Quantum RTLS Universal Device Manual v1.0.4

Quantum RTLS Universal Anchor (QTM-UAR10)
Quantum RTLS Universal Mobile (QTM-UMR10)
Quantum RTLS Universal Tag (QTM-SMR10)

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Revision Tracking

Rev	EC	Author	Reviewer	Approver	Change Notes	Date
V1.0.0	N/A				Released to Baseline	**2021/10/25**
V1.0.1	N/A	D.McNab			Update to Regulatory Statements Add revision history table	**2021/12/02**
V1.0.2	N/A	K. Fulton			Add system diagram	**2021/12/10**
V1.03	N/A	D.McNab			Adjust operating temp to -10 to +50c	**2021/12/24**
V1.04	N/A	D.McNab			Added models covered by manual Modified title to reflect	**2022/01/27**

Certification and Compliance

The radio used in this device has been certified for use according to Federal Communications Commission (FCC), Industry Canada (IC) and Conformitè Europëenne (CE) rules and regulations.

FCC Regulatory Statement

Model(s): QTM-UAR10, Model QTM-UMR10, QTM-SMR10
FCC ID: 2AX6LQTMUR10

Caution: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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, and
(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/TV technician for help.

This equipment can be installed and operated with a minimum distance 5 millimeters between the radiator and user's body. This equipment has been evaluated to meet general RF exposure requirement at 5 millimeters distance.

ISED Regulatory Statement

Model: QTM-UAR10, Model QTM-UMR10, QTM-SMR10
IC: 26679-QTMUR10

CAN ICES-003(B)/NMB-003(B)
This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:
(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

CAN ICES-003(B)/NMB-003(B)
Le présent appareil est conforme aux CNR Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:
(1) il ne doit pas produire de brouillage et (2) l' utilisateur du dispositif doit étre prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fomctionnement du dispositif.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.
Le dispositif rencontre l'exemption des limites courantes d'évaluation dans la section 2.5 de RSS 102 et la conformité à l'exposition de RSS-102 rf, utilisateurs peut obtenir l'information canadienne sur l'exposition et la conformité de rf.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of 5 millimeters between the radiator and your body.
Cet émetteur ne doit pas être Co-placé ou ne fonctionnant en même temps qu'aucune autre antenne ou émetteur. Cet équipement devrait être installé et actionné avec une distance minimum de 5 millimètres entre le radiateur et votre corps.

CONTENTS

1 PREFACE

1.1 ABOUT THIS GUIDE

This guide contains the information you will need to operate the QTM-UAR10 and QTM-UMR10 with the Quantum RTLS system.

1.2 WHERE TO FIND MORE INFORMATION

Refer to the following sources for additional information and for product and software updates.

- **QTM-UAR10 & QTM-UMR10 Resources**
  For more information and the most up to date user manual please visit our website (https://zerokey.com) which contains additional product specifications, user documentation, and notices.

- **Included product documentation**
  Your product package includes documentation detailing the setup, configuration, and operation of the Quantum RTLS system.

1.3 CONVENTIONS USED IN THIS GUIDE

Take note of these symbols which indicate important information within this manual.

CAUTION: Important instructions to prevent damage or improper operation of the Smart Space system.

NOTE: Key information and helpful tips that

CONFIG: Critical setup information that MUST be followed prior to operation of the system.

1.4 TYPOGRAPHY

Bold text	Indicates the name of a menu item, field, or important variable.

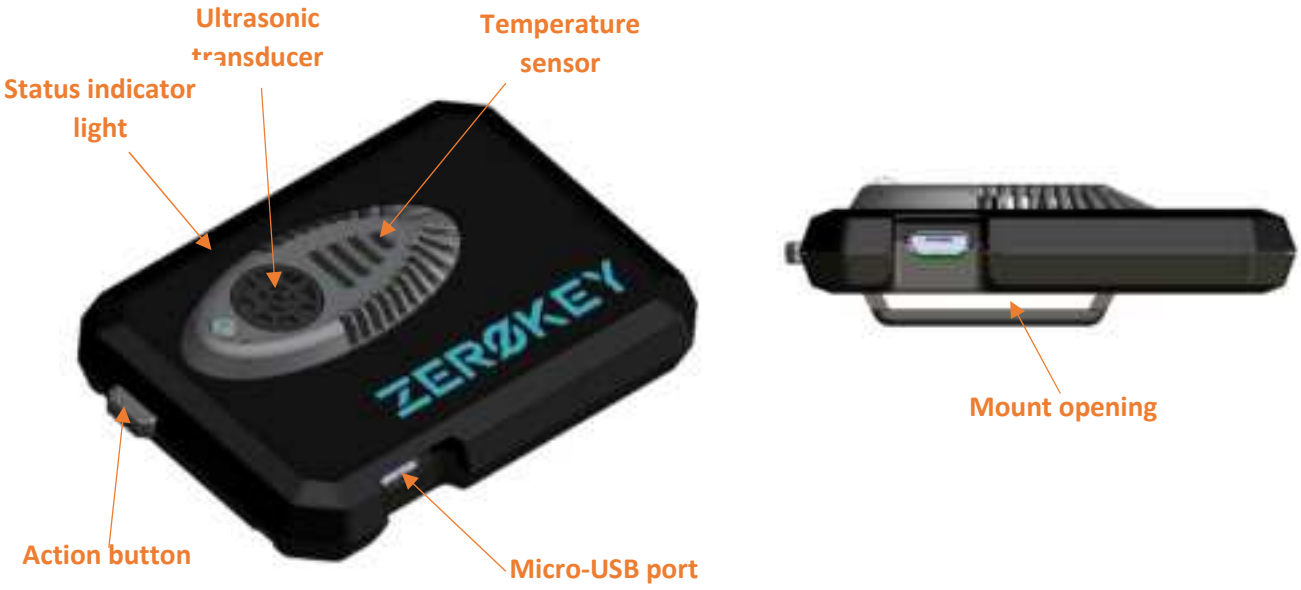
Italics	Emphasizes a word or a phrase.

2 PRODUCT OVERVIEW

The QTM-UAR10 is configured for use as an Anchor node. It is one of many reference nodes in the tracking system. This Anchor node is the stationary, tracking reference node that should not be moved after system calibration.

The QTM-UMR10 is configured for use as a Mobile node. It is the target of the tracking system. This node functions as the tracked object and is tracked in real time by the Quantum RTLS system. The QTM-UMR10 has the same form factor as the QTM-UAR10. The QTM-UMR10 also includes an inertial measurement unit (IMU) internally and different software configuration settings than the Anchor unit.

2.1 DEVICE COMPONENTS



2.2 PHYSICAL CHARACTERISTICS

2.2.1 SIZE

45 mm tall, 62 mm wide and 18 mm deep.

2.2.2 WEIGHT

30 grams.

2.2.3 POWER

The QTM-UAR10/QTM-UMR10 is battery powered with an integral rechargeable internal battery. ONLY use the supplied charger and cable to recharge the unit. Use of another charger could cause damage or impair the device.

2.2.4 CONNECTOR(S)

A micro-USB type connector is used to connect to an external AC adapter for charging the battery. Although possible, it is not recommended to establish a USB connection between the device and a PC unless directed by a ZeroKey support member.

2.3 ALERTS, WARNINGS, AND INDICATORS

2.3.1 LIGHT ALERT

Upon boot-up, the QTM-UAR10 LED will turn solid white for 1 second, then turn solid red for 1 second before entering idle state.

Upon boot-up of the QTM-UMR10, the LED will turn solid white for 1 second, then turn solid red for 5 seconds before entering idle state.

COLOUR & PATTERN	MEANING
Blinking green	On, normal operation – idle or positioning
Solid red	Low battery warning – running on battery Charging – connected to power
Solid white	DFU mode - receiving firmware update

2.3.2 BUTTON FUNCTIONALITY

FUNCTION	ACTION
Turn on	Tap (<0.5 seconds) while device is off
Reset	Tap (<0.5 seconds) while device is on
Turn off	Hold 2 seconds

3 INSTALLATION

3.1 MOUNTING

Before mounting any Anchor nodes, ensure the network of Anchor mounting locations are deliberately placed to provide the tracked space with as much coverage area as possible. For each Anchor node, ensure the transducer is pointed towards the tracked space, and that Anchor nodes are deployed in a manner that provides as much spatial diversity as possible. For more information on anchor network and placement requirements, see ZeroKey Support Materials at zerokey.com.

The QTM-UAR10/QTM-UMR10 features an opening on the back of the device to provide flexible mounting options.

This opening can be used to secure the node with materials such as cable ties or Velcro. ZeroKey has two mounting apparatuses' available that are designed to install into this opening.

3.1.1 CLIP-ON

To use the clip-on mount:

- Slide the mount into the opening on the back of the device. The mount will click into place.
- If using to mount an Anchor node (QTM-UAR10), ensure the device is secure in its mounting location so that there is no risk of it moving after calibration.
- If using to mount a Mobile node (QTM-UMR10), this mount is designed to be worn on the clothing of a tracked human. It can be worn on a lapel, pocket, or belt.

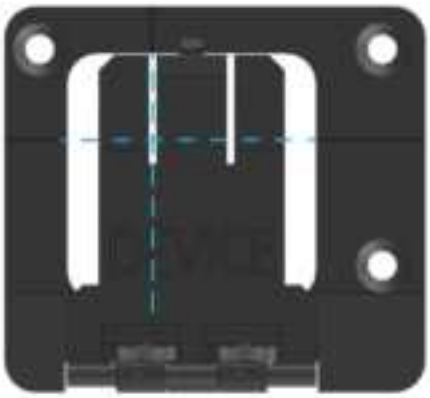
The mount features grooves that when secured properly to the node, will line up with the center of the transducer on the node.

3.1.2 Adjustable Stand

To use the adjustable stand:

- Slide the mount into the opening on the back of the device. The mount will click into place.
- Use the holes on the mount to secure to its install location.
- If using to mount an Anchor node (QTM-UAR10), ensure the device is secure in its mounting location so that there is no risk of it moving after calibration. Adjust the angle of the mount as needed so that the transducer of the node is pointing towards the tracked space.

Like the clip-on mount, the adjustable mount features grooves that when secured properly to the node, will line up with the center of the transducer on the node.



3.2 CALIBRATION

Before regular system operation can occur, all Anchor nodes must undergo calibration. With the Gateway of the Quantum RTLS system connected to a PC, use the ZeroKey Configuration Tool for step-by-step guidance through the calibration process.

NOTE: For more information on system calibration, see ZeroKey Support Materials at zerokey.com.

4 OPERATION

The QTM-UAR10/QTM-UMR10 will be pre-configured with the rest of the Quantum RTLS system and should only be communicated with via. Gateway device unless otherwise specified by a ZeroKey support member.

4.1 QTM-UAR10

In Quantum RTLS, the anchor unit performs as one of many reference nodes in the RTLS tracking system. In regular operation there is a network of 6 or more anchor nodes that have enough spatial diversity covering the tracked space to provide diverse ranging information to each mobile device to enable accurate positioning. Anchor nodes are mounted in permanent locations and must remain stationary after calibration and during system operation.

Whenever the anchor unit is within range of a mobile node, the mobile will refer to the anchor node with a calibrated coordinate for ranging information. The network of anchor nodes must go through a calibration via. the ZeroKey Configuration Tool before regular system operation can be established.

In order to preserve battery life, the anchor node enters a deep sleep if it does not pick up other ZeroKey radio activity for 2 consecutive minutes. This occurs when the system is running idle and not actively positioning. Once in this mode the anchor node will wake up every 30 seconds to determine whether to assume normal activity. During the 30 second sleep time the status RGB LEDs will be disabled but will operate once each time the anchor wakes up.

4.2 QTM-UMR10

The mobile node is a tracking reference and should be attached to the person or object of interest in the tracking system. In regular operation the user clips the mobile node to their clothing or equipment in an outward-facing manner. The user then goes about their standard day to day activities.

The mobile has an RGB LED for status indication with each color operating independently. See section 2.3.1 for LED behavior.

The QTM-UMR10 will interact with anchor nodes and any Gateway devices in the Quantum RTLS system. Mobile nodes do not interact with each other.

5 CHARGING

The device contains a rechargeable lithium polymer battery and can be successfully recharged over 600 times. A QTM-UAR10/QTM-UMR10 takes around 1 hour to fully charge. While charging, the LED will remain red, and will turn off when charging is complete. The QTM-UAR10/QTM-UMR10 contains circuitry that is designed to inhibit charging the battery at temperatures below 0°C (32°F) which could cause irreparable damage to the unit and battery. Should a “frozen” unit be connected to the charge cable, the unit will monitor the internal temperature and when it is above 0°C, will engage the battery charge process.

6 PRODUCT CARE

6.1 GENERAL CARE

6.1.1 CLEANING

The device can be cleaned using a moistened soft cloth and nonabrasive hand/dish soap. DO NOT IMMERSE. Wipe dry to prevent any moisture build up.

6.1.2 OPERATING TEMPERATURE

This device is designed to operate from -10°C to +50°C ambient. Do not place the unit in direct sun for extended periods without proper ventilation as the unit may exceed the +50°C temperature.

7 REPAIRS AND DISPOSAL

7.1 FIRMWARE UPDATES

The QTM-UAR10/QTM-UMR10 can be updated with few firmware through our over-the-air reprogramming application to correct, improve, or add new features to enhance the unit's performance. Details on how to perform these updates is included with each update installation package.

7.2 OPERATION LOGS

The QTM-UAR10/QTM-UMR10 updates and maintains information concerning its operation and activities as it is being used around the site or acting as reference. This information is used to the monitor the health of the unit and improve the device performance. The information collected does not contain any personal information from the user.

7.3 REPAIRING DAMAGED DEVICE

Units that have been damaged or have failed to operate in the field can be returned for repair or replacement with a few exceptions. If the battery has been physically compromised or has been found to be defective, the unit can NOT be legally shipped by any carrier. If the unit is intact but has ceased to operate, it can be returned via an RMA request to our repair center. Please contact your plan administrator for more information and an RMA form.

7.4 DISPOSAL OF DEVICE

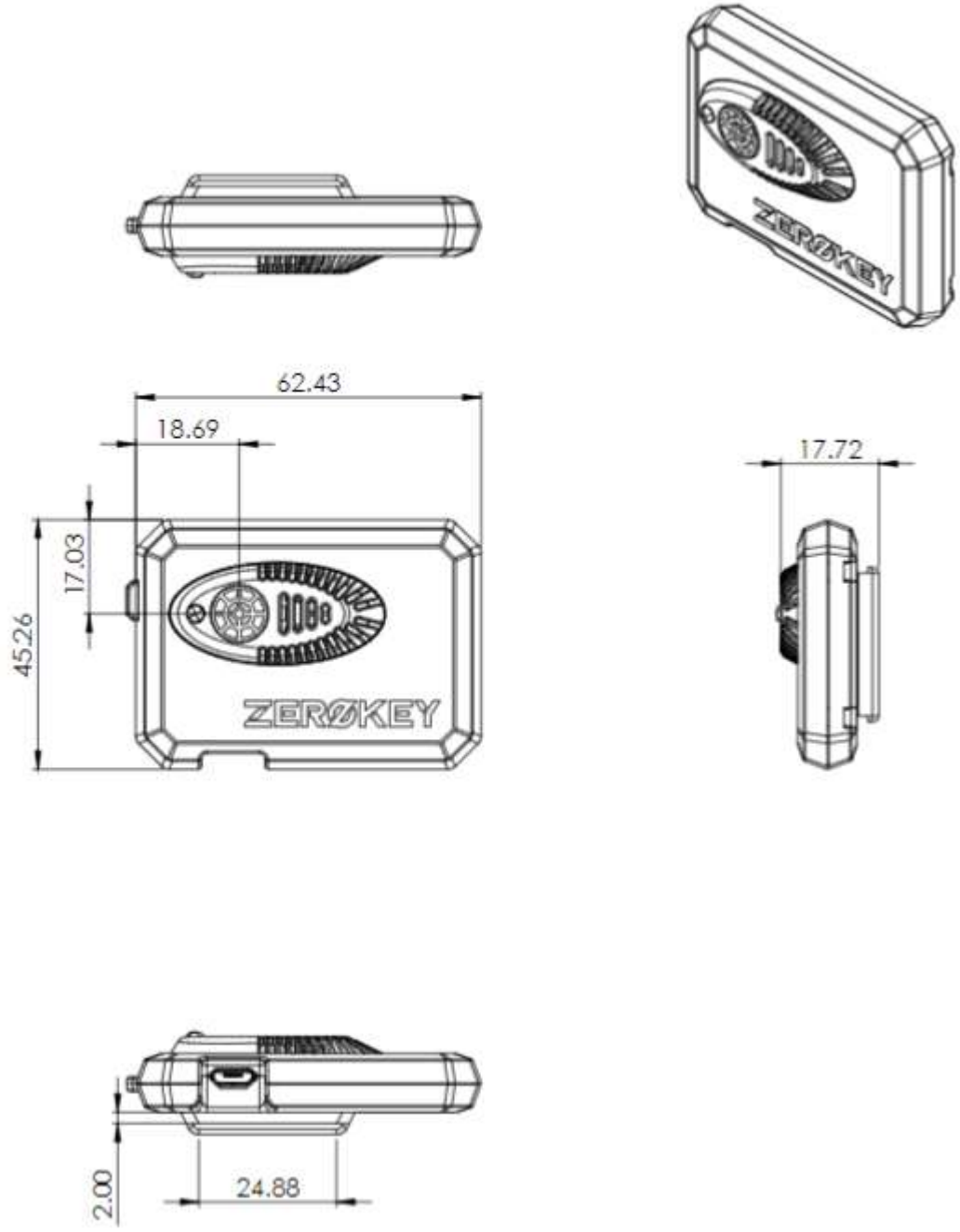
The QTM-UAR10/QTM-UMR10 must be sent to an electronics recycling depot to reclaim the electronics. Please contact your nearest electronics recycling company for details on their collection requirements.

APPENDIX A – SPECIFICATIONS

Dimensions	62.4 x 45.3 x 17.7
Weight	30g
Accuracy (Ultrasonic)	1.5 mm[1]
Update Rate	20 Hz
Charge Port	Micro-USB
Battery Life	24 hours (typical)
Maximum Range	20 m
Wi-Fi Coexistence	Yes
Bluetooth Coexistence	Yes
Operating Temperature	-10 to 50°C
Operating Humidity	5 to 95% Non-condensing
Shock	200g (max)
Vibration	3g (max)
Interfaces	Status LED, push button
Mounting Options	Screw, strap, adhesive, magnet, and Velcro
RF Band	2.4 GHz ISM
RF Modulation	GFSK
RF TX Power	0-8 dBm
RF RX Sensitivity	-90 to -97 dBm
RF TX Burst Duration	2.8 - 3.2 ms
Ultrasonic Frequency Band	50.0KHz +/- 0.1KHz
Ultrasonic Output	96 dB SPL (max)
Ultrasonic Duty Cycle	2.8% (min) 3.2% (max)
Certifications	FCC (US) / IC (Can) / CE (EU) / VCCI (JP) / K (KR)

[1] Under unobstructed conditions with view to 6 anchor nodes with ideal geometry

APPENDIX B – MECHANICAL DRAWINGS



APPENDIX C – SYSTEM DIAGRAM