



UMD Installation Manual

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 UNDESIRE OPERATION.

Warning: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this 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.
- 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.

Caution: Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Only the antenna provided with this Part 15 Transmitter must be used with this device.

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UMD Installation V2 RF: Thermo King.

Standard System Kit of Parts:

1. Universal Monitoring Device (UMD).
2. One Dual Band Antenna with co-axial cables attached.
3. RF Temperature Tags – if required by the customer
4. RF Door Tag and Magnet – if required by the customer
5. RF Truck Mount Antenna
6. One 1.5M UMD Power Cable.

With the Thermo King Fridge interface the following additional components are required.

1. One Thermo King I-Box with installation kit. This item is to be supplied by Thermo King (TK).
2. One 1.5M Fridge Comms Cable.

Note: Ensure that the I-Box kit is the correct type for the Thermo King Fridge controller deployed on the trailer, there are two types of TK i-Boxes – SR2 Compatible and μ P1V, V & V1 compatible.

Picture 1: UMD System Kit



Picture 2: UMD Connections

System Installation

Initial Setup:

1. Open the front engine bay access doors
2. Open RH electronics compartment access door
3. Turn OFF the main toggle switch on the side or front of the TK Controller cabinet – ensure the fridge is in OFF Mode.
4. Disconnect TK Refrigeration System Battery. If a fridge interface is to be installed AND the fridge controller is a uPIV, uPV or uPVI the system battery must be removed.
5. Open the TK electronics enclosure door.

First Step – Install Antenna's:

Dual Band GSM/GPS Antenna:

1. Locate the Dual Band UMD Antenna on top of the fiberglass canopy directly above the header tank and approximately 40mm in from the back edge.
2. Drill a 13mm or 0.5" hole through the canopy.
3. Feed the two separate lengths of antenna cable into 20mm convoluted tubing for protection
4. Remove the split nut from the underside of the antenna.
5. From the top side, lower the two co-axial cables fully through the drilled hole.

6. From the underside of the canopy, place the split nut over both the co-axial cables with the serrated side up, spin onto the threaded antenna shaft and firmly tighten.
7. Cable tie the co-axial cables to the TK system's wiring harness or fixed hardware that does not get hot.
8. Loop and secure the excess co-axial cable in the UMD cavity and connect and finger tighten the co-axial connectors to the UMD.

Note:

If the UMD is installed inside the Controller Box then the antenna cables can be fed through the existing cable hole/gland at the back and bottom of the Controller box or else a hole can be drilled in the side of the box.

Picture 4: GSM/GPS Antenna Location



1/2" Hole drilled in Fridge Unit Canopy



GSM/GPS Antenna Installed



GSM/GPS Antenna Installed – side shot



Dual GSM/GPS or 3G Antenna

Picture 4: UMD Cable Options for UMD installed in Controller Box:



Hole drilled in side of Controller Box for UMD Cables



Existing Cable Hole/Gland in bottom of Controller Box which can be used for UMD Cables

RF Antenna:

The RF antenna should be mounted inside the refrigerated trailer (the “box”) for optimal results when receiving data from RF temperature or door tags located within the trailer. If the customer configuration is for fridge interface only with NO internal RF Tags then the Antenna can be located on the outside of the trailer BUT within the fridge unit so it can’t be seen or easily accessed/tampered with.

Internal RF Antenna:

1. From the engine bay side, locate the cable bundle that goes through the firewall from the diesel / compressor compartment to the refrigerated compartment. Ensure that the area 50mm above the cable bundle is clear of cables and engine bay hardware. The cables from the refrigerated area will enter the engine bay through a 25mm hole to be drilled through the firewall in this area. **This area must be cleared for the drilling process so that looms or hardware within the engine bay are not damaged should the drill bit enter the engine bay.**
2. From within the refrigerated area, remove the bulk heads and evaporator panel to expose the primary evaporator.
3. Locate the cable loom to the LHS of the evaporator near the lower end of the heat exchanger and the bottom LH corner of the suction pipe. Ref Fig 1 below
4. Mark a point on the firewall approximately 50mm above the cable loom and in between the heat exchanger and the suction pipe.
5. Drill a small pilot hole through the firewall and ensure the loom and hardware clearance from the engine bay side is adequate.
6. If OK, enlarge the hole to 25mm.
7. Remove any drill swarf from both sides of the firewall

8. Feed the mounting plate onto the RF Antenna Cable and tighten into place using the supplied lock-nut.
9. Feed the length of antenna cable into 20mm convoluted tubing for protection
10. From inside the trailer feed the connector end of the RF Antenna through the prepared hole leaving sufficient cable to reach the preferred mounting location inside the trailer.
11. Loop and secure the excess co-axial cable in the cavity and connect and finger tighten the co-axial RF connector to the UMD
12. Cable tie the antenna cable to existing cabling or components that do not get hot near the firewall hole and up the evaporator cavity.

Note: On some trailer bodies it is too difficult to remove the internal bulkhead – there are a number of variations which differ from Manufacturer to Manufacturer – in this case measure up a suitable location to drill a hole through from the front which will exit just to the left of the internal bulkhead and feed the antenna cable through as described above.

Note:

If the UMD is installed inside the Controller Box then the antenna cable can be fed through the existing cable hole/gland at the back and bottom of the Controller box or else a hole can be drilled in the side of the box.

Figure 1: Drill Location for RF Antenna Hole

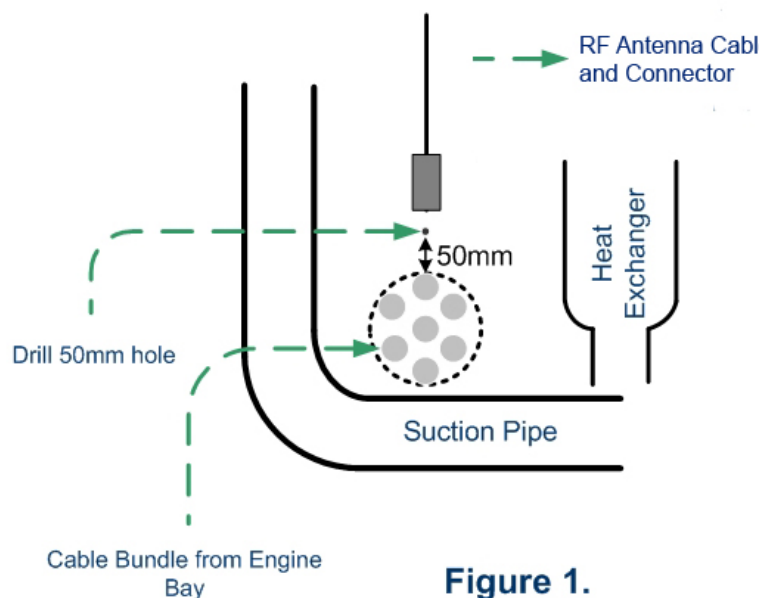


Figure 1.

Picture 5: RF Truck Antenna



RF Antenna Installation – Physical Location Inside the Trailer:

For optimal results the antenna should be mounted to the roof of the trailer in a horizontal position. Ensure that the antenna is located out from the back wall as far as possible but where it is still protected from damage by the internal bulkhead of the fridge unit – this provides the best opportunity for the antenna to communicate consistently with any tags located inside the trailer.

Wherever possible the RF Antenna should be located 300mm away from any steel such as fridge supports, internal bulk-heads etc

Use P-Clips to tidy up excess cabling and fasten to the internal wall.

Picture 6: RF Antenna Location inside the Trailer Box



RF Antenna Location behind the Side Panel
of the Fridge Unit



RF Antenna Located Above Internal Bulkhead –
Horizontal Orientation

RF Antenna Installation – Physical Location outside the Trailer Box:

If there are no Tags installed within the trailer then the RF Antenna can be located within the fridge unit on the outside of the trailer. The antenna is installed behind one of the side panels of the fridge so that it is out of sight to prevent unauthorized access or tampering with the system. See below for a suggested location.

UMD Power Cable:

The CoolTrax Power Cable comes complete with a 2A in-line fuse. The cable is 1.5M long and has a 6-Pin connector at one end and eye-connectors at the other.

Picture 7: CoolTrax Power Cable



Power Cable

1. Thread the power cable UMD connector up from the battery area behind all the engine bay hardware to the UMD. **DO NOT CONNECT TO THE UMD** at this time but leave enough cable in the area of the UMD so that there will be no tension on the cable when it is connected.
2. Coil and tie down any excess Power Cable Length in the UMD area.
3. Cable tie the UMD Power cable from the UMD area down to the battery area onto the existing wiring harness or fixed hardware that does not get hot.

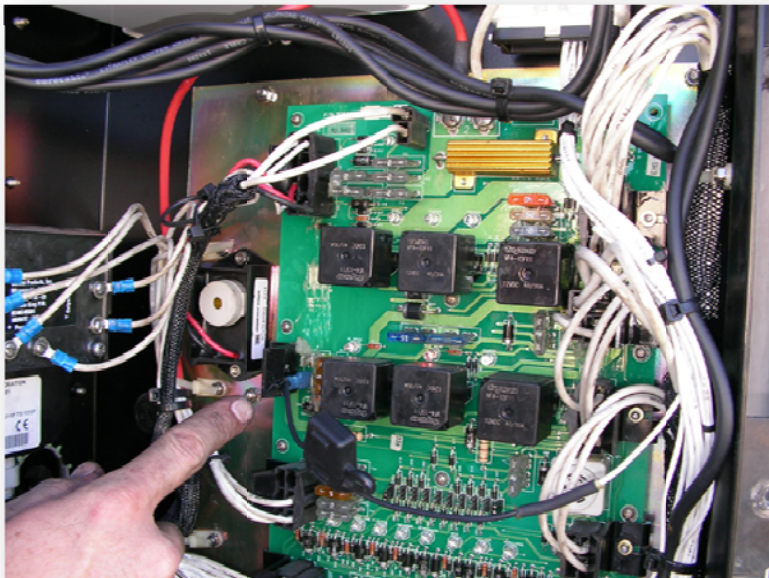
Note:

If the UMD is installed inside the Controller Box then the power cable can be fed through the existing cable hole/gland at the back of the Controller box or else a hole can be drilled in the side for the power cable and antenna cables.

Note:

Continuous power can also be taken from the motherboard of the controller rather than from the battery.

Picture 8: Continuous Power taken from Controller Motherboard



Installing the UMD

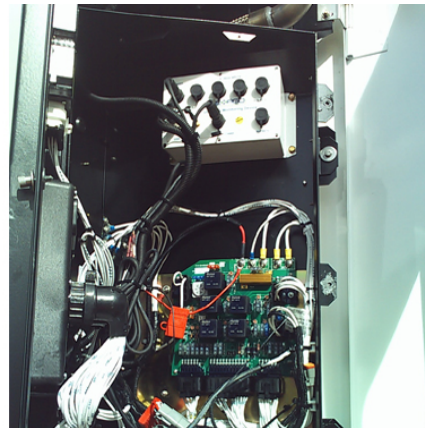
If you are fitting the UMD to a SB310 or later model TK fridge the UMD is located inside the controller box itself.

If you are fitting the UMD to a Spectrum, SL 200/400E or earlier model fridge the UMD is typically located in a space immediately above the controller – see images below.

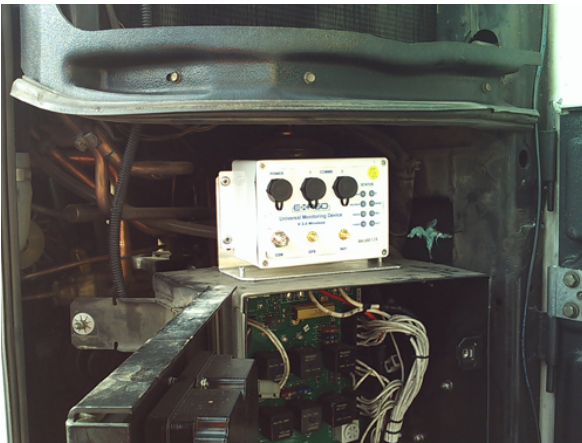
Picture 9: UMD Installation Location.



UMD Located Above the Fridge Controller – V2 UMD in picture



UMD Located inside the Fridge Controller - V1 UMD in picture



UMD attached to bracket on top of Controller Box - V2 UMD in picture

The method of fitting the UMD depends upon the fridge controller and where you choose to locate it, the UMD can be fixed to the controller box or fridge chassis with any combination of the following:

1. The UMD can be pop-riveted or screwed to the chassis of the fridge if it is installed in the gap above the fridge controller box

2. The UMD can be pop-riveted directly to the inside of the controller box itself – as seen in the second picture above
3. The UMD can be attached to a mounting bracket and the bracket then secured to the top of the controller box in the case of a SB400 Installation or others.

Once the UMD is installed the Thermo King i-Box can be fitted.

Thermo King I-Box and Loom Assembly:

This procedure should be read in conjunction with the TK I-Box installation procedure, which forms part of the I-Box kit. There are at least two different types of I-Box to suit various types of TK controllers.

1. uP IV or uPV or uP VI or TG V1 – TK Part No# 40-816
2. SR2 TK part No# 40-870

Ensure the I-Box kit provided matches the TK Controller type.

Most TK controllers have the optional Data Acquisition System 'DAS' fitted. If the DAS is fitted it is located on the inside top of the TK controller door. The DAS is mounted on three fixed studs with its cable loom on the bottom face. This I-Box installation procedure addresses both options, that is TK Controllers with and without the DAS fitted.

TK uP1V or uPV or uPV1 I-Box installation:

Refer to TK Instruction Sheet for the 40-816

IF A TK 'DAS' BOX IS ALREADY FITTED:

1. Remove the nylok nuts and washers, which secure the DAS box.
2. Pull the DAS box away from the Controller door and let it gently hang by its cable harness.
3. Fit the I-Box over the three panel studs with the I-Box connector facing down and firmly secure with three tapped hex spacers supplied in the I-Box installation kit.
4. Plug in the I-Box cable harness supplied in the I-Box installation kit and ensure its connector locking clip engages.
5. Place DAS box over the top of the I-Box on the three hex spacers and secure it with three screws, plain and shake-proof washers supplied in the I-Box installation kit.

IF THERE IS NO 'DAS' BOX FITTED:

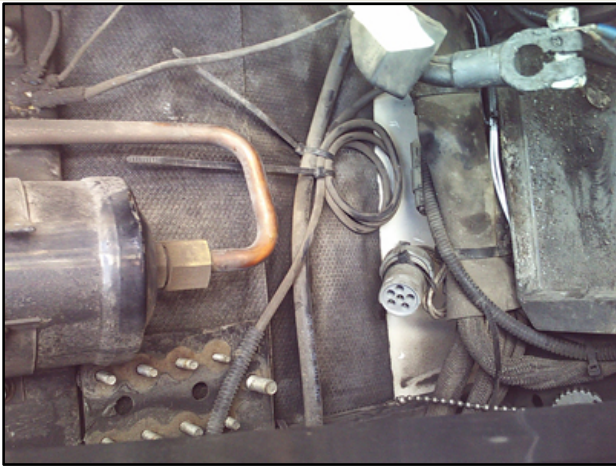
1. Fit the I-Box over the three panel studs with the I-Box connector facing down and firmly secure with three plain washers and nylok nuts supplied in the I-Box installation kit.
2. Plug in the I-Box cable harness supplied in the I-Box installation kit and ensure its connector locking clip engages.

I-BOX WIRING:

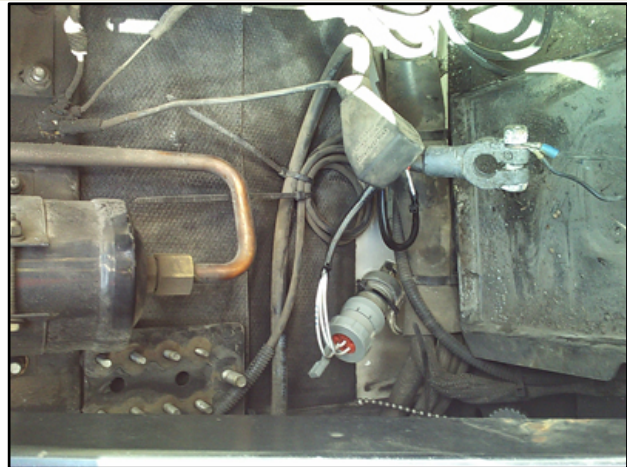
- | HARNESS WIRE LABEL | UMD FRIDGE COMMS CABLE |
|--------------------|------------------------|
| RXD3 | Red Wire |
| TXD3 | White/Clear Wire |
| COM3 | Black Wire |

1. Connect the blue eye terminal to the chassis connection above the cable harness exit from the enclosure.
2. Thread the strain relief back-shell of the Deutsch connector from the I-Box kit over the wire harness with the three female crimped terminals with the cable support bracket away from the female terminals.
3. Insert the three female terminals into the 6 way Deutsch connector from the I-Box kit from the connector rear and ensure they are pressed fully home and locked. These are to be inserted as follows :
4. WIRE LABEL DEUTSCH CONNECTOR LOCATION
5. TXD2 A
6. RXD2 B
7. COM2 C

8. Insert the three blanking / sealing pins into the unused connector locations, D, E & F
9. Screw the strain relief onto the rear of the connector and tighten.
10. Cable tie the three wire cable bundle to the strain relief.
11. Locate the unused 6 way Deutsch connector that should be tied down with the cable bundle that runs behind the battery on the floor of the engine bay. This cable / connector assembly should have a sealing cap fitted. Remove the cap.
12. Connect and lock the Deutsch connector from the I-Box to this connector.
13. Stow the mated connectors and cable tie to the main wiring harness.

Picture10: i-Box Connection to Deutsch Connector

Deutsch Connector located behind the battery



i-Box connected to Deutsch Connector

Picture 11: DAS***TK SR2 I-Box installation:***

Refer to TK Instruction Sheet provided with the 40-870 Kit. With these units there will not be a separate DAS box fitted so the three internal studs on the controller cabinet door should be free.

I-BOX INSTALLATION:

1. Fit the I-Box over the three panel studs with the I-Box connector facing down and firmly secure with three plain washers and nylok nuts supplied in the I-Box installation kit.
2. Plug in the I-Box cable harness supplied in the I-Box installation kit and ensure its connector locking clip engages.

I-BOX WIRING:

1. Cut off the three female crimped terminals from the leads labeled TXD2, RXD2 and COM2 and strip approximately 4mm of insulation from these leads.
2. Hard wire the i-Box Harness wires with the UMD fridge Interface cable wires as per the connections below
3. Push the COM2 blue eye terminal lead through the cabinet's main cable entry port in the bottom rear of the cabinet. From the battery side of the cabinet pull this lead through until the red tape on the wire just appears. Connect this lead to the chassis connection point on the firewall, behind the Controller cabinet
4. Attach the 8 pin connector to the connector labeled J12 on the TK Controller PCB.

UMD / Fridge Comms Cable:

Picture 12: Interface Cable



The UMD Fridge comms cable can be installed in two ways.

OPTION 1: The UMD Fridge comms cable can be installed through the grommated hole in the bottom rear of the controller cabinet if there is room. This is the preferred option. If there is not room to fit the UMD comms cable in this area, the second option may be used.

OPTION 2: The UMD Fridge comms cable can be installed through an existing hole in the side of the TK Controller Cabinet. This hole has a sealing patch fitted over it. If this option is used, the hole must be re-sealed with silicone adhesive after the UMD Comms cable has been installed.

OPTION 1 Cable Installation:

1. Feed the UMD Fridge Comms cable from the UMD down the back of the TK Controller cabinet behind the engine bay hardware. (In the same area that the other UMD cables have been run.). Leave enough cable in the UMD area so that when the UMD Comms Cable connector is connected to the UMD there is no tension on the cable or connector.
2. Cable tie the UMD Comms cable at the rear of the TK Controller cabinet.

3. From the battery compartment side , gently push the three loose crimped male pins and cable body through the grommated hole in the bottom rear or the TK Controller cabinet. Pull any excess cable length into the TK Controller cabinet.

OPTION 2 Cable Installation:

1. Push a hole through the sealing patch where the hole is in the TK Controller cabinet (Ref. Fig. 6.)
2. Feed the UMD Fridge Comms across the top of the TK Controller cabinet, down the side and through the formed hole. Leave enough cable in the UMD area so that when the UMD Comms Cable connector is connected to the UMD there is no tension on the cable or connector.
3. Pull any excess cable length into the TK Controller cabinet.
4. Silicone seal around the formed hole.

UMD to i-BOX Connection:

For μ P1V, V and V1 i-Boxes:

1. The Rxd3 wire connects to the UMDs comms cable red wire
2. The Txd3 wire connects to the UMDs comms cable white / clear wire.
3. The Com3 connects to the UMDs comms cable black wire.

For SR2 i-Boxes:

1. The RXD2 wire to the UMD cable RED wire
2. The TXD2 wire to the UMD cable WHITE / CLEAR wire
3. The COM3 wire to the UMD cable BLACK wire

Final Steps to Connect UMD and I-BOX:

Unplug the dust cap on the UMD 'COMM 1' connector

Connect the UMD Fridge Comms Cable to the 'COMM 1' port on the UMD

Diagnostic Tests:

In all cases, after these connections are made and the I-box and UMD are ON, the following voltages should be present.

- Set a Digital Multi Meter to DC volts
- Connect the meters negative lead to the chassis and connect the positive lead of the multi meter to UMD cable RED Wire. This should read -8 to -11 Volts
- Move the meters positive lead to the UMD cable WHITE / CLEAR wire. This should read 0 volts
- Then move the meters positive lead to RXD(x) from the Thermo King I-Box. This should read 0 Volts (To RED wire on UMD)
- Then move the meters positive lead to the TXD(x) from the Thermo King I-Box. This should read -8 to -11 Volts (to Black wire on UMD)

Make sure all the leads are fully insulated and supported after the correct connections are verified.

System Test:

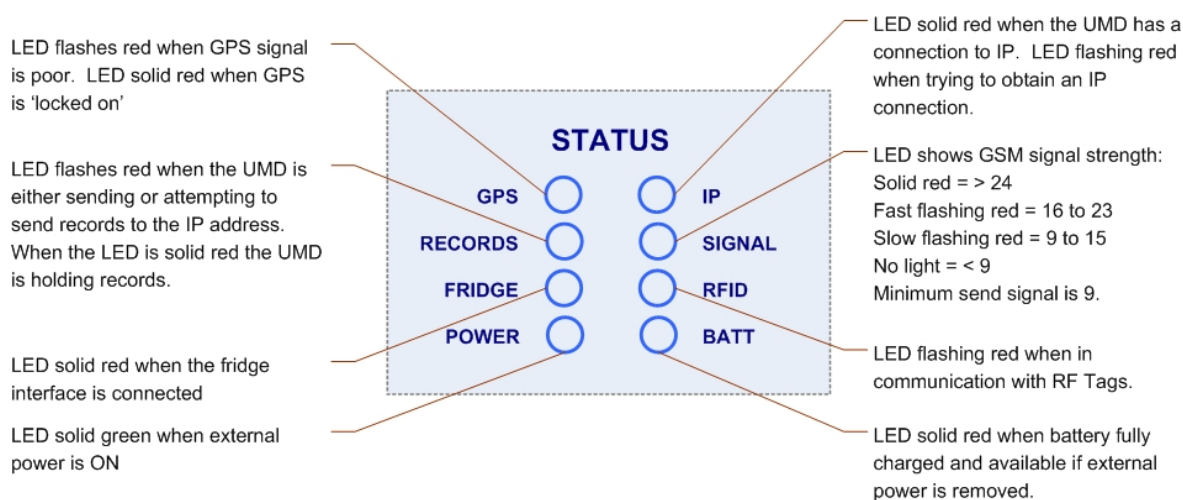
1. Check the Engine Bay for any tools, fixings or off-cuts, which may have been left behind.
2. Install and re-connect TK System Battery
3. Tie all new I-Box and UMD looming within the TK Controller Cabinet.
4. Un-plug the UMD 'POWER' connector dust-cap and connect the UMD Power lead.
5. Turn ON the TK Controller using the main 12V ON/OFF switch and be prepared for the refrigeration system to start.
6. Ensure that the RED led in the I-Box in either a uP or an SR application is glowing a steady RED.
7. Screw closed the TK Controller Cabinet Door.

Please Note: Always connect the power to the UMD last!

Boot-Up Sequence:

1. Within approximately 30 seconds the UMD 'Power' LED will light up GREEN, followed closely by the battery light.
2. Shortly after the Signal LED will begin to flash, assuming that there is GPRS or 3G service available on the GSM/3G network.
3. The IP LED will at first flash and then remain in a constant ON State once an IP connection has been established
4. The GPS LED will light up a constant RED to indicate that GPS has been acquired – typically in 30 secs or less.
5. If RF Tags have been installed then the RF LED will flash every few seconds as the tags communicate with the RF Reader section of the UMD

Picture 13: UMD LED's



Wireless Tag Installation:

The new RFID UMD communicates with CoolTrax remote temperature and door sensors via wireless; this saves considerable installation time. Depending on the customers desire to have independent temperature reading points in the trailer or a door open and close tag and magnet, CoolTrax provides RF capable tags which communicate with our UMD, these tags should be located by the installer according to the customer's requirements.

Picture 14: Wireless Temperature and Door Tags



Wireless Temperature Tag



Wireless Door Tag and Magnet

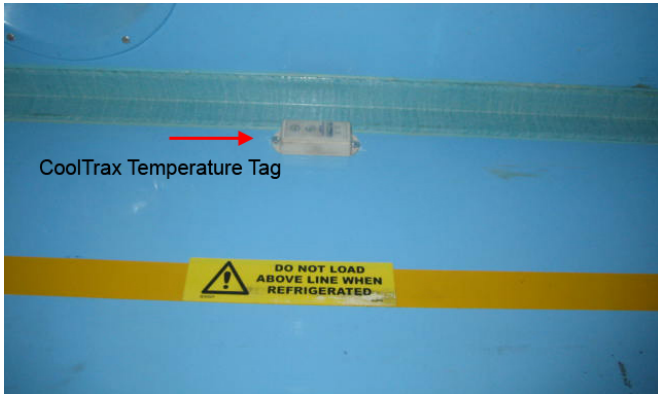
CoolTrax Wireless Temperature Tag:

Each CoolTrax Tag has a flanged base with holes to allow the installer to either screw or pop-rivet the tag to the trailer wall or door.

Check with CoolTrax or the customer for information in respect to where the tags should be located in each trailer.

Important Note: The RFID Tags supplied with a UMD are specific for that particular UMD they must be kept with and installed with the specific UMD. If RF Tags from another UMD Kit are installed they will not be able to report to that UMD.

Temperature and Door Tags need to be located in a position within the trailer where they will not be damaged in the trailers normal daily operations – by fork-lifts when loading pallets etc.

Example Temperature Tag Locations:*Picture 15: Wireless Temperature Tags*

Temperature Tag located above the load line along the trailer wall.



Temperature Tag located by the Return Air duct

CoolTrax Wireless Door Tag and Magnet:

The location of the Door Tags and Magnet will vary according to the various body types of the trailer and whether the fitted doors are roller or barn style. The important consideration, again, is to locate the Tag and Magnet in a position where they will not be damaged. This requires a careful assessment by the installer on a case by case basis as there are so many variations from trailer to trailer and even between the different door types.

Installation Options:

1. On the Inside of the Barn doors with the magnet located on the RH door (looking from inside the trailer out
2. If the Trailer body has a lip along the top at the rear then the tag can be located on the inside of that lip where it is protected and the magnet attached to a bracket on the inside of the door
3. In the case of a roller type door the tag is typically located on the inside LH side wall directly adjacent to the roller door and the magnet located on the roller door itself – checking for clearance when the door is “rolled up”. See picture below.

Picture 16: Wireless Door Tags

Door Tag fitted to a Roller Door Installation

Door Tag and Magnet fitted to Barn Door

Post Installation:

Once the physical installation of the unit is complete and the UMD is powered on contact CoolTrax Support staff so that they can check that the unit is reporting as expected.

On contact provide the following Installation Details (via phone or fax the completed Installer Template provided by CoolTrax):

1. The Customer Name
2. The Fleet ID of the Trailer
3. The UMD ID (located on the front of the UMD – typically UBXXXX)
4. The Fridge Model
5. The Sensor location with Sensor ID – if fitted
6. The installer name and contact details – mobile phone number to call once the unit has been tested

Please ensure that CoolTrax staff confirms that the unit is reporting data as expected **BEFORE** the trailer leaves the installers premises.

CoolTrax staff will ask you to conduct a number of fridge operations as part of the Installation Check to make sure the unit fridge interface is correctly installed and configured.

- Power the fridge unit on and off to check the Fridge Interface is functioning as expected
- Change Set Point Temperature

- Open and Close the Rear Door to test Door Tag if fitted.

CoolTrax Support Contacts:

Andrew Wong Yen – (613) 9686 6011

Joseph Bortignon – (613) 9686 6011

UMD Specifications:

UMD Power	Power Supply	12VDC to 48VDC
	Average Power Consumption	Less than 2W
	Internal Fuse	2A (not field replaceable)
Discrete	Type	Closing contact
	No of Channels	2
WiFi Interface	Band	430 MHz UHF ISM
	Transmit Power	10 dBm Max Burst Transmission
	Receive Sensitivity	-100 dBm typical
	Range	50m typical in clear line of sight
Serial Data Comms	Comm 1	RS-232
	Data Rate	9600 Baud Standard - configurable up to 38.4K Baud by firmware
	Function	Typical use for fridge interface
	Comm 2	RS-232
	Data Rate	9600 Baud Standard - configurable up to 38.4K Baud by firmware
	Function	Typical use for firmware upgrades
GPS		Specifications subject to available / visible satellites
Acquisition Time	Power Up	< 1min typical

Accuracy	Re-acquisition	< 1 sec typical
	Horizontal	< 2.5 meters CEP
Enclosure Dimensions	Length	2170 mm
	Width	103 mm
	Height	95 mm
Mounting Centers	Min height clearance	160 mm
	(4 by 5.0mm slot holes in base flanges)	Mountable in any attitude
	Length	157 mm
	Width	60 mm
Environmental Specifications	Sealing	IP65
	Operational Temperature	-30°C to +60°C (external)

RF Tag Specifications:

Tag Power	Internal battery	3.6V lithium thionyl chloride
	Average Power Consumption	Less than 70 uW
	Expected Life	< 3 years
Range and Accuracy	Temp measurement accuracy	±0.5°C by calculation
	Temp range	-30°C to +70°C
	Stabilisation period	4 hrs typical
Sample Rates and Temperature Data Storage	Sample send rate (temp mode)	20 secs average
	Sample rate (consignment mode)	1 min to 4 hrs in 1 min increments
	Temp data storage capacity (consignment mode)	31,488 samples
	Temp data upload rate	400 samples per sec
	Range	50m typical in clear line of sight
WiFi Interface	Band	430 MHz UHF ISM

Enclosure Dimensions	Transmit Power	10 dBm Max Burst Transmission
	Receive Sensitivity	-100 dBm typical
	Range	50 m typical in clear line of sight
	Length	97 mm
	Width	40 mm
Mounting Centers	Height	22 mm
	(2 by 3.5mm by 13mm slot holes in base flanges)	Mountable in any attitude subject to antenna requirements
Environmental Specifications	Sealing	Wet assembled
	Operational Temperature	-30°C to +70°C (external)