ZEBRA TECHNOLOGIES

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WhereTag IV GT™

Models TFF-3110

User Guide

Name: WhereTag IV GT Basic
Part Number: TFF-3110-00AA

Name: WhereTag IV GT Vehicle
Part Number: TFF-3110-01AA

User Guide, WhereTag IV GT, TFF-3110   D2280 Rev 02

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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

FCC Regulatory Compliance Information

This device complies with FCC Part 15.247.

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

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

RF Notice

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

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Industry Canada Compliance Statements

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 nedoit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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

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

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionnant en conjonction avec une autre antenne ou transmetteur.

This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body

Cet équipement doit être installé et utilisé à une distance minimale de 20cm entre le radiateur et votre corps.

It is the responsibility of the installer to ensure that when using the outdoor antenna kits, only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden by FCC rules 47 CFR part 15.204 and IC RSS standards.

Il est de la responsabilité de l'installateur de s'assurer que lorsque vous utilisez les kits d'antennes extérieures, seules les antennes certifiés avec le produit sont utilisés. L'utilisation d'une antenne autre que ceux qui sont certifiés avec le produit est expressément interdite par la réglementation FCC partie 47 CFR 15.204 et IC normes RSS.

EU & EFTA Compliance Information

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	
IS	LI	NO	CH		TR	

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Cautions:

- No modifications to the tag allowed. This includes any type of modification to the case, such as adding metal foils, holes, disassembly or modifications to the PCB assembly, antenna, battery or modifications to the product labels, etc.

- Prior to installation, carefully inspect the tag, looking for crack, 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.

- Follow limitations of use as set forth by any applicable regulatory bodies.

- The tag contains replaceable primary Lithium Thionyl Chloride (Li-SOCl$_2$) batteries, which must be replaced only by trained service technicians. ZTC offers service to replace the batteries. Please contact your ZTC account manager for more information.

WARNING

- 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, dissemble, heat above 100 ^{o}C (212 ^{o}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 ^{o}C (86 ^{o}F).

Document Revision History

Revision	Change	Change Description	Date	Initials
01		Draft	2/26/12	HH
02		Draft #2: Change to one model #, TFF-3110, for both tag versions.	3/6/14	HH

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1   INTRODUCTION

1.1   System overview

The Zebra Real Time Locating System (RTLS) 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 Zebra RTLS are shown in Figure 1 on page 9.

Figure 1   Zebra Real Time Locating System Block Diagram
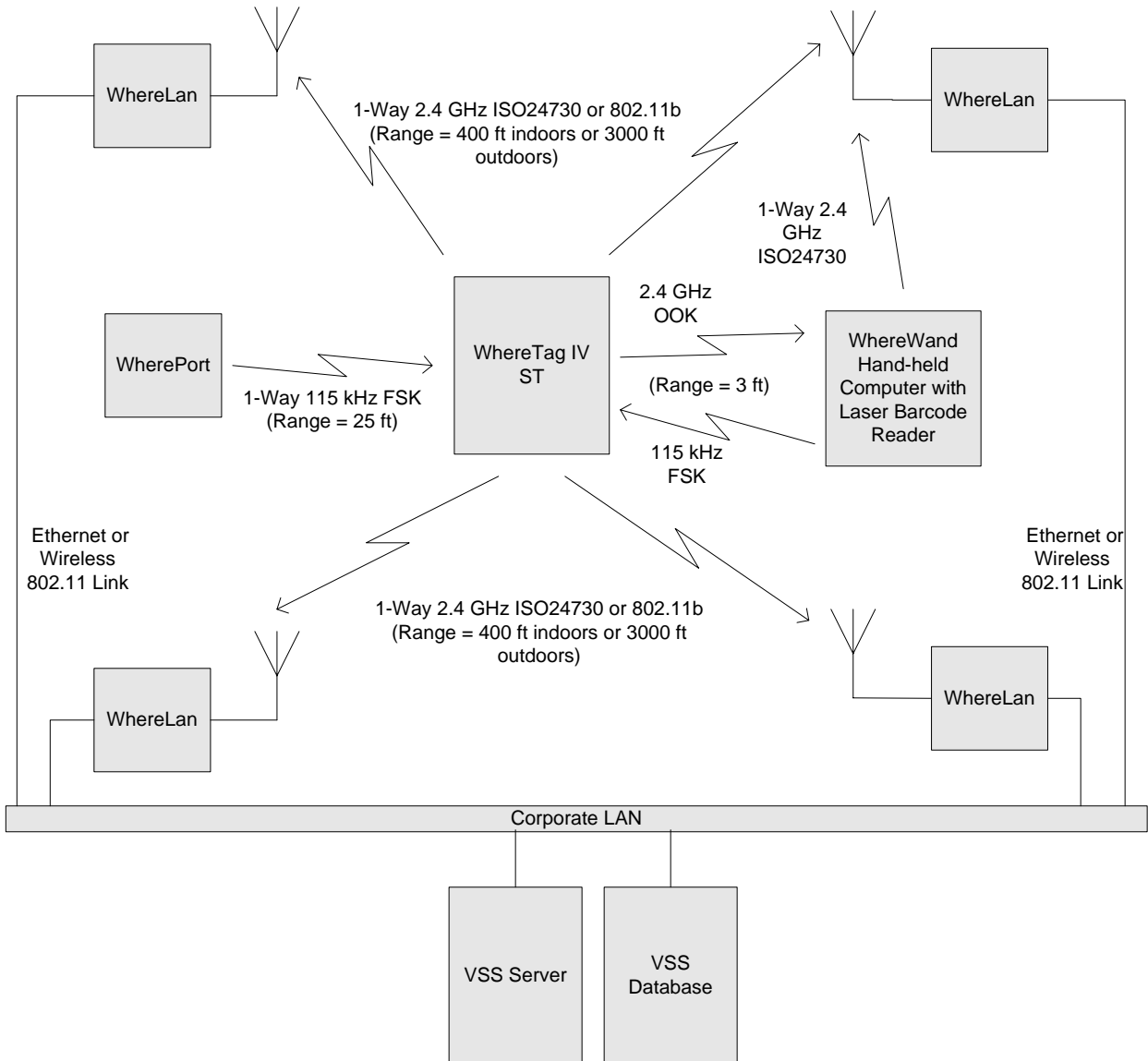
1.2 WhereTag IV GT Device

The WhereTag IV GT is a component of the Zebra Real Time Locating System (RTLS). It can be attached to assets whose status must be quickly and accurately monitored. Examples are the movement of a shipping container through a loading yard or a trailer through a warehousing facility.

The WhereTag IV GT "blinks" a radio frequency (RF) transmission at a pre-programmed rate ranging from 1 second to 5 days between blinks. The Zebra 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 GT 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 meter locate range outdoors, and 120 meter locate range indoors.

The WhereTag IV GT also incorporates an 802.11b/g transceiver for data communication and/or positioning by standard or location-enabling 802.11 access points.

A magnetic receiver is also built into the WhereTag IV GT. 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.

The WhereTag IV GT also incorporates a GPS receiver module, which allows the tag to be located outdoors, where a complete installation of Zebra RTLS system with 4 or more WhereLANs is not required. The position fixes from GPS module can be transmitted via ISO 24730 RF link to WhereLAN's. Due to long range of ISO 24730 RF link, large outdoor area can be covered with a few WhereLAN units.

Each WhereTag IV GT has a unique identification number that is transmitted via radio during each blink. When its battery is running low, the tag alerts the Zebra RTLS infrastructure so that the tag can be proactively replaced. WhereTag IV GTs are configured at the factory to work with common container handling equipment. Alternatively, the WhereTag IV GT can be configured through the serial port by sending text command strings as defined in appendix A.

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 Zebra RTLS.

The vehicle version of WhereTag IV GT contains a screw terminal block for connecting the tag to external power supply, RS-485 interface, contact detections and contact closure.

Designed to operate in a wide range of applications, the WhereTag IV GT is fully sealed and will function in both indoor and outdoor environments.

1.3　WhereLan™ Location Sensor (LOS)

The Location Sensor and Locating Access Point receive the tag transmissions and forwards the information to the Zebra Visibility Server Software which performs locations calculations, database functions and systems management. The Location Sensors and Locating Access Points 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 LOS and LAP 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. The Locating Access Point combines multiple functions: an RTLS Location Sensor and a Wi-Fi certified access point for wireless LAN clients and applications.

1.4   WherePort III and WherePort IV

WherePort III and WherePort IV are proximity communication devices that are used to trigger a WhereTag to transmit an alternate "blink" pattern. When a WhereTag passes though 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. When the WhereTag is sending WherePort-initiated blinks, the tag includes the identification number of the WherePort.

1.5   WhereWand Handheld Programmer

The WhereWand Handheld Programmer consists of a handheld computer with an integrated Type II PC card and an antenna assembly. 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 allow 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)

Zebra 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 Zebra 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 VSSand any of the many applications available from Zebra, 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 Zebra 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 GT device has a variety of ways to be mounted depending on the user's needs. The following mounting methods can be used:

- ...**Poly-Lock™**

- ...**Adhesive tape**

- ...**screw with mounting adapter plate**

4   SPECIFICATIONS (SUBJECT TO CHANGE WITHOUT NOTICE)

4.1   WhereTag IV GT (Model TFF-3110)

P E R F O R M A N C E

I S O   2 4 7 3 0 - 2   M O D E

Frequency Range .... ……………..2.4 to 2.483 GHz

Typical Locate Range, Indoors………………………..120 m (400 ft)

Typical Locate Range, Outdoors........ ………………1,000 m (3200 ft)

Typical Read Range, Indoors............. ……………..280 m (920 ft)

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

User Configurable Blink Rate............. ………………1 sec to 5 days

Typical Battery Life (Internal Battery).........................TBD years (dependent on blink rate and operating temperature)

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

8 0 2 . 1 1 B / G   C C X   A N D   C L I E N T   M O D E S

Frequency Range .... ……………..2.4 to 2.483 GHz

Typical Locate Range, Indoors………………………..21 m (70 ft)

Typical Read Range, Indoors............. ……………….54 m (180 ft)

User Configurable Blink Rate............. ……………….1 sec to 5 days

Typical Battery Life (Internal Battery).........................TBD years (dependent on blink

                                               rate and operating temperature)

G P S   R E C E I V E R

Receiver Type.................................... ……………..56 Channels, GPS L1C/A

Satellite-based Augmentation System ………………..SBAS L1C/A

Horizontal position accuracy (CEP 50%)……………..3 m (10 ft)

W I R E D   C O M M U N I C A T I O N   I N T E R F A C E

Protocols………………. .... ………………RS-485

Cable Length (Data Rate < 1Mbps) ... ……………....100 meter (328 ft) maximum

TAG MOUNTING OPTONS

- Poly-lock

- Adhesive tape

- screw in mounting adapter

ELECTRICAL

Internal Power .... Two D-cells, 3.6V Lithium Thionyl Chloride (the batteries are replaceable by trained technician)

External Power .... Input: 12VDC-25VDC, 100mA typical, 400mA maximum

ANTENNA OPTIONS

- Integral 2.4 GHz Inverted F-antenna (Zebra P/N 10370)

ENVIRONMENTAL / PHYSICAL

Operating Temperature Range .... -40º C to +70º C (-40º F to +158º F)

Storage Temperature Range .... -30º C to +30º C (-22º F to +86º F)

Durability .... 1.8 m (6 ft) drop to concrete

Height .... 4.57 cm (1.8 in)

Length, with mounting tabs .... 16.3 cm (6.4 in)

Width... 9.9 cm (3.9 in)

Weight TFF-3110-00AA / -01AA .... 540 g (19 oz) / 580 g (20.5 oz)

Environmental Sealing IP54

Case Material.................................... Molded Plastic (polyester)

REGULATORY APPROVALS

North America

FCC Part 15 Class B, Part 15.247

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

Worldwide

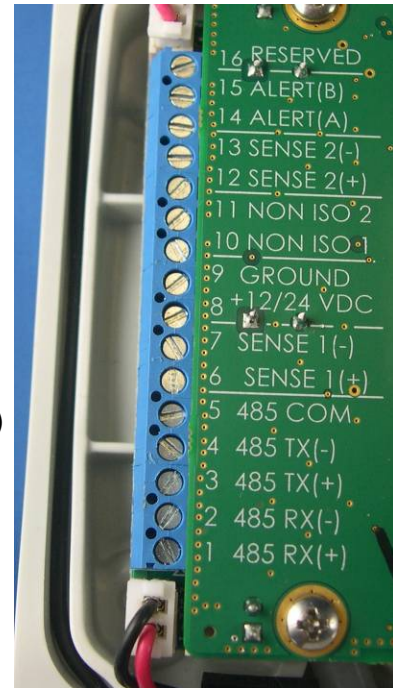ISO/IEC 24730-2 Compliant

Cisco CCX Compliant

Appendix A

Physical Interface for P/N TFF-3110-01AA only

Screw Terminal Block:
Terminal Block MFG ....ON-SHORE
Terminal Block P/N OSTTE160161

Recommended Cables:
Outer Jacket Diameter ....3-6.5 mm (0.11"-0.26")
Cat-6 UTP...................................P/N TBD

Unless otherwise specified in table below, cable length must not exceed 100 m (328 feet)

Pin	Signal	Notes
1	RS-485 RX(+)	Isolated Input: differential pair with 120 ohm load
2	RS-485 RX(-)	Isolated Input: differential pair with 120 ohm load
3	RS-485 TX(+)	Isolated Output: differential pair with standard RS-485 voltages
4	RS-485 TX(-)	Isolated Output: differential pair with standard RS-485 voltages
5	RS-485 COM	Isolated ground for RS-485 interface
6	SENSE 1 (+)	Isolated Input: differential pair for contact detection [open or short between SENSE1(+) and SENSE1(-)]
7	SENSE 1 (-)	Isolated Input: differential pair for contact detection [open or short between SENSE1(+) and SENSE1(-)]
8	+12/24 VDC	+12 VDC to +28V DC, 400 mA absolute max, 100 mA typ
9	GROUND	
10	NON ISO 1	Non-isolated Input: open or close to GND **Maximum cable length must not exceed 3 m (10 feet)**
11	NON ISO 2	Non-isolated Input: open or close to GND **Maximum cable length must not exceed 3 m (10 feet)**
12	SENSE 2 (+)	Isolated Input: differential pair for contact detection

		[open or short between SENSE2(+) and SENSE2(-)]
13	SENSE 2 (-)	Isolated Input: differential pair for contact detection [open or short between SENSE2(+) and SENSE2(-)]
14	ALERT (A)	Isolated Output: Contact closure terminal A 100 mADC/AC max, 35 ohm on resistance max
15	ALERT (B)	Isolated Output: Contact closure terminal B 100 mADC/AC max, 35 ohm on resistance max
16	RESERVED	

Available Protocols

RS-485   Differential serial transmit / receive pairs

Serial Data

Baud Rate ....19,200 (default)

Data Bits 8

Stop Bits.......................................1

Parity..None

Flow Control.................................None