**Ubisense**

# Ultra-wideband In-Building Location System

# Ubitag V1.0

User's Manual

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# Table of Contents

# Introduction

The Ubitag V1.0 is a wireless device intended to be used for the real-time location of objects within buildings. It transmits ultra-wideband (UWB) pulses which are picked up by a network of basestations (Ubisensors) placed inside the building, allowing the 3D position of the tag to be found. The use of UWB technology enables greater positioning accuracy within buildings than other wireless technologies, because it is much less susceptible to multipath interference effects. Applications of the system include healthcare, workplace productivity, security, retail management and manufacturing.

This document describes the features and specifications of the Ubitag, important regulatory information concerning its use, and details on how to diagnose potential problems.

# Information to the User

The Ubitag V1.0 is an ultra-wideband (UWB) wireless device certified under FCC Part 15.517. Its use is subject to technical requirements for indoor UWB systems, in particular the stipulation that the devices must only be used indoors. Users should note carefully the following information:

- CAUTION: This equipment may only be operated indoors. Operation outdoors is in violation of 47 U.S.C. 301 and could subject the operator to serious penalties.
- Ubitags will only operate (i.e. transmit UWB signals) in conjunction with an in-building Ubisensor network, which must be professionally installed. The installed Ubisensor network will be configured to cover only the area inside the building, preventing Ubitags from emitting UWB signals outdoors. Contact your system administrator if you are unsure as to the extent of coverage of the Ubisense In-Building Location System in your building.
- 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.

Users should also carefully note the following information:

- CAUTION: Any changes or modifications made to the Ubitag which are not expressly approved by the Ubisense Limited could void the user's authority to operate the equipment.
- 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.

# Features of the Ubitag

The diagram below shows several important features of the Ubitag:



LEDs

Mounting cord slots

Identification pocket

Buttons

Buzzer
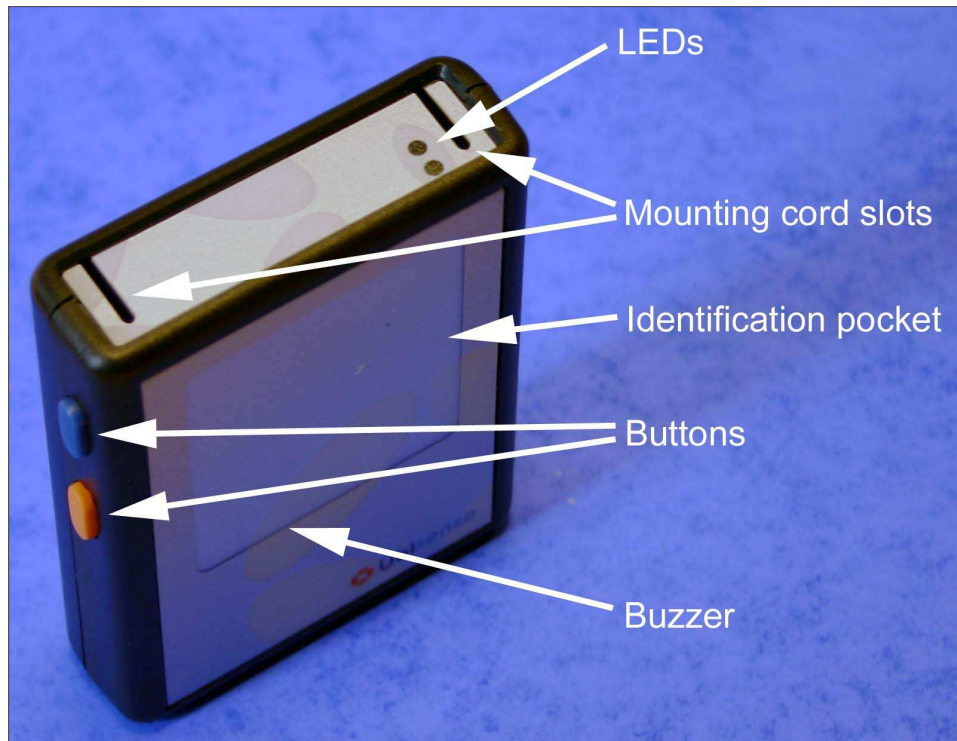
# Installation and Operation Instructions

## Switching the Ubitag on for the first time

The Ubitag is supplied with batteries. A paper tab prevents the device from operating and drawing current from the batteries until it is removed by the user. The Ubitag can be switched on for the first time by pulling the paper tab directly away from the body of the Ubitag and clear of the device, as shown in the photograph below. The Ubitag will bleep once and flash its LEDs to indicate correct start-up, and the Ubisense In-Building Location System will then be able to determine the Ubitag's location.
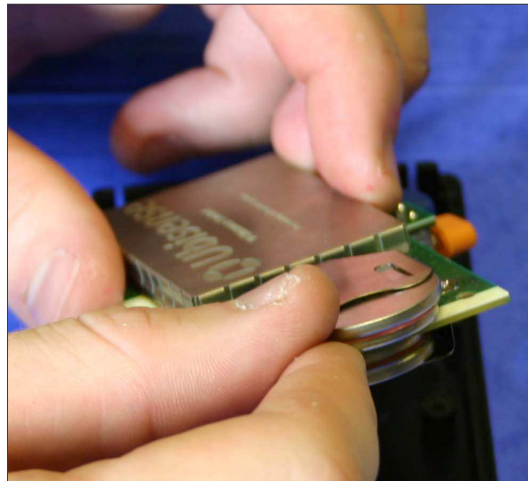
## Replacing the batteries in the Ubitag

The Ubitag uses two Sony CR2450 3V lithium coin cells (or equivalent). Ubitags frequently report their battery health to the system via the Ubisensors, so system administrators should be notified by the system when the batteries in a particular tag require replacement.
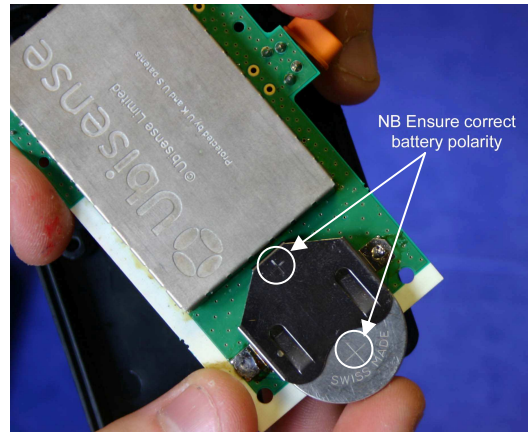
To replace the batteries in a Ubitag, remove the back panel of the device by unscrewing the four retaining screws as shown in the photograph below:
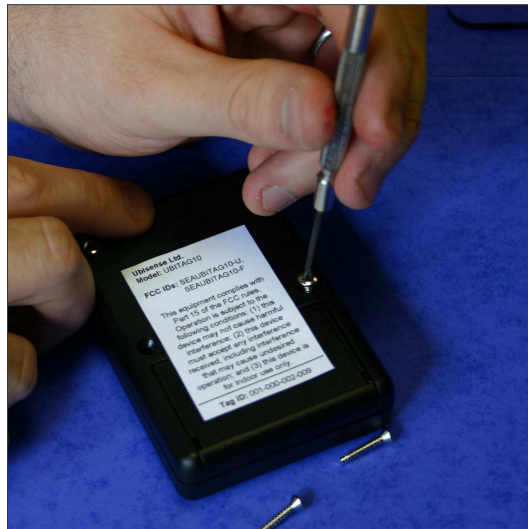


Next, remove the two spent batteries from the retainers:

Leave the Ubitag unpowered for 30 seconds, then insert two fresh batteries into the retainers, observing the polarity marked on the battery and the retainers:



When both batteries have been replaced, the Ubitag will bleep once and flash its LEDs to indicate correct start-up, and the Ubisense In-Building Location System will then be able to determine the Ubitag's location. Replace the back of the Ubitag and tighten the four screws removed previously to complete reassembly of the device.

Should the Ubitag not bleep and flash its LEDs to indicate correct start-up after the batteries have been replaced, remove the batteries, check that they are fresh, wait for 30 seconds, and reinsert the batteries. Contact your system administrator if you continue to have problems replacing the batteries in the Ubitag.

## Using the mounting cord option

In some applications it may be advantageous to mount the Ubitag using a cord. The top panel of the Ubitag case has two slots to facilitate the use of a mounting cord. To insert the cord, remove the back panel of the Ubitag by undoing the retaining screws (as shown above in the section 'Replacing the batteries in the Ubitag') and insert the mounting cord as shown in the photograph below. Replace the back of the Ubitag and tighten the four screws removed previously to complete reassembly of the device.



To remove the mounting cord, undo the retaining screws on the back panel of the Ubitag (as shown above in the section 'Replacing the batteries in the Ubitag'), remove the panel, and detach the mounting cord. Replace the back of the Ubitag and tighten the four screws removed previously to complete reassembly of the device.

## Troubleshooting

The activity of the LEDs on the Ubitag may be used to diagnose potential problems with the device:

- Periodic, short (less than 1/10$^{th}$ second) flashes of the green LED indicate that the tag is in communication with the local Ubisensor network, and that the device is emitting ultra-wideband signals enabling its position to be found.
- Longer (half-second) flashes of the red LED indicate that the tag is searching for signals from the local Ubisensor network, and that tracking functionality is not available at that location. Ensure that the tag is within an area of the building covered by the Ubisense In-Building Location System.

If you are still unsure as to whether or not the Ubitag is operating correctly, contact your system administrator, who should be able to use Ubisense's monitoring tools to determine the extent and cause of any potential problem.

# Ubitag Specifications

UWB transmitter section (FCC ID: SEAUBITAG10-U)

| | |
|---|---|
| Centre frequency: | 5.963GHz |
| -10dB bandwidth: | 2.025GHz |
| Output power: | -42.5dBm/MHz |

Conventional radio transceiver section (FCC ID: SEAUBITAG10-F)

| | |
|---|---|
| Number of channels: | 7 |
| Lowest channel frequency: | 908.36MHz |
| Highest channel frequency: | 915.00MHz |
| Output power: | -7dBm |

General specifications

| | |
|---|---|
| Dimensions: | 91mm x 66mm x 21mm |
| Update rate: | Variable (10Hz to 0.0375Hz) |
| Power supply: | 2 x Sony CR2450 3V lithium coin cells (or equivalent) |
| Operating temperature range: | -20ºC to +60ºC |

# Requirements for indoor UWB device operation

This section lists the technical requirements laid down in the FCC's rules which must be met by UWB devices operating indoors under §15.517 of those rules. Ubitags operating with a correctly-installed Ubisense location system will meet these requirements.

(1) Indoor UWB devices, by the nature of their design, must be capable of operation only indoors. The necessity to operate with a fixed indoor infrastructure, e.g., a transmitter that must be connected to the AC power lines, may be considered sufficient to demonstrate this.

(2) The emissions from equipment operated under this section shall not be intentionally directed outside of the building in which the equipment is located, such as through a window or a doorway, to perform an outside function, such as the detection of persons about to enter a building.

(3) The use of outdoor mounted antennas, e.g., antennas mounted on the outside of a building or on a telephone pole, or any other outdoors infrastructure is prohibited.

(4) Field disturbance sensors installed inside of metal or underground storage tanks are considered to operate indoors provided the emissions are directed towards the ground.

(5) A communications system shall transmit only when the intentional radiator is sending information to an associated receiver.