R151 Tethered Temperature Sensor

RF Code™
discover. track. monitor.

Installation Guide

Contents

Trademarks

Copyright Statement

RF Code, Inc.
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FCC Compliance

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 Code is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications 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.

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Industry Canada Compliance Statement
This Class A digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

Avis de conformité à la réglementation d'Industrie Canada
Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

The system is designed to operate with RF Code RFID Tags – whose operating frequency is 433.92 MHz which have been certified or are in the certification process. These devices comply with part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) these devices may not cause harmful interference, and
(2) these devices must accept any interference received, including interference that may cause undesired operation.

a. FCC ID: P6F2005433 for beacon intervals greater than, or equal to 10 seconds.
b. FCC ID: P6F433MHZ for the security tag with beacon intervals less than 10 seconds.

CE Compliance

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures. This equipment complies with the requirements relating to electromagnetic compatibility, EN 55022 class A, the essential protection requirement of Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility.

WEEE Compliance

Do Not Dispose Product with Municipal Waste. Special Collection/Disposal Required.

Battery Statement

RF Code warrants all tags to be free from defects in materials and workmanship for a period of 1 year.

Based on the ratings and specifications from the battery manufacturers, RF Code develops usage models to calculate the life of the active RFID Tags. Like all models there are assumptions and approximations involved. The values are to be taken as engineering estimates - not guaranteed performance.

In most asset tag deployment scenarios, RF Code tags with a 10-second beacon rate have a useful life of 5-to-7 years.

In most sensor tag deployment scenarios, RF Code tags will typically have a useful life of 3 or more years.

Exposure to extreme temperatures for all tags will shorten the battery life.

R151 Tethered Temperature Sensor

Introduction

The R151 Tethered Temperature Sensor is a battery-powered RF transmitter that monitors and reports the temperature measured by a digital thermometer located at the end of a 6-foot plenum-rated tether cable. This design provides physical separation between the RF transmitter and the sealed temperature sensor. This allows the tethered sensor cable to be installed in harsh environments, particularly when compared to the R150 Temperature Tag. The R151 Tethered Temperature Sensor is ideal for monitoring within freezers or other areas where condensation occurs.

This form factor is particularly well-suited for environments where the RF transmitter is mounted in open space while the temperature sensor is installed inside RF-blocking enclosures such as a metal duct work or refrigerators. Mounting is easy and flexible. The temperature tether sensor cable can be routed into difficult to reach places, such as above a suspended ceiling or inside HVAC air ducts. The RF transmitter will report its own unique ID, along with the ambient temperature measured by the temperature sensor every 20 seconds.

RF Code's Environmental Monitoring solution line is made up of:

- R120 Door Tag
- R130 Dry Contact Tag
- R135 Fluid Detector Tag
- R150 Rack Temperature Tag
- **R151 Tethered Temperature Sensor**
- R155 Humidity-Temperature Tag
- R160 Air Pressure Tag
- R170 PDU Family of Tags
- Sensor Manager Software

Features

Features of the R151 Tethered Temperature Sensor include:

- Operating temperature range from -67° F to 212° F
- Temperature reporting accuracy of +/- 2° F between 14° F and 185° F and accuracy of +/- 4° F below 14° F and above 185° F
- The temperature sensor can be installed inside metal enclosures without affecting RF transmission range
- Removable and re-attachable temperature sensor
- Temperature sensor design suitable for use in plenum spaces
- Real-time temperature monitoring for harsh environments (e.g., higher/lower temperatures and condensation compared to the R150 temperature tag)
- Leverages existing RF Code active RFID infrastructures

Contents

The contents of the R151 Tethered Temperature Sensor package are:

- R151 RF transmitter with 6 ft. temperature sensor tether cable
- Adhesive pads for mounting
- Three tie-wraps and tie-wrap mounts (for positioning temperature sensor)
- Printed R151 Installation Guide

Hardware

The RF transmitter is housed in a polycarbonate case that is 3.5 in (88.9 mm) wide x 2.5 in (64.3 mm) deep x 1 in (26.2 mm) high. It can be securely mounted using the provided industrial adhesive or optionally using user-supplied screws, fasteners or tie-wraps. The digital temperature sensor has a small footprint and is attached to a 6 ft long plenum-rated cable. The temperature sensor tether cable is attached to the tag's terminal connector block using a two-wire connection. The cable is user-removable for installations that require temporary detachment for mounting. RF Code tags and sensors are designed to ensure clear RF transmissions in high-density deployments, such as within racks and data centers. The RF transmitter operates with a low duty cycle that translates to long battery life. The R151 temperature tag has an expected life of a minimum of 5 years*.

RF Transmitter Operational Specifications

- **RF Transmitter Operational Temperature**: -20° C to +70° C (-4° F to +158° F)
- **RF Transmitter Storage Temperature**: -40° C to +80° C (-40° F to +176° F)
- **Sampling Rate**: 20 seconds
- **Temperature Sensor Tether Cable Operational Temperature**: -55° C to +100° C (-67° F to +212° F)
- **Temperature Sensor Accuracy**: +/- 2° F from -10° C to +85° C (14° F to +185° F)

Power Specifications

- **Battery Type**: Three (3) Lithium CR2032 replaceable coin cells
- **Battery Life**: 5 years*

* The R151 RF Transmitter can operate over the operational temperature range and withstand periods of time subjected to the RF transmitter storage temperature limits, however the battery life is optimized at 5 years for normal use in temperature-controlled environments between 50° F and 130° F. If the RF transmitter is subject to prolonged exposure or use under extreme temperature conditions, this will decrease the life of the batteries. The R151 Tethered Temperature Sensor design allows the tag unit to be installed inside less extreme environments while the more durable temperature sensor tether cable is installed in areas exposed to more extreme temperatures or condensation. The RF transmitter should be protected from condensing environments; condensation can cause the electrical circuit or mechanical connections to become unreliable. Exposing the RF transmitter directly to liquids may cause the product to malfunction, or permanently damage the circuitry, and voids the product warranty. Based on the ratings and specifications from the battery manufacturers, RF Code develops usage models to calculate the life of the active RFID Tags. Like all models, there are assumptions and approximations involved. The stated values are engineering estimates and not guaranteed performance. Exposing the RF transmitter to extreme temperatures will shorten the battery life. RF Code warrants all tags to be free from defects in materials and workmanship for a period of 1 year. Featuring a low-battery alert, the tag will continue to monitor and report temperature for at least two months following the initial low battery condition. After that, the tag will continue to broadcast its unique ID and a low battery indication with each beacon, but will not report temperature until the batteries are replaced.

Installation Steps

1. Extend the temperature sensor inside the space to be monitored (e.g. inside refrigerator, freezer or under raised floor) and secure with the tie-wraps and tie-wrap mounting pads provided with the device.

2. Mount the RF transmitter using the provided adhesive pad or by optionally securing with screws or tie-wraps (not provided). To mount the RF transmitter using the adhesive backing, remove the protective backing, position the sensor tag where it is to be mounted and apply firm pressure for ten seconds.

   Note Best read-range can be achieved by mounting the RF transmitter at least 4 ft. or more above the ground.

   If mounting the tag in an area where it could potentially be bumped or snagged, you may want to use a strain relief method with a tie-wrap and tie-wrap mount to position the sensor connector wire in such as way that if snagged, the wire will not be ripped from the tag.

Figure 1: Strain Relief Wire Mounting Method

3. Secure the temperature sensor using the provided tie-wraps so that movement of the cable is minimized.

Once the R151 Tethered Temperature Sensor has been properly installed, it can be configured within RF Code's Sensor Manager software where users can view tag details, use graphs and reports to analyze temperature trends, or create alert policies to send notifications. For information regarding configuration of Sensor Manager, please refer to the **Sensor Manager Administrator Manual and User Manual** available at:

http://www.rfcode.com/Resources/Library/User-Manuals.html

Temperature Sensor Tether Cable Connection Steps

In some installation instances the temperature sensor tether cable may need to be removed. The following steps outline the process for removing and reattaching the temperature sensor tether cable:

1. Remove the R151 RF Transmitter case top using a Philips head screwdriver to remove the four case screws and set aside tag case top and screws.

Figure 2: R151 Remove RF transmitter Case Top

2. Using a standard size 2 or smaller Flat head screwdriver, loosen the two tether connection terminals. Gently pull the wire ends from the respective terminals to detach the temperature sensor tether cable from the RF transmitter.

Figure 3: Temperature Sensor Tether Cable Connector Terminal

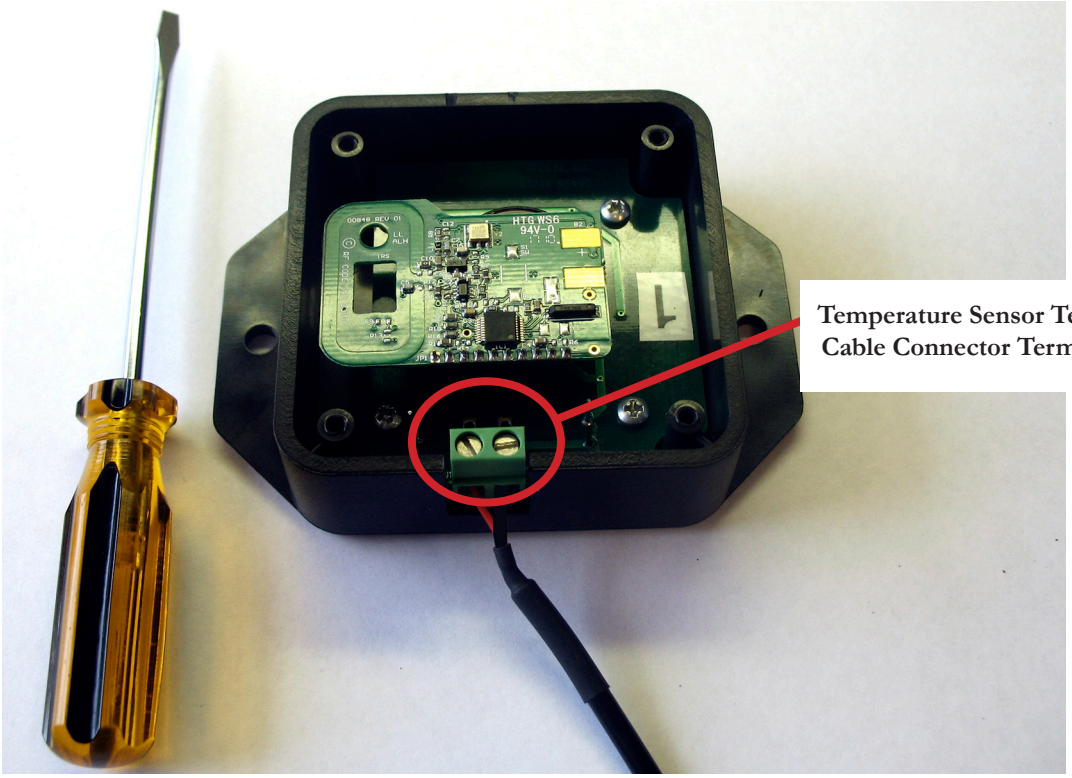
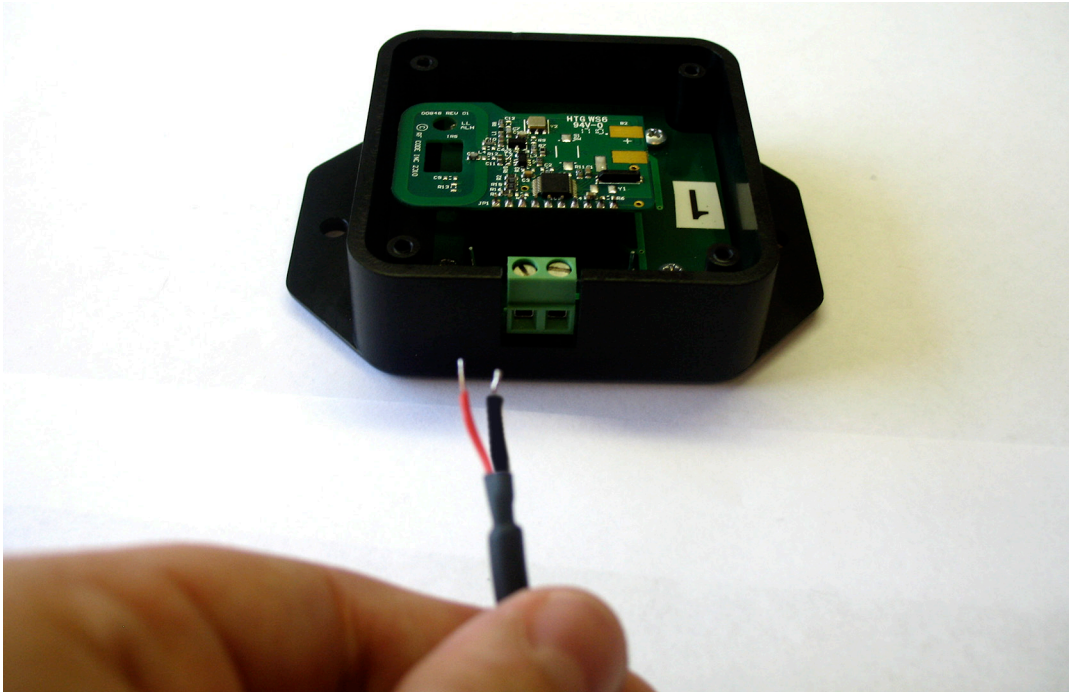


Figure 4: Temperature Sensor Tether Cable Detached



3. Place the temperature sensor tether cable in the environment in which you desire to monitor.

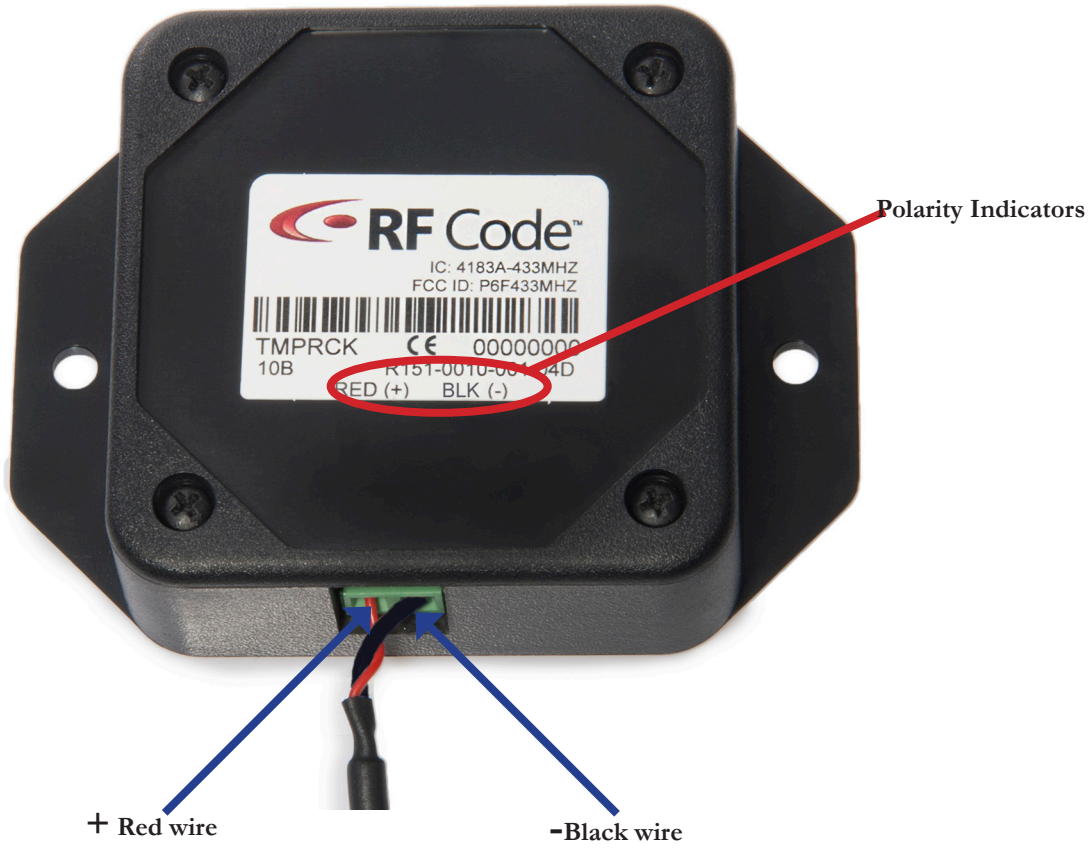
4. Secure the temperature sensor tether cable in place using the tie-wraps and tie-wrap mounts provided. Extra length of cable can be coiled and held in position using a tie-wrap and tie-wrap mount.

5. Determine proper position and placement for the R151 Tethered Temperature Sensor mounting. Keep in mind that the temperature sensor tether cable will need to be reattached to the adhesive and its positioning should not cause strain on the tag nor the tether. Remove the paper backing from the tag and press firmly for ten seconds to mount it into place (or optionally secure by using mechanical fasteners or tie-wraps).

6. Slide the exposed cable ends back into the tether connector, paying close attention to the proper polarity. The **Red** cable wire should be positioned in the left (**+**) terminal and the **Black** cable wire should be positioned in the right (**-**) terminal (See image below). Tighten the terminal connector screws down to make contact with the temperature sensor tether cable wires using a size 2 or smaller Flat head screwdriver.

Take care to avoid twisting and fraying the end of the exposed wires when tightening the terminal connectors. Doing so can cause connection issues and cable damage.

Figure 5: R151 Temperature Sensor Tether Cable Wire Attachment



Recommended Best Practices

Note

The RF Transmitter should be mounted four feet or more above the floor to enable the best possible read range.

RF fields of active tags are affected by large metal surfaces. Adhering tags directly onto metal surfaces may result in diminished read range and therefore should be avoided if possible.

Battery Replacement Instructions

1. Using a small Phillips head screw driver, remove the four screws from the top of the RF transmitter case and set them aside.

Figure 6: Remove screws from the RF transmitter Case

2. Carefully remove the RF transmitter case cover and set aside.

Figure 7: Remove RF transmitter case cover

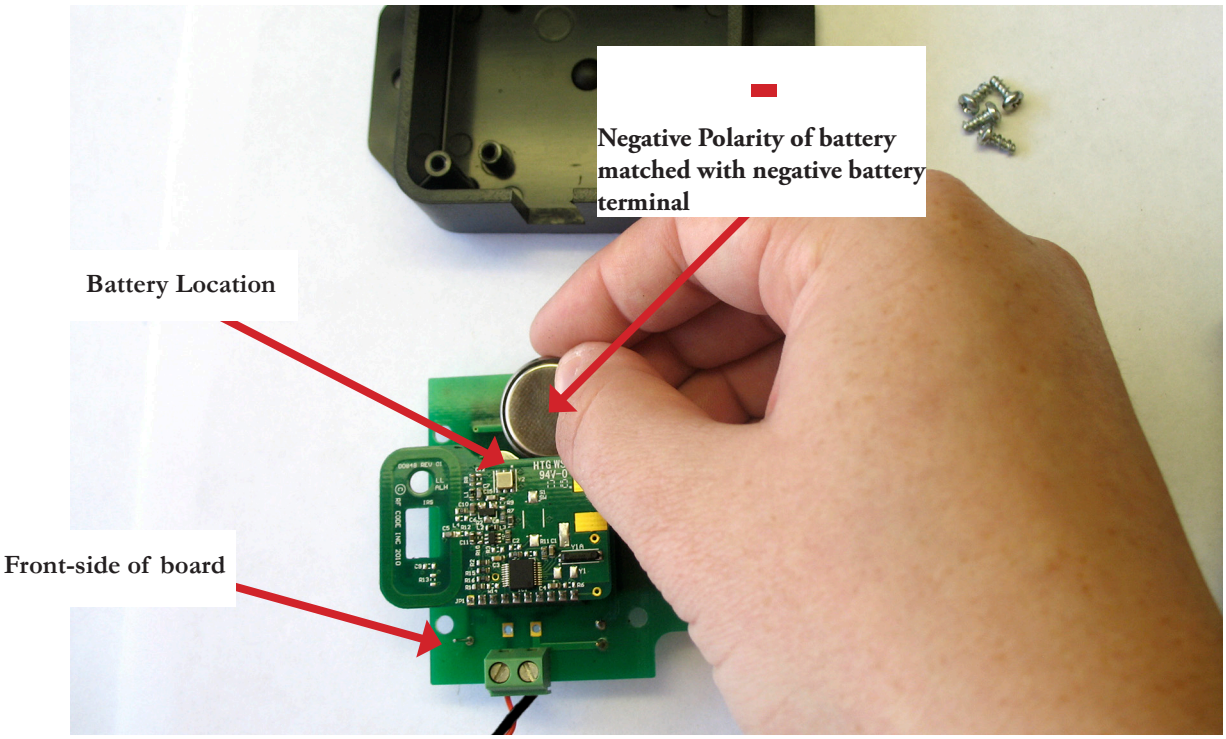
3. Remove the four small screws that are holding the circuit board in place and set aside.

Figure 8: Remove screws holding tag board in place

4. Remove the board from the RF transmitter case.

5. Remove the first battery (located on the front-side of the board) from the battery holder.

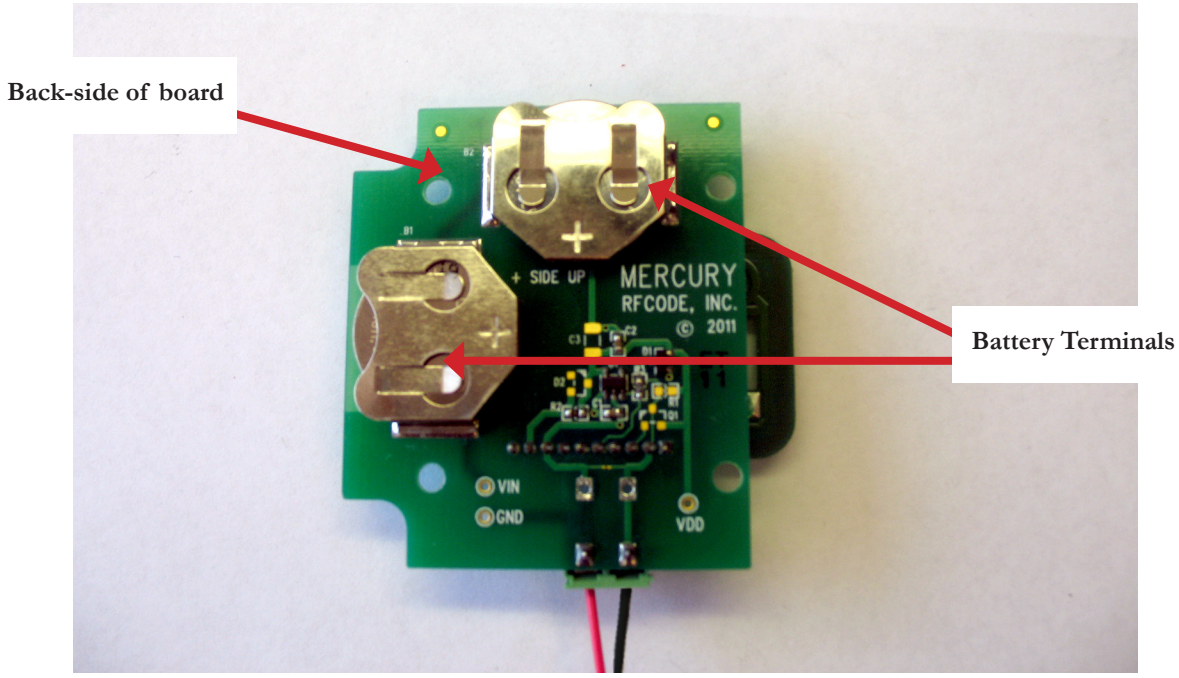
Figure 9: Remove battery



6. Replace the front-side battery with a fresh **CR2032** battery ensuring that polarity matches the battery contact.

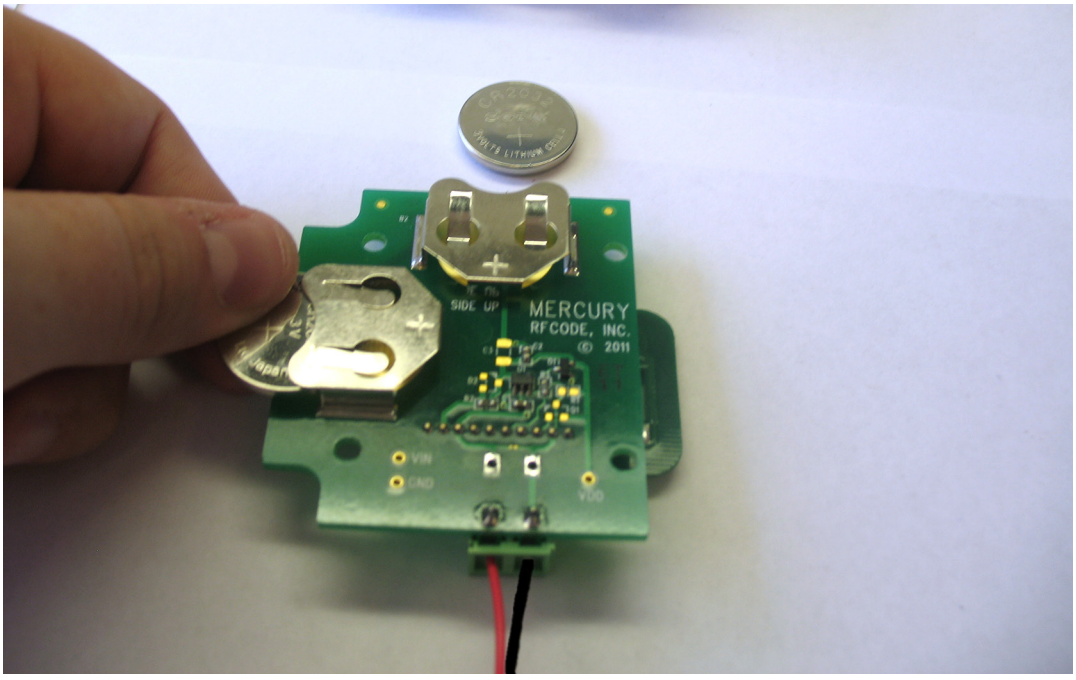
7. Flip the circuit board over to the back-side to where there are two additional batteries and battery terminals.

Figure 10: Batteries and Battery Terminals on back-side of board



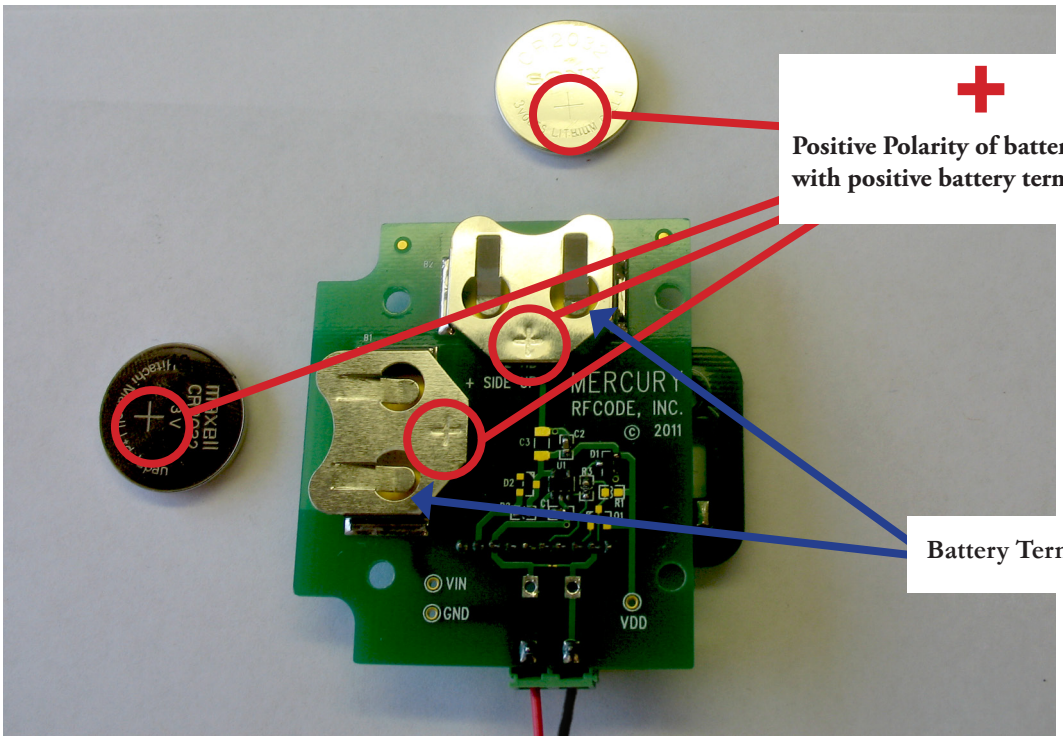
8. Remove the batteries from their terminals.

Figure 11: Remove Batteries from back-side of board



9. Replace the back-side batteries with a fresh **CR2032** batteries ensuring that polarity matches the battery contacts.

Figure 11: Replace Back-side Batteries



10. Once you have replaced all three batteries with fresh batteries, turn the board back over to the front-side and insert the board with replacement batteries back into the RF transmitter case.

11. Use the three small screws that you previously removed in Step #3 to secure the circuit board to the RF transmitter case.

12. Replace the RF transmitter cover and secure in place using the four larger screws that were removed in Step #1.

13. It is recommended that you Access Sensor Manager or your 3rd-party software to ensure the R151 Tethered Temperature Sensor is transmitting readings before mounting the tag in your deployment environment.

Note If mounting the tag in an area where it could potentially be bumped or snagged, you may want to use a strain relief method with a tie-wrap and tie-wrap mount to position the sensor connector wire in such as way that if snagged, the wire will not be ripped from the tag (shown in **Installation Steps** section above).

Limited Standard Warranty Terms

RF Code warrants its products to be free from defects in materials and workmanship for a period of 1 year (12 months) for hardware and software from the date of purchase from RF Code. Its obligation under this warranty is limited to repairing or replacing, at its own sole option, any such defective products. This warranty does not apply to equipment that has been damaged by accident, negligence, or misapplication or has been altered or modified in any way. This warranty applies only to the original purchaser (end-user) and is not transferable.

Standard Warranty Limitations

Except as provided herein, the entire liability of RF Code and its suppliers under this limited warranty will be that RF Code will use reasonable efforts to repair or replace, without charge, all defective Products returned to RF Code by Customer, all as more particularly described in the End User Warranty. Except for the express warranties STATED HEREIN, RF Code makes no other representations or warranties and RF Code hereby disclaims, all other warranties, express, implied, statutory, or otherwise, including without limitation, any warranty of merchantability, non-infringement of third party intellectual property rights, fitness for a particular purpose, performance, satisfactory quality, or arising from a course of dealing, usage or trade practice.

Obtaining Service & Support

For in-warranty service, customers have several options. Customers having difficulty with RF Code products should attempt to solve those problems through RF Code's Technical Support Problem Escalation Process:

First, contact the RF Code representative or other distributor from whom the RF Code product was purchased for information on how to obtain local support.
Second, contact the RF Code Customer Support via e-mail.
Third, contact the RF Code Customer Support via the Support Line.

For product returns, the support engineer will give you a return material authorization (RMA) number. No returns will be accepted without an RMA number. If the warranty expired, there is a charge for repair or replacement per RF Code's out-of-warranty policy. For full details of the RF Code RMA policy, please review the "RF Code Warranty, RMA, and Extended Warranty Policy" document.

RF Code Customer Support

RF Code Customer Support gives entitled customers and partners the ability to contact RF Code about installation and usage-related questions as well as make defect inquiries about eligible products that are covered under RF Code warranty agreements. A team of technical specialists can be contacted electronically or via phone.

The Support Line is available to provide General Support during normal business hours: Monday through Friday, 8:00 am to 5:00 pm Central time, excluding national holidays.

E-mail: support@rfcode.com
Support form: http://www.rfcode.com/Resources/Support/Support-Request.html
Voice: 512.439.2244 or toll-free at 866.830.4578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