

PLUS
LOCATION SYSTEMS

Model: 1104 Tag

User's Manual

(RFID) Tracking System

DRAFT 2

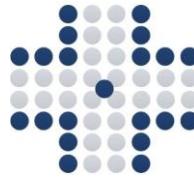
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Nondisclosure Provisions

This manual contains PLUS Location Systems (PLUS) Proprietary Information. Purchasers of this device are reminded of their obligation to protect PLUS confidential and proprietary information in accordance with the Terms and Conditions (T&C) of sale.

Rights

Rights to use this documentation are set forth in the Terms and Conditions accompanying the PLUS hardware.

Regulatory Notice

U.S. Operation. This device complies with Part 15 of the FCC Rules. Operation is subject to the following 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. (3) Operation on board an aircraft or a satellite is prohibited. (4) Devices operating under this section may not be employed for the operation of toys. (5) Except for operation onboard a ship or a terrestrial transportation vehicle, the use of a fixed outdoor infrastructure is prohibited. A fixed infrastructure includes antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or on a telephone pole. This outdoor infrastructure prohibition applies to intentional ultra-wideband (UWB) emitters.

Operation in disregard of these conditions is a violation of 47 U.S.C. 301 and could subject the operator to serious legal penalties. Disassembling or modifying the unit will void FCC compliance and void PLUS warranty provisions.

Non-U.S. Operation: ~~This product has not been authorized for use or commercial exploitation under the regulations of any non-United States government agency. Please confer with your government's regulatory agency to ensure proper authorizations are obtained.~~

Please consult with PLUS if you have any questions, prior to use.

Information to User:

Caution: Changes or modifications not expressly approved by PLUS Location Systems USA, LLC, may void 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. 33

- 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.

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Active Change Record

| Version | Comments | Release Date |
|---------|---------------|--------------|
| Rev X | Draft release | 3/22/07 |

1. Introduction

The 1104 Personnel Name Tag is a small, active RFID tag that works as part of a PLUS Real Time Location System. The tag consists of a circuit board with integrated antenna, coin cell battery, and plastic enclosure. The tag is designed to support attachment of a CR80 format ID badge. The tag is worn on a lanyard or clip to enable location information for personnel.



2. Overview

Background

The 1104 Tag periodically transmits a short (~100 us) packet that is received by a network of PLUS Readers. The Readers generate time of arrival data for the tag, and then send this data across an Ethernet network to a server running the PLUS Location Software. The PLUS software uses the time of arrival from multiple readers to determine an accurate location for the tag.

1104 Tag

Each packet transmitted by the 1104 tag consists of pulses transmitted at a 1 MHz pulse repetition frequency (PRF). Data is transmitted using On-Off Keying (OOK) modulation, in which a pulse present in a given timeslot = data value 1, and a missing pulse in the timeslot = data value 0.

The OOK modulation of the 1 MHz pulse train results in a 1 MHz data rate.

Each pulse has an RF center frequency of 6.6 GHz. The pulse is generated from a logic gate edge, filtered by a passive RLC network, and amplified by a transistor drive circuit coupled to the integrated antenna.

The pulse characteristics are determined only by the drive circuit and are not a function of the 1 MHz PRF. This direct signal generation approach does not use an intermediate frequency and up-conversion approach.

The tag signaling only consists of an OOK modulated 1 MHz pulse train and does not use channel coding, frequency hopping, or other channelization techniques. All signal shaping is implemented in the hardware circuit described above.

The tag programming interface is for factory loading of the microcontroller firmware only. The programming pins are internal to the tag (only accessible prior to welding of the plastic enclosure). The programming pins can not be accessed by the user after the tag case has been ultrasonically welded.

It is not possible for the user to change RF signal characteristics, PRF, or transmitted data content. The tag antenna is integrated onto the circuit board inside the plastic enclosure and cannot be accessed, removed, or replaced.

3. Specifications

The 1104 Tag specifications are listed below.

| | |
|----------------------|---|
| Function: | Transmits RF packets |
| Battery Life: | 3 Years at 6 Hz Packet Rate |
| Range: | 130' typical line of sight |
| Dimensions: | 2.28" W x 0.13" D x 3.53" T |
| Weight: | 90 oz (25.5g) |
| Temperature: | Operating: -4deg F to 131deg F Storage: -22deg F to 140deg F |
| FCC ID: | ZEH0412 |
| RF Emissions: | FCC 15.250 compliant |

4. Beam Orientation Recommendations

TBD

Warranty Statement and Return Policy

WARRANTY PERIOD: Subject to the limitations herein, the warranty period for hardware product to which this warranty applies shall be for one (1) year from the date PLUS Location Systems USA LLC ("PLS") delivers the product to the shipping carrier.

WARRANTY: During the warranty period stated herein and subject to the limitations herein, PLS warrants that items provided by PLS and supplied under Buyer's order shall be free from defects in materials and workmanship and will conform substantially to applicable specifications and drawings in product data sheets on PLS website. This warranty extends only to Buyer and is not transferable. Any such transfer shall void the above warranty. Notwithstanding anything herein, PLS's liability herein, whether based upon breach of warranty or contract or negligence in manufacture, shall be limited to replacement or repair at PLS's election of all such defective or nonconforming items, provided that this warranty shall apply only where Buyer has given PLS written notice of such defects or nonconformity within the applicable warranty period after delivery by PLS of such items to Buyer. PLS shall have the right prior to return to inspect at Buyer's plant any items claimed to be defective or nonconforming. The foregoing constitutes the sole and exclusive remedy of the Buyer and exclusive liability of PLS AND IS IN LIEU OF ANY AND ALL OTHER WARRANTIES EXPRESSED OR IMPLIED OR STATUTORY AS TO MERCHANTABILITY, FITNESS FOR PURPOSE SOLD, DESCRIPTION, QUALITY, PRODUCTIVENESS, NONINFRINGEMENT OF ANY THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS OR ANY OTHER MATTER. WITHOUT LIMITING THE FOREGOING, IN NO EVENT SHALL PLS BE LIABLE TO BUYER FOR ANY INCIDENTAL, SPECIAL, PUNITIVE, EXEMPLARY OR CONSEQUENTIAL DAMAGES EXPERIENCED BY EITHER BUYER, BUYER'S CUSTOMER, OR A THIRD PARTY (INCLUDING, BUT NOT LIMITED TO, LOSS OF DATA OR INFORMATION, LOSS OF PROFITS, OR LOSS OF USE). Notwithstanding anything herein to the contrary, PLS is not liable for damages for any cause whatsoever (whether based in contract, tort, or otherwise) in excess of the amount paid by Buyer for the applicable product.

RETURNS: Return authorization and a Return Material Authorization ("RMA") number must be obtained from PLS prior to return of any items for repair. Buyer's rights to repair or replacement are governed by this Warranty.

SHIPPING: The cost of shipping the item from Buyer's facility back to PLS shall be paid by the Buyer. The cost of shipping the item from PLS back to the Buyer shall be paid by PLS. At the request of the Buyer, PLS will utilize other means of express shipment in which case the cost of return express shipping shall be paid by the Buyer.

OUT OF WARRANTY: In-warranty repair will be made at no charge to Buyer provided that reason for failure is not excluded under Warranty Restrictions herein. The cost of out-of-warranty repair, including return shipment, is subject to a charge as quoted by PLS. Buyer's acceptance of these charges is necessary before repairs will be made. The cost of the repair and return shipment will be invoiced to Buyer. The return shipment of the product will be made using the most economical shipment means available. At the request of the Buyer, PLS will utilize other means of express shipment in which case the additional cost of return using express shipping shall also be paid by the Buyer.

REPAIR WARRANTY: Repair work performed on an in-warranty item is warranted for the remainder of the original Warranty Period or ninety (90) days, whichever is greater. Repair work performed on an out-of-warranty item is warranted for ninety (90) days from the date of shipment of the repaired item from PLS. This

ninety (90) day period for in-warranty or out-of warranty repair covers only the actual repair(s) made to the item and is exclusive of potential non-related faults that may occur during the ninety (90) day period.

WARRANTY RESTRICTIONS: Modification or alteration to purchased item by Buyer, other than that specifically authorized in writing by PLS, shall VOID AND NULLIFY, in its entirety, all warranty rights as set forth in Warranty paragraph above. Any damage or malfunction resulting from exposure of the item to abnormal physical or electrical stress, abnormal environmental conditions, misuse, negligence, abuse or other such cause shall VOID AND NULLIFY, in its entirety, all warranty rights for such product.

ENGINEERING UPDATES: PLS reserves the right to upgrade and modify items during in-warranty or out-of-warranty repair without prior approval or notification to Buyer and without incurring any obligations or liability to make the same changes in items previously provided.

DATA RIGHTS: Rights to any intellectual property residing in the product or any data furnished hereunder are not granted except by specific written permission by an Officer of PLS. Buyer shall have no right to copy, reverse engineer or reproduce, in whole or part, the product or any data thereof without the prior written consent of PLS.

PRODUCT SUPPORT AND RMA INFORMATION

PRE-SALES INQUIRIES AND APPLICATIONS SUPPORT

Contact PLUS Location Systems at +1.256.217.4072 and please select option 2 for Sales.

POST-SALE SUPPORT

Contact PLUS Location Systems at +1.256.217.4072 and please select option 3 for Technical Support and have the product serial number available.

REPAIR AND RETURN: If PLS Technical Support determines that a repair or replacement is necessary, Technical Support will issue a Return Material Authorization (RMA) number. Buyer must supply a valid product serial number prior to PLS providing the requested RMA number.

For the duration of Warranty, PLS will provide advance replacement units for any product found to be defective (subject to product availability). PLS will use commercially reasonable efforts to ship advance replacement units within two business day when determination of hardware failure has been made. A purchase order number is required in order for advance replacements to be shipped.

Defective unit must be returned within 30 days of the date of shipment of advance replacement unit. Buyer may be notified by letter or email within 15 days from date of advance replacement shipment to return the defective unit. If the defective unit is not returned within the 30 days, Buyer will be invoiced at list price for the advanced replacement unit using the provided purchase order number.

Replacement unit will be warranted for the remaining warranty period of the original item, and may be new or refurbished product. In-warranty product returned for repair but found not to be defective (i.e., no trouble found), shall be subject to a processing fee of \$100 USD.

Any charges should be verified by the Buyer at time of RMA issuance prior to returning the item. Out-of-warranty repairs will be made at a nominal cost based, in part, on the selling price of the product. For information regarding item currently in-house or possible fees associated with repair, contact Technical Support at +1.256.217.4072 and please select option 3.

When returning a product to PLUS Location Systems, identify the RMA number clearly on the package label as shown below:

PLUS Location Systems
4955 Corporate Drive
Suite 101
Huntsville, Alabama 35805
RMA # _____