i-Q350 RCM
SensorSMART™
Installation and Operation Manual

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Issue 1.3 / December 2014 (EGD)
Subject to alteration without prior notice.
Printed in Austria

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Radio Frequency Compliance Statement

IDENTEC SOLUTIONS is the responsible party for the compliance of the following devices:

MODEL:		i-Q350 RCM
Region/Country	Organization	Marking
EUROPE:	EC	CE
USA:	FCC	OO4-ILR-IQ350WAM OO4-ILR-IQ350WAM2
Canada:	Industry Canada	3538A-IQ350WAM 3538A-IQ350WAM2

The user(s) of these products are cautioned to only use accessories and peripherals approved, in advance, by IDENTEC SOLUTIONS. The use of accessories and peripherals, other than those approved by IDENTEC SOLUTIONS, or unauthorized changes to approved products, may void the compliance of these products and may result in the loss of the user(s) authority to operate the equipment.

European Notification according R&TTE Directive

This equipment complies to Art. 6.4 of R&TTE Directive (2006/95/EU, 2004/108/EC, 1999/5/EC). It is tested for compliance with the following standards: EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 489-1, ETSI EN 301 489-3, EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011

USA Notification

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.

Canada Certification

This device complies with Industry Canada's license exempt RSS's. Operation is subject to the following two conditions:

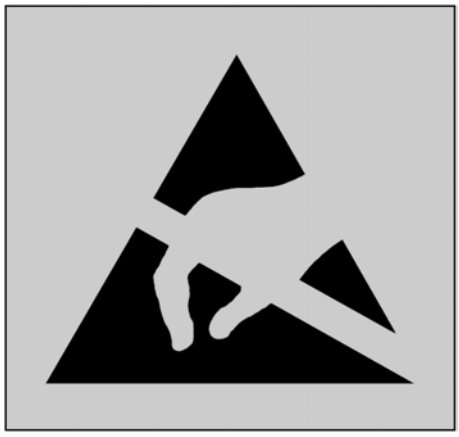
(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

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, 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 product contains components that are sensitive to electrostatic discharges. Please observe the special instructions for their protection. Incorrect handling can damage the unit and cause the invalidation of the warranty.

Minimum safety precautions against electrostatic discharge:

- Establish earth contact before you touch the unit. For example, touch the earthing screw on the unit. Even better: Use an antistatic ribbon and earth yourself permanently for the time you handle the unit.
- Avoid unnecessary contact with the unit connectors and assemblies inside the unit.
- Only open the unit if the operational settings (as described in the manual) expressly require this.
- Use antistatic tools for the setting of the unit. (Warning: Do not touch life-threatening voltages with these tools).
- Do not store unit and components without protective packaging.
- Only remove unit and components from the packaging immediately prior to installation.

These notes are not sufficient to guarantee complete protection from electrostatic discharges!
We recommend the use of suitable protective equipment.

Contents

1. SAFETY INSTRUCTIONS

The system described in this manual is for exclusive operation of trained employees. Only qualified personnel that have knowledge of the potential dangers involved should perform the installation, settings, maintenance and repair of the units used.

Operational Safety

The correct and safe use of these systems assumes that operating and service personnel follow the safety measures described in the manual alongside the generally acceptable safety procedures.
If there is a possibility that safe operations cannot be guaranteed, the system must be switched off, secured against accidental use and the service unit responsible immediately informed.

Safety Documents

The i-Q350 tag was designed, tested and supplied in perfect condition according to document IEC348 Safety Requirements for Electronic Units of Class 1.

Condensate / Change of Temperature

To avoid condensation in the system, the unit must be allowed to slowly adjust itself to warmer temperatures after removal from cold and cool environments.

Do not open the housing

There is absolutely no need to open the systems housing during set up. Configuration is done with built in interface wirelessly.

Earthing

Before establishing any connections the housing of the system must be earthed.

Battery Inside

All system tags contain a battery; therefore the following warning should be heeded:

WARNING - Fire, explosion and burn hazard risk of explosion if battery is replaced by an incorrect type. Do not recharge, short circuit, crush, disassemble, heat above
100 °C (212 °F)
Do not incinerate, or expose contents to water

Fuses

Only experts who are aware of the dangers involved may replace the fuses. It must be ensured that only fuses of the required current rating and the correct type are used for replacement. The use of repaired fuses and/or short-circuiting the fuse holders is prohibited.

Spare Parts

We recommend that only personnel, original products, spare and replacement parts authorized by IDENTEC SOLUTIONS be used for installation, service and repair. IDENTEC SOLUTIONS does not accept any responsibility for materials used, work carried out or possible consequences from unauthorized third party vendors.

Electrostatic Discharge

Semi-conductors of the type MOS or CMOS as well as two-pin types and precision resistance are sensitive to ESD. All components, printed circuit boards and auxiliary systems should therefore always be classed as sensitive to electrostatic discharge.

Before opening the cover the unit should be placed onto an ESD-protected surface. As with all work on modern electronic modules, the use of ESD clamps and ESD mats during work on the unit is recommended.

- Sufficiently protect all printed circuit boards that were removed from the unit from damage.
- Observe all normal precautions for the use of tools.
- Use ESD-protected packaging material.

Never use measuring units with low impedance for measuring or testing systems with semi-conductor components. Never use high voltage testing units or dielectric test units to test systems with semi-conductor components.

If it is necessary to check the isolating properties of the field wiring, the assemblies (electronic units and sensors) should be disconnected.
Earth the test units.

IDENTEC SOLUTIONS does not accept the return of products where the regulations concerning the ESD precautions and protective packaging materials were not followed.

ESD – Electrostatic Discharge

EMC – Electromagnetic Compatibility

SELV – Safety Extra Low Voltage – Protective measure against dangerous body currents, formerly: protective first voltage range

1.1. Preparations

This installation manual must be read carefully prior to starting the installation. The described installation works assume that installation materials like cable, antenna and data sensor holder, etc. are available.

1.2. Scope of This Document

This document is the hardware description of the i-Q350TLX R. This document is intended only for mechanical and electrical installation of these central units.

1.3. Responsibility

IDENTEC SOLUTIONS reserves the right to make changes and updates to the content contained herein. It is the user's responsibility to contact the service department for any possible changes or updates to operating and maintenance procedures.

1.4. Updates

Updates will be provided upon request. The information in this document may be subjected to changes without prior notice.

1.5. Scope of Delivery—Visual Inspection

Check whether delivery is complete and for any damages. If the delivery is not complete or damaged immediately inform the carrier. The dispatch and service organization of IDENTEC SOLUTIONS should also be informed to facilitate the repair or exchange of the system.

1.6. Associated Documents

Software description and Programmer's Guide

- SDK Online Help
- i-SHARE Manual
- Specific sensor manuals

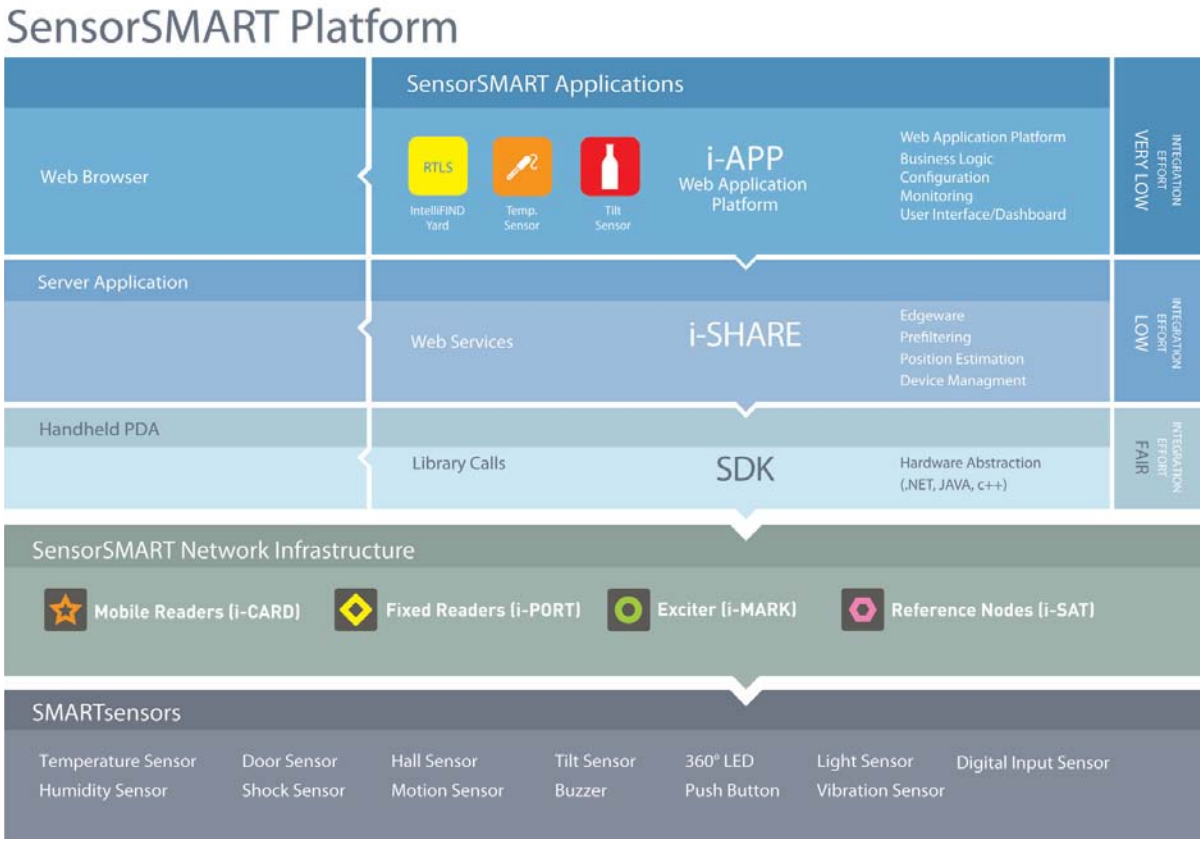
2. INTRODUCTION

2.1. Fundamentals

The IDENTEC SOLUTIONS' SensorSMART Platform is the latest development in asset management, localization and process optimization. Developed to deliver the last mile in industrial communication, the SensorSMART Platform fulfills a niche not previously addressed by available networks.

The SensorSMART Platform takes the complexity out of managing assets, personnel safety monitoring and/or the tracking of valuable cargo and the need for multiple technologies. The unique combination of active RFID, RTLS and WSN in one platform eliminates the necessity for complex deployments of multiple technologies, or the need to compromise with one technology's specific functionalities. The pinnacle of the SensorSMART Platform is that it captures the best of RFID, WSN, and RTLS while also avoiding the less desirable features of each technology. Third party application development is also simplified for added flexibility.

2.2. Component Overview



3. INTRODUCTION

3.1. Fundamentals

Designed to automate the data collection and business processes associated with refrigerated container management in complex marine and intermodal terminal environments, the Reefer Container Monitoring System (RCMS) from IDENTEC SOLUTIONS represents the next generation in 'plug and play' wireless reefer monitoring and control.
RCMS increases visibility and helps optimize operational performance with a proven, off the shelf solution for proactive reefer box management:

- View and manage temperatures and other critical condition parameters with two-way monitoring and control software
- Avoid undetected reefer failures and respond rapidly to events with real-time alarms
- Eliminate the need for power-line modems with low infrastructure wireless hardware
- Reduce capital outlay with managed service options

The innovation at the heart of the system is the iQ350 RCM sensor which talks directly with the reefer unit's microprocessor controller via the standard external serial port for immediate, live monitoring operations.
The RCM System, in conjunction with the i-Q350 RCM, provides the perfect combination to monitor the status of all reefer containers within your terminal.

3.2. System Components—Sensors

3.2.1. i-Q350 RCM

The i-Q350 series of tags is IDENTEC SOLUTIONS' newest generation of Intelligent Long Range® (ILR®) active RFID tags.
ILR provides highly accurate, real-time data collection without human intervention in wireless applications such as:

- identification
- tracking and tracing
- localization and
- Measurements monitoring.

Using advanced UHF radio frequency technology, i-Q350 WAM tags transmit and receive data at distances of up to 30 meters (100 feet) from a handheld device or up to 500 meters (1,640 feet) from a fixed interrogator.

The i-Q350 RCM tag includes a serial interface which communicates to container refrigeration units. The tag auto detects the type of the controller and monitors the status information.
Also, LEDs support visual signalization during search, locate and alarms. The i-Q350 Reefer tag operates in the 850 – 928 MHz UHF band.

3.2.2. Polarization of Sensors

Vertically Polarized

Horizontally Polarized

Polarization is dependent on orientation and is rotation symmetrical.

3.3. System Components—Readers

3.3.1. i-PORT M350-2

The i-PORT M350-2 is a reader for the i-Q350 and i-B350 series of IDENTEC SOLUTIONS's Response and Broadcast Sensors. Built into a compact housing, the i-PORT M350-2 reads and writes data to the sensors at distances of up to 500 meters (1640 feet) on two antennas. Connection to the host system is established via a RS422 interface, resulting in the capability to connect up to 8 readers in a Daisy Chain using commercially available CAT 5 cables and connectors.

A simple master/slave protocol enables data exchange. Not only does the protocol contain the data received from the sensor but it can also provide information about the time of data reception, field strength and information about the number of times the sensor has been received by the reader.

3.4. System Components—Antennas

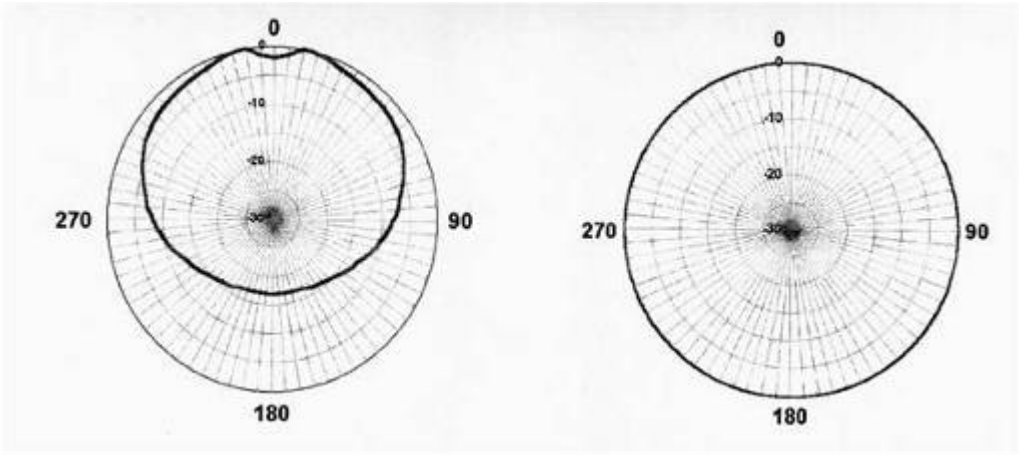
IDENTEC SOLUTIONS' antennas are distinguished by their compact design. A variety of antennas can be used, depending on application. The antennas are differentiated by characteristics such as polarization, apex angle, and gain. Optimal fit to the reading zone is achieved by the right choice of antenna (characteristics) and receive sensitivity. As the antennas are passive system elements, no tuning is required, which facilitates installation and maintenance.

3.4.1. Elliptical Polarized Antennas

Because of the wide apex angle (120°), a large read zone is achieved, which is desirable when a large quantity of sensors need to be read at one time, or when sensors moving at great speeds need to be interrogated.

Since the polarization is elliptical, orientation of the sensor relative to the antenna is not important; if the sensor is in front of the antenna the sensor may be polarized horizontally or vertically along the line of sight of the antenna. Due to its small size and weight, this antenna is very easy to integrate.

Orientation Diagrams: Elliptical polarized antenna



Elevation Azimuth

For this antenna, the maximum transmit power setting is:

- A-9185: -8 dBm

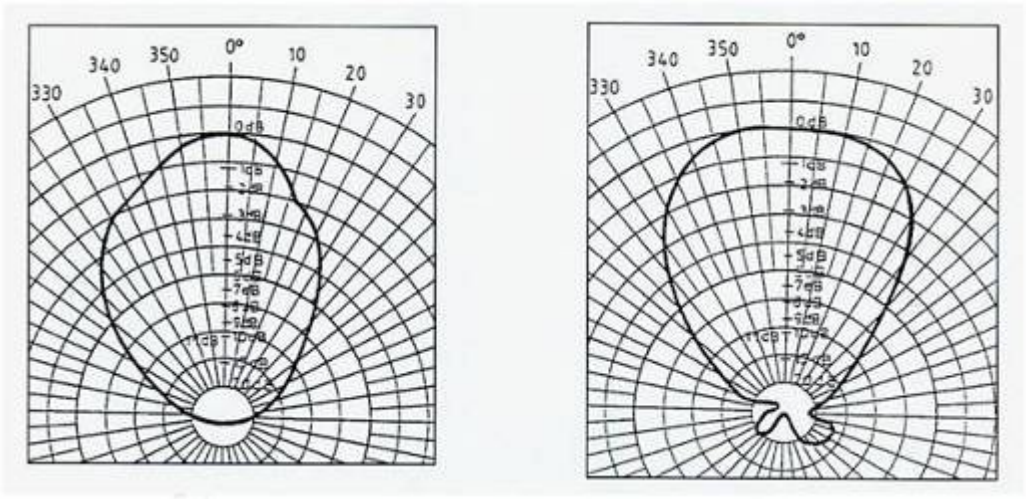
3.4.2. Linear Polarized Antennas

Because of the smaller apex angle (60º), this antenna is more suited to selective data collection and restriction of read zones.

Depending on the direction of mounting, the antenna's field is either vertically or horizontally polarized, requiring the sensor to have the same orientation.

Because of the greater gain, longer read ranges can be achieved with this antenna compared to the elliptical polarized type above.

Orientation Diagrams: Linear polarized antenna



Elevation
Vertical Polarization

Azimuth
Horizontal Polarization

◄ - Antenna Orientation - ►

For this antenna, the maximum transmit power setting is:

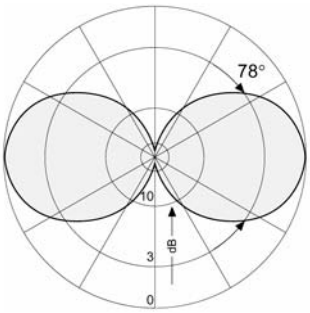
- W-900R: -12 dBm

3.4.3. 1-Wave Rod Antenna

Overall Dimensions: 425 × 90 mm

Mounting proposal

Antenna diagram



Vertical

For this antenna, the maximum transmit power setting is:

- Rod antenna: 6 dBm

4. TAG MOUNTING SOLUTIONS

The Tag can be mounted either with cable straps using the 2 slits at each end, by using screws or a magnet as described in the following 3 subchapters.

4.1. Cable Straps

4.2. Screws

Important Information

1. Only screws with cylindrical heads are suitable for mounting the tag. We do not advise using counter-sunk screws. If for some reason this should be necessary, then use only with a suitable counter-sunk cushioning disc (refer to UN 1277).
2. The attached bushing is recommended to protect the plastic around the mounting hole from being damaged when tightening the rivet.
3. Secure the screws with self-locking nuts, spring washers or Nord-lock washers (refer to UN 7014). Should mounting be completed with self-tapping screws, loosening may occur over time.
4. If the tag is mounted outdoors or in a damp environment, all mounting parts need to be made of stainless steel or other non-rusting material.
5. A temperature of at least +10 °C (+50 °F) must be maintained during mounting to prevent the casing from cracking.
6. Recommended maximum torque
   M4/ #8 (with bushing): 2 Nm
   M5/#10 (w/o bushing): 3 Nm
   M6/#14 (w/o bushing): 3 Nm
   If the torque is any greater, the screw may over tighten, or the casing might break.
7. Metal surfaces in direct proximity to the tag may reduce the tag's range of function. Tags should not be mounted in metal recesses or corners.
8. After mounting, the tag's function should be tested with appropriate devices and software.

4.3. Magnet (optional)

The tag can be easily removed by grabbing it on the part of its body with the cable outlet. Slightly pull it off the wall and the magnetic holding force is removed at once.
DO NOT pull the cable.

5. CONNECTING TO THE REEFER CONTROLLER

Safety Instructions

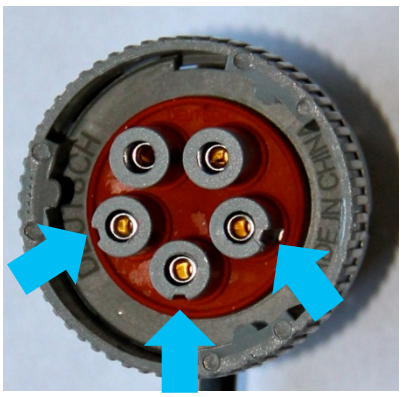
A screened cable must be used for the data cable.

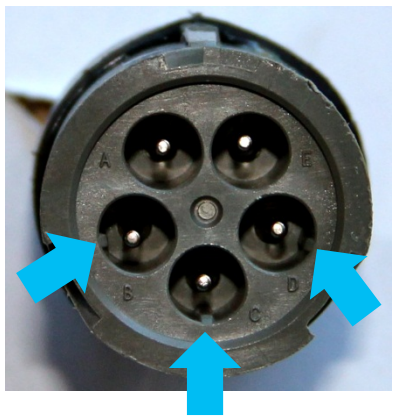
Important Note

The total cable runs between tag and the monitored device must not exceed a total of 15 m. This is due to limitations of the RS232 (EIA-232) standard.

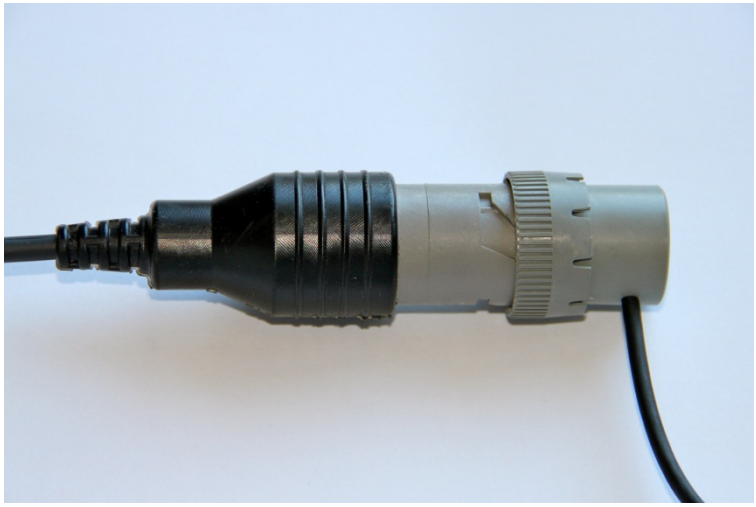
Connecting the i-Q350 RCM to the controller

3 of the 5 connector pins are coded with a small edge to align correctly the plug and connector. The 2 connector pins which are not coded are longer to simplify identification. The data rate of the external device is automatically detected.
Follow the process hereafter to connect the tag to the reefer controller.

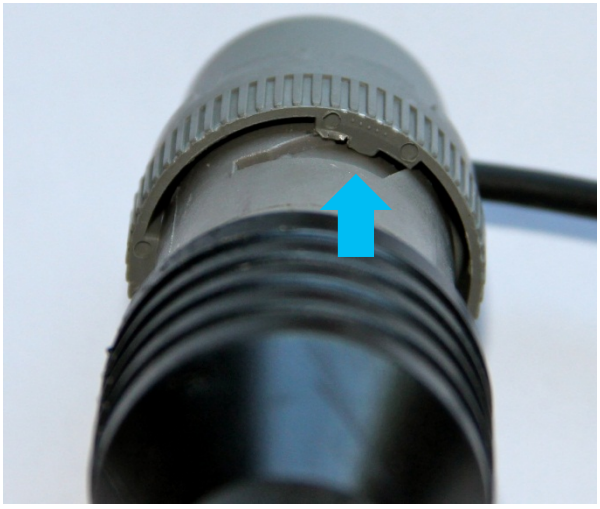




Step 1
Align the male connector of the i-Q350 RCM tag to the female connector on the reefer connector.
In order to align correctly the connectors, use the indent and edges highlighted on the pictures on the left.



Step 2
Connect the male connector to the female connector.
Do not apply too much pressure since the bayonet locking mechanism might not be properly aligned.



Step 3
Align the bayonet locking mechanism by rotating the outer ring on the male connector.

Step 4
Press both connector together and lock the bayonet mechanism to insure proper electrical connection and weatherproofness.

6. ACCESSORIES

In order to accomodate different installations and to operate with most of the reefer container's plug's variation, we are providing several accessories.

6.1. Extension Cable

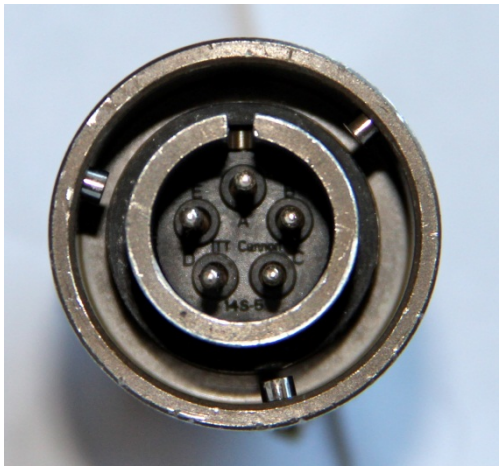
We are providing a 2 meters (6 ft) extension cable to accomodate installation where the i-Q350 RCM is installed on racks.
The extension cable can be used between the i-Q350 RCM and an adaptor.
Up to 5 extension cables can be connected together to reach greater distances.

Extension Cable

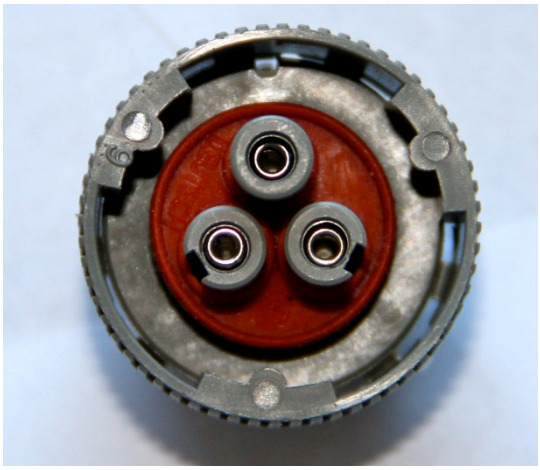
6.2. Adaptors

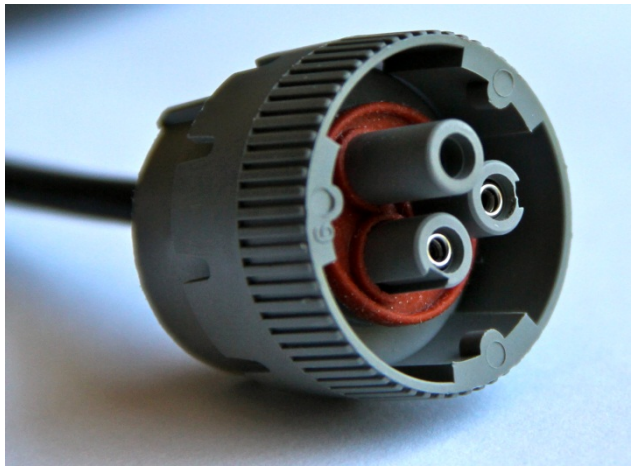
Multiple adaptors are available in order to connect the i-Q350 RCM to different type of reefer controllers. Each adaptor is 50 centimeters (19 inches) long and use the standard 5 pin Deustch female connector to connect to the tag. Adaptors can be use in combination with extension cable.
Hereafter are the list of adaptors available for the RCMS solution.

RCM Adaptor 3
Adaptor with a 5-pin Cannon connector used by some Carrier or Thermoking reefer controllers
p/n: 450363



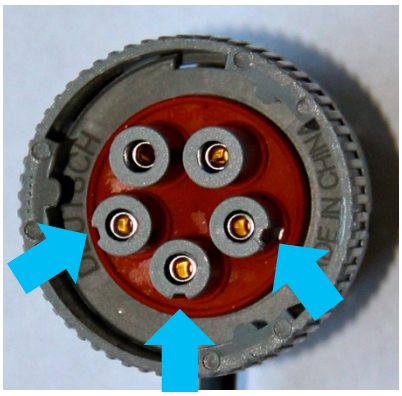
RCM Adaptor 4
Adaptor with a 3-pin Deutsch connector used by some Daikin reefer controllers.
p/n: 450464

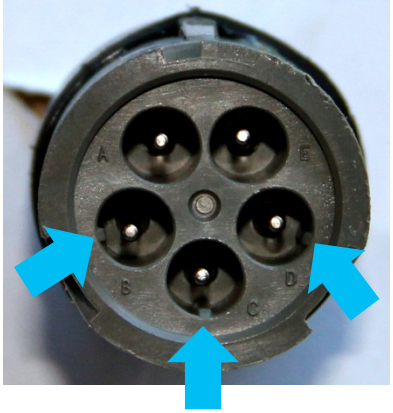




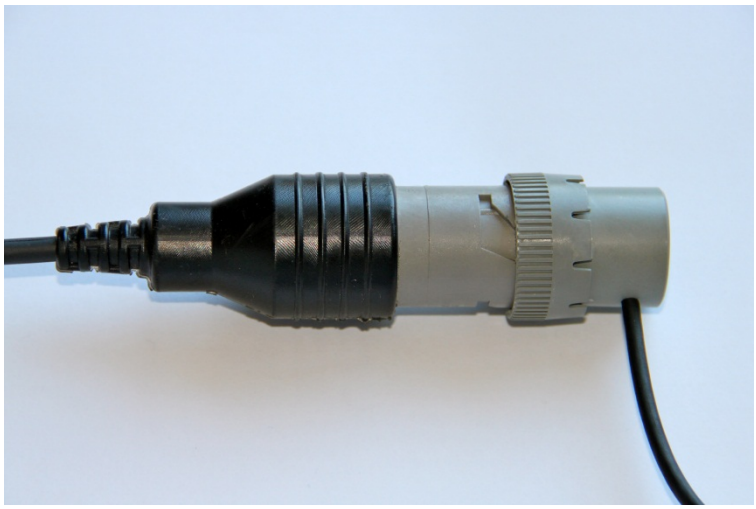
6.3. Connecting to the tag

Follow the process hereafter to connect the extension cable or adaptors to the i-Q350 RCM.

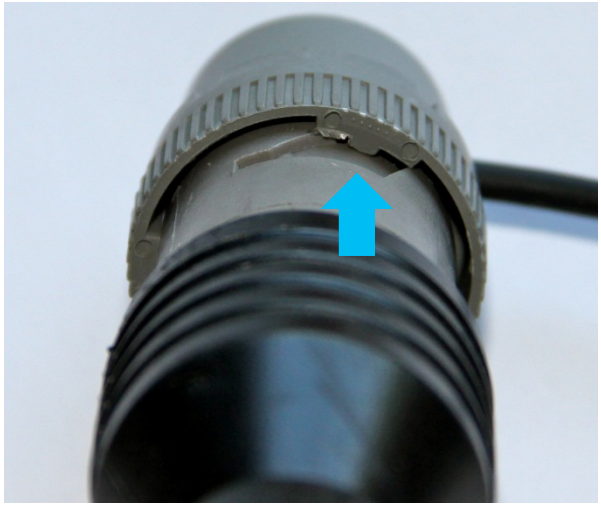




Step 1
Align the male connector of the i-Q350 RCM tag to the female connector of the adaptor or extension cable.
In order to align correctly the connectors, use the indent and edges highlighted on the pictures on the left.



Step 2
Connect the male connector to the female connector.
Do not apply too much pressure since the bayonet locking mechanism might not be properly aligned.



Step 3
Align the bayonet locking mechanism by rotating the outer ring on the male connector.

Step 4
Press both connector together and lock the bayonet mechanism to insure proper electrical connection and weatherproofness.

7. TROUBLESHOOTING

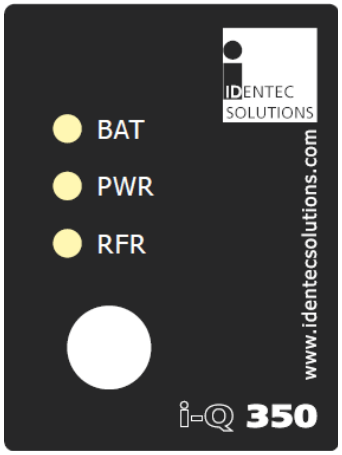
7.1. General

This chapter covers how faults can be recognized and rectified. There are potentially four main problem sources:

- The user control system, including task requirements, communication cables, peripheral units with possible object recognition switches.
- The SensorSMART platform including peripheral units and their cables, also potential object recognition switches.
- The environment including large objects between antenna and sensor, electrical disturbance sources, intervention by persons, etc.
- The quality of the technical design, including alignment between antenna, data, ratio of task requirements/available communication time etc. The information about system performance is contained in the relevant datasheets.

When planning the total system, not overlook the problem sources and “Fault finding procedures on system level” should be included in the host system. How this could look in detail depends on the relevant system concept and very likely varies from one system to another.

7.2. Status Display (LEDs)



BAT	
Green	tag’s battery is OK
Red	tag’s battery is low and needs to be replaced
PWR	
Green	the external device is powered up
Red	the external device is switched off
RFR	
Green	the external device is working properly
Orange	no communication with the external device
Red	not connected to the external device or no successful communication with the external device

8. MAINTENANCE

8.1. General

When installed correctly the ILR System will operate virtually maintenance free for many years. However, in the event maintenance is required only trained and authorized personnel are permitted to perform the updates, changes and maintenance necessary.

8.2. Regular Cleaning of The Surface

Remove dust with a brush or compressed air. If there are fatty or oily substances use a soft cloth moistened with a mild rinsing agent.

Warning

Do not clean the tag in a dishwasher. Do not sandblast the tag. Do not use high pressure water jet or steam cleaner. Do not use cleaning products containing chemical additives.

8.3. Precautionary Maintenance

A regular check of the system is recommended. Unstable connections could lead to damage and malfunctions of the system and should therefore be repaired as soon as possible.

A Brief Checklist

- Are all housings intact?
- Are all cables intact?
- Are all connectors intact?
- Are all connectors securely fastened?
- Are all screws still tight?
- Is there a malfunction at a specific unit?

8.4. Returns

Parts or main components returned for repair or exchange must be handled with great care. PC cards must be returned in the appropriate ESD-protecting packaging material. All returns should include an error description and a short application overview and be sent to the local distributor or to:

IDENTEC SOLUTIONS AG
Service Department
Millenium Park 2
6890 Lustenau
AUSTRIA

9. TECHNICAL DATA

Communication Broadcast 350

Operation Mode	Transmits Sensor ID and user data in pre-defined interval
Read Range	up to 500m*
Compatibility	i-PORT M350, i-CARD CF 350 and i-PORT 4-350
Operating Frequency	868 MHz (EU) or 920 MHz (NA)
Transmit Power	<1mW

Communication Response 350

Operation Mode	Bi-directional communication (reading log, blink LED, write/read data)
Read Range	up to 250m*
Compatibility	i-PORT M350 and i-CARD CF 350
Operating Frequency	868 MHz (EU) or 920 MHz (NA)
Transmit Power	<1mW

Data

Data Retention	> 10 years without power
Write Cycles	100,000 writes
Memory Size	10,000 Bytes user definable
Identification Code	48 bit fixed ID

Configuration

Device	i-PORT M350 or i-CARD CF350
Ping Rate	Configurable from 0.5 to 300 seconds insteps of 0.5 seconds
Number of Bursts	Configurable from 0 to 15
Broadcast User Data	Up to 50 Bytes

Interface

serial interface	RS232 Deutsch connector

supported Reefer units

Thermo King	MP4000 (monitoring only)
Daikin	Decos IIIc
	Decos IIId
Starcool	RCCU5
	SCC6
Carrier	Microlink 3
	Microlink 2i
	Microlink 2

Electrical

Power Source	Lithium Battery (replaceable)
Battery Monitoring	Yes

Environmental Conditions

Operating Temperature	–20 °C to +70 °C (–4 °F to +158 °F)
Humidity	10% to 95% relative humidity @ 30°C
Shock	Multiple drops to concrete from 1m (3ft), 3 times DIN IEC 68-2-27
Vibrations	3G, 20 sine wave cycles, 5 to 150 Hz, DIN IEC 68-2-6 5G, noise 5 to 1.000 Hz, 30 minutes, DIN IEC 68-2-64

Standard/Certification

Europe	CE (EN 300 220-1, -3; EN 301 489-1,-3; EN 60950)
North America	FCC Part 15 (US); Industry Canada

Mechanical Data

Dimensions	171 x 56 x 26 mm (6.7 x 2.2 x 1.0 inches)
Enclosure Material	Plastics
Enclosure Rating	IP 65
Weight	50 grams (1.75 ounces)