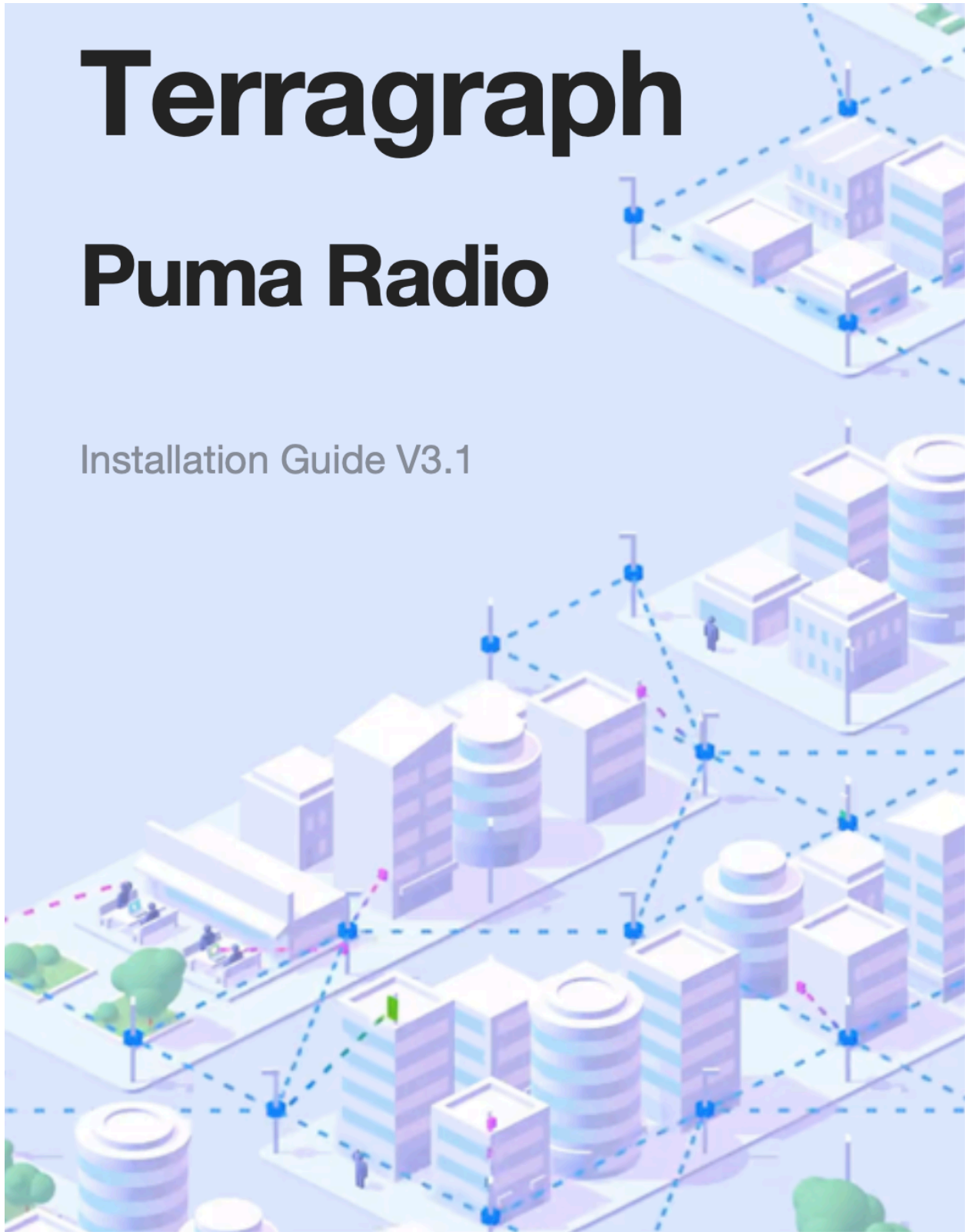


Terragraph

Puma Radio

Installation Guide V3.1



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Warnings

WARNING: Shock Hazard. May result in serious injury or death. Turn off circuit power at circuit breaker or disconnect power at source receptacle before installing unit.

WARNING: Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

WARNING: Installation of this equipment must comply with local and national electrical and building codes.

WARNING: Fall Hazard. When working at height, observe safe practices and use a suitably-attached safety harness.

WARNING: Installing the DC power with reversed polarity may result in completely and permanently destroying the Terragraph primary radio.

Compliance

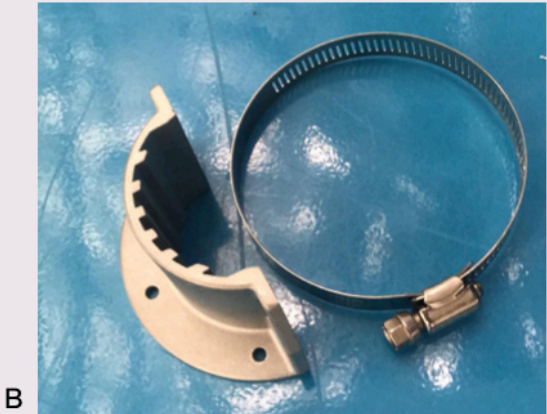
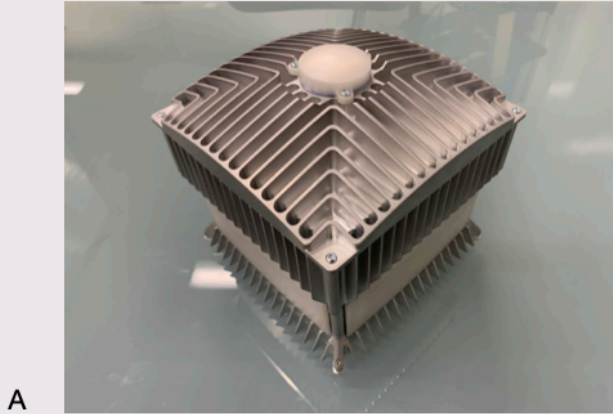
This device complies with Part 15 rules. Operation is subject to the following two conditions:

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

This equipment has been tested and found to comply with the limits for Class A digital devices, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device contains transmitter module FCC ID: 2AC7Z-ESPWROOM32D
RF Exposure: This device has been evaluated for RF exposure for Human in reference to ANSI C95.1 (American National Standards Institute) limits. The evaluation was based on ANSI C95.1. At least :**40Cm (15.74")** of separation distance between this device and the user's body must be maintained at all times. Any changes or modification to the product not approved by FCL Tech could void the user's authority to operate this device.

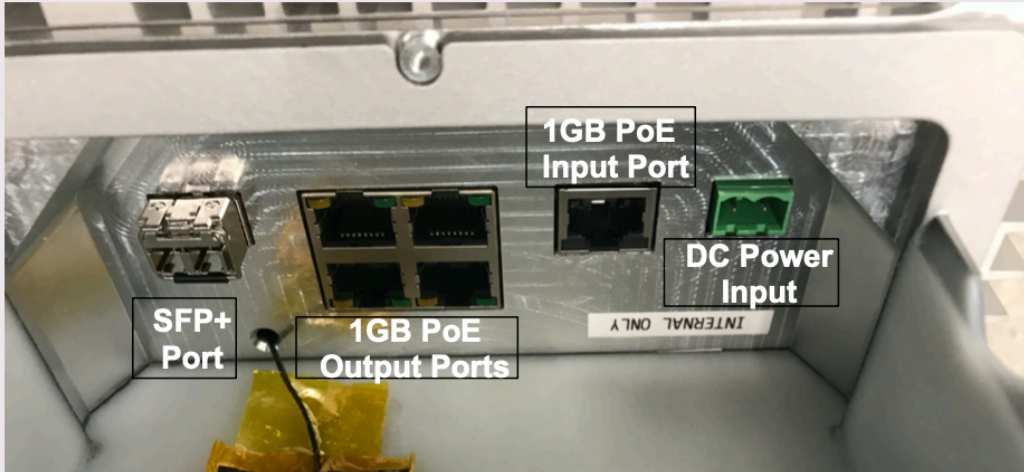
Package Contents



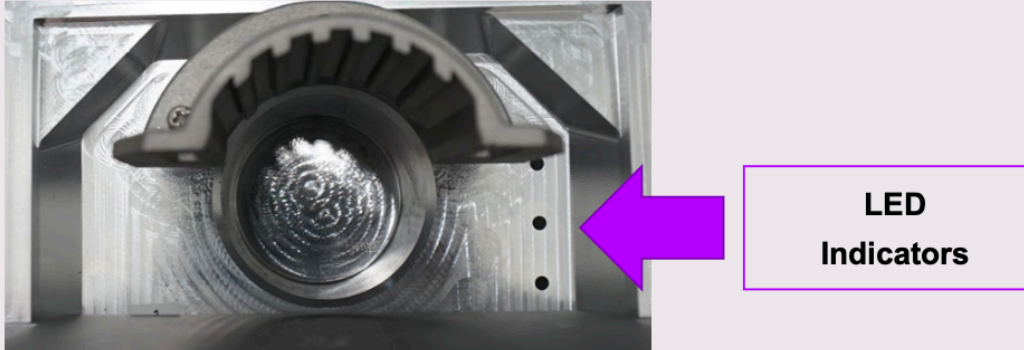
Key	Part Description	Part Number	Quantity
A	Terragraph Puma radio		1
B	Terragraph mounting bracket and stainless steel band clamp		1
C	Cable Cover		1

Terragraph Radio Ports and LEDs

Power and Connectivity



LEDs



Terragraph Overview

Terragraph Network Hierarchy:

Site – A site is a physical location at which one or more nodes (radios) are installed. A site is considered a fiber point of presence (PoP) when the primary radio at the site is connected to a provider's IP network.

Node – A node is the physical radio element in the network. There are two different types of nodes used in Terragraph:

- **Distribution Node (DN)** – The DN builds the backbone mesh for the Terragraph networks. DNs wirelessly connect to other DNs, CNs, or both in a P2MP configuration.
- **Client Node (CN)** - A CN terminates IP connectivity to a customer (similar to a modem). A CN connects wirelessly to a DN.

Link - A link is a relationship between two nodes. There are two different types of links:

- **Wired** - Ethernet links used for primary DN to secondary DN connections, and occasionally for wired cross-site connections.
- **Wireless** - RF links, used for DN to DN or DN to CN connections.

Terragraph Network Installation Best Practices:

To maximize the efficiency of a Terragraph installation, it is important to follow these network installation best practices. These best practices help to ensure that Terragraph links will be commissioned as the network is built, and that troubleshooting can be performed during installation, reducing the need for follow-up site visits.

Installation Order:

1. The Terragraph end-to-end (E2E) controller should be installed and configured before the Terragraph radios are added to the network.
2. The cabling and networking between the E2E controller and the POP nodes should be completed before the radios are installed in the PoP nodes, so that the uplink connections of the PoP radios can be validated.
3. The installation of a Terragraph network should originate with the Terragraph PoP radio sites. The installations of the other sites should expand outward from the PoP radio sites.
4. Sites should have power before the radios are installed, so that the status of the radios can be validated during installation.

Record Keeping:

It is essential to keep records of all Terragraph radios and their locations to assist with network commissioning and maintenance. It is also recommended that pictures be taken of the completed installation for each node and site to assist with future troubleshooting.

The following information should be collected and maintained for each node:

- GPS coordinates of the site where the radio is located
- Azimuth of the radio
- QR code (serial number and the 60GHz MAC address) of the radio
- Name or location of the site at the remote end of the link
- Pictures of the node and site where the radio is located

Materials Required (Customer Supplied)

Required:

- 4cm-5cm OD pipe to mount radio
- Electrical wire/materials conforming to local codes for DC power supply
- 54-Volt DC power supply or POE injector capable of supplying at least 1.5A
 - *Example power supply: Meanwell HEP-100-54 or Ubiquiti POE-54v-80w*

Optional:

- UV-rated plastic cable ties or stainless-steel cable ties for securing cables
- Outdoor-rated 2-strand multi-mode or single-mode armored fiber patch cord with LC connector to match SFP module
- Outdoor-rated Cat5e or Cat6a J-45 Ethernet cable conforming to local codes
- SFP or SPF+ module supporting 2-strand operation. See table below:

SFP Type	Speed	Range	Common Wavelength
Multi Mode SFP	1Gbps	Medium Range	850nm
Single Mode SFP	1Gbps	Long Range	1310, 1550nm
Multi Mode SFP+	10Gbps	Medium Range	850nm
Single Mode SFP+	10Gbps	Long Range	1310, 1550nm
DAC	10Gbps	Short Range	N/A (Copper)

Tools (Customer Supplied):

Required:

- Electrician's wire cutter/stripper
- 8mm nut driver or cordless drill with 8mm socket (for band clamps)
- Philips screw driver

Recommended:

- Personal Safety Protection (Safety glasses, Hard Hat, Work Gloves, Safety Harness)
- Digital multimeter
- Crimping tool for RJ-45 connector
- RJ-45 tester with POE tester
- Fiber light tester

Installation Steps

Mounting Terragraph Radio

Note: The Terragraph radio must not have any obstructions above it. The Terragraph radio contains a GPS receiver which requires a clear view of the sky to function properly.

Terragraph radio should be mounted on a pipe with an outer diameter of 4-5cm (1.57 to 2.0 inches). Pipes larger in diameter will not correctly fit the opening of the bottom of the radio and a pipe adapter will have to be used.



Installation on a pipe