



## Description

A DWTAG is an Ultra-Wideband (UWB) transceiver intended for use with **Ciholas** UWB (CUWB) Real Time Location Systems (RTLS). In a typical CUWB RTLS system the DWTAG operates as a mobile device whose location is tracked. DWTAGs have a comprehensive set of on-board sensors and an integrated rechargeable battery. The DWTAG is lightweight with a mechanical design that allows for easy mounting on assets or personnel.

DWTAG devices are FCC certified in the United States, and have CE marking in the European Union.



## 1 Features

- 32-bit ARM Cortex-M4 Processor with FPU
  - 64MHz clock
  - 512kB Flash
  - 64kB RAM
  - Integrated 2.4GHz Transceiver
  - BLE 2.4GHz Protocol Stack Compatible
- **Decawave** DW1000 Ultra-Wideband Transceiver
  - IEEE802.15.4-2011 Compliant
  - 6 RF bands from 3.5GHz to 6.5GHz
  - Data rates 110kbps-6.8Mbps
  - Up to 1023-byte packet length
- Integrated Omni-directional UWB antenna
- Motion Processing Unit (MPU)
  - 16-bit 3-Axis Gyroscope 250-2000°/S
  - 16-bit 3-axis Accelerometer  $\pm 2g$  up to  $\pm 16g$
  - 14-bit 3-axis Magnetometer  $\pm 4800T$
  - Digital Motion Processing including low-power quaternion
- MEMS High Resolution Barometric Altimeter
  - 24-bit resolution with 0.01hPa RMS
  - 260-1260hPa absolute pressure range
  - 16-bit temperature  $\pm 2^{\circ}C$  absolute accuracy
- Tri-Color LED Indicator
- Integrated 300mA-h Lithium-Ion Rechargeable Battery
- USB to serial UART connection.
  - Fully compliant with USB 2.0 specification
  - Standard Micro-USB Type-B Jack
- FCC Certified in the United States under 47 CFR 15.250
- CE marking in the European Union under EN 302 065-1

*Note: Not all hardware features are supported by CUWB System software. See [CUWB.io](http://CUWB.io) documentation for specific feature support.*

## 2 Ordering

Model	Part Number	Description
DWTAG100	E00619-00633	Battery powered UWB tag.

Available from the **CIHOLAS Webshop**



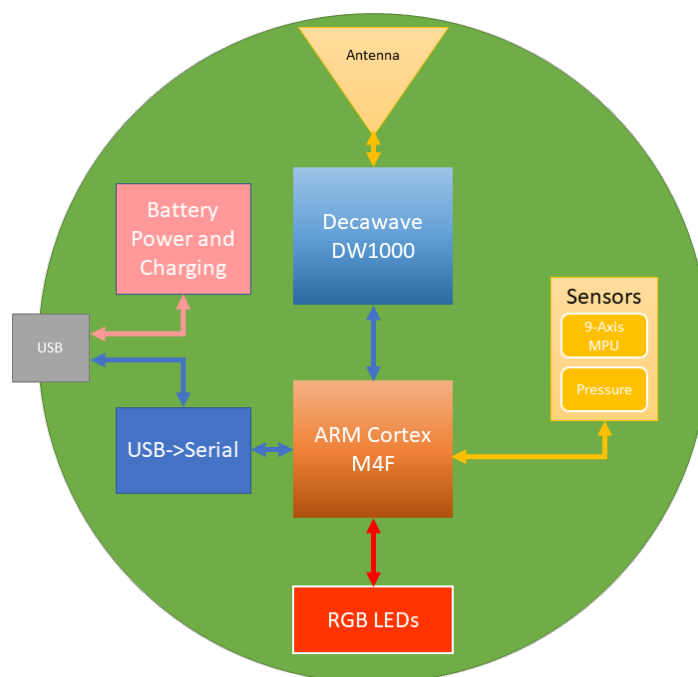
## 3 Electrical

### 3.1 Ratings

Parameter	Description	Min.	Typ.	Max	Units
<b>V<sub>c</sub></b>	Charging Voltage	4.5	5.0	5.5	V
<b>P</b>	Powered Unconfigured <sup>1</sup>		3.7		mW
	Powered Tag @ 10Hz <sup>1</sup>		19.2		mW
<b>B</b>	Battery Capacity		300		mA-h
<b>T</b>	Operational Temperature	-20		60	°C

1. DWTAG Power Draw is highly dependent on usage and system configuration. DWTAGs configured with beacon rates higher than listed in the table will draw more power.

### 3.2 Block Diagram

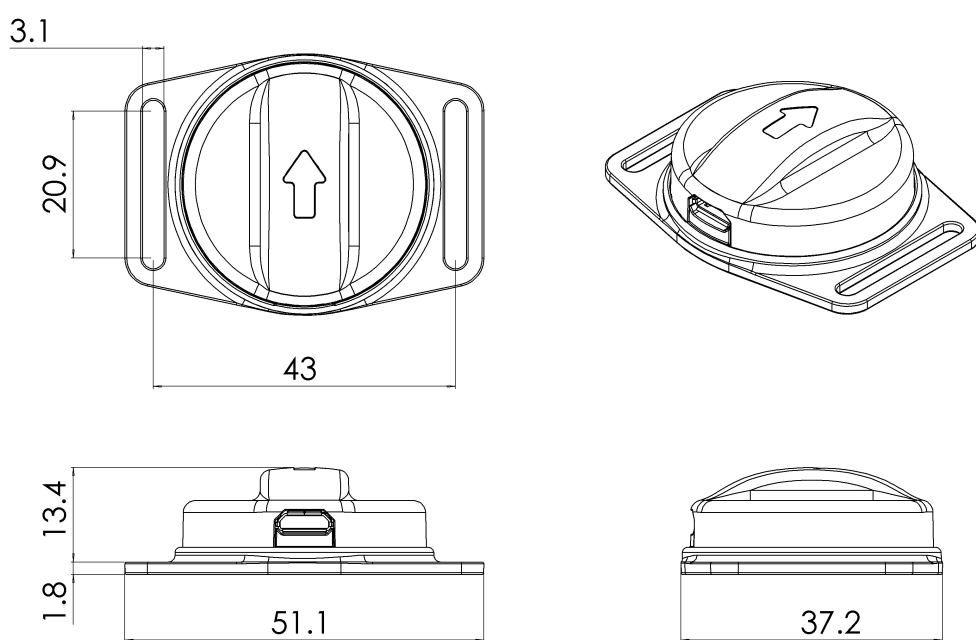


## 4 Mechanical

Parameter	Description	Min.	Typ.	Max	Units
Mass	Typical Unit Mass	15	17	19	g

### **Ingress Protection**

IP30, protected against solid objects over 2.5mm, no protection against liquids



Dimension unit: millimeter

## 5 Operation

### 5.1 Charging and Communication

The DWTAG is designed with a Micro USB Type-B connector for easy connection. To charge the battery connect to power via the Micro-USB connector. A device that is charging will drop off of any CUWB network that it is currently participating in.

DWTAG100 devices may also be charged using the Ciholas **CHG100** charging rack.

The design of the DWTAG includes a USB to serial converter and may be connected to a USB compatible hub for communications.

## 5.2 Network Operation and Configuration

The DWTAG will attempt to join any network that is within range of its UWB transceiver. If no network is in range the device will go into a low power mode periodically waking to check for presence of a CUWB network.

DWTAG devices must be added to the CUWB RTLS network configuration in order to join a network and beacon.

Details regarding DWTAG100 setup and configuration for the CUWB RTLS can be found on the [CUWB Documentation Site](#).

## 5.3 Sensor Data Reporting

DWTAG100 has a variety of sensors and can be configured to transmit data from those sensors. Sensor data received by the CUWB server broadcast via the [Ciholas Data Protocol \(CDP\)](#) providing access to users.

Sensor scaling and data rates can be configured for the following types of data:

Sensor Type	Measurement Standard
3-Axis Accelerometer	standard gravity (g)
3-Axis Gyroscope	°/Second
3-Axis Magnetometer	μTesla
Absolute Pressure	hPascal
Temperature	°C
Battery monitoring:	Volts
Quaternions	Unit Coefficients

## 5.4 LED Indication

The DWTAG100 has a tri-color (RGB) LED for conveying device state to users. In normal operation<sup>1</sup> the device state can be determined using the table below:

Status	Battery	Color	ON Time	Period
ON Network	<20%	Red	10mS	1.0S
ON Network	20-100%	Green	10mS	1.0S
OFF Network	<20%	Red	10mS	10.0S
OFF Network	20-100%	Green	10mS	10.0S
Charging	90-100%	Green	FULL	N/A
Charging	0-90%	Orange	FULL	N/A
Power On Reset <sup>2</sup>	N/A	Blue	500mS	N/A

- This table denotes normal LED operation. The CUWB network can be configured to show different patterns on the LEDs*
- Power On Reset (POR) occurs only on system reset. This will happen when charging a dead battery, on reboot after firmware update, and when the device resets due to system watchdog.*

The RGB LED also conveys error states to the user. An error is indicated by a 500mS red flash followed by a color sequence. The following color sequences are used to decode error states:

Color Sequence	Code	Description
Red — Yellow-White-White	6	Battery over discharge
Red — White-White-White	7	DW1000 communication error
Red — Yellow-White-Yellow	8	Over temperature
Red — Yellow-White-Blue	11	Under temperature
Red — White-White-Yellow	14	Too hot while charging
Red — White-White-Blue	15	Too cold while charging
Red — Green-White-Yellow	16	Too hot to charge
Red — Green-White-Blue	17	Too cold to charge

## 5.5 Error Handling

### 5.5.1 [CODE 6] - Battery over discharge

This condition indicates that the DWTAG battery has been discharged below recommended levels potentially damaging the battery. To rectify this condition the place the DWTAG on charge. To ensure best performance users should charge their DWTAG devices regularly.

### 5.5.2 [CODE 7] - DW1000 communication error

This indicates that the DWTAG firmware is unable to communicate with the UWB transceiver. Plug DWTAG into USB host device to cause a system reset. If the problem persists please contact [Ciholas](#) for support.

### 5.5.3 [CODE 8] - Over temperature

The DWTAG will indicate over temperature error when it has reached a temperature that is potentially damaging to the device and battery. The device should be moved to a room temperature area and allowed to cool down before continued use.

### 5.5.4 [CODE 11] - Under temperature

The DWTAG will indicate under temperature error when it has reached a temperature that is potentially damaging to the device and battery. The device should be moved to a room temperature area and allowed to warm before continued use.

### 5.5.5 [CODE 14] - Too hot while charging

This indicates that the DWTAG reached a temperature that is potentially damaging to the device while charging. The device should be removed from charge and allowed to cool down before continued charging.

### 5.5.6 [CODE 15] - Too cold while charging

This indicates that the DWTAG reached a temperature that is potentially damaging to the device while charging. The device should be removed from charge and allowed to warm before continued charging.

### 5.5.7 [CODE 16] - Too hot to charge

This indicates that the DWTAG reached a temperature that is potentially damaging to the device while charging and automatically cut off charging. The device should be removed from charge and allowed to cool down before continued charging.

### 5.5.8 [CODE 17] - Too cold to charge

This indicates that the DWTAG reached a temperature that is potentially damaging to the device while charging and automatically cut off charging. The device should be removed from charge and allowed to warm before continued charging.

## 5.6 Regulatory Compliance

- FCC Certified in the United States under 47 CFR 15.250
- CE marking in the European Union under EN 302 065-1

### 5.6.1 Federal Communications Commission

#### FCC Notice (For US Customers):

**FCC ID: 2ALIR-DWTAG100**

**Model: DWTAG100**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference
2. This device must accept any interference received, including interference that may cause undesired operation.

**Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician to help.

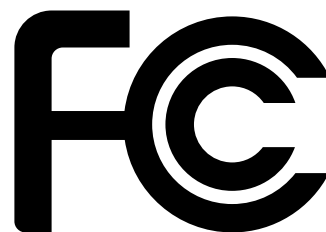
Changes and modifications not expressly approved by Ciholas, Inc. can void your authority to operate this equipment under Federal Communications Commissions rules.

### 5.6.2 European Conformity

Hereby, Ciholas declares that this device is in compliance with the essential requirements and other provisions of Directive 2014/53/EU and Directive 2014/30/EU.

The full text of the EU declaration of conformity is available at the following internet address:

- [DWTAG100 Declaration of Conformity](#)



## 5.7 Product Warnings



- Before working or installing electrical equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents



- Usage of this product outside the parameters outlined in the user manual can result in bodily injury and damage to this and other equipment. To prevent this, please follow all instructions in the user manual.
- Installation of this equipment must comply with all local and national electrical codes.
- Do not operate any wireless network devices near unshielded blasting caps or in an explosive environment unless the devices have been modified to be especially qualified for such use.

## 5.8 Ciholas Standard Software License and Warranty

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## 6 More Information

Please visit the following links for more information and documentation regarding **Ciholas** UWB systems and products:

- Documentation, installation, and usage instructions visit **CUWB.io**
- To purchase **Ciholas** UWB products, please visit the **Ciholas Shop**
- Ask other users questions and find community information in the **Community Forum**
- Learn more about Ciholas services at **www.ciholas.com**

## 7 DWTAG100 Datasheet Change Log

Version	Date	Change Description
<b>1.0</b>	2018-05-10	Initial Public Release
<b>1.1</b>	2018-06-04	Added Product Warnings Added Warranty Disclaimer Added IP Rating Added UE Conformity Notes Modified Operation Temperature Range
<b>1.2</b>	2018-08-06	Added block diagram to electrical section