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TECHNICAL PUBLICATIONS

CT 3500 (with ECM)
Installation Guide

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ABOUT THIS INSTALLATION GUIDE

IMPORTANT

READ ALL INSTRUCTIONS CAREFULLY BEFORE INSTALLING. FAILURE TO DO SO MAY CAUSE PERSONAL INJURY OR DAMAGE TO PRODUCT AND/OR PROPERTY.

• Review the product package and contents prior to beginning the installation. Take care when opening the packaging and removing items. If a return is needed, you will want to return the product in its original packaging if possible. • This instruction guide is provided as a GENERAL installation guide; some assets vary dimensionally and may require additional steps. • ORBCOMM has a policy of continuous development and improvements. Therefore, products, guides, and technical information are subject to change without prior notice. • The manufacturer and / or distributors do not accept responsibility for third-party charges, labor, and / or third-party replacement modifications that are not ORBCOMM approved. Some modifications may void the factory warranty. • ORBCOMM does not accept any responsibility for installations performed by installers / third parties not approved and / or authorized by ORBCOMM. Some installations may void the factory warranty.• Exercise due diligence when installing this product. ORBCOMM does not accept any responsibility for asset damage or personal injury resulting from the installation of this product. Careless installation and operation can result in serious injury or equipment damage. • All liability for installation and use rests with the owner / operator. • Always make sure you have a clean, dry, and well-lit work area. • Always ensure products are secure during disassembly and installation. • Always take steps to protect yourself when drilling, cutting, and grinding because this may create flying particles that can cause injury. • Thoroughly inspect the area to be drilled, on both sides of material, prior to modification, and relocate any objects that may become damaged. • Always route electrical cables carefully. Avoid moving parts, parts that may become hot and rough, or sharp edges. • Make sure to fully understand the product, its intended use, and operation prior to use.

Purpose

This guide contains hardware and installation information for the CT 3500. The intended audiences for this guide include field support personnel, product evaluators, and certified third-party personnel. It is particularly intended for personnel who are responsible for system installation and activation. In addition, and as is appropriate, this guide may be used for customer training.

Cautions Concerning Servicing of the CT 3500

⚠️ The reefer must be turned off when service work is required, and there may be a temperature change within the refrigerated compartment that may lead to the loss of the load. ORBCOMM is not liable for lost loads. Be aware of the temperature within the refrigerated compartment during servicing.

Battery Warnings

CAUTION: Always follow local disposal guidelines to properly dispose of the Lithium-ion battery and the device.

CAUTION: Store in a cool, well-ventilated area. Elevated temperatures will result in shortened battery life.

CAUTION: DO NOT replace the battery. Changing the battery without ORBCOMM's permission could violate regulatory conformity.

CAUTION: DO NOT throw the internal battery or the device into fire.

WEEE Statement

Disposal of this product should be handled according to all national laws and regulations.

The mark shown to the right is in compliance with Waste Electrical and Electronic Equipment Directive 2002/96/EC (WEEE). The mark indicates the requirement NOT to dispose the equipment as unsorted municipal waste but use the return and collection systems according to local law.	

1 INSTALLATION OVERVIEW

The CT 3500 allows for remote management and control of reefers traveling globally in complex supply chains. It is drilled and fixed to reefers with connections inside the controller cabinet. Refer to APPENDIX G for a summary of the CT 3500.

Figure 1: CT 3500 (bottom view showing double-sided tape)

1.1 Gather the Required Tools and Materials

Tools and materials required for a CT 3500 installation vary by OEM and mount type. Review the various sections below to ensure you have the items you need before you begin the installation.

1.1.1 Gather the Customer Supplied Tools and Materials

Table 1 lists the typical customer supplied tools and materials that are required for a CT 3500 installation. Some installations may require additional tools.

Table 1: Customer Supplied Tools and Materials

Quantity	Description	Quantity	Description
1	Electric drill	1	Wire cutters
1	Drill bit sizes: 29 mm (1-1/8") and 34 mm (1-21/64")	1 pkg	Wire / cable ties
1	Small flat head screwdriver	1	Phillips head screwdriver
1	2.5 m (8 ft.) Step ladder (Optional)	1	Flood lamp (Optional)
1	30.5 m (100 ft.) Extension cord (Optional)		

1.1.2 Verify the Components

Use Table 2 and the figures in section 1.1.4 as a checklist to verify that you have all the parts you required before starting the installation.

1.1.3 System Components Parts List

Once you have determined the type of installation (OEM and mount style), use Table 2 as a checklist to verify that you have all the required parts for that type of installation. These parts are available from ORBCOMM. You require a CT 3500 + an Installation Kit + (if required) ancillary cables / connectors.

The installation kit includes a main cable harness (door or panel) that interfaces between the CT 3500 and the ECM.

Contact your Account Manager if you require additional product details or parts.

Table 2: Checklist of Components

OEM	Mount Type (required)	CT 3500 Device (required)	Installation Kit [1] and the list of items within each kit based on mount type (required)		Ancillary Cables (ONLY required for a PLM install)
Carrier / Daikin / Star Cool	Door Mount	CT3500-1700-S	ST101285-002	- Door mount cable harness (p/n ST101218-001) - ECM - Cleaning items (alcohol swab, abrasive pad, primer)	ST101051-001 (PLM AC) ST101052-001 (PLM Comms)
	Panel Mount	CT3500-1700-S	ST101285-001	- Panel mount cable harness (p/n ST101217-001) - NPT cable gland - ECM - Cleaning items (alcohol swab, abrasive pad, primer)	

Thermo King INSTALLATION

OEM	Mount Type (required)	CT 3500 Device (required)	Installation Kit [1] and the list of items within each kit based on mount type (required)		Ancillary Cables and Connectors (required)
Thermo King (TK) MP3000	Panel Mount	CT3500-1700-S	ST101285-001	- Panel mount cable harness (p/n ST101217-001) - NPT cable gland - ECM - Cleaning items (alcohol swab, abrasive pad, primer)	ST101050-001 (Reefer AC) ST101049-001 (Reefer Comms)
Thermo King (TK) MP4000	Panel Mount	CT3500-1700-S	ST101285-001	- Panel mount cable harness (p/n ST101217-001) - NPT cable gland - ECM - Cleaning items (alcohol swab, abrasive pad, primer)	ST101050-001 (Reefer AC) ST101054-001 (Reefer Comms) ST101053-001 (PLM Comms) CON100537 (Wago connector x 3)

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[1]Components within the install kit are subject to change without notice.

1.1.4 Images of Common System Components

These images[1] are for easy identification of the components mentioned in Table 2.

Note: Not all of these components are required for every type of installation, and some components are included in the Installation Kits described in Table 2.

CT 3500	Door Mount Cable Harness (main cable harness)	Panel Mount Cable Harness (main cable harness)
External Connection Module (ECM)	Alcohol Wipe / Abrasive Pad / Adhesive (cleaning supplies in the Install Kits)	NTP Cable Gland
Wago Connector	Refer to Table 2 for the list and APPENDIX A for images Ancillary Cables	No Image IoT Presence Label [2]

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[1]Actual hardware may not be exactly as shown and is subject to change without notice.
[2]This item is available in some kits.

1.2 Disconnect the Reefer Power

CAUTION: WARNING: Risk of Electrical Shock
Only trained service personnel should perform the procedures outlined in this installation guide.
These procedures may allow exposure to high electrical energy that could result in electric shock
and injury to untrained personnel during unit servicing, maintenance, and installation.

1. Disconnect the AC power cable.
2. Ensure the breaker is in the OFF position.

1.3 Determine a Suitable Mounting Location

Note: For locations other than the controller door, the long harness and the optional cable sealing gland are required.

1. Choose one of the following mounting locations based on the model of your reefer, and then mark the location.

   Carrier (2 possible locations - controller door or side panel)
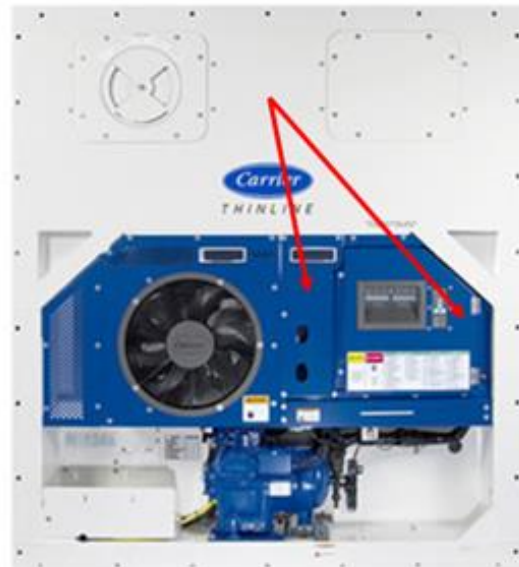
Daikin (3 possible locations - controller door, handle panel, or side panel)

Star Cool (3 possible locations - controller door or side panels)

Thermo King (side panel)

1.4 Drill the Hole

Some installation locations may have a preexisting hole in the controller cabinet that you can use. If not, drill a hole for the main cable harness as per the instructions below.

1. For a panel mount installation, remove any adjacent panels or the fan shroud to gain access to the back of the mounting panel. Take care not to drill into anything behind the mounting panel.

   Note: Panel installations also require a second feed hole in the reefer panel.

   OR

   For a door mount installation, open the door and ensure there are no obstacles behind the door that would restrict the cable access.

2. Use the 29 mm (1-1/8") drill bit to drill a hole in the panel or door.

Hole in panel for device mounting

3. Clear away any debris or drill shavings.

1.5 Route the Main Cable Harness

Note: Be aware of the bend radius of the cables to ensure they are not adding stress to the cable connectors.

CAUTION: DO NOT route cables over the top of existing fans.

1. Use the supplied cable harness (door or panel) from the appropriate installation kit (Table 2).

    For a panel mount installation

    a. Start inside the controller cabinet, feed the 12-pin (M12) circular connector of the main harness through the NPT cable gland, and then through the hole in the controller cabinet to the outside of the cabinet

    b. Route the 12-pin connector end of the harness along to the back of the panel to the 29 mm (1-1/8") hole.

    c. Ensure the harness is tucked away and secured to other wiring or structures, using cable ties, and does not interfere with the fan or other moving parts.

    d. Feed the 12-pin (M12) circular connector end of the main cable harness through the back of the panel hole to the outside, as shown below.

    OR

    For a door mount installation

    a. Route the main cable harness from the back of the hole in the door, across the door hinge and along any existing wiring route to the location of the available 7-pin serial and 3-pin power connections (normally used for an RMU/PLM).

    b. Secure the main cable harness to other wiring or structures using cable ties.

    c. Ensure there is enough slack for the door to open and close freely.

1.6 Install the ECM

1. Find a mounting location for the ECM in the cabinet.

2. Use the provided cleaning supplies to prepare the mounting surface (sand and clean).

3. Apply the primer to the area and wait at least 30 seconds for the primer to dry. Refer to Inclement Weather Guidelines if the temperature is below 15°C / 59°F or the mounting surface is wet.

4. Remove the adhesive backing on the bottom of the ECM.

    CAUTION: DO NOT touch the double-sided tape.

5. Affix the ECM to the desired location, and then press firmly on the entire top surface (applying a force of 7 kg (15 pounds) for 60 seconds) to bond the double-sided tape to the install surface.

1.7 Make the Main Harness Connections

1. Check the pins on the CT 3500 to ensure they are not bent or damaged, before making the harness connections.

    CAUTION: Slightly bent pins can result in mating problems with the harness connector. In this case, straighten the pin. Completely bent pins make the device unusable.
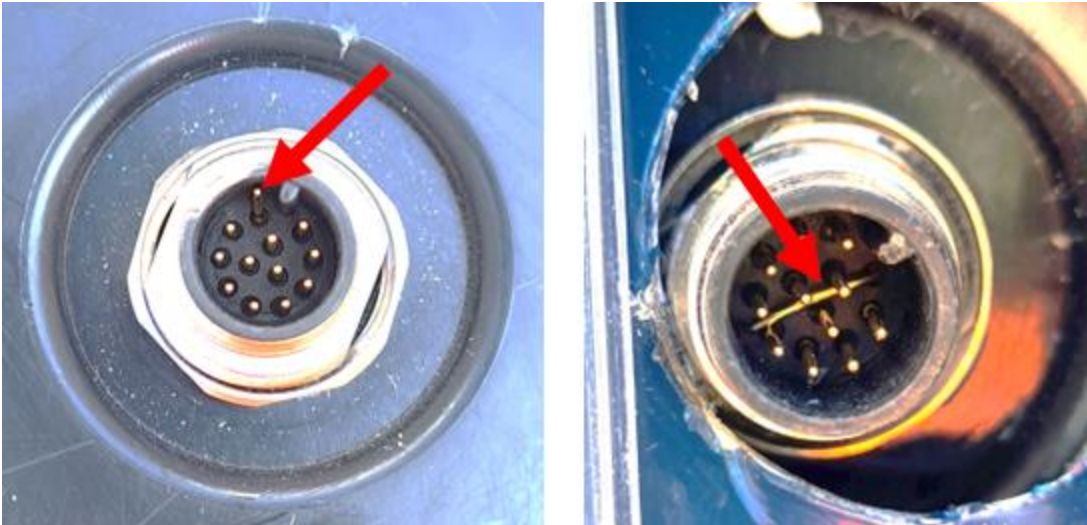
2. Make the ECM 3-pin, 7-pin, and 10-pin connections. Refer to the appropriate appendix to make the harness connections inside the cabinet. See cautions and guidelines in the next step for the 12-pin (M12) circular connector.

    Note: Make sure all the ECM connectors are fully pushed in (seated / good contact) before continuing with the installation.

    CAUTION: Misalignment of the main cable harness green 10-pin connector to the ECM terminal connector causes electrical over stress on the CT 3500 and the ECM. Refer to the misalignment figure in APPENDIX B.

OEM	Description	Refer to
Carrier / Daikin / Star Cool	Installation without PLM - for door or panel install	APPENDIX C

OEM	Description	Refer to
	Installation with PLM [1] - for door or panel install	APPENDIX D
Thermo King	MP3000	APPENDIX E
	MP4000	APPENDIX F

3. Make the 12-pin (M12) circular connection to the CT 3500.

    a. Align the keys.

    CAUTION: Ensure you align the key on the harness with the key on the CT 3500 12-pin (M12) connector before pushing the two connectors together.

    b. Push in the direction of the arrow, and then slowly hand tighten the connectors together. Periodically push and tighten to ensure it is fully seated and the lock nut stops turning.

    CAUTION: DO NOT over tighten and DO NOT use any tools to turn the lock nut.

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[1]PLM - Power Line Modem

1.8 Commission the CT 3500

The installation is successful if you see a solid green LED on the device and the device is communicating.

1. Connect the reefer AC power cord.

2. Reset the reefer circuit breaker.

3. Turn on the reefer and allow it to start.

   Note: The reefer must be in Normal Run mode, NOT in Unit OFF mode or in Pre-Trip Inspection (PTI) mode.

4. Power cycle the reefer by powering it OFF at the breaker for >10 seconds, and then powering it back ON. Wait for the LED to turn green.

   Note: On some assets, it can take up to 10 minutes for the LED to appear as solid green. If after this time the LED is not green, power cycle the reefer again, and then check for a green LED. For more LED information, refer to the troubleshooting LED section in APPENDIX L.

5. Verify CT 3500 operation by doing <u>one</u> of the following:

   - Confirm that the CT 3500 is reporting in the ORBCOMM Maritime platform.

   - Use the ORBCOMM Field Support Tool to confirm the asset ID. Refer to the *MA002 Field Support Tool User Guide* for download instructions.

   Note: Once installed and powered on, the CT 3500 self-commissions, so no additional activation steps are required.

1.9 Mount the CT 3500

1. Use the cleaning supplies from the installation kit to prepare the surface (sand and clean) around the 29 mm (1-1/8") device hole in the panel (or door).
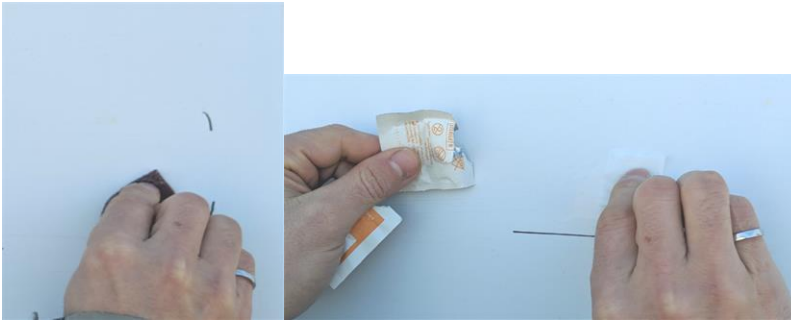
2. Apply the primer to the area and wait at least 30 seconds for the primer to dry. Refer to APPENDIX K for inclement weather guidelines.
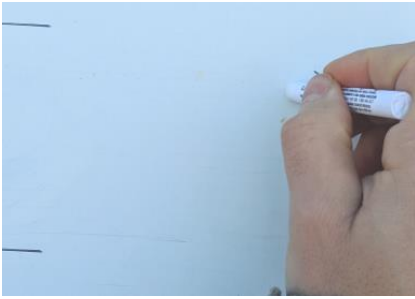
3. Peel the backing off the CT 3500.

   CAUTION: ORBCOMM recommends that you ensure the CT 3500 and hardware are working as expected <u>before</u> affixing the ECM or CT 3500 to the asset with double-sided tape.

   CAUTION: DO NOT touch the double-sided tape.

4. With the CT 3500 in a vertical position, and the ORBCOMM branding label text running left to right, press firmly on the entire top surface of the device (**applying a force of 15 kg (30 pounds) for 60 seconds**) to ensure the double-sided tape bonds to the asset.

5. If an IoT Presence label is required (ships with some device models), place it on the face of the reefer above the reefer door or in the designated location.

APPENDIX A CABLE HARNESS DESCRIPTIONS

This section describes the cable harness hardware. For details on how to connect the cable harness to the device, refer to APPENDIX B to APPENDIX F as appropriate. All units shown in mm.

Installation Kit Main Cable Harnesses

Depending on the type of installation kit ordered, it includes either a panel mount cable harness or a door mount cable harness.

Figure 2: CT 3500 Panel Mount Cable Harness (p/n ST101217-001)
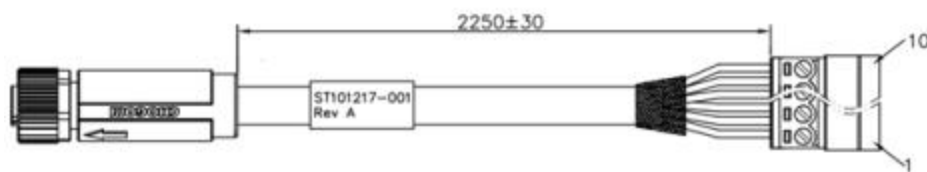
Figure 3: CT 3500 Door Mount Cable Harness (p/n ST101218-001)
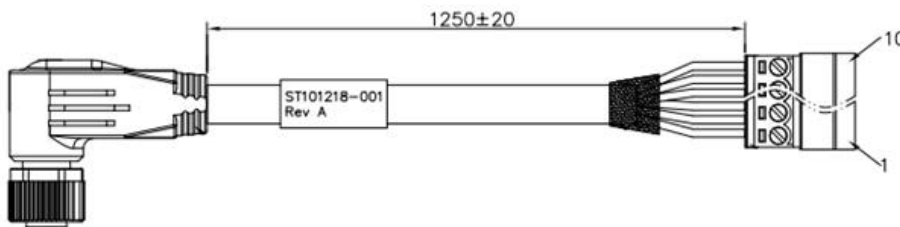
Ancillary Cables

Units are shown in mm.

Refer to Table 2 to see which CT 3500 ancillary cables are required for the various types of installations.

PLM Cables

Figure 4: PLM / AC Power Cable (p/n ST101051-001)
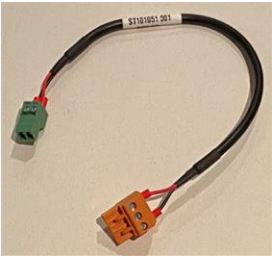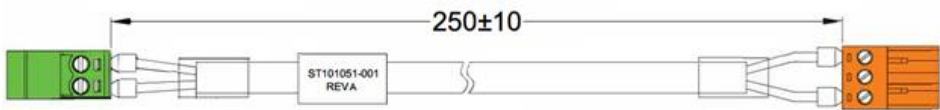
Figure 5: PLM Comms Cable (p/n ST101052-001)
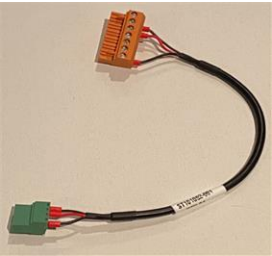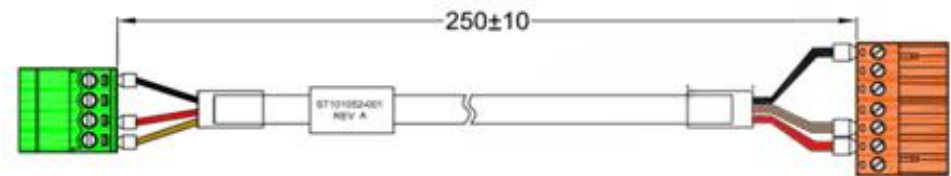
Thermo King MP3000

Figure 6: Reefer (Transformer)/ AC Power Cable (p/n ST101050-001 for MP3000 and MP4000)

(NO IMAGE)

Figure 7: MP3000 Reefer Comms Cable - 40 pin (p/n ST101049-001)
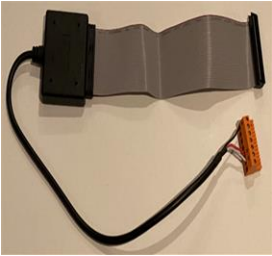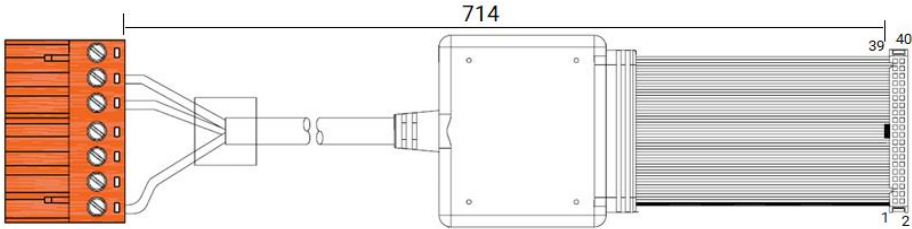
Thermo King MP4000

This installation also uses the ST101050-001 cable.

Figure 8: MP4000 PLM Comms Cable (p/n ST101053-001)
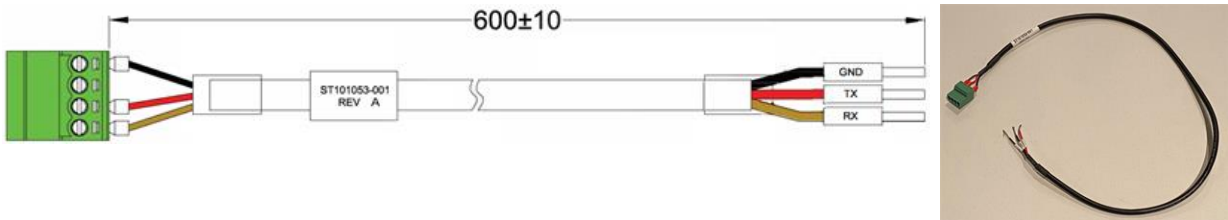
Figure 9: MP4000 Reefer Comms Cable (p/n ST101054-001)
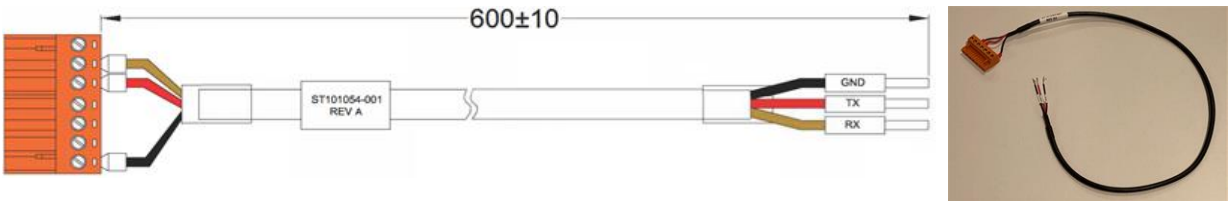
APPENDIX B DESCRIPTION OF ECM CONNECTIONS

The figure below shows the various ECM (p/n ST101057-001) connections.

| REEFER AC	Connects to the reefer's free hanging 3-pin power connector, sometimes referred to as RMM/PLM power.
REEFER COMMS	Connects to the reefer's free hanging 7-pin serial communications connector, sometimes referred to as RMM/PLM reefer comms.
TERMINAL	Connects the CT 3500 to the ECM via the CT 3500 10-pin cable harness.
PLM AC	Used when the CT 3500 and PLM co-exist on the reefer (co-existence). This connects to the RMM/PLM power connector.
PLM COMMS	Used when the CT 3500 and PLM co-exist on the reefer (co-existence). This connects to the RMM/PLM serial connector.
I/O	For ORBCOMM future use

CAUTION: Misalignment of the main cable harness green 10-pin connector to the ECM terminal connector causes electrical over stress on the CT 3500 and the ECM.

APPENDIX C ECM CONNECTIONS FOR A CARRIER / DAIKIN / STAR COOL INSTALLATION WITHOUT PLM

These instructions focus on the ECM connections for a Carrier / Daikin / Star Cool Power Line Modem (PLM) standard door or panel installation (without a Power Line Modem (PLM)). Refer to APPENDIX B for a description of each ECM connection.

Note: Figures shown are not to scale and cables or connectors may be longer than they appear.

Make the ECM Connections

For panel mount installations: Everything to the right of the NPT gland is inside the controller cabinet.

Figure 10: Standard Panel Mount Connection (without PLM)
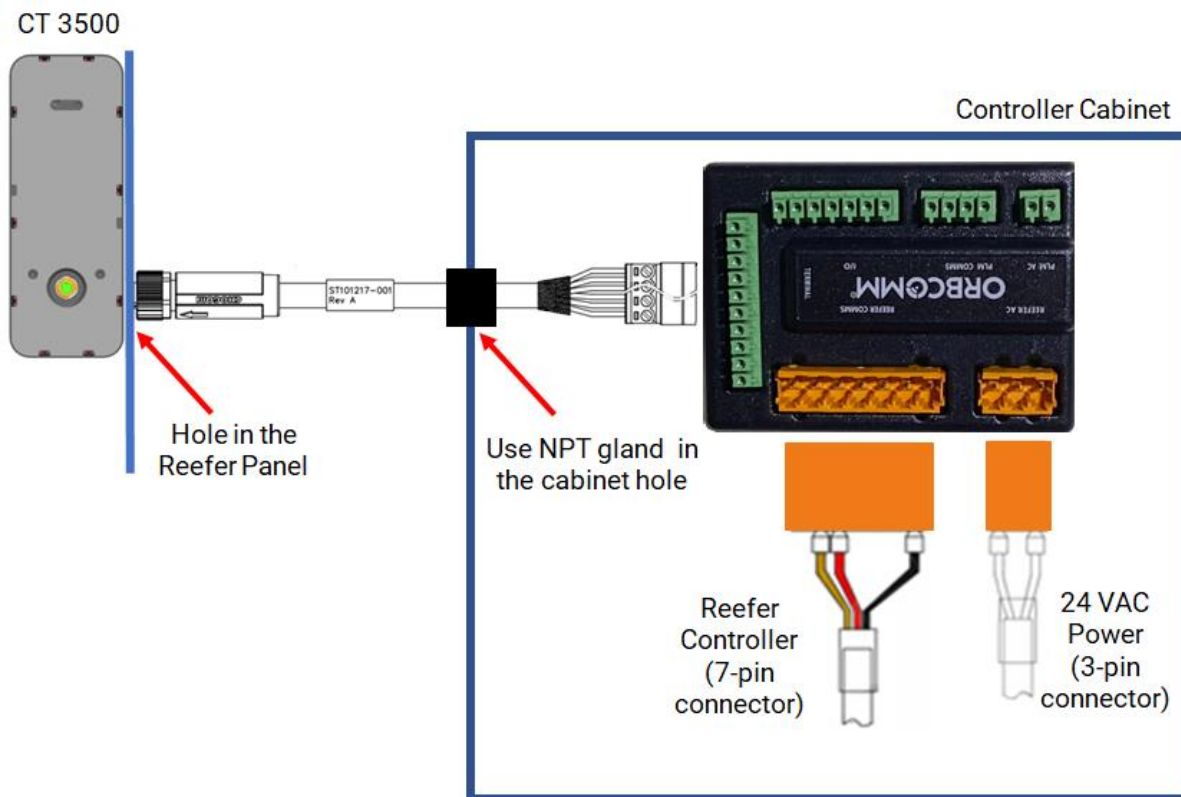
For the door mount installations: Connection to the device is made though a hole in the controller cabinet door, and then the main cable harness is contained within the cabinet.

Figure 11: Standard Door Mount Installation (without PLM)

Connections for a door or panel installation without PLM

1. Connect the green 10-pin connector of the main cable harness (door or panel) to the ECM **TERMINAL** connector.

    CAUTION: **Misalignment of the main cable harness green 10-pin connector to the ECM terminal connector causes electrical over stress on the CT 3500 and the ECM. Refer to the misalignment figure in** APPENDIX B.

2. Make the ECM connections for Carrier / Daikin /Star Cool:
    a. Connect the reefer's free hanging (green or orange) 7-pin serial connector to the 7-pin connector on the ECM identified as **REEFER COMMS**.
    b. Connect the reefer's free hanging green 3-pin 24 VAC connector to the 3-pin connector on the ECM identified as **REEFER AC**.
3. Continue with 1.9 Mount the CT 3500

# APPENDIX D ECM CONNECTIONS FOR A CARRIER / DAIKIN / STAR COOL INSTALLATION WITH PLM

These instructions focus on the ECM connections for a Carrier / Daikin / Star Cool Power Line Modem (PLM) door or panel installation. Refer to APPENDIX B for a description of each ECM connection.

These installations use ancillary cables:

- ST101051-001 (PLM AC)
- ST101052-001 (PLM Comms)

Note: Figures shown are not to scale and cables or connectors may be longer than they appear.
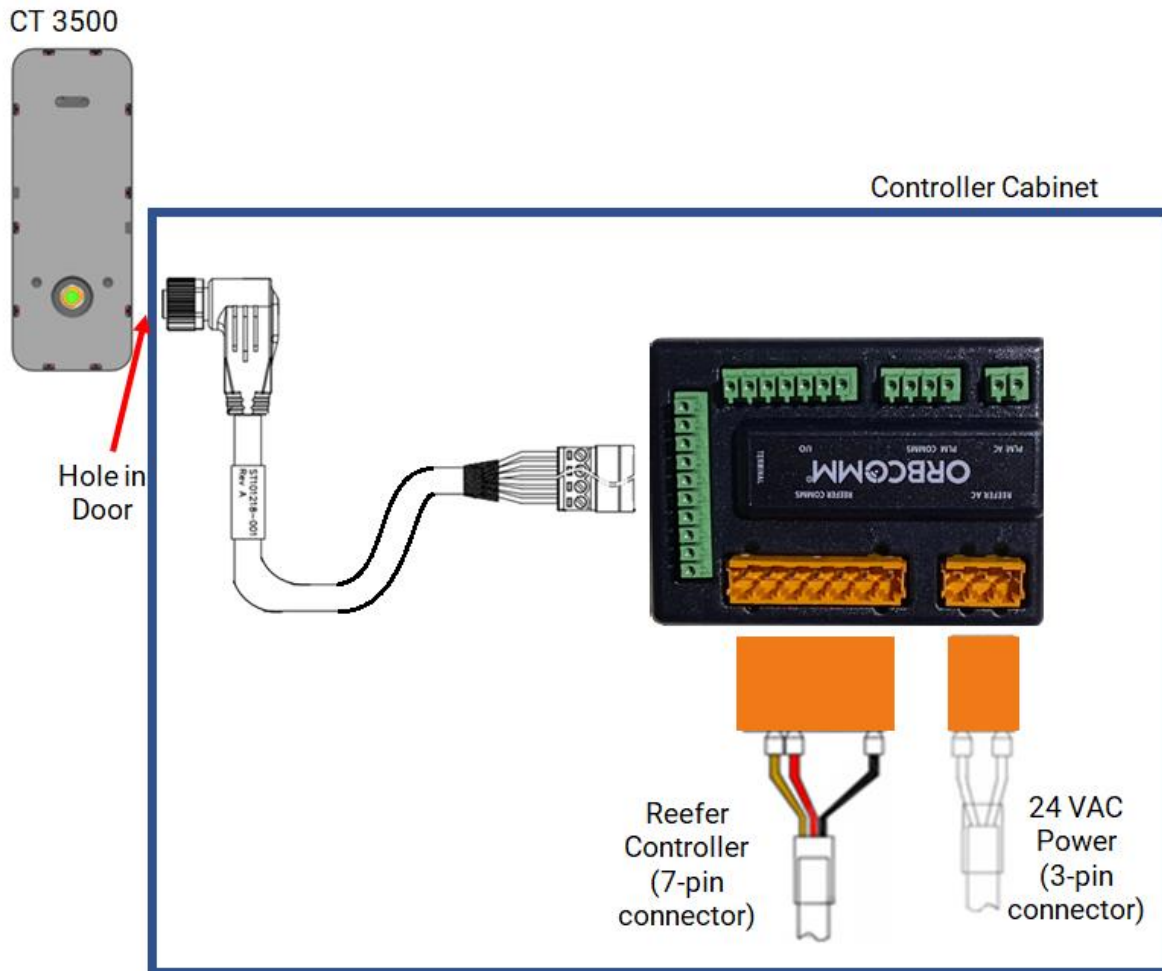
Make the ECM Connections

For panel mount installations: Everything to the right of the NPT gland is inside the controller cabinet.

Figure 12: Panel Mount Connection with PLM
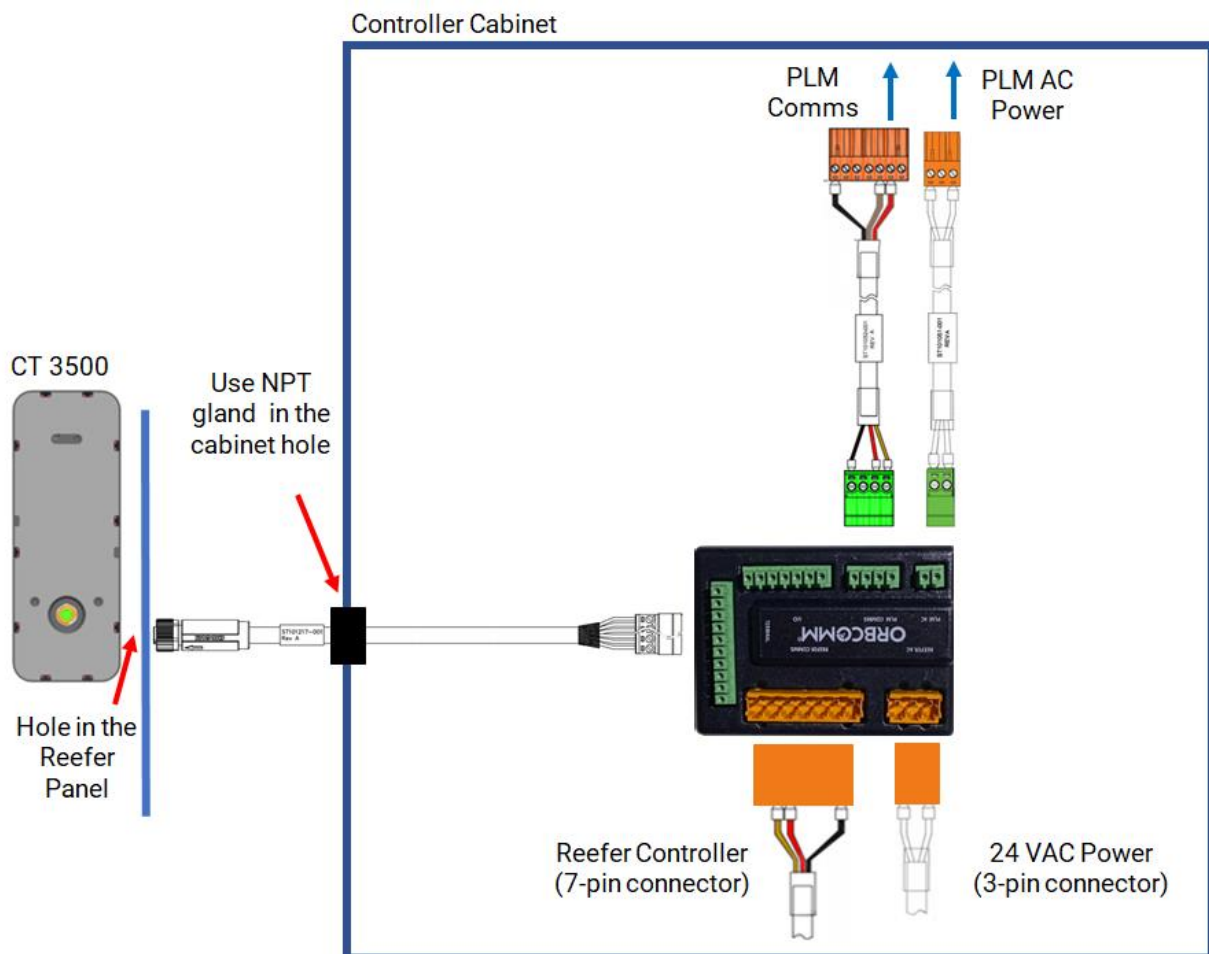
For the door mount installations: Connection to the device is made though a hole in the controller cabinet door, and then the main cable harness is contained within the cabinet.

Figure 13: Door Mount Installation with PLM

Connections for a door or panel installation with PLM

1. Connect the green 10-pin connector of the main cable harness (door or panel) to the ECM **TERMINAL** connector.

   CAUTION: Misalignment of the main cable harness green 10-pin connector to the ECM terminal connector causes electrical over stress on the CT 3500 and the ECM. Refer to the misalignment figure in APPENDIX B.

2. Make the ECM connections for Carrier / Daikin /Star Cool:
   a. Connect the reefer's free hanging green or orange 7-pin serial connector to the 7-pin connector on the ECM identified as **REEFER COMMS**.

    b. Connect the reefer's free hanging green or orange 3-pin 24 VAC connector to the 3-pin connector on the ECM identified as **REEFER AC**.

    c. Connect the ST101052-001 cable harness's orange PLM (7-pin) connector to the corresponding 7-pin connector on the PLM Comms.

    d. Connect the ST101051-001 cable harness's orange PLM AC (3-pin) connector to the corresponding 3-pin connector on the PLM AC Power.

    e. Connect the ST101052-001 green 4-pin connector to the 4-pin connector on the ECM identified as **PLM COMMS**.

    f. Connect the ST101051-001 green 2-pin connector to the 2-pin connector on the ECM identified as **PLM AC**.

3. Continue with section 1.9 Mount the CT 3500.

APPENDIX E ECM CONNECTIONS FOR A TK MP3000 INSTALLATION

These connections are for a Thermo King MP3000 installation. Refer to APPENDIX B for a description of each ECM connection.

This installation uses the following ancillary cables:

- ST101050-001 (Reefer AC)
- ST101049-001 (Reefer Comms)

Note: Figures shown are not to scale and cables or connectors may be longer than they appear.
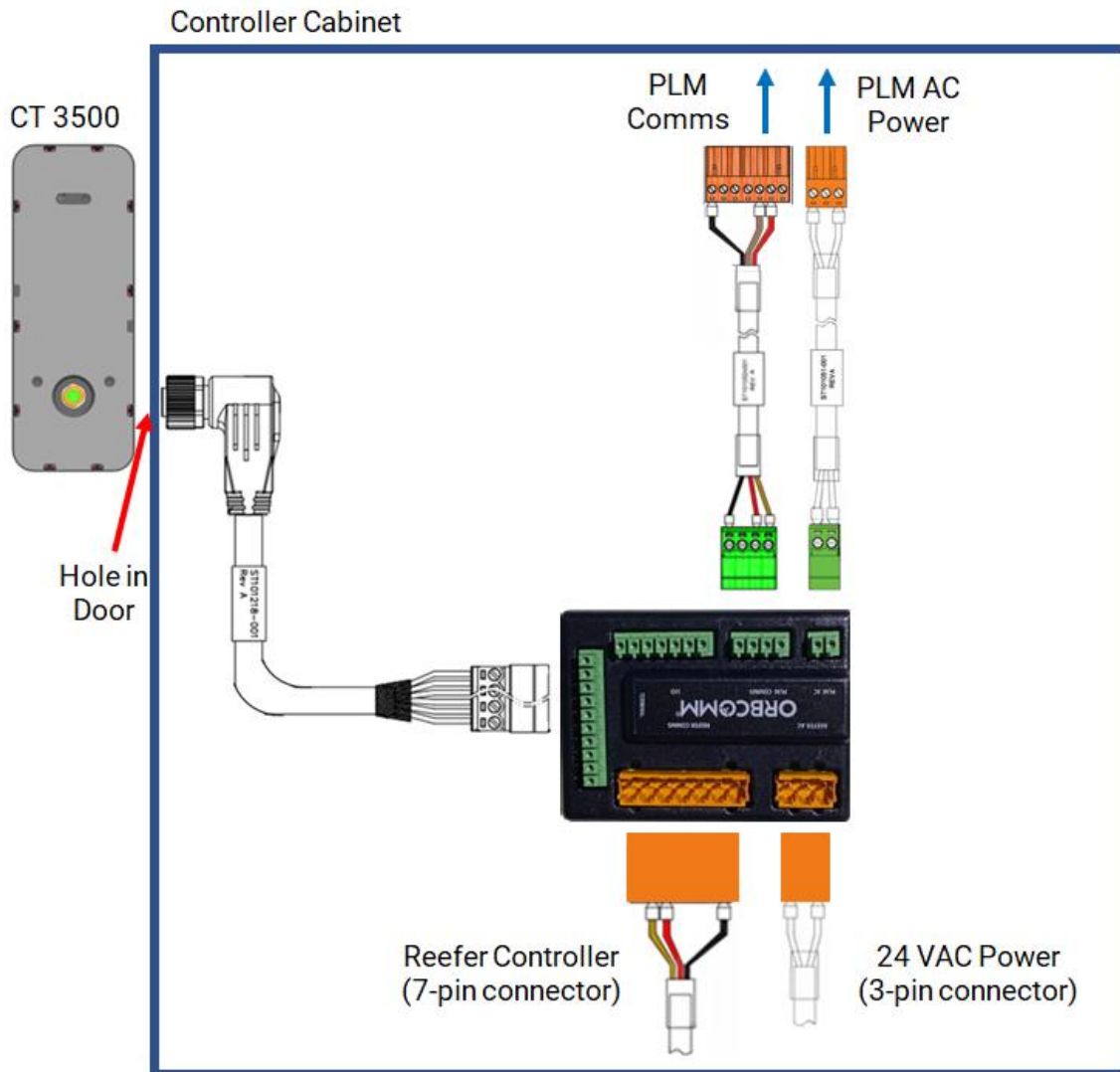
Make the ECM Connections

Figure 14: TK MP3000
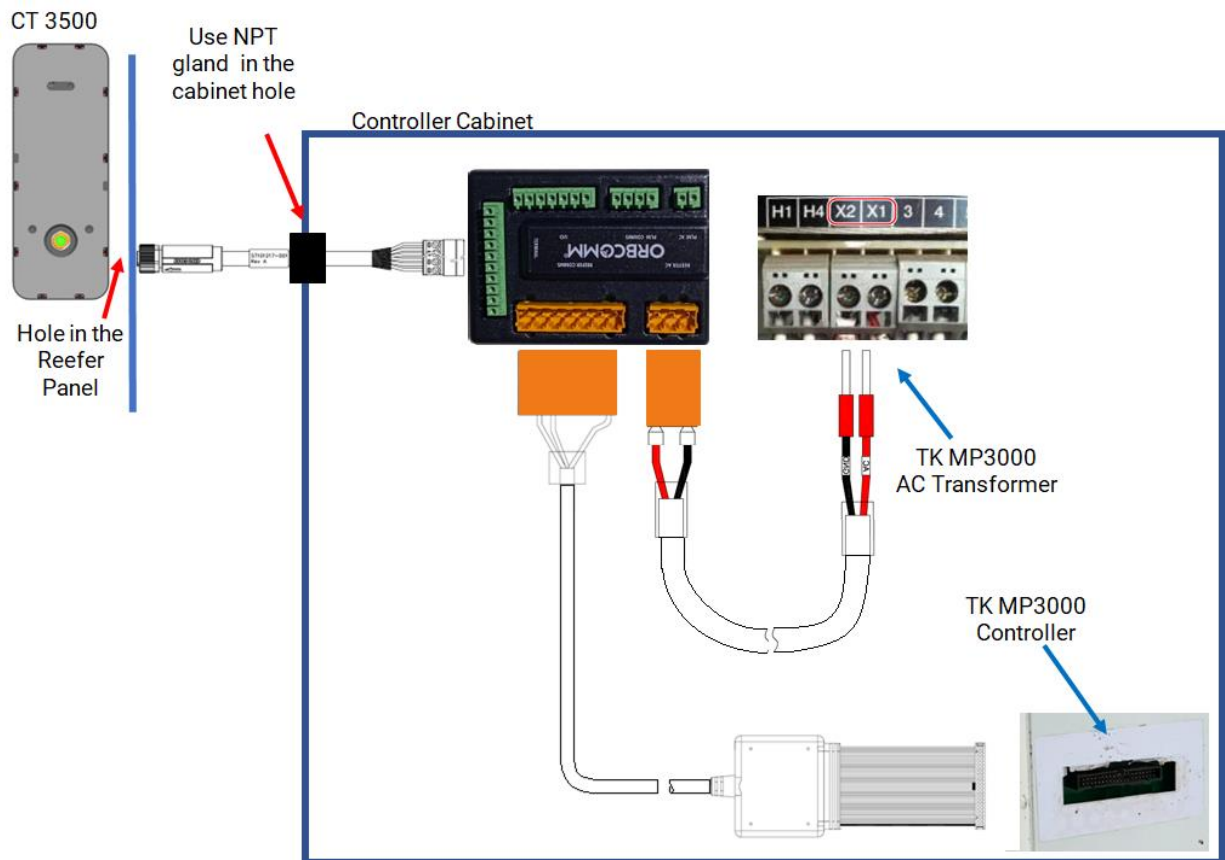
1. Connect the green 10-pin connector of the main cable harness (door or panel) to the ECM **TERMINAL** connector.

   CAUTION: Misalignment of the main cable harness green 10-pin connector to the ECM terminal connector causes electrical over stress on the CT 3500 and the ECM. Refer to the misalignment figure in APPENDIX B.

2. Connect the orange 7-pin connector on the ST101049-001 reefer comms cable to the 7-pin connector on the ECM identified as **REEFER COMMS**.

3. Mate the other end of the ST101049-001 reefer comms cable with the 40-pin connector on the MP3000 controller on the door.

4. Connect the orange 3-pin connector on the ST101050-001 reefer power cable to the 3-pin connector on the ECM identified as **REEFER AC**.

5. Connect the red wire labeled **AC** on the other end of the ST101050-01 cable into the transformer's **X1** terminal block.

6. Connect the black wire labeled **GND** on the ST101050-001 cable into the transformer's **X2** terminal block.

7. Continue with section .1.9 Mount the CT 3500.

APPENDIX F ECM CONNECTIONS FOR A TK MP4000 INSTALLATION

These ECM connections are for Thermo King MP4000 installations. Refer to APPENDIX B for a description of each ECM connection.

This installation uses the following ancillary cables and connectors:

- ST101050-001 (Reefer AC)
- ST101053-001 (PLM Comms)
- ST101054-001 (Reefer Comms)
- CON100537 (Wago connector - quantity 3)

Note: Figures shown are not to scale and cables or connectors may be longer than they appear.

Make the ECM Connections

Figure 15: TK MP4000
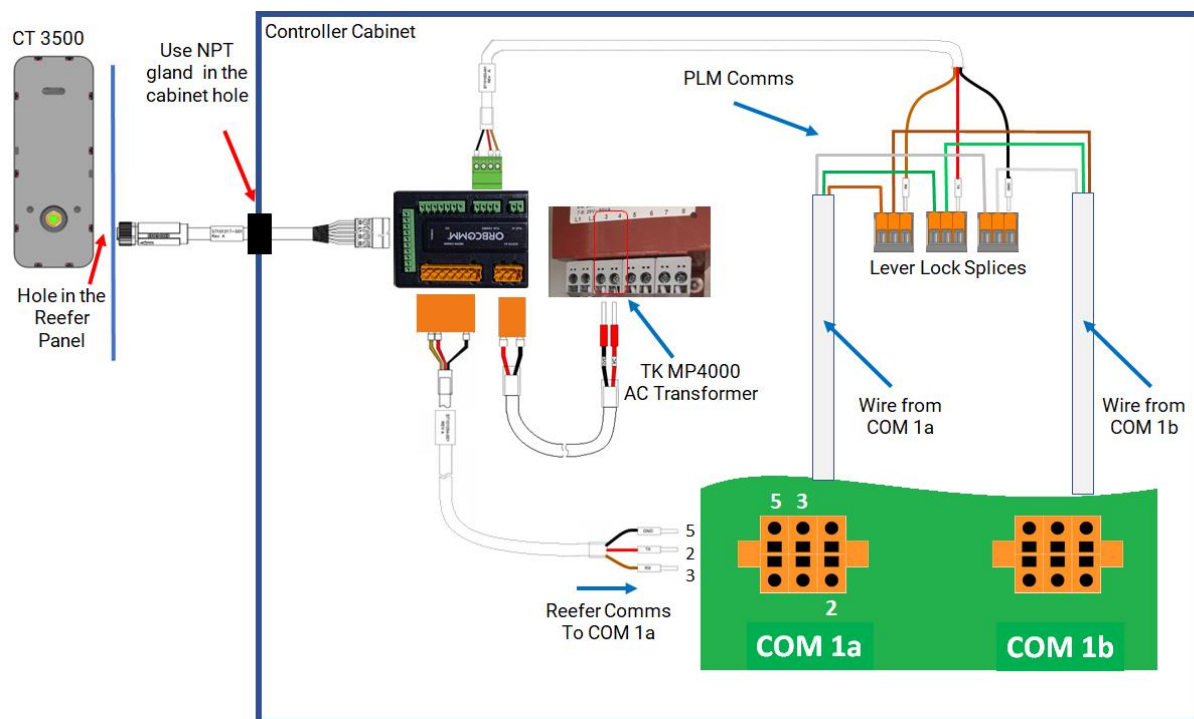
Make the ECM and PLM Comms Connections

1. Connect the green 10-pin connector of the main cable harness (door or panel) to the ECM **TERMINAL** connector.

   CAUTION: Misalignment of the main cable harness green 10-pin connector to the ECM terminal connector causes electrical over stress on the CT 3500 and the ECM. Refer to the misalignment figure in APPENDIX B.

2. Use a 1.5 mm (0.04") precision screwdriver (or equivalent) to release the wires from the COM 1a and COM 1b connectors by pressing on the tab for each wire.

3. Combine together the three wires from the COM 1a, COM 1b, and PLM Comms harness (ST101053-001) using the supplied orange tab Wago connectors, as per the table below.

   To insert each wire, lift the orange clamp lever, insert the wire, and then lower the clamp lever.

COM Port / Controller Wires		PLM Wires	
		Wire	**Color**
	2 green wires	Tx	Red
	2 brown wires	Rx	Brown
	2 white wires	GND	Black

(Note: the `<->` symbol appears in the center column of the table spanning the rows.)

4. Connect the green connector on the PLM Comms harness (ST101053-001) to the connector on the ECM identified as **PLM COMMS**.

Make the Reefer Comms Connections

1. Insert the three wires on the Reefer Comms harness (ST101054-001) into the orange 6-pin controller connector (COM 1a) as shown below.
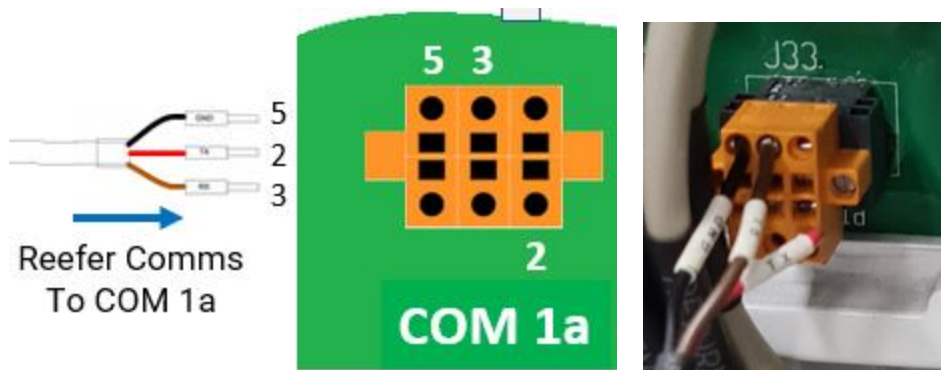
2. Connect the orange 7-pin connector on the Reefer Comms harness (ST101054-001) to the connector on the ECM identified as **REEFER COMMS**.

Make the Reefer AC Connections

1. Connect the wire labeled **AC** on the ST101050-01 cable into the transformer's **4** terminal block.
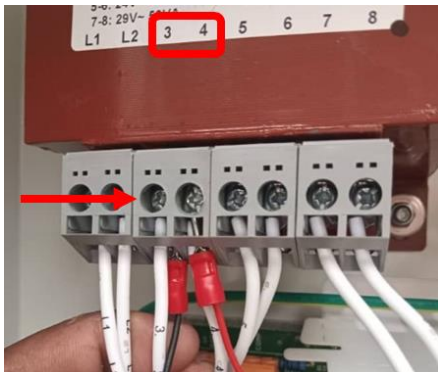
2. Connect the wire labeled **GND** on the ST101050-001 cable into the transformer's **3** terminal block.

3. Connect the orange 3-pin connector on the Reefer AC harness (ST101050-001) to the connector on the ECM identified as **REEFER AC**.

4. Continue with section 1.9 Mount the CT 3500.

APPENDIX G CT 3500 SUMMARY AND SPECIFICATIONS

Mode	Standard
Application	Globally roaming reefers
Power	Reefer powered
Use Description	PERMANENT - The CT 3500 is integrated into the reefer and controller cabinet wiring and is married to the reefer permanently. It gets power when the reefer is running and runs on battery when not. It continually monitors the reefer for life wherever it moves globally.
Installation	The CT 3500 is permanently installed on the reefer controller cabinet door or side panel and wired inside the controller cabinet to the controller and AC power via a special AC/DC harness.
Device Owner	Reefer owner (typically shipping line)
GPS	Enabled

APPENDIX H MODES AND LED BLINK RATES

CT 3500 Modes

The device supports the following modes:

Ship / Hibernation Mode:	In this mode, all radio functionality is off. The device is packed and shipped in ship mode. It exits ship mode through application of external power or application of the magnet.
Inventory Mode:	In this mode, all but the BLE radio is off. The device exits inventory mode through application of external power or application of the magnet.
Guest Mode:	In this mode, the device is connected to a reefer's external data port for temporary asset tracking purposes.
Operational (Reefer ON):	Connected to a powered reefer and operational (reports regularly).
Operational (Reefer OFF):	Connected to an unpowered reefer and operational (reports infrequently).

LED Location and Descriptions

Refer to APPENDIX L if you need to troubleshoot the LEDs.

Figure 16: LED Location

Ship Mode

To exit ship mode, turn Reefer Controller ON to apply external power to the device or apply the magnet.

Color	LED State	Meaning
Yellow and Green	Alternating (2 Cycles)	CT 3500 has entered Ship / Hibernation Mode.
None	LED OFF	CT 3500 is in Ship / Hibernation Mode.

Inventory Mode

To exit inventory mode, turn Reefer Controller ON to apply external power to the device or apply the magnet.

Color	LED State	Meaning
Yellow and Blue	Alternating (2 Cycles)	CT 3500 has entered the Inventory Mode.
None	LED OFF	CT 3500 is in Inventory Mode.

Guest Mode

Color	LED State	Meaning
n/a	n/a	The CT 3500 is in guest mode while running on battery.
n/a	n/a	The CT 3500 is in guest mode while running on AC without a full charge.
Blue	Solid	The CT 3500 is in guest mode, running on AC and fully charged.

Operational Reefer Controller ON

Color	LED State	Meaning
White	Blinking	The CT 3500 is detecting / establishing communication with the Reefer Controller.
White	Solid	The CT 3500 has successfully established communication with the Reefer Controller. Lit for 10 seconds.
Red	Blinking	The CT 3500 is unable to detect the physical connection to the Reefer Controller. Check the harness.
Red	Solid	The CT 3500 can detect the physical connection, but it's unable to communicate with the Reefer Controller. Check the harness.
Green	Blinking	The CT 3500 is searching for cell coverage.
Green	Solid	The CT 3500 has attained cell coverage.

Operational Reefer Controller OFF

Color	LED State	Meaning
Blue	Very Quick Blinking	CT 3500 is alive (still reports a message).

Magnet Switch

Color	LED State	Meaning
Yellow	Solid	Magnet detected while the device is in its normal operation mode.
Magenta	Solid	Magnet detected while the device is in the shipping or inventory mode.
Blue	Blinking (2 cycles)	Magnet action detected, refer to APPENDIX I.

APPENDIX I MAGNET SWITCH ACTIONS

Refer to APPENDIX H for Magnet Switch[1] LED behavior.

Action	Time Asserted	Meaning
Generate Message	3-7 seconds	The device generates a wake-up button message. If the device requires a new GPS fix, then it takes up to 4 minutes for the completed message to reach the platform. This action is disabled while the device is in either ship or inventory mode.
Enter / Exit Ship Mode	13-17 seconds	The device exits ship and inventory modes if it is already in one of those two modes. The device enters ship mode if it is not already in ship or inventory mode.
Reset Device	23-27 seconds	The device performs a software reset.

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[1]Firmware version 1.10 or higher supports the magnet switch.

APPENDIX J MECHANICAL DIMENSIONS

The weight of the CT 3500 is ~420 g (15 oz).

Units are shown in inches [millimeters].
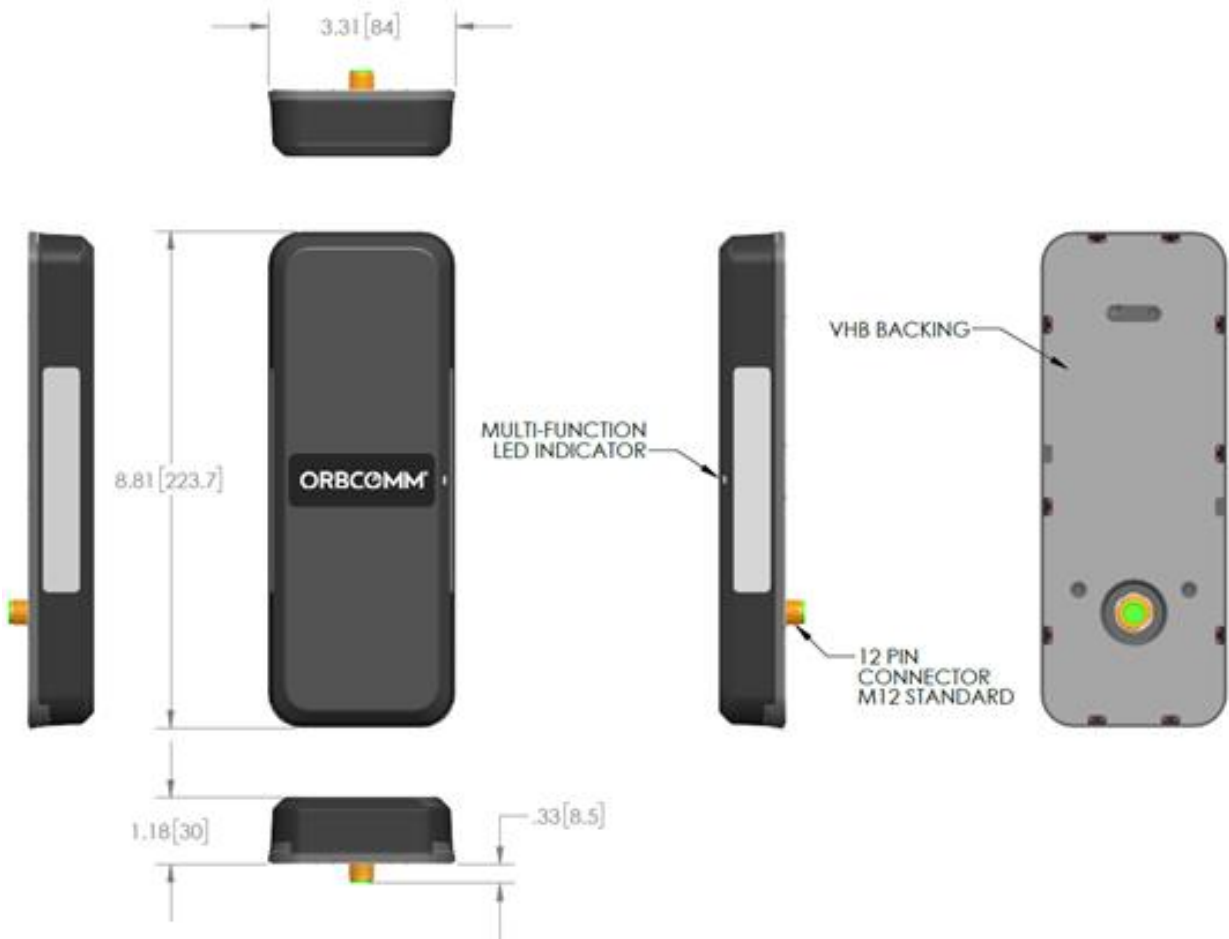
APPENDIX K INCLEMENT WEATHER GUIDELINES

One method of securing the device to an asset is double-sided tape. Proper tape application requires that the tape is kept warm (room temperature), and the asset surface is both clean and dry.

Mandatory Guidelines for Installation in Wet Weather

The installation surface on the asset must be completely clean and dry for the tape to bond. If it is raining or snowing hard enough that the surface cannot be kept dry, **DO NOT** proceed with the installation.

Mandatory Guidelines for Installation in Cold Weather

Below 15°C (60°F) the double-sided tape starts becoming firm which makes it more difficult to bond to the asset.

If the guidelines below are followed correctly, the device can be installed at temperatures down to -20°C (-5°F).

- At or below freezing temperatures (0°C or 32°F), both the device and the tape primer* must be kept at room temperature, for example, inside an idling vehicle or a warm building.

  *If tape primer is not provided with the device, the cold temperature installation kit (ORBCOMM p/n ST101505, suitable for up to 25 installs) MUST be used.

<p align="center">Example of Tape Primer</p>

- Keep the primer warm (room temperature) until ready to apply. The primer will not dry quickly at cold temperatures however, in this situation the tape should be applied when the primer is still wet, as it improves initial bond.
- Keep the device warm (room temperature) until it is time to mount it to the asset.
- **Press firmly on the entire top surface of the device (7 kg (15 lb) for 15 seconds)** to bond the tape to the asset.

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<p align="center" style="color:red">Failing to follow these guidelines will compromise the installation.</p>

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APPENDIX L TROUBLESHOOTING

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Always ensure that you are using the latest version of the installation guide. Guides are available from ORBCOMM Customer Care.
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CAUTION: Always follow safety guidelines when working with hardware that may be connected to a power source or removing hardware from an asset.

Note: If after troubleshooting, the issue is not resolved, contact ORBCOMM Customer Care.

General Troubleshooting

Issue	Possible Reason	Solution
General troubleshooting (see below for LED specific troubleshooting)	Various	Order of testing until the issue is resolved (NOTE: You may not need to perform all of these steps): 1. Check all connections to ensure they are completely pushed in (fully seated) (3-pin, 7-pin, 10-pin, and the 12-pin (M12) circular connector on the back of the CT 3500). Check the circular connector for bent pins. Disconnect and reconnect pushing in fully. 2. Check that the reefer controller is set to normal mode (NOT Unit OFF mode). 3. Ensure that the reefer has a programmed reefer ID. 4. Ensure that the reefer is not running a Pre-Trip Inspection (PTI) or that it is not in PIT mode. 5. Power cycle the reefer (power OFF at the breaker for >10 seconds and then power ON again), and then check again for a solid green LED (wait up to 10 minutes for a solid green LED). 6. If you have reached this point and still do not see a solid green LED, you may need to replace the ECM, harness, or device. If removing any hardware affixed to an asset with double-sided tape, this may require a Return Material Authorization (RMA). Contact Customer Care for guidance / approval BEFORE removing any double-sided tape affixed hardware as this may damage the asset.

LED Troubleshooting

LED Color	Activity	Troubleshooting Steps (Order of testing until you see a solid green LED) NOTE: You may not need to perform all of these steps.
Green solid	Functioning as expected. NOTE: See the Green solid exception below.	No action required. The device is installed correctly, and it is reporting as expected. At your discretion, you may also want to confirm, using the Field Support Tool (FST), that an asset / reefer ID is visible (indicating the device captured the reefer data), or log into the ORBCOMM Maritime platform to see that reefer data is reported.

LED Color	Activity	Troubleshooting Steps (Order of testing until you see a solid green LED) NOTE: You may not need to perform all of these steps.
Green solid	No reefer ID in the ORBCOMM Maritime platform	Focus on reefer ID programming, cellular connection, and ORBCOMM Maritime platform maintenance. 1. Use the Field Support Tool to - check if it shows an asset / reefer ID - ping the device 2. Power cycle the reefer (power OFF at the breaker for >10 seconds and then power ON again), and then check again for a solid green LED (wait up to 10 minutes for a solid green LED) and the reefer ID to report. 3. Move the device / asset to a location where it has a clear line-of-sight to the satellite as it may be in a poor cellular coverage area. 4. Check that the ORBCOMM Maritime platform is not undergoing a scheduled maintenance update. 5. In the ORBCOMM Maritime platform, check that the power cycle messages appear on the device page, otherwise, you may need to submit a Return Material Authorization (RMA) request and replace the device. NOTE: You should avoid removing an double-sided tape affixed devices without authorization from ORBCOMM as this may damage the asset.
Green blinking	Trying to establish a cellular connection.	Focus on cellular coverage. 1. Move the device / asset to a location where it has a clear line-of-sight to the satellite as it may be in a poor cellular coverage area.
Blue blinking	Reefer has no power.	Focus on power. 1. Verify that the reefer has power, and that the reefer is running in normal mode. Not Unit OFF mode or Pre-Trip Inspection (PTI) mode. NOTE: Some reefers may look powered ON, but they have a soft ON / OFF switch that must be pressed (for example, Daikin).
Red blinking	Unable to detect physical connection.	Focus on harness and ECM 1. Check the 3-pin, 7-pin, and 10-pin connections to ensure they are completely pushed in (fully seated). Disconnect and reconnect pushing in fully. 2. Check the 12-pin (M12) circular connector on the back of the CT 3500 for bent or misaligned pins. Disconnect and carefully reconnect ensuring the key is aligned and the connector is completely pushed in (fully seated). Push in while turning the screw until fully connected. 3. Power cycle the reefer (power OFF at the breaker for >10 seconds and then power ON again), and then check again for a solid green LED (wait up to 10 minutes for a solid green LED). 4. If you have reached this point and still do not see a solid green LED, you may need to replace the ECM, harness, or device. If removing any hardware affixed to an asset with double-sided tape, this may require a Return Material Authorization (RMA). Contact Customer Care for guidance / approval BEFORE removing any double-sided tape affixed hardware as this may damage the asset.

LED Color	Activity	Troubleshooting Steps (Order of testing until you see a solid green LED) NOTE: You may not need to perform all of these steps.
Red solid	Unable to communicate with reefer controller.	Focus on software items. 1. Check that the reefer controller has a valid reefer ID programmed and verify that the reefer software is certified by ORBCOMM. 2. Ensure the reefer is not running a Pre-Trip Inspection (PTI). 3. Ensure the device is not performing a firmware update. 4. Check the 3-pin and 7-pin connections to ensure they are completely pushed in (fully seated). Disconnect and reconnect pushing in fully. 5. Check the 12-pin (M12) circular connector on the back of the CT 3500 for bent or misaligned pins. Disconnect and carefully reconnect ensuring the key is aligned and the connector is completely pushed in (fully seated). Push in while turning the screw until fully connected. 6. Power cycle the reefer (power OFF at the breaker for >10 seconds and then power ON again), and then check again for a solid green LED (wait up to 10 minutes for a solid green LED). 7. If you have reached this point and still do not see a solid green LED, you may need to replace the ECM, harness, or device. If removing any hardware affixed to an asset with double-sided tape, this may require a Return Material Authorization (RMA). Contact Customer Care for guidance / approval BEFORE removing any double-sided tape affixed hardware as this may damage the asset.
No LED (OFF)	No activity	Focus on power issues or hardware failures. 1. Check that the reefer has power, and that the controller display lights up. 2. Verify that the reefer has power, and that the reefer is running in normal mode (Not Unit OFF mode or Pre-Trip Inspection (PTI) mode. Note: Some reefers may look powered ON, but they have a soft ON/OFF switch that must be pressed (for example., Daikin). 3. Check the 3-pin power connection at the ECM or y-cable. 4. Check the 12-pin (M12) circular connector on the back of the CT 3500 for bent or misaligned pins. Disconnect and carefully reconnect ensuring the key is aligned and the connector is completely pushed in (fully seated). Push in while turning the screw until fully connected. 5. Power cycle the reefer (power OFF at the breaker for >10 seconds and then power ON again), and then check again for a solid green LED (wait up to 10 minutes for a solid green LED). 6. If you have reached this point and still do not see a solid green LED, you may need to replace the ECM, harness, or device. If removing any hardware affixed to an asset with double-sided tape, this may require a Return Material Authorization (RMA). Contact Customer Care for guidance / approval BEFORE removing any double-sided tape affixed hardware as this may damage the asset.