

# TEKTELIC COMMUNICATIONS INC.

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## Table of Contents

1	Product Description .....	4
1.1	Overview .....	4
1.2	Physical Interfaces.....	5
1.3	Specifications.....	7
2	Installation .....	8
2.1	Safety Precautions.....	8
2.2	Unpacking and Inspection .....	9
2.3	Required Equipment for Installation.....	9
2.4	Dish Macro Gateway Mounting .....	9
2.5	Ground Cable Installation .....	12
2.6	Direct DC Power Cable Installation .....	13
2.7	RF Cable Installation .....	14
2.8	Copper Ethernet Cable Installation .....	14
3	Commissioning and Monitoring .....	15
3.1	Required Equipment .....	15
3.2	Procedure .....	15
4	Radio Compliance Statements .....	16

# 1 Product Description

## 1.1 Overview

The Dish Macro Gateway is an outdoor hardened LoRaWAN IoT gateway that supports the full range of LoRaWAN uplink channels while supporting the DISH custom downlink channels in the 722-728MHz band. The Gateway supports one external LoRa antenna, an internal GPS antenna, two power options including direct DC input power or Power over Ethernet (PoE), and two backhaul options including copper Ethernet or 3G/4G wireless. Table 1 presents the currently available Dish Macro Gateway models for the North American market.

**Table 1: Dish Macro Gateway Models**

Product Code	Description	RF Region
T0006033	LORA GATEWAY MODULE, KONA MACRO, DISH, LTE MODEM	NA
T0006034	LORA GATEWAY MODULE, KONA MACRO, DISH, LTE MODEM, GEOLOCATION	NA
T0006231	LORA GATEWAY MODULE, KONA MACRO, DISH	NA
T0006232	LORA GATEWAY MODULE, KONA MACRO, DISH GEOLOCATION	NA

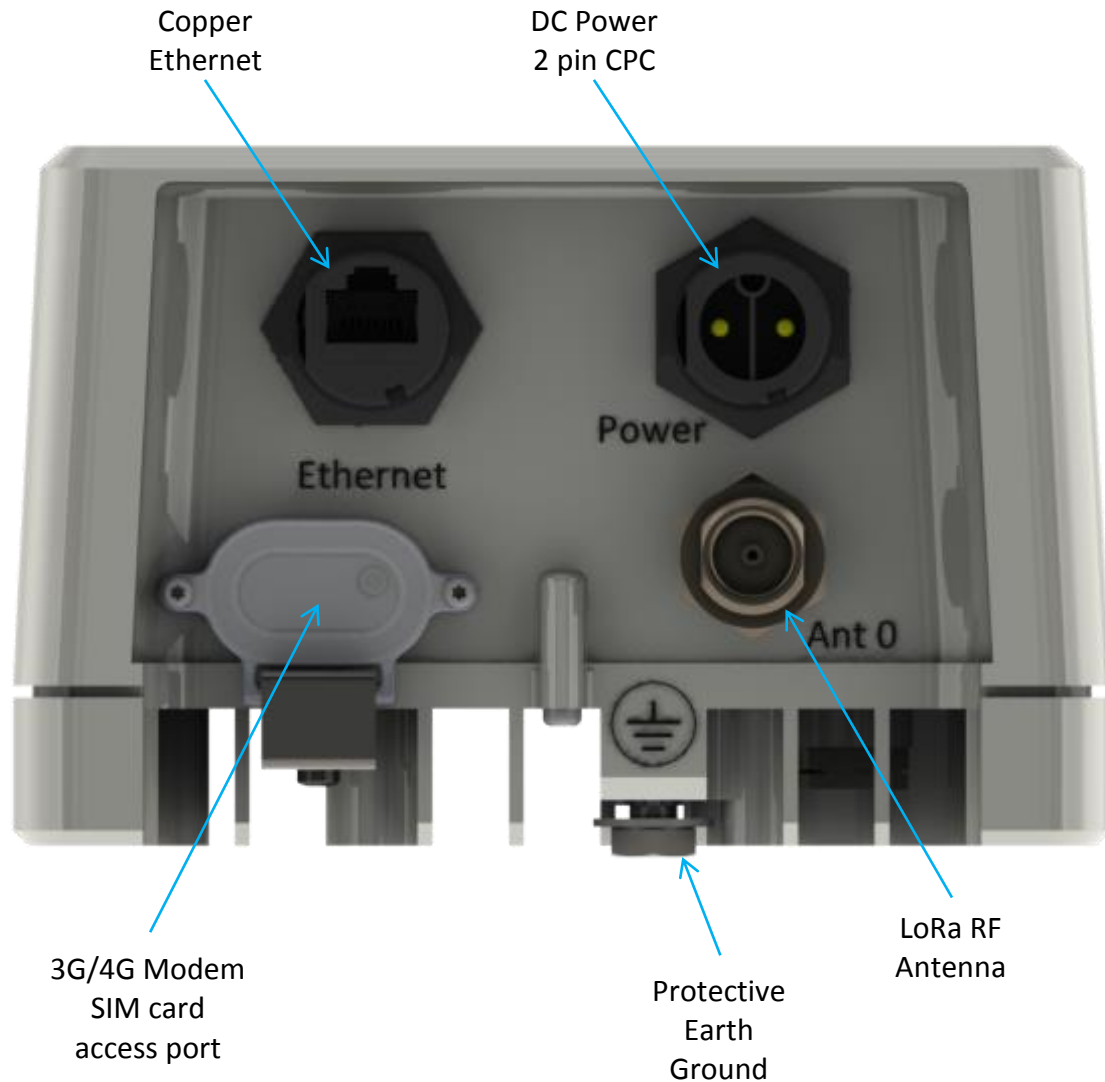
Figure 1 illustrates the Dish Macro Gateway external form-factor with the front view on the left and rear view on the right. All models share the same mechanical form-factor.



**Figure 1: Dish Macro Gateway Common Dimensions**

## **1.2 Physical Interfaces**

Figure 2 illustrates the bulkhead layout for the Dish Macro Gateway. All models share the same bulkhead layout.



**Figure 2: Dish Macro Gateway Bulkhead Layout**

All Kona Gateway module interconnect is located on the bottom facing bulkhead. The RF connectors are water proof while un-mated but all other connectors must be terminated with mating connectors or covered with the supplied protective cap when not in use in order to be water tight. Connector types and their mating connectors are listed in Table 2.

**Table 2: Dish Macro Gateway Interface Connector Types**

Interface	Connector Type	Mating Connector
LoRa Antenna Ports	N-Type female	Industry standard N-Type male
3G/4G Modem SIM card	SIM card	Industry standard, located behind SIM card access port cover
Copper Ethernet Port	Threaded, circular, RJ-45	Shenzhen Chogori Technology Co., Ltd. approved mating connector (p/n 33000111-02 or equivalent)
Direct DC Power Input Port	Threaded, circular, 2 contact DC power	Shenzhen Chogori Technology Co., Ltd. approved mating connector (p/n 23002211-02, or equivalent)
Earth Ground	Chassis Protective Earth Ground terminal	Industry standard 2-hole lug, 1/4 x 0.75" spacing

### 1.3 Specifications

The Dish Macro Gateway specifications are listed in Table 3.

**Table 3: Dish Macro Gateway Specifications**

Attribute	Specification
Dimensions	144.4mm (5.7") wide x 92mm (3.6") deep x 282.8mm (11.1") tall
Weight	2.5 kg (5.5 lbs)
Operating Temperature	-40°C to 60°C (-40°F to 140°F) at sea level Including solar loading.
Relative Humidity	10% to 100%
Operating Altitude	-60 m to 4,000 m (-197 ft to 13,123 ft)
Power Input, Direct DC	48 VDC nominal, 37 to 57 VDC operating range. Positive or negative ground referenced feed. SELV source required. 5A recommended input overcurrent protection (2A minimum to 10A maximum allowed).
Power Input, PoE	802.3 at (Type 2 Class 4), Mode A or Mode B or 4-pair Mode.
Power Consumption	25.5 W maximum
Weather Tightness	UL Type 6 (IP-67)
Regulatory Compliance	CSA/UL 60950-1 & CSA/UL 60950-22, CE IEC 60950-1 FCC Pt. 15, RSS-247, EN 301 489-1
Surge Protection	All interfaces are protected to primary levels.

## 2 Installation

### 2.1 Safety Precautions

- The Dish Macro Gateway must be installed in a restricted access location (such that touching of the Gateway by non-service persons is not likely).
- The Dish Macro Gateway may become hot to the touch during normal operation at elevated ambient temperatures.
- The Dish Macro Gateway has no internal field serviceable parts. The Gateway module must only be opened by an approved TEKTELIC service center.
- All installation practices must be in accordance with the local and national electrical codes.
- Do not work on the system during periods of lightning activity.
- The Dish Macro Gateway is considered permanently connected equipment. The Protective Earth Ground connection (that is, the two-hole lug to chassis ground) is always required.
- Ensure the Dish Macro Gateway Protective Earth Ground connection is properly terminated prior to the connection of any other interface.
- The Dish Macro Gateway contains primary lightning surge suppression on the Direct DC power port, the Copper Ethernet port, and the LoRa RF antenna port. The primary lightning protectors have the ability to bridge the interface to chassis isolation boundary during over-voltages. Ensure that the Protective Earth Ground connection is always in place.
- Ensure that the Dish Macro Gateway is secured to eliminate any physical hazard to people or property. The Gateway must be securely mounted according to the mounting instructions prior to any cable connection and operation.
- The Dish Macro Gateway does not contain a power disconnection device; a readily accessible disconnection device must be incorporated external to the Dish Macro Gateway.
- The direct DC powered Dish Macro Gateway shall be supplied through an input overcurrent protection device rated not more than 10 A. The overcurrent protection must have the appropriate current interrupt capacity for the power source and must be incorporated into the non-earthed conductor(s) of the Dish Macro Gateway DC supply.
- For the direct DC power input, the DC positive pin must be at positive potential relative to the DC negative pin. If the polarity is reversed, the unit will not sustain damage but will not operate until the connection polarity is corrected.



- Although the Dish Macro Gateway can be powered through either the direct DC input or the power over Ethernet (PoE) input, simultaneous application of power to both inputs may result in unexpected operation and shall be avoided.
- The Dish Macro Gateway power source must meet SELV requirements.
- Always ensure the 3G/4G Modem SIM card access port is properly sealed after installing a SIM card.

## **2.2 Unpacking and Inspection**

The following should be considered during the unpacking of a new Dish Macro Gateway.

1. Inspect the shipping carton and report any significant damage to TEKTELIC.
2. Unpacking should be conducted in a clean and dry location when possible.
3. Do not discard the shipping box or foam inserts as they will be required if a unit is returned for repair or re-configuration.

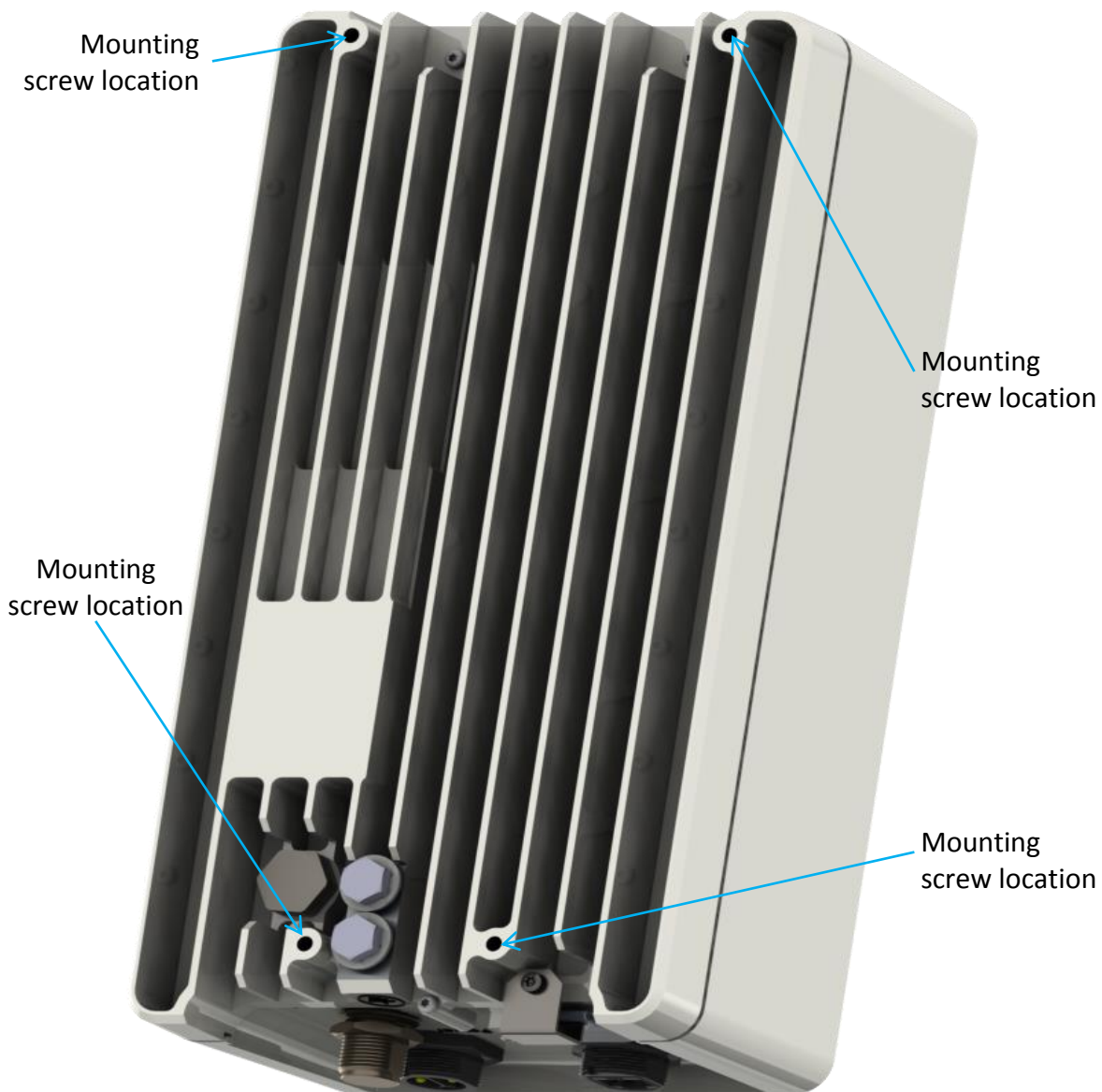
## **2.3 Required Equipment for Installation**

The following tools are required to install the Dish Macro Gateway module:

1. A 6 point metric socket set and torque wrench drive.
2. Anti-oxidant compound (NO-OX-ID, Penetrox, Noalox, Ox-Gard or equivalent).
3. A small wire brush.
4. A clean cloth.
5. Weatherproofing tape kit for the RF connector (Scotch Wireless Weatherproofing Kit, WK-101 recommended).
6. Appropriately sized pipe clamps for pole mounting or appropriate screws or bolts (four sized M8) with any required anchors according to the wall construction for wall mounting.

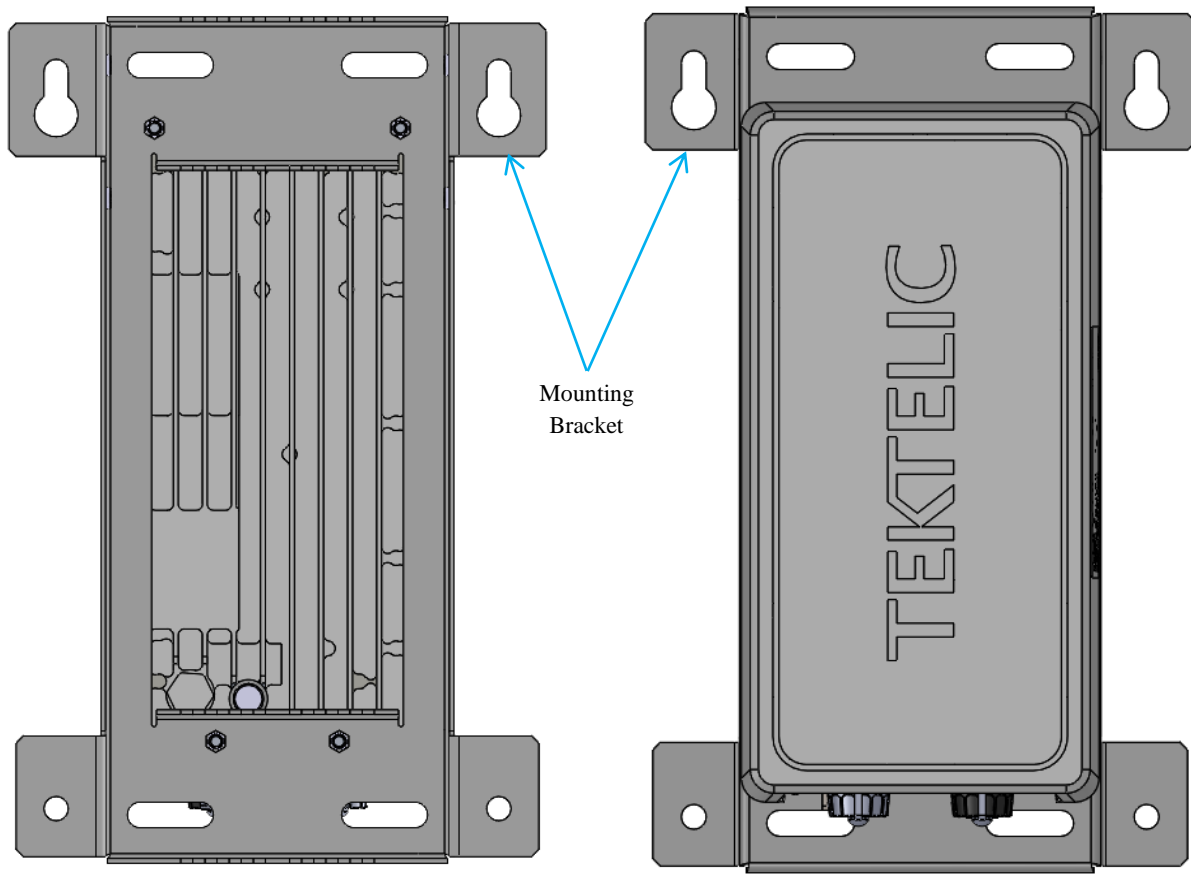
## **2.4 Dish Macro Gateway Mounting**

Dish Macro Gateway is designed to be mounted to a vertical pole or wall using the supplied mounting bracket which attaches at the four screw locations on the back of the module illustrated in Figure 3.



**Figure 3: Dish Macro Gateway Mounting Bracket Attachment Screw Locations**

The mounting bracket is a single part that bolts to the back surface of the Gateway using supplied hardware (four M6x1.0 - 14 mm bolts with flat and star lock washers) as illustrated in Figure 4. The Gateway module must be oriented with the connector bulkhead facing down, towards earth.



**Figure 4: Dish Macro Gateway Module with Mounting Bracket**

Ensure that the structure to which the Gateway is being mounted is secure and able to support a dead load of at least 136 kg (300 lbs). The area below must be free of any obstructions to cable ingress.

The Dish Macro Gateway wall mounting procedure is as follows:

1. Bolt the wall mounting bracket to the Gateway module using the supplied bolts and washers.
2. Install 2 site supplied M8 bolts into the wall at 139.7 mm (5.5") center spacing, leaving the bolt heads protruding with a 2mm gap from the wall surface.
3. Hang the Dish Macro Gateway with bracket from the two bolts by inserting the keyhole slots at the top of the bracket onto the 2 bolts and tightening the bolts.
4. Insert and tighten two additional site supplied M8 bolts through the holes at the bottom of the bracket.

The Dish Macro Gateway pole mounting procedure is as follows:

1. Bolt the wall mounting bracket to the Gateway module using the supplied bolts and washers.
2. While temporarily supporting the Gateway with bracket, install the two site supplied pipe clamps, one through each of the upper and lower slotted clamp mounting points.

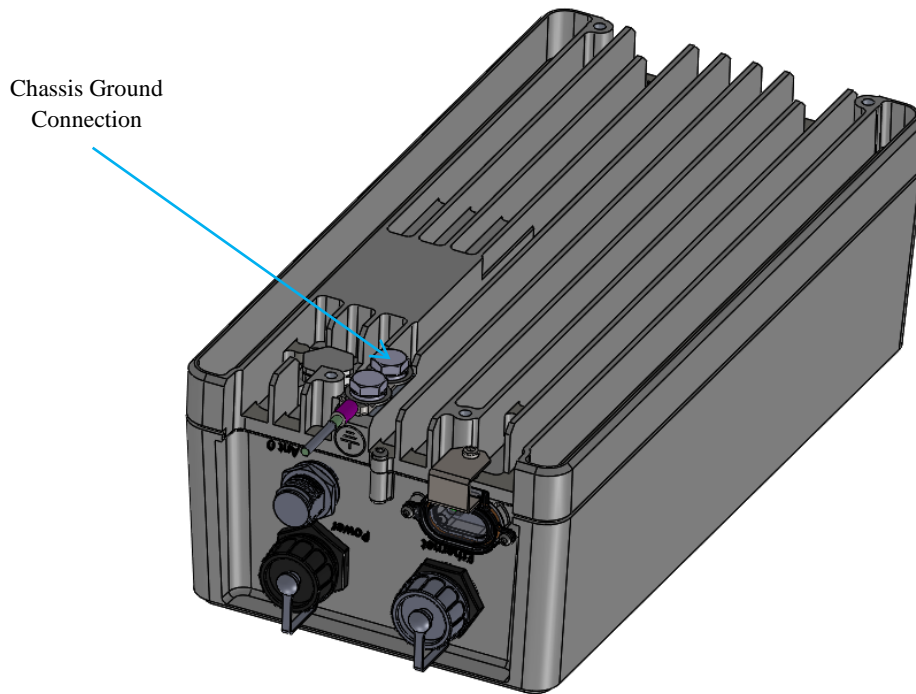
## 2.5 Ground Cable Installation

The Dish Macro Gateway is considered Permanently Connected Equipment and requires a permanently connected Protective Earth Ground (PEG) conductor. The Protective Earth Ground connection is made through a 1/4 x 0.75" on center double hole lug to the ground termination point illustrated in Figure 5. The recommended ground cable gauge is #10 AWG.

The Dish Macro Gateway grounding system shall follow local and national electrical codes. The Protective Earth Ground conductor terminated at the double hole lug point is mandatory and must be the first connection made to the Dish Macro Gateway during installation. Proper routing and termination of this cable is key to robust lightning withstand performance; in high susceptibility installations, every effort shall be made to minimize connection inductance and ground bed resistance.

The ground cable installation steps are as follows:

1. Lightly abrade the surface of the casting ground area with a fine wire brush to remove the oxide layer.
2. Use a clean cloth to remove any debris from this surface.
3. Immediately coat the contact surface with a thin layer of anti-oxidant compound.
4. Install the ground cable through its 2-hole lug onto the chassis ground point using the two supplied 1/4 - 20 x 1/2" bolts with flat and star lock washers, torqued to 10.4 Nm (92 in·lbs).



**Figure 5: Chassis Ground Connection**

## **2.6 Direct DC Power Cable Installation**

The Dish Macro Gateway direct DC feed terminates at a dedicated two pin circular plastic connector (CPC) on the bulkhead. The direct DC power input is isolated from chassis (earth) with the exception of the primary surge suppressors. One lead of the DC power feed is normally earth referenced external to the Dish Macro Gateway (usually at the power source by convention).

The DC power cable shall be rated for outdoor application according to local and national electrical codes.

The CPC direct DC connector shall be as specified in Table 2 and shall follow the signal polarity identified in Figure 6.



**Figure 6: Direct DC Power CPC Connector Connection Polarity**

## 2.7 RF Cable Installation

The Dish Macro Gateway installation requires connection to a LoRa RF antenna. The RF cable attaches to the N-Type connector located on the bulkhead of the Gateway. Torque the connector to 1.7 to 2.3 Nm (15 to 20 in·lbs). The N-Type connector interface to a cable is not water proof and must be taped to be used outdoors. TEKTELIC recommends taping with Scotch Wireless Weatherproofing Kit, WK-101. Follow the taping procedures outlined by the supplier of this tape system.

Note that the 3G/4G modem antenna is internal to the Dish Macro Gateway.

## 2.8 Copper Ethernet Cable Installation

The Dish Macro Gateway Ethernet port may be used on a temporary basis for commissioning and maintenance or may be permanently connected for backhaul. When the port is not in use, the weatherproof protective cap must be installed. When the port is permanently connector for backhaul, the proper water-tight mating connector specified in Table 2 must be used.

The Ethernet cable must have minimum 24 AWG conductors and shall be rated for outdoor application according to local and national electrical codes.

## 3 Commissioning and Monitoring

### 3.1 Required Equipment

The following equipment is required for commissioning and monitoring the Dish Macro Gateway.

1. A laptop running Windows XP/Vista/7.
2. A Cat5 or better Ethernet cable.

### 3.2 Procedure

Once the DC power and GPS and LoRa RF antenna connections are in place the Dish Macro Gateway may be commissioned.

1. Connect an Ethernet cable between the Host PC and the bulkhead copper Ethernet connector (RJ45). For a PoE powered installation, a PoE power injector may be required.
2. Apply DC power to the Dish Macro Gateway. The initial current draw is expected to be greater than 0.1A. If there is no current, the polarity of the DC power cable connection may be reversed or the power source may not be configured properly.
3. The Dish Macro Gateway supports DHCP; from the Gateway MAC ID label on the enclosure, determine the IP address using your local DHCP tools.
4. Install the Tektelic Kona Factory Test Tool on a PC and follow the operating instructions as detailed in the reference document T0004142\_GUI\_Instructions.

## 4 Radio Compliance Statements

### *Federal Communications Commission*

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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

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 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.

To comply with FCC/IC RF exposure limits for general population / uncontrolled exposure, the antennas used for this transmitter must be installed to provide a separation distance of at least 46cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. This product must be installed by professional trained RF technicians.

Recommended Antennas:

WTTX-OMNI07250910-10-NJ – High gain 8 dBi

WTTX-OMNI0720730900930-5-NJ – Medium gain 5 dBi