

Model TFF-5100

WhereNet RTLS Badge Tag

User Guide



Typographical Conventions



WARNING

Warnings call attention to a procedure or practice that could result in personal injury if not correctly performed. Do not proceed until you fully understand and meet the required conditions.



CAUTION

Cautions call attention to an operation procedure or practice that could damage the product if not correctly performed. Do not proceed until understanding and meeting these required conditions.

NOTE

Notes provide information that can be helpful in understanding the operation of the product.

REGULATORY COMPLIANCE INFORMATION

The following regulatory agency information is for Model TFF-5100.

RF Notice

Any changes or modifications to Zebra Technologies Corporation (ZTC) equipment not expressly approved by ZTC could void the user's authority to operate the equipment.

FCC Compliance Statement

This device complies with Part 15 rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference
- (2) This device must accept any interference which may cause undesired operation.

FCC ID: XWX-TFF5100

This equipment has been tested and found to comply with the limits for both Class A and Class B devices, pursuant to Part 15 of the FCC Rules & Regulations.

Canadian DOC Compliance Statement

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

IC: 8701A-TFF5100

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End user must follow the specific operating instructions for satisfying RF exposure compliance.

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- 1) l'appareil ne doit pas produire de brouillage;
- 2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC Radiation Exposure Statement

This EUT is compliance with SAR for general population/uncontrolled exposure limits in IC RSS-102 and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528.

CAN ICES-3 (B)/NMB-3(B)

EU Compliance Information

This Class I radio is approved for use in the following countries

AT	BE	BG	CY	CZ	DK	EE
FI	FR	DE	GR	HU	IE	IT
LV	LT	LU	MT	NL	PL	PT
RO	SK	SI	ES	SE	GB	HR
IS	LI	NO	CH			

NOTE There are no restrictions for use for this device in countries indicated in the table.

Statement of Compliance for Wireless Devices, Zebra hereby declares that this radio equipment is in compliance with Directives, 2014/53/EU and 2011/65/EU.

GENERAL CAUTIONS



WARNING

- Prior to installation, carefully inspect the tag, looking for cracking, puncture or any other breach of the plastic case. Damaged tags must not be used. Properly dispose of any damaged tag.
- Never dispose of the tag in a fire.
- Deactivate the tag when not in use. It is mandatory to deactivate the tag prior to shipment by airplanes.
- Always verify the level of battery voltage prior to use.
- Follow limitations of use as set forth by any applicable regulatory bodies
- **Do not attempt to open the tag and modify the battery due to fire, explosion and severe burn hazard. Do not recharge, short circuit, crush, disassemble, heat above 100° C (212° F), incinerate, or expose contents of the battery to water.**
- Do not dispose the tag or its lithium batteries in unsorted municipal waste. In most countries, recycling programs are available through non-profit organization, mandated by local government or organized on a voluntary basis. Contact your local government for disposal practices in your area. ZTC offers recycling programs in certain geographic areas. To determine if a program is available for this product in your area, please refer to our web site at: <http://www.zebra.com/environment>.
- When not in use, the tag should be stored in dry and cool conditions at a temperature preferably not exceeding +30° C (+86° F).



WARNING



DOCUMENT REVISION HISTORY

Revision	Change	Change Description	Date	Initials
A		Final Release	3/12/18	ET

1 INTRODUCTION

1.1 System Overview

The ZTI Real Time Locating System (RTL) determines the position of tagged assets in both indoor and outdoor facilities such as factories and freight yards. The system locates tagged assets by a process involving redundant triangulation. Each tag autonomously emits a 2.4 GHz direct sequence spread spectrum (DSSS) radio signal at a predetermined blink rate. Each tag's blink rate is randomized around its predetermined value to minimize the number of collisions between transmissions made by different tags. The signal emitted by the tag is received by a minimum of four Location Antennas. A typical transmission contains a preamble which is used to synchronize the receiver, the tag's serial number which identifies the tag, a status word which monitors various tag functions, data stored in the tag's memory and finally a Cyclic Redundancy Check (CRC) used to assure that the tag's message is correct as received.

The principal components of the ZTI RTL are shown in Figure 1 ...

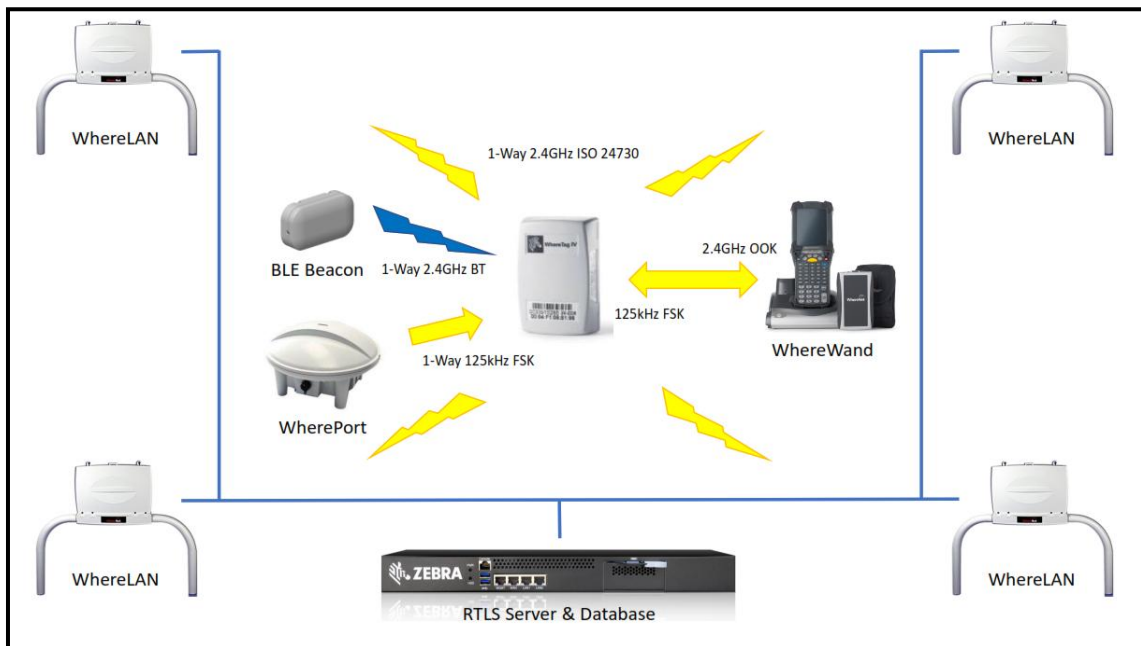


Figure 1 – ZTI Real Time Locating System Block Diagram

1.2 WhereTag IV Device

The WhereTag IV is a key component of the ZTI Real Time Locating System (RTLS). It is a small device that can be attached to assets of many kinds, such as forklifts, containers, unit load devices hospital and test equipment as well as trailers and container chassis's. It is used to manage those assets by allowing them to be identified and located by the system.

The WhereTag IV "blinks" a radio frequency (RF) transmission at a pre-programmed rate ranging from 1 second to 5 days between blinks. The ZTI RTLS infrastructure receives these blinks and use sophisticated Differential Time of Arrival, (DTOA), algorithms to determine the location of the tag. Accuracy of this determined location can be as low as 2 meters and is nominally within 3 meters in most installations.

The WhereTag IV complies with the ISO 24730-2 RTLS standard. It operates in the globally accepted 2.4GHz frequency band and transmits spread spectrum signals in accordance with the standard. The use of direct sequence spread spectrum technology provides extremely long range; in excess of 1,000 meters locate range outdoors, and 120 meters locate range indoors.

The combination of low average power consumption and good engineering allow the WhereTag IV to operate for long periods of time without any maintenance. Battery life can be as long as 6 years depending upon blink rate and temperature.

A magnetic receiver is also built into the WhereTag IV. The tag can receive low frequency magnetic signals from an exciter called a WherePort. The WherePort transmissions can be read at distances ranging from 1 to 8 meters (depending on WherePort power setting).

Each WhereTag IV has a unique identification number that is transmitted via radio during each blink. When its battery is running low, the tag alerts the ZTI RTLS infrastructure so that the tag can be proactively replaced. WhereTag IVs are configured with the ZTI WhereWand.

The WhereTag unique ID number is also printed as a Code 128 on the bar code labels affixed to the tag's case. The bar code enables seamless integration with existing inventory systems and delivers a cost effective total resource visibility solution that extends beyond the range of the ZTI RTLS.

Designed to operate in a wide range of applications, the WhereTag IV is fully sealed and will function in both indoor and outdoor environments. The tag's case is also resistant to oils, solvents and hydraulic fluids.

1.3 WhereLAN™ Location Sensor (LOS)

The Location Sensor receives the tag transmissions and forwards the information to the ZTI Visibility Server Software which performs locations calculations, database functions and systems management. The Location Sensors communicate with each other and the Visibility Server Software via standard wired Ethernet cables or an 802.11b-compliant wireless LAN. Utilizing sophisticated digital signal processing technology, the Location Sensors are able to track large populations of WhereTags simultaneously. They can be installed in a grid configuration to provide ubiquitous coverage over large areas comprised of many cells.

1.4 WherePort

WherePorts are proximity communication devices that continuously transmit 125kHz FSK magnetic messages. When the WhereTag enters the magnetic field of a WherePort device, it will transmit a configurable number of blinks that include the identification number of the WherePort.

WherePorts can also be used to trigger a WhereTag to transmit an alternate "blink" pattern. When a WhereTag passes through the WherePort's field, the tag can initiate a pre-programmed and (typically) faster blink rate to allow more location points as a tagged asset passes through a critical threshold, such as a shipping/receiving dock door or from one zone to another.

1.5 WhereWand

The WhereWand is capable of two-way wireless communication with WhereTag devices. The WhereWand is also capable of wired communication with WherePort devices. The third capability of the WhereWand is wireless communications with the WhereLAN. The WhereWand communicates with WhereTag devices by sending magnetic FSK data to the tag and receiving on-off keyed / frequency shift keyed (OOK/FSK) RF data from the tag. Communication with the WhereTag allows the user to set tag configuration parameters such as DSSS blink intervals and tag responses to such stimuli as WherePorts and/or switch/telemetry inputs. It also allows the user to read back configuration and other data from the tag.

1.6 Visibility Server Software (VSS)

ZTI Visibility Server Software (VSS) is an integrated software package that provides all the tools required to effectively manage assets and resources as well as the ZTI Real-Time Locating System (RTLS). Visibility provides all core software components to allow efficient resource management. Key among those software components is WhereSoft Locate, which is a

distributed Windows® Service. When WhereSoft Locate is combined with VSS and any of the many applications available from ZTI, it is possible to locate assets, know their status, and react to any number of user configurable alert conditions. Visibility also provides the tools required to control and monitor the Real-Time Location System (RTLS). It includes configuration tools, diagnostics, system alerts, an interface manager and installation tools.

2 TAG INSTALLATION AND ACTIVATION

Tags are shipped with all radio emitters deactivated. Prior to installing a tag on an item to be tracked, the tag must be activated. This is done using the ZTI WhereWand. The WhereWand is used to configure and activate the tag, and to confirm that the tag is properly configured and operational. The detailed procedure for tag activation is covered in the WhereWand User's Manual.

3 TAG MOUNTING OPTIONS

3.1 Introduction

The WhereTag IV device has a variety of ways to be mounted depending on the user's needs. The following mounting methods can be used:

- **Lanyard**
- **Belt Clip**

4 PRODUCT SPECIFICATIONS

4.1 WhereNet RTLS Badge Tag (Model TFF-5100)

CAPABILITIES

Frequency Range..... 2.4 to 2.483 GHz

Typical Read Range, Indoors..... 200 m (650 ft)

Typical Read Range, Outdoors..... 1,750 m (5700 ft)

User Configurable BLE Scan Blink Rate 5sec to 240sec

WherePort Range..... 8 m (24 ft) (With WherePort set for maximum power and optimum orientation)

ELECTRICAL

Power 3.0V Lithium Coin Cell Battery (the battery is not replaceable)

Typical Battery Life..... 1.0 year (dependent on blink rate, mode of operation, and operating temperature)

ENVIRONMENTAL / PHYSICAL

Operating Temperature Range	-20° C to +50° C (-4° F to +122° F)
Storage Temperature Range	-30° C to +30° C (-22° F to +86° F) ¹
Durability.....	1.5 m (5 ft) Drop to Vinyl
Height.....	75.5 mm (2.97 in)
Length	94.0 mm (3.70 in)
Width	14.8 mm (0.58 in)
Weight.....	70 g (2.5 oz)
Environmental Sealing	IP54 (dust protected, water splashed)
Case Material	Molded Plastic (polyester)

¹ Storage of WhereTag at extreme temperatures (above 30 ° C) will have a detrimental effect on battery life

REGULATORY APPROVALS**North America**

FCC Part 15 Class B, Part 15.247

Industry Canada ICES-003, RSS-210, RSS-GEN

Europe

CE, RED, 2014/53/EU: EN 300328, EN 301489-1/-17, EN 60950-1

EN 300 440

EN 300 330

Worldwide

ISO/IEC 24730-2

5 ADDITIONAL INFORMATION

ZEBRA.COM LINKS

Zebra Technologies (<https://www.zebra.com/us/en.html>)

Zebra Location Solutions (<https://www.zebra.com/us/en/solutions/location-solutions.html>)

Zebra Customer Support (<https://www.zebra.com/us/en/forms/support-center-login.html>)