INSTALLATION GUIDE

Cat.No/Rev.

TERRABRIDGE

Rel. y.z

RADWIN

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FOR REGULATORY USES ONLY

Chapter 1: Introduction

1.1 Scope of this Document

This document shows how to install and configure the TerraBridge radio units.

1.2 Overview

TerraBridge is a millimeter-wave radio unit that provides up to 1.5 Gbps aggregated wireless connectivity between railroad cars. The product enables Gbps Ethernet network throughout the train, seamlessly supporting dynamic changes in the train consist.

The unit complies with outdoor spec IP-69K. It is small and lightweight, which allows it to be mounted out of the way in convenient locations.

1.3 Basic Working Model

Show two train cars, with two TerraBridges on each.
Show how each TerraBridge is connected to the network and power from within the train car.

Mention the GUI.

1.4 Main Features

Radio based on 802.11ad standard in mm-waves unlicensed band

Capacity of up to 1.5 Gbps aggregated

Spectrum: mmWave / 60GHz

Throughput: 1.5Gbps

Delay:1-3msec

Power: PoE GbE interface, 802.3af

Connector:M-12 X-coded connector

Environmental: IP69 (high pressure water jet at 80deg C)

Railway standards: EN50155, EN 50121 and EN61373, IEC 60571

Antenna:Integrated inside the radio unit

1.5 Mechanical Specifications

Show a mechanical drawing including the locations of the screws and the M12 X (PoE) connection

Size (HxWxD): 12x12x2.25 cm

Weight

Operating Temperature

Chapter 2: Installation Steps

To install and establish a basic connection with a radio unit, carry out the steps shown below. Print out this list, and place a checkmark next to a completed task.

Table 2-1: Installation Check-List

| Step	Action	Page	Done?
	Before deploying at installation site		
1.	*Prepare Laptop*	page 2-2	
2.	*Connect Laptop to Radio Unit*	page 2-2	
3.	*Update Connectivity Parameters of Radio Unit*	Page 2-3	
4.	*Prepare Items to be Installed*	Page 2-3	
5.	*Prepare Tools*	Page 2-4	
	Installation		
6.	*Prepare Railroad Car*	Page 2-4	
7.	*Prepare PoE*	Page 2-5	
8.	*Mount Unit*	Page 2-6	
9.	*Ground Unit*	Page 2-11	
10.	*Connect Radio*	Page 2-12	
	Commissioning		
11.	*Check Connectivity to Radio*	Page 2-13	
12.	*Verify Link*	Page 2-13	

2.1 Prepare Laptop

Configure IP address and subnet mask of laptop as follows:

- Control Panel -> Network and Internet -> Network and Sharing Center -> Change Adapter settings -> click on Network Interface Card name
- Properties -> Select Internet Protocol Version 4 (TCP/IPv4) -> Properties -> set IP address to 10.0.0.100 and Subnet mask to 255.255.255.0

2.2 Connect Laptop to Radio Unit

Connect PoE to power, connect the laptop's ethernet port to the IN (or LAN) socket on the PoE, then connect the OUT (or PoE) socket on the PoE to the M-12 X port on the radio unit. Make sure you are using the appropriate PoE for your specific radio unit.
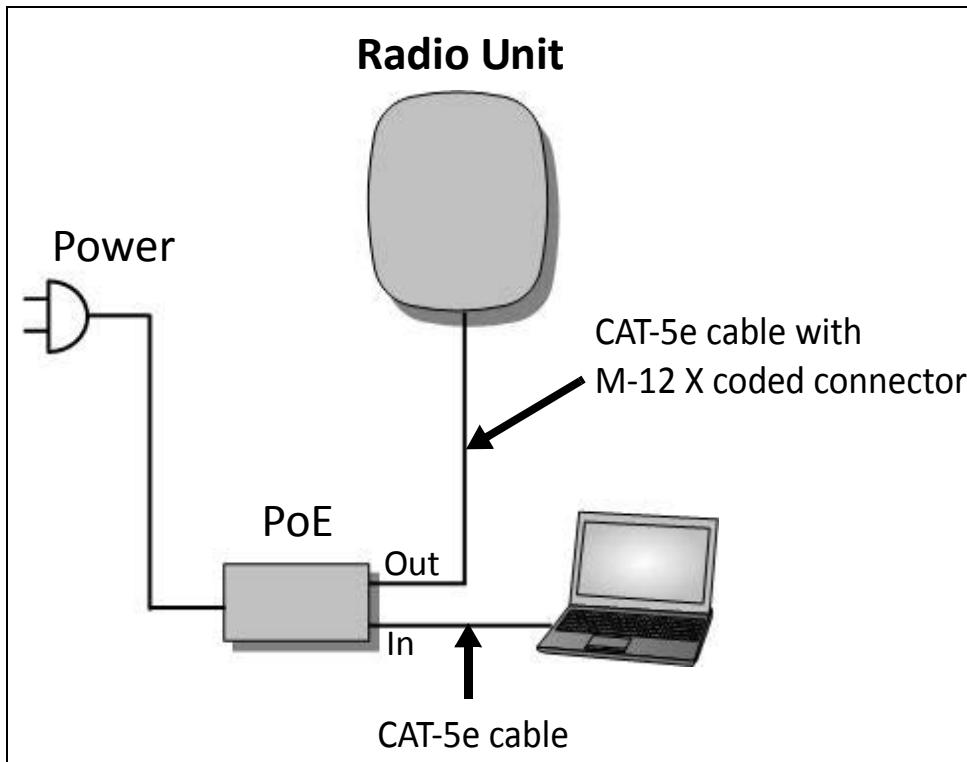
Connecting laptop to a radio unit

FOR REGULATORY USES ONLY

Connect to -> Input socket (not labeled)
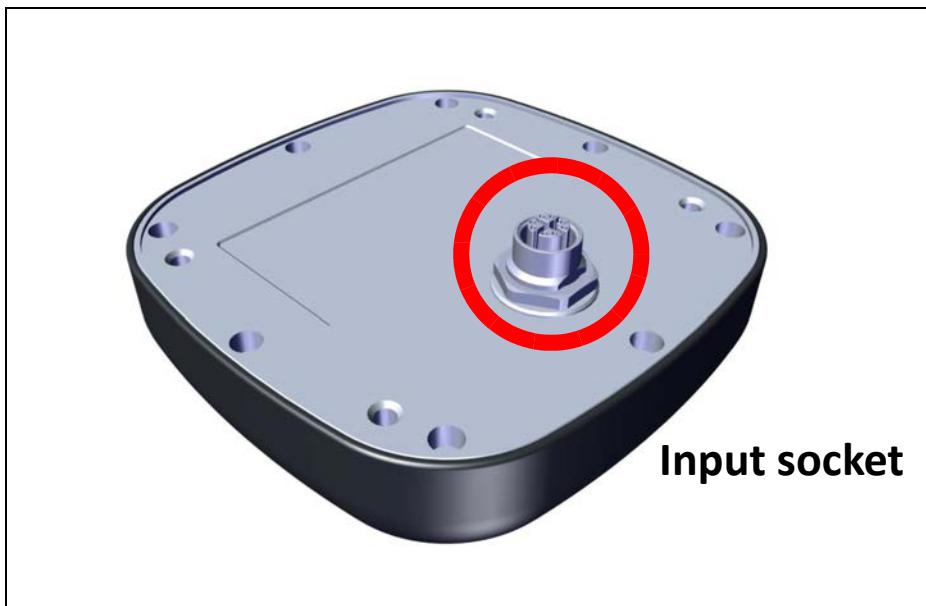
Figure 2-1: Laptop/network port: TerraBridge radio unit

2.3 Update Connectivity Parameters of Radio Unit

Make sure you have Google Chrome or Microsoft Edge installed

Log on to the device via web browser – http://10.0.0.130/ (default IP)

Enter the username – root

Enter the password – admin

You will be prompt to change the username and password for the first-time login

Under "Setting"→ "Network Settings" configure the device IP (DHCP/Static)

Under "Settings" → "System" configure device NTP server IP

Add a few screens here

2.4 Prepare Items to be Installed

- Radio unit (including mounting plate)
- Screws and bolts

- PoE (if used), including ethernet cable with M12 X connector
- Ethernet cables
- Grounding cable (10 AWG)

2.5 Prepare Tools

- Crimping tool
- Spanner/wrench 13mm (1/2")
- Cable ties
- Drill and appropriate bits to make holes for PoE and bolts

2.6 Prepare Railroad Car

1. Determine where on the cars the units will be fastened.

- It is required that you choose a specific location and keep that location for all cars that will receive the TerraBridge.
- We recommend using two units on each car (see Figure 2-2, *Two units on each car*).
- The units must be opposite each other.
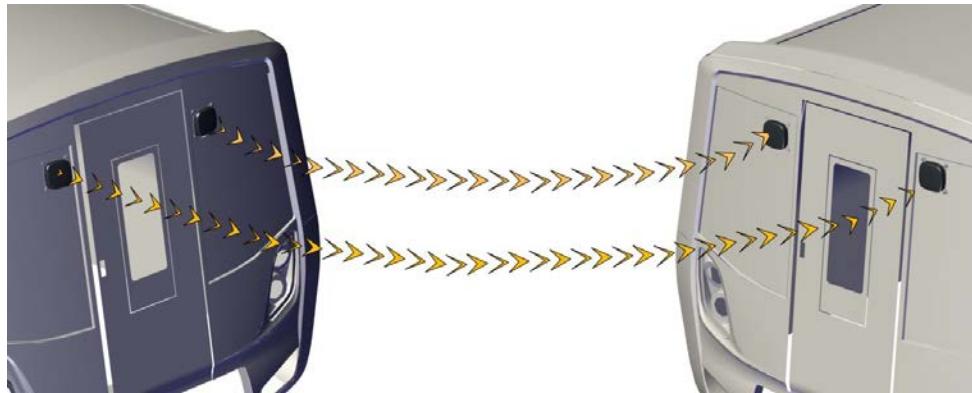
Figure 2-2: Two units on each car
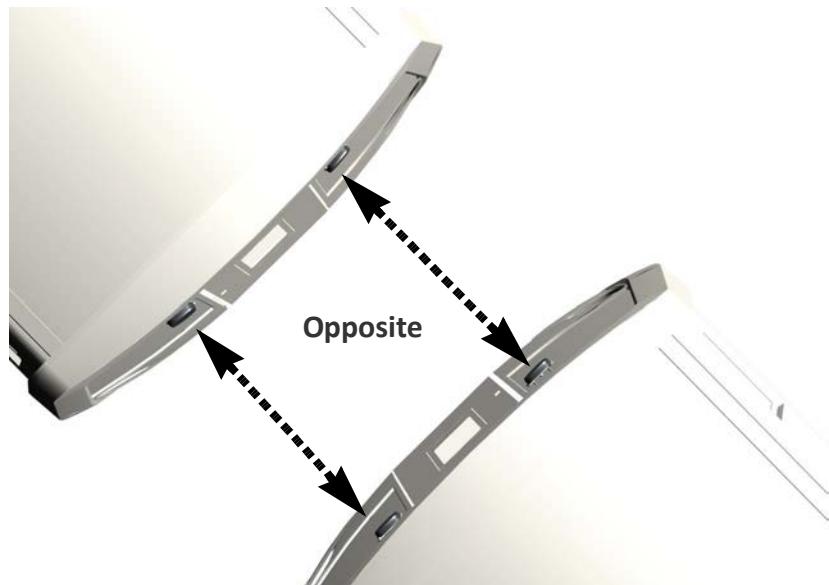
Figure 2-3: View from above
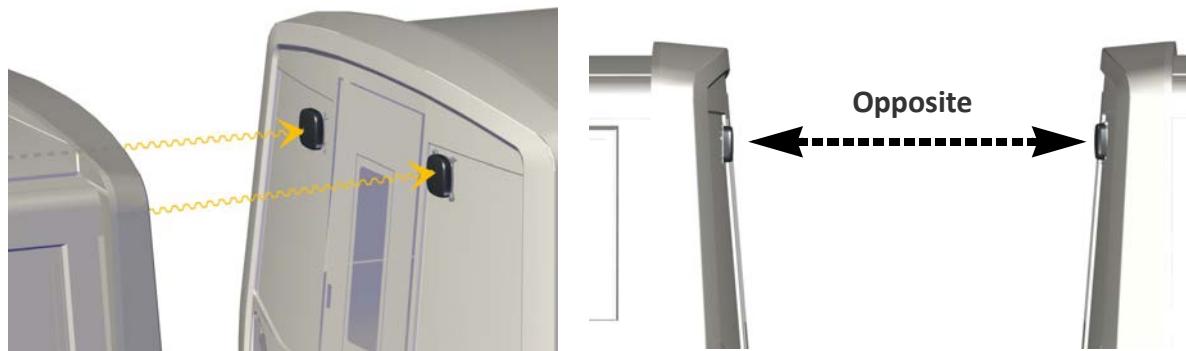
Figure 2-4: View from the side

2.7 Prepare PoE

You can use a RADWIN- supplied PoE unit, or the power supply on the car fulfilling the following criteria:

PoE GbE interface, 802.3af.

2.8 Mount Unit

You can mount the unit with the base plate or without the base plate.

2.8.1 Without the Base Plate

1. Note where on the train car you have determined to install the TerraBridge unit.
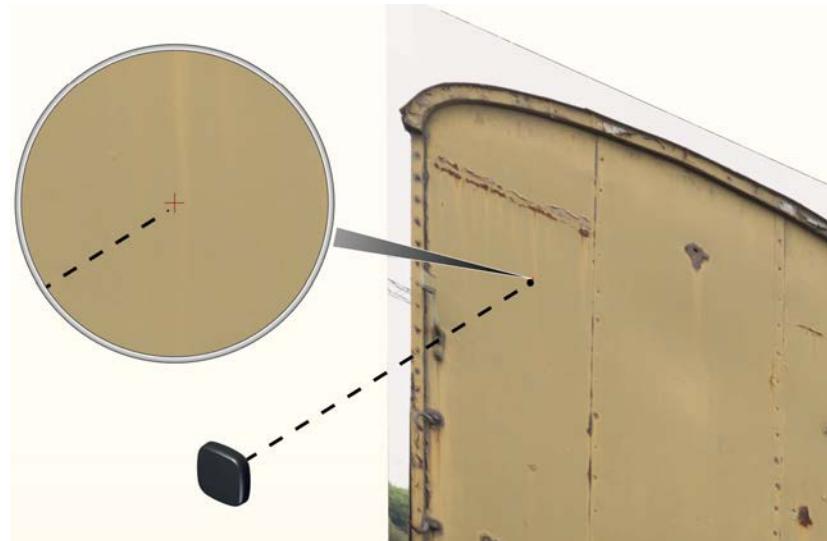
2. Using the screws from the body of the TerraBridge unit, install them from the internal side of the wall:
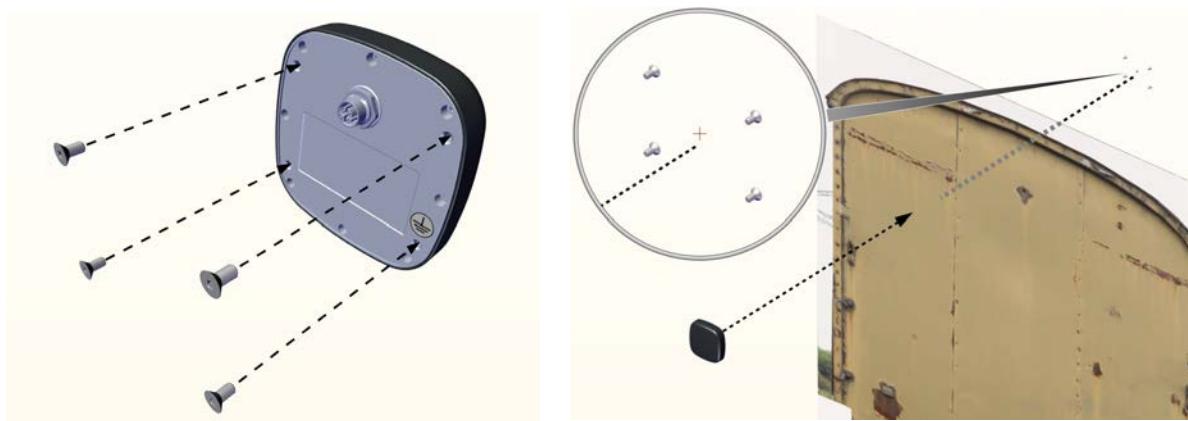
3. Insert screws (internal side of wall shown) :
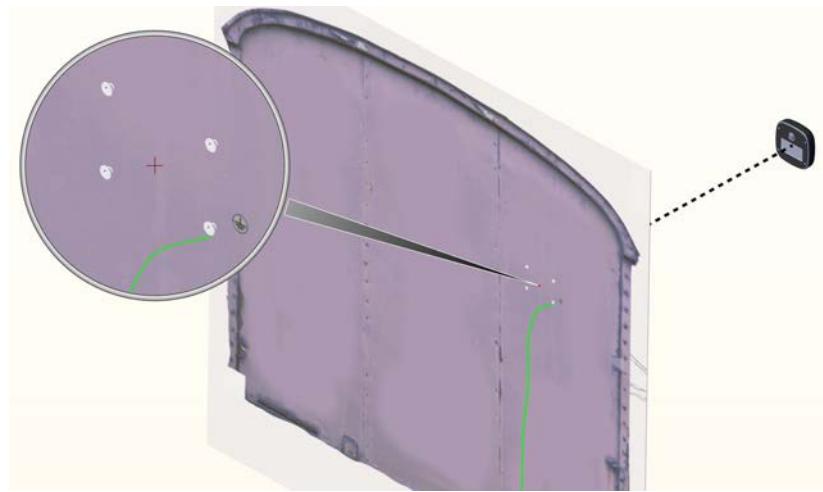
4. Drill hole for PoE connection:
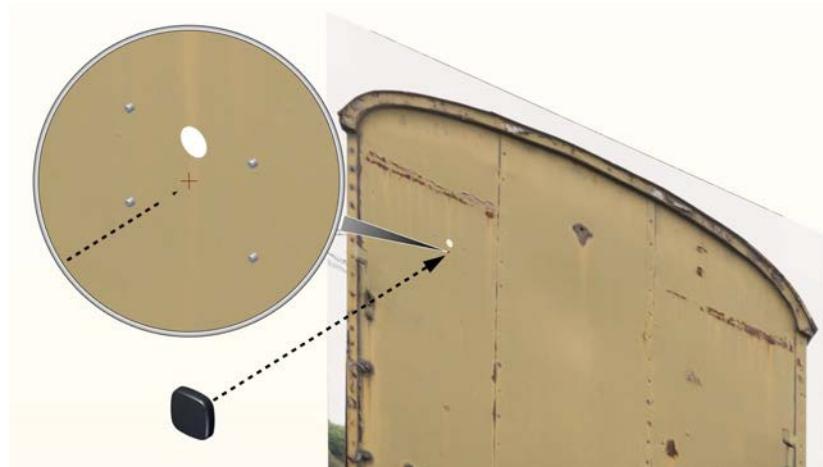
5. Fasten unit to screws on wall:

6. Connect PoE cable and ground (internal side of wall shown):
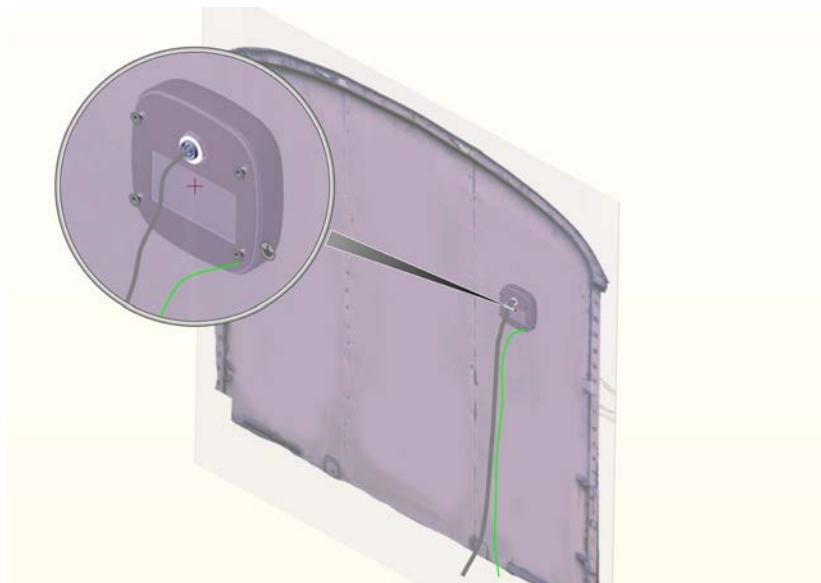
2.8.2 With the Base Plate

1. Connect base plate and external sealing gasket to unit.
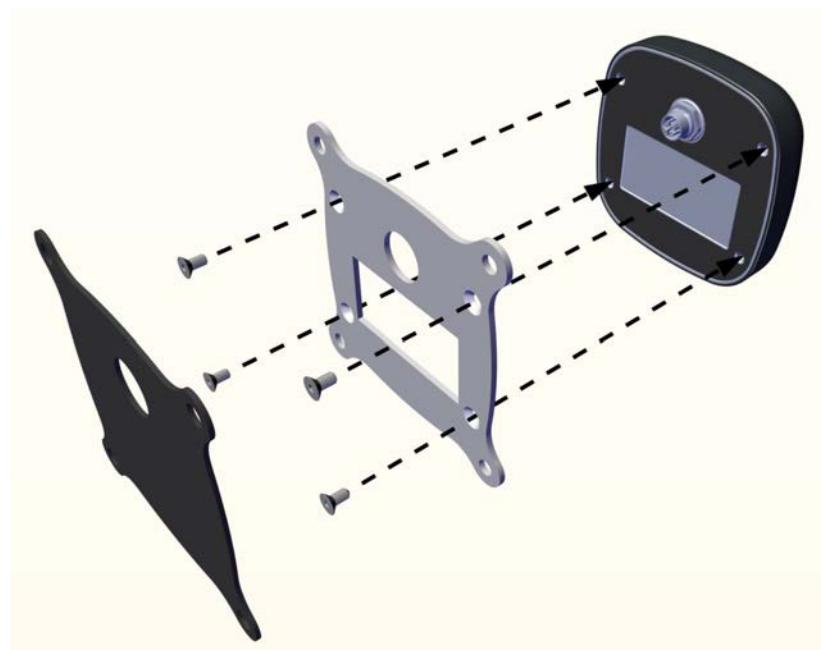
2. Note where on the train car you have determined to install the TerraBridge unit.
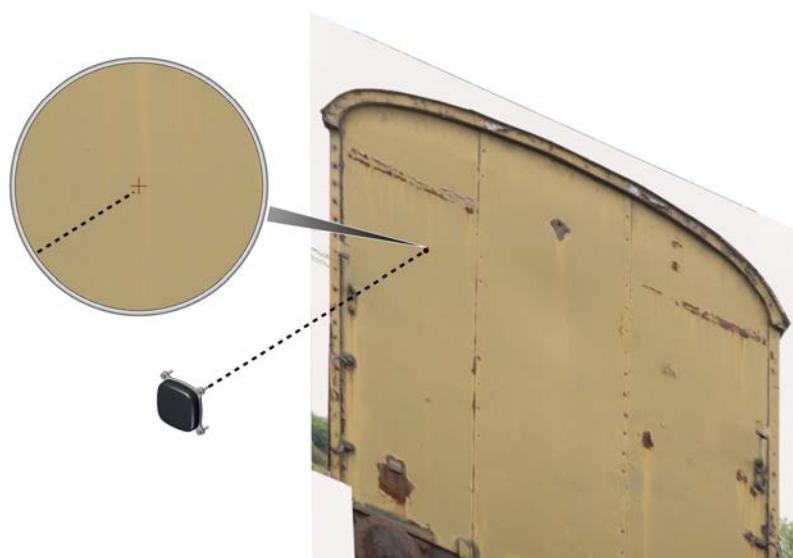
3. Drill holes for screws:
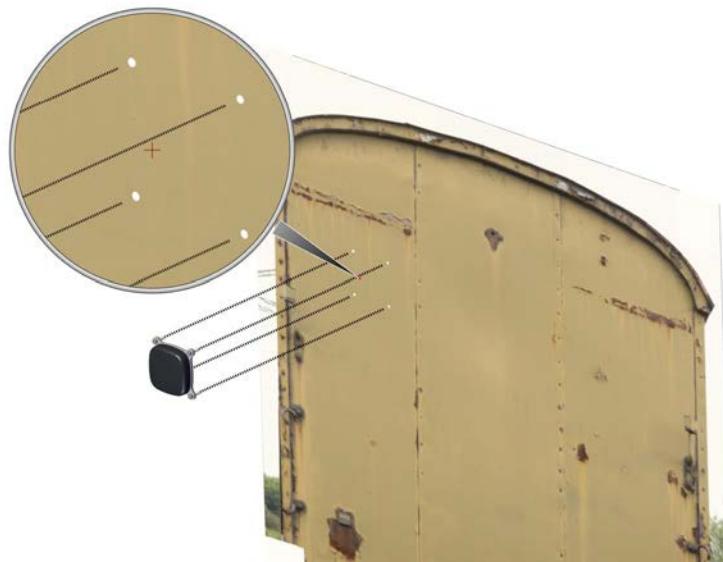
4. Drill hole for PoE connection:

5. Fasten unit to screws on wall:

6. Connect PoE cable and ground (interior of train wall shown):
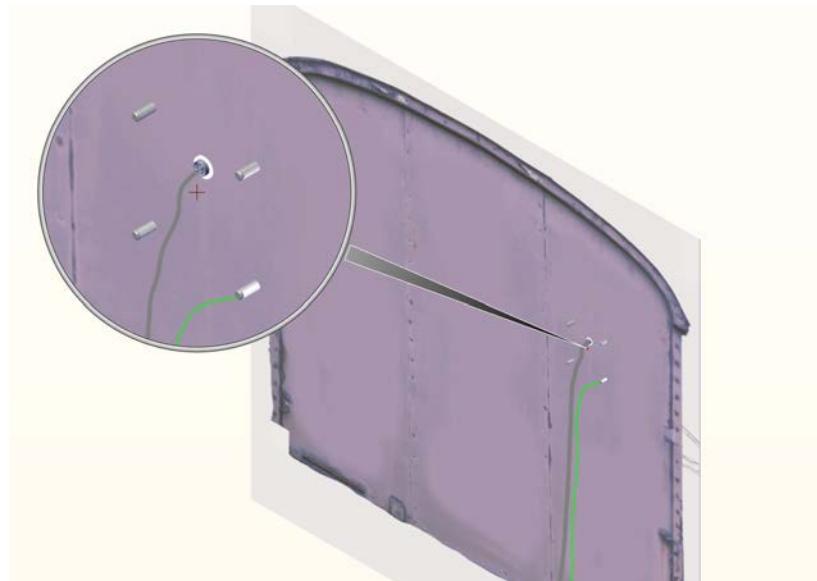
2.9 Ground Unit

Connect a 10 AWG cable to one of the mounting screws on the plate, or one of the inner screws. This depends on if you are using the base plate or not.

2.9.1 With the Base Plate
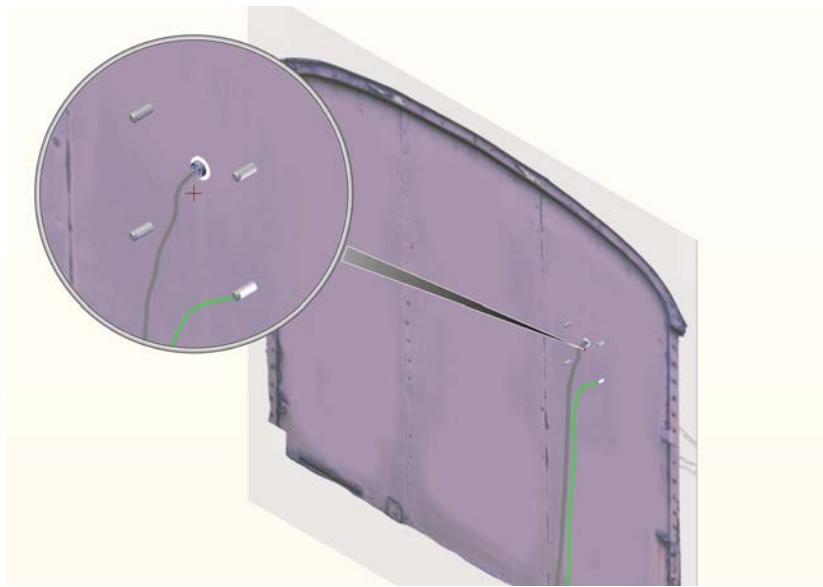
2.9.2 Without the Base Plate
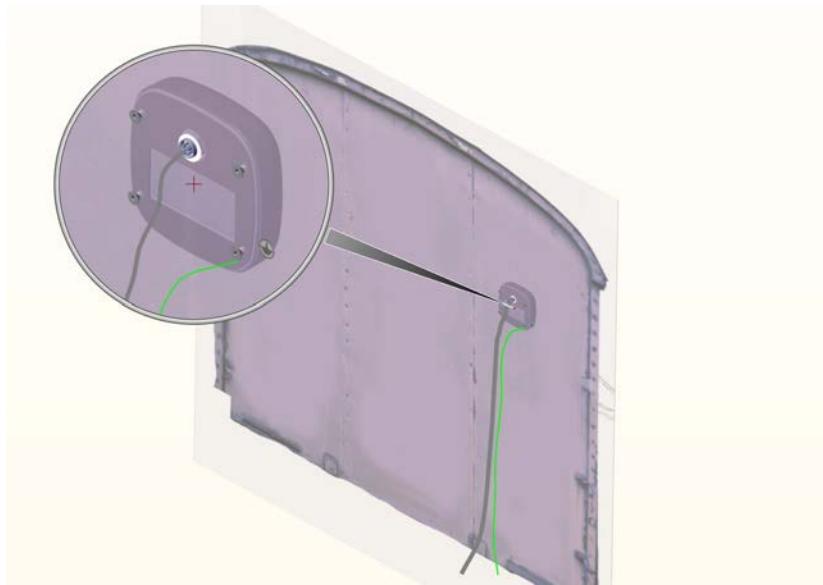
2.10 Connect Radio

Connect special cable that we supply, with PoE or on-board supply.
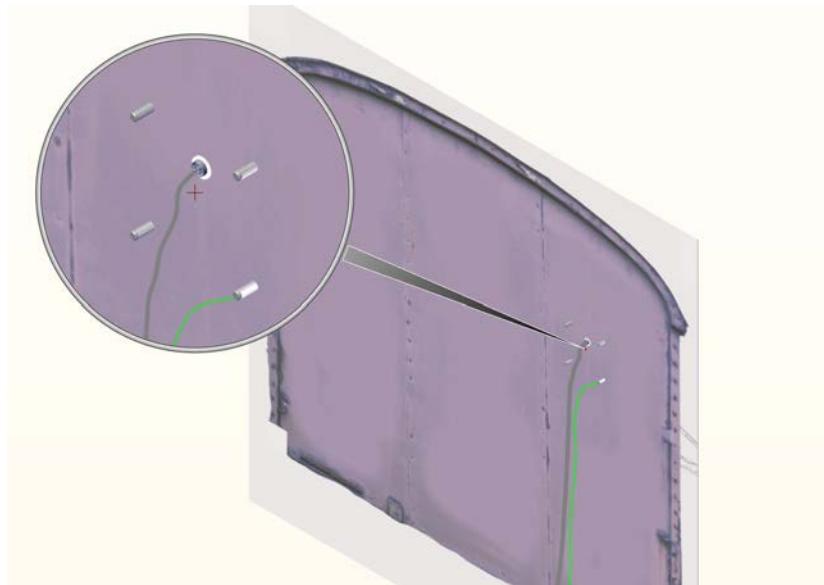
2.11 Check Connectivity to Radio

Ping the installed unit.

Show figure

2.12 Verify Link

I'm not sure we need this, but it's in the PP presentation, so I'm adding it here.

Install second device by repeating step 1-2

Make sure not to use the same IP (for example – 10.0.0.131)

Once the device is configured, face the 2 devices one another (distance 30cm-50cm)

Connect your PC to the unit via a PoE, either directly, or via your local network

Ping from device 1 to device 2 to confirm connectivity

Login to both devices (web UI) to verify link status from the "Dashboard" tab

Appendix A: Certified Antennas

A.1 For Deployment in US/Canada

TerraBridge bears the following FCC/IC IDs on the label, refer to the table below:

FCC ID: Q3K-TRBR600G

IC: 5100A-TRBR600G

TerraBridge must be installed so as to provide a minimum separation distance from bystanders as specified in the table below:

Table A-1: Frequency Band 60 GHz

Gain (dBi)	EIRP (dBm)	Min. Safe Distance (cm)
19	27.0	20

Regulatory Compliance

General Note

This system has achieved Type Approval in various countries around the world. This means that the system has been tested against various local technical regulations and found to comply. The frequency bands in which the system operates may be "unlicensed" and in these bands, the system can be used provided it does not cause interference.

For information on the restrictions on putting the device into service please contact your national telecommunication authorities.

FCC/ISED - Compliance

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.

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

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.

2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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;

2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF Exposure

For the safety of the general public it is recommended to keep a minimum safe distance from radiating antennas according to Table A-1.

Pour la sécurité du grand public, il est recommandé de respecter une distance de sécurité minimale par rapport aux antennes rayonnantes, conformément au tableau Table A-1.

Indoor Units comply with part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) These devices may not cause harmful interference.

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

Caution	Outdoor units and antennas should be installed ONLY by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may void the product warranty and may expose the end user or the service provider to legal and financial liabilities. Resellers or distributors of this equipment are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas. The installer should configure the output power level of antennas according to country regulations and antenna type.
Caution	Les unités extérieures et les antennes doivent être installées UNIQUEMENT par des les professionnels de l'installation qui connaissent le bâtiment et la sécurité locaux codes et, le cas échéant, sont autorisés par les autorités compétentes autorités de réglementation gouvernementales. Ne pas le faire peut annuler le produit garantie et peut exposer l'utilisateur final ou le fournisseur de services à des passifs financiers. Les revendeurs ou distributeurs de cet équipement ne sont pas responsable des blessures, des dommages ou de la violation de la réglementation installation d'unités extérieures ou d'antennes. L'installateur doit configurer le niveau de puissance de sortie des antennes selon les réglementations du pays et type d'antenne.
Warning	• Where Outdoor units are configurable by software to Tx power values other than those for which the product is certified, it is the responsibility of the Professional Installer to restrict the Tx power to the certified limits. • This product was tested with special accessories - indoor unit (IDU or PoE), FTP CAT-5e shielded cable with sealing gasket, 16 AWG grounding cable - which must be used with the unit to insure compliance.

⚠ **Warning**	The system must be professionally installed to ensure compliance with the Part 15 certification. It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in the United States. The use of the system in any other combination (such as co-located antennas transmitting the same information) is expressly forbidden. The radio must be installed and used in strict accordance with the manufacturer's instructions as described in this guide. Any other installation or use of the product violates FCC Part 15 regulations.
⚠ **Warning**	Le système doit être professionnellement installé pour assurer la conformité avec Certification de la partie 15 Il est de la responsabilité de l'opérateur et de l'installateur professionnel que seuls les systèmes certifiés sont déployés aux États-Unis. L'utilisation du système dans toute autre combinaison (p.antennes transmettant la même information) est expressément interdite. La radio doit être installée et utilisée en stricte conformité avec les instructions du fabricant décrites dans ce guide. Toute autre installation ou utilisation du produit enfreint les règlements de l'ISDE règlements.
⚠ **Warning**	It is the responsibility of the installer to ensure that when using the outdoor antenna kits in the United States (or where FCC rules apply), only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden by FCC rules 47 CFR part 15.204. A list of approved external antennas can be found in the Certified Antennas appendix .
⚠ **Warning**	Le système doit être professionnellement installé pour assurer la conformité avec Certification de la partie 15 Il est de la responsabilité de l'opérateur et de l'installateur professionnel que seuls les systèmes certifiés sont déployés aux États-Unis. L'utilisation du système dans toute autre combinaison (p. antennes transmettant la même information) est expressément interdite. Il est de la responsabilité de l'installateur de s'assurer que lors de l'utilisation du kits d'antenne extérieure aux États-Unis (ou lorsque les règles de la FCC s'appliquent), seulement les antennes certifiées avec le produit sont utilisées. L'utilisation de tout l'antenne autre que celles certifiées avec le produit est expressément interdite par les règlements ISED. Une liste d'antennes externes approuvées peut se trouve à l'annexe Antennes Certifiées
⚠ **Warning**	It is the responsibility of the operator and professional installer to ensure that when configuring the radio in the United States (or where FCC rules apply), the Tx power is set according to the values for which the product is certified. The use of Tx power values other than those, for which the product is certified, is expressly forbidden by FCC rules 47 CFR part 15.204

<table>
<tr>
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⚠️ **Warning**

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<td>

Il est de la responsabilité de l'opérateur et de l'installateur professionnel que lors de la configuration de la radio au Canada (ou lorsque les règles canadiennes appliquer), la puissance Tx est définie en fonction des valeurs pour lesquelles le produit est agréé. L'utilisation de valeurs de puissance Tx autres que celles pour lesquelles le produit est certifié, est expressément interdit par les règlements de l'ISDE

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⚠️ **Warning**

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Under regulatory environments supporting other than FCC/ISED rules: Where Outdoor units are configurable by software to Tx power values other than those for which the product is certified, it is the responsibility of the Professional Installer to restrict the Tx power to the certified limits.

This product was tested with special accessories indoor unit (IDU or PoE), FTP CAT-5e shielded cable with sealing gasket, 16 AWG grounding cable - which must be used with the unit to insure compliance.

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⚠️ **Warning**

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<td>

Dans des environnements réglementaires prenant en charge d'autres règles que celles de la FCC / ISED: Où les unités extérieures sont configurables par logiciel aux valeurs de puissance Tx autres que ceux pour lesquels le produit est certifié, c'est le la responsabilité de l'installateur professionnel de restreindre la puissance Tx à les limites certifiées.

Ce produit a été testé avec des accessoires spéciaux - unité intérieure (UDI ou PoE), câble blindé FTP CAT-5e avec joint d'étanchéité, mise à la terre 16 AWG câble - qui doit être utilisé avec l'unité pour assurer la conformité.

</td>
</tr>
</table>

Canadian Emission Requirements for Indoor Units

This Class B digital apparatus complies with Canadian ISED-003.

Cet appareil numeique de la classe B est conforme a la norme NMB-003 du Canada.

Warning

The radio devices in this manual have been approved by Industry Canada to operate with the antenna types listed in the Certified Antennas appendix with the maximum permissible gain and required antenna impedance for each antenna type indicated.
Antenna types not included in this list, having a gain greater than the maximum gain indicate for that type, are strictly prohibited for use with this device.

Les appareils de radio dans ce manuel ont ete approuves par Industrie Canada pour fonctionner avec les types d'antenne enumeries à l'annexe Antennes Certifiées avec le gain maximal admissible et l'impedance d'antenne requise pour chaque type d'antenne indique.
Types d'antennes non inclus dans cette liste, ayant un gain superieur au gain maximum indique pour ce type, sont strictement interdics pur une utilisation avec cet appareil.

EU – Compliance

$C\!E$

For Norway and Sweden only

Equipment connected to the protective earthing of the building installation through the mains connection or through other equipment with a connection to protective earthing - and to a cable distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a cable distribution system has therefore to be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11).

Norway

Utstyr som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplet utstyr - og er tilkoplet et kabel-TV nett, kan forårsake brannfare. For å unngå dette skal det ved tilkopling av utstyret til kabel-TV nettet installeres en galvanisk isolator mellom utstyret og kabel- TV nettet

Sweden

Utrustning som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i vissa fall medföra risk för brand. För att undvika detta skall vid anslutning av utrustningen till kabel-TV ät gal-vanisk isolator finnas mellan utrustningen och kabel-TV nätet.

Unregulated

In countries where the radio is not regulated the equipment can be operated in any regulation configuration, best results will be obtained using Universal regulation configuration.

Safety Practices

Applicable requirements of National Electrical Code (NEC), NFPA 70; and the National Electrical Safety Code, ANSI/IEEE C2, must be considered during installation.

NOTES:

1. A Primary Protector is not required to protect the exposed wiring as long as the exposed wiring length is limited to less than or equal to 140 feet, and instructions are provided to avoid exposure of wiring to accidental contact with lightning and power conductors in accordance with NEC Sections 725-54 (c) and 800-30.

In all other cases, an appropriate Listed Primary Protector must be provided. Refer to Articles 800 and 810 of the NEC for details.

2. For protection of ODU against direct lightning strikes, appropriate requirements of NFPA 780 should be considered in addition to NEC.

3. For Canada, appropriate requirements of the CEC 22.1 including Section 60 and additional requirements of CAN/CSA-B72 must be considered as applicable.

4. Only UL Listed parts and components will be used for installation. Use UL Listed devices having an environmental rating equal to or better than the enclosure rating to close all unfilled openings.

5. Use min. 16 AWG external protective earthing conductor.

6. Installation altitude is limited to a maximum of 2000 meters (6,560 ft.).

Les Pratiques De Sécurité

Exigences applicables du Code Électrique National (CEN), NFPA 70; et le National Electrical Code de la Sécurité ANSI/IEEE C2, doivent être considérés lors de l'installation.

NOTES:

1.Un Principal Protecteur n'est pas nécessaire pour protéger le câblage exposé aussi longtemps que le exposedwiring longueur est limitée à moins de ou égal à 140 pieds, et des instructions sont fournies toavoid exposition de câblage d'un contact accidentel avec la foudre et les conducteurs d'alimentation conformémentà NEC Sections 725-54 (c) et 800-30.

Dans tous les autres cas, un Répertoriés Principal Protecteur doit être fournie. Reportez-vous à Articles800 et 810 du NEC pour plus de détails.

2.Pour la protection de l'ODU contre la foudre, aux exigences appropriées de la NFPA780 devrait être considéré, en plus de NEC.

3.Exigences appropriées de la CEC 22.1 notamment l'Article 60 et additionalrequirements de la can/CSA-B72 doivent être considérées comme applicables.

4.Seulement UL pièces et composants seront utilisés pour l'installation. Utilisation de la liste UL deviceshaving un environnement de notation égale ou supérieure à l'indice de protection du boîtier pour fermer allunfilled ouvertures.

5.Utilisation min. 16AWG externe de protection de mise à la terre du conducteur.

6.L'altitude d'installation est limitée à 2000 mètres maximum

TerraBridge

Installation Guide

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