
- Multimedia Player
- Web Browser
- Flashlight mode control application

##### Application Developer Support

- Software Developer Kit with documentation for WEH 6.5
  - o Specific SDKs for C, G, S, and R models to customize workflows
- Software Developer Kit with documentation for Android 4.1
  - o Specific SDKs for C, G, S, and R models to customize workflows

#### STANDARD ACCESSORIES

- International AC Charging Kit
- T41 USB Cable
- Wrist Strap
- Ultra Clear Screen Protectors (qty 2) Kit
- SIM/SD Card Tool
- Quick Start Guide

#### ENVIRONMENTAL SPECIFICATIONS

**Water:** Survives immersion at 6.6 ft (2m) for 1 hour (gray models), IEC-60529 IP-X8

Survives driving rain and water spray (yellow models), IEC-60529 IP-X5, water jet 12.5mm dia @ 2.5-3m

**Dust:** Protected against dust, IEC-60529 IP-6X, dust chamber with under-pressure

**Drops:** Survived multiple drops of 4 ft. (1.22m), MIL-STD-810G, Method 516.6, Procedure IV, Transit Drop

**Operating Temperature:** -22 °F to 144 °F (-30 °C to 60 °C), MIL-STD-810G, Method 502.5, Procedure I, II, III (Low Temp Operating -30 °C); Method 501.5, Procedure I & II (High Temp Operating 60 °C)

**Storage Temperature:** -40 °F to 158 °F (-40 °C to 70 °C), MIL-STD-810G, Method 502.5, Procedure I, II, III (Low Temp Storage -40 °C); Method 501.5, Procedure I & II (High Temp Storage 70 °C)

**Temperature Shock:** Cycles between -22 °F and 144 °F (-30 °C and 60 °C), MIL-STD-810G, Method 503.5, Procedure I-C

**Humidity:** 90% relative humidity with temperatures between 22 °F and 144 °F (30 °C and 60 °C), MIL-STD-810G, Method 507.5, Procedure II

**Altitude:** 15,000 ft (4,572 m) at 73 °F (23 °C) to 40,000 ft (12,192 m) at -22 °F (-30 °C), MIL-STD-810G, Method 500.5, Procedure I, II & III

**Vibration:** General minimum integrity and loose cargo tests, MIL-STD-810G, Method 514.6, Procedure I & II, Category 5

**Solar Exposure:** Survives prolonged UVB exposure, MIL-STD-810G, Method 505.5, Procedure II

**Chemical Exposure:** Resistant to mild alkaline and acid cleaning solutions, fuel hydrocarbons, alcohols and common vehicle and factory machine lubricants

#### PHYSICAL

Size (C,X,M) ..... 6.1 in x 3.2 in x .9 in  
(15.5 cm x 8.2 cm x 2.5 cm)  
Size (G) ..... 8.26 in x 3.2 in x 1.26 in  
(20.98 cm x 8.14 cm x 3.19 cm)  
Size (S,R) ..... 8.26 in x 3.2 in x 1.26 in  
(20.98 cm x 8.14 cm x 3.19 cm)  
Weight (C,X,M) ..... 13.5 oz (.4 kg), including battery  
Color ..... Black with Yellow or Black with Gray

#### ELECTRICAL

**Processor:** 800 MHz or 1GHz TI OMAP 3

**Memory:** 512 MB RAM

**Storage:** 8/16/32 GB non-volatile Flash Storage

**Expansion:** microSD card slot, SIM Card Slot

**Display:** 4.3 in (10.9 cm), 480 x 800 pixel, WVGA TFT

**Battery Capacity:** 3300 mAh, 3.7 V (@0.2C), 12.2 Wh

**I/O:** 3.75mm audio jack, MCX GPS antenna port and a custom port that supports USB 2.0 Host, USB Client, 15 VDC power and Serial connections

**GPS:** 2-4 m or 1-2 m accuracy with WAAS/SBAS correction

**Radios:** Bluetooth 2.1 +EDR; Wi-Fi 802.11 b/g/n

**WWAN radios:** UMTS / HSPA+, GSM / GPRS/ EDGE, UMTS

**Bands (WCDMA/FDD):** 800, 850, 1900

**GSM Bands:** 850, 900, 1800, 1900 MHz

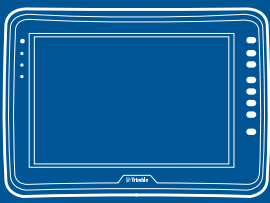
#### CERTIFICATIONS

FCC, CE, R&TTE, IC (Canada), A-tick, C-tick, GCF compliant, RoHS compliant, Section 508 compliant, PTCRB, SAR, AT&T network compatible, Wi-Fi Alliance certified, CCX, USB 2.0 Full Speed, MIL-STD-810G, IP65/IP68, MIL-STD-461E.



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# Kenai

## Rugged Tablet Computer

### KEY FEATURES

Microsoft® Windows® 10 Professional

10.1" Gorilla® Glass sunlight readable full-color display

4G LTE WWAN data capability

Choice of standard (up to 5 hours) or extended (up to 10 hours) batteries, with hot-swappable capability to meet your full workday needs

Fully Rugged IP65 and MIL-STD-810G

RS 232 DB 9 Serial Port

Connectivity options: Wi-Fi, Bluetooth, and/or 4G LTE data GSM WANN

1.46GHz dual-core Intel processor

8MP camera with LED flash for photos and videos

Integrated GPS 2-4 m (6-13 ft)

Encryption options

Two-year standard warranty

Built for mobile workers in any environment

The Trimble® Kenai™ tablet is a reliable, rugged, mobile computer designed for ease of use and high performance in the field. This is the tablet for those mobile workers who need a computer they can count on no matter where the job takes them, or how long they have to stay in the field to get the job done.

### PROFESSIONAL GRADE

Featuring the Microsoft® Windows® 10 Professional operating system, powered by a 1.46GHz dual-core Intel® Atom™ E3826 processor, the Kenai brings professional-grade computing to the field.

The Kenai provides up to 8 GB of DDR3 DRAM for all the memory needed.

Mobile workers who require large screens for forms and documents have the advantage with a capacitive multi-touch display that is for finger, glove-sensitive, or can be customized for stylus performance.

For field mapping, imagery and asset management, the Kenai comes standard with an Integrated GPS Receiver and antenna supporting several ancillary GNSS protocols (L1 GPS, SBAS, GLONASS, BeiDou) providing accuracy in the range of 2-4 meters (6-13 feet). In addition, it supports connecting an external GPS antenna and cable that can be utilized when users are on foot or inside a vehicle.

Take photographs and video of business resources and assets in the field to provide clear status visuals, and geotag to provide security as well as business intelligence. Communicate it immediately to management and meet compliance and auditing requirements in an easy, accurate computerized record.

### DESIGNED FOR TOUGH WORK REQUIREMENTS

The Kenai brings together a fully-rugged enclosure, and a host of options. Built fully rugged to IP65 standards for dust and water, and the latest MIL-STD-810G standards for drops, shock, vibration, humidity, rain or dusty conditions, Trimble Kenai was created for hard work by hard working professionals, anywhere.

With impressive full-color outdoor view-ability even in the brightest sunshine, the 10.1" WUXGA display is under Corning® Gorilla® Glass and will not be affected by rain. The tablet is also tested against prolonged solar exposure.

Designed to last for all-day performance, the Kenai boasts hot-swappable batteries so the tablet can keep going from shift to shift. Lengthen your work day with extended batteries and charge batteries in the field or office.

### CONNECTIVITY AND SECURITY

Fully cloud-capable, the Kenai provides connectivity options including Bluetooth®, Wi-Fi and 4G LTE GSM WWAN data module capability. Communicate data collected in the field in real-time through secure high speed data transfer, and access and work on the same documents and data as in the office. For security, the Kenai provides a built-in, certified Trusted Processing Module (TPM) encryption module to allow security programming for Wi-Fi and direct connect authentication. The tablet is FIPS compliant for security in a variety of mobile device management applications, and also has a Kensington Security Slot to provide field data safety.

The Kenai is designed to be easily connected to the other computer equipment most businesses use. It comes standard with an RS 232 DB 9 Serial Port as well as 2 USB 2.0 connectors. There is also an Office Docking Station for the Kenai that allows connectivity with USB peripherals such as mice, keyboards and HDMI monitors even as it's charging. A fully rugged vehicle docking station is also available.

The Kenai comes with a standard two year warranty that can be extended so business can be assured of ROI through years of performance.

The Kenai is everything mobile workers require from a rugged tablet computer in the field – built with Trimble reliability for confidence that it will perform at optimum capability no matter where the workplace may be.



# Kenai Rugged Tablet Computer

## STANDARD FEATURES

- Microsoft® Windows® 10 Professional
- Intel® BayTrail-I Atom E3826 1.46GHz dual-core processor
- Wi-Fi 802.11 a/b/g/n
- Bluetooth® 4.0
- L1 GPS, GLONASS and BeiDou with SBAS (WAAS, EGNOS, MSAS)
- 10.1" full color sunlight readable display: WUXGA [1920 x 1200]; 1,000 NITS
- 10-point multi-touch capacitive touchscreen
- IP65 Water and Dust ingress protection rating
- Rugged design certified and tested to MIL-STD-810G standards
- 3.5 mm audio jack and integrated microphone and speaker
- RS 232 DB 9 Serial Port
- 8MP camera with LED flash; supports video
- Kensington security slot
- FIPS 140-2 Compliance
- Hot swappable battery
- Programmable keypad, with LEDs for power and battery charge status
- 2 year standard warranty

## CONFIGURATION OPTIONS

- WWAN: GSM, 4G LTE data only
- Memory: 4 GB or 8 GB DDR3 DRAM
- User Storage: 128 GB or 256 GB SSD

## SOFTWARE COMPATIBILITY

- Microsoft Windows 10 Professional Operating System comes bundled with many free software applications and utilities, and users have access to over 120,000 applications available through the Windows Store as well as custom enterprise software applications.

## STANDARD INCLUDED ACCESSORIES

- Standard battery pack (49 Whr/5 hours\*)
- International AC Charger
- Capacitive stylus and tether
- Screen protector with cleaning cloth

## OPTIONAL ACCESSORIES

- Extended battery pack (98 Whr/10 hours\*)
- External battery pack charger
- Desktop docking station
- DC charger (12V/24Vdc)
- Carry case
- Hand strap
- Screen protector and cleaning kit
- Pole mount
- Capacitive touch gloves

- USB keyboard
- In-vehicle docking station (12V/24Vdc)
- GPS/GNSS antenna adapter
- In-Vehicle mounting kit

## PHYSICAL

Size (LxWxH) .....298mm x 206mm x 43mm  
(11.7in x 8.1in x 1.7in)  
Weight..... standard battery - 1.6 kg (3.5 lb)  
extended battery - 1.8 kg (4.0 lb)

## ENVIRONMENTAL RANGE

(Tested to MIL-STD-810G test standards as noted)

**Operating temperature:** -30 °C to 55 °C (-22 °F to 130 °F)

MIL-STD-810G Method 502.5, Procedure II & III (Low Temp.

Operating)

MIL-STD-810G Method 501.5, Procedure II (High Temp. Operating)

**Storage temperature:** -40 °C to 70 °C (-40 °F to 158 °F)

MIL-STD-810G Method 502.5, Procedure I (Low Temp. Storage)

MIL-STD-810G Method 501.5, Procedure I (High Temp. Storage)

**Humidity:** 90% RH, MIL-STD-810G Method 507.5, Procedure II (Humidity Aggravated Cycle)

**Water & Dust Ingress:** IP65, IEC 60529 (Protected against dust, survives driving rain and water spray from any direction)

**Drops:** Survives multiple 1.22 m (4 ft.) drops, MIL-STD-810G Method 516.6 Procedure IV, Transit Drop

**Vibration:** General minimum integrity and loose cargo tests, MIL-STD-810G, Method 514.6, Procedure I Procedure II, Category 5 (Vibration) (Vibration; Truck/Trailer-Loose Cargo Annex C, figure 514.6C-4, Table 514.6C-I, one hour)

**Altitude:** Operational at 4,572 m (15,000 ft), MIL-STD-810G, Method 500.5, (Altitude) Procedure I, II & III

**Temperature Shock:** Survives cycles between -30 °C and 60 °C (-22 °F and 144 °F), MIL-STD-810G, Method 503.5, Procedure I-C

**Solar Exposure:** Survives prolonged solar exposure, MIL-STD-810G, Method 505.5, Procedure II, Solar Exposure

**Chemical Resistance:** Resistant to mild alkaline and acid cleaning solutions fuel hydrocarbons, alcohols and common vehicle and factory machine lubricants

## SYSTEM

**Processor:** Intel BayTrail-I Atom E3826 1.46GHz dual core

**RAM Memory:** 4 GB or 8 GB

**User Storage:** 64 GB, 128 GB or 256 GB SSD

**Display & Touch:** 10.1" full color sunlight readable WUXGA (1920 x 1200), multi-touch capacitive touch panel, 1.3 mm Corning® Gorilla® Glass Panel

**Standard Battery Pack:** 10.8V 4.5mAh, 49Whr/5 hour

**Extended Battery Pack:** 10.8V, 9.1mAh, 98Whr/10 hour

**Audio:** Internal mono speaker and microphone

**I/O:** 3.5 mm audio jack, USB 2.0 Host (2), RS232, docking station I/O plate, DC input power

**Wireless:** Bluetooth® 4.0

**WLAN:** Wi-Fi (802.11 a/b/g/n)

**WWAN Modules:**

Americas: 4G: LTE-FDD, HSPA+, GSM/GPRS/EDGE

(Frequency bands B1, B2, B4, B5, B8, B13, B17, B25, BC0, BC1, BC10)

EMEA, Australia, New Zealand: 4G: LTE-FDD, HSPA+, GSM/GPRS/EDGE

(Frequency Bands B1, B2, B3, B5, B7, B8, B20)

**Sensors:** Gyro, accelerometer, e-compass, ambient light sensor

**Location:** L1 GPS, GLONASS or BeiDou. Accuracy: 2-4 meter (6-13 feet) Supports real-time DGPS: RTCM v2.3 or SBAS.

**GNSS Protocols:** NMEA-0183, SBAS (WWAS, EGNOS, MSAS) UBX binary.

## CERTIFICATIONS:

FCC, CE, UL 60950, IC (Canada), RoHS compliant. MIL461, RSS 210, CSA, RSS CSA C22.2, IEC 60950, A-Tick, C-Tick, Wi-Fi Alliance Certified, MIL-STD-810G, IP65, GSM AT&T network compatible.

\*Battery life affected by power settings, usage patterns and environmental conditions. Standard battery life approx. 5 hours; extended battery life approx. 10 hours

Note: Specifications subject to change without notice.

## CONFIGURATIONS

Model	Memory		SSD Drive			4G LTE WWAN	
	4 GB	8 GB	64 GB	128 GB	256GB	None	Option
KEN46	•		•			•	
KEN48	•			•		•	
KEN88		•		•			•
KEN89		•			•		•



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