ONRAMP WIRELESS

TOTAL REACH NETWORK

TRN-1031 and TRN-1032 Base Station Installation Guide

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TRN-1031 and TRN-1032 Base Station Installation Guide

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Revision History

Revision	Release Date	Change Description
A	July 26, 2013	Initial release.

1 Introduction

This manual covers the assembly and installation of the On-Ramp Wireless Total Reach Network (TRN), rack-mounted base station models TRN-1031 and TRN-1032. It is ***strongly recommended*** that installers read through all instructions BEFORE starting assembly and installation. For network planning and configuration considerations as well as installation prerequisites, refer to the *Access Point Deployment Guide*.

The scope of this document assumes that the base station and its components are being installed by a wireless installation contractor or customer employees experienced with installing wireless communications systems. All common wireless installation and safety practices should be followed.

On-Ramp Wireless provides two rack-mounted base station models:

- **TRN-1031 Base Station**
  This base station is intended for applications where the Access Point (AP) will be located indoors.
- **TRN-1032 Base Station**
  This base station is intended for applications where the AP will be located outdoors and connected over an Ethernet cable to other indoor equipment.

The primary difference between the two base station models is the location of the AP and the model number of the AP antenna cable surge (lightning) suppressor supplied.

Table 1. Components of Rack-mounted Base Station Kits

TRN-1031 Base Station Kit for Indoor AP	RN-1032 Base Station Kit for Outdoor AP
A 19-inch rack mount shelf with a PoE, Power over Ethernet (PoE) injector, and 120/240 VAC or 48 VDC power options.	A 19-inch rack mount shelf with a PoE, Power over Ethernet (PoE) injector, and 120/240 VAC or 48 VDC power options.
Access Point (Model TRN-1000)	Access Point (Model TRN-1000)
GPS Antenna, PCTEL GPSL1-TMG-SPI-40NCB	GPS Antenna, PCTEL GPSL1-TMG-SPI-40NCB
9 dBi, omni-directional, 2.4 GHz antenna	9 dBi, omni-directional, 2.4 GHz antenna
PolyPhaser AL-LSXM-**MA** RF surge suppressor	PolyPhaser AL-LSXM-**ME** RF surge suppressor

In preparation for assembly and installation, it is important that you determine the installation configuration so that you have the proper tools, equipment, antenna mounts, antenna cable, connectors, and cable attachment hardware available.

Before starting installation you **MUST** have the following items available:

- A 50 ohm coaxial antenna cable and connectors, specified for the site, to connect the base station to the AP antenna. Depending upon length of cable required for installation, acceptable options include, but are not limited to: LMR400, ½-inch Heliax, or ⅞-inch Heliax. See Appendix A for AP antenna cable recommendations based on cable length.
- Cable attachment clamps recommended by the antenna cable manufacturer for the cable being installed. These clamps should be installed at the recommended spacing.

- Appropriate antenna mounts, brackets, or standoffs for the specific site. If the antenna is side mounted, a standoff mount providing a minimum separation of 24 inches is required.
- A 50 ohm coaxial GPS antenna cable and connectors. If the GPS cable length is greater than 25 feet, ½-inch Heliax cable (such as Andrew LDF4-50A) is recommended. LMR-400 cable is suitable for cable lengths up to 25 feet.

2 Installation Procedures

The TRN-1031 and TRN-1032 base station kits are shipped with the same base station shelf. The shelf is shipped with the PoE injector and a 48 VDC terminal strip installed. The photo below shows the base station shelf prior to installing the Access Point.

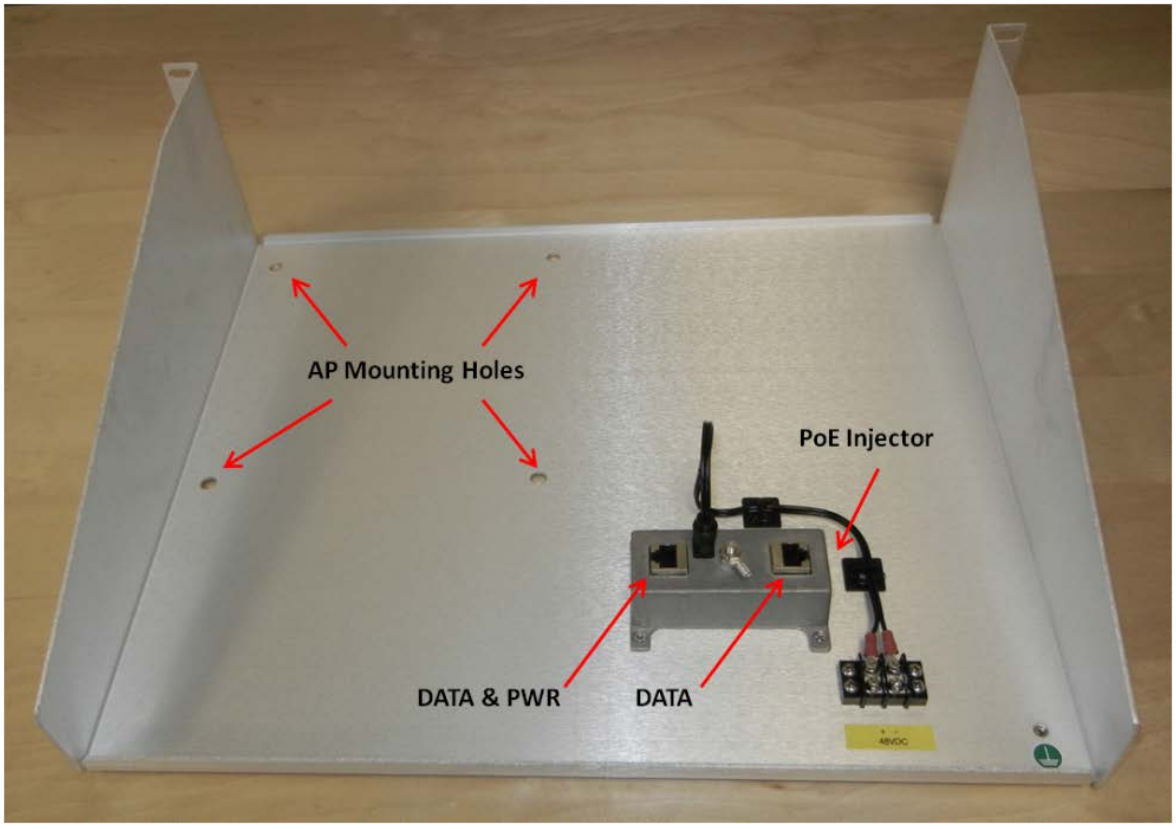

Figure 1. TRN-1031 or TRN-1032 Base Station Shelf without AP Installed

2.2 Installing the AP for the TRN-1031 Base Station (Indoor AP)

2.2.1 Indoor AP Installation

1. Orient the AP as shown in the photo below.

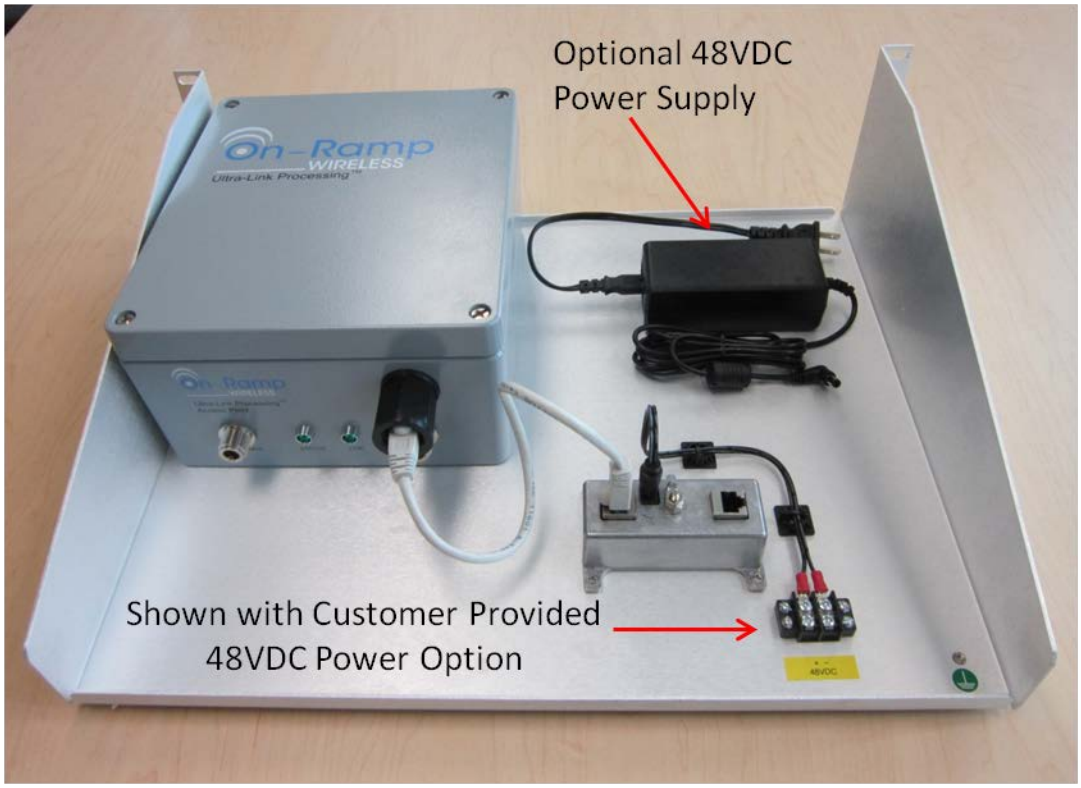

Figure 2. TRN-1031 Rack-mounted Base Station with AP on a Shelf

2. Locate the four 5/16-inch, self-threading, hex head screws provided in the shipping carton with the AP. Attach the AP to the shelf with these screws inserted from the bottom side of the shelf.

2.2.2 AP Data and Power Cable Connection

1. Plug one end of the 12-inch Ethernet cable into the RJ45 connector on the front of the AP.
2. Plug the other end of the Ethernet cable into the RJ45 connector on the PoE injector labeled **DATA and PWR**.

2.3 Installing the AP for TRN-1032 Base Station (Outdoor AP)

2.3.1 Outdoor AP Installation

The AP is waterproof and designed for outdoor installation. When installed outdoors, the front panel of the AP, with the connectors, must be installed facing down.

The AP is provided with four mounting tabs and four 5/16-inch by 3/4-inch self-threading hex head screws. These tabs are attached to the AP with the self-threading hex head screws as shown in the following photo. The mounting tabs are suitable for attaching the AP to a wall or a backboard.

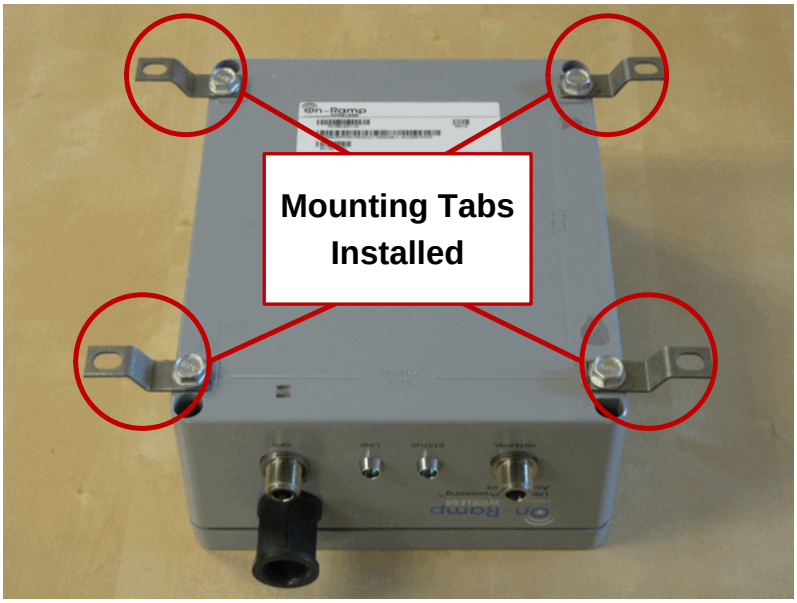

Figure 3. AP with Mounting Tabs Installed

On-Ramp Wireless offers an optional pipe mounting kit that provides two short lengths of U-channel the width of the AP. The U-channel sections are attached to the AP in place of the mounting tabs. The AP can then be attached to a pipe up to 6 inches in diameter using two standard U-channel conduit or pipe clamps designed for the diameter of the pipe. Conduit standoff brackets can also be used with the pipe mount kit to attach the AP to any size wood pole.

2.3.2 AP Data and Power Cable Connection

Power and data are provided to the AP over a single Ethernet cable between the AP and the PoE injector mounted on the base station shelf indoors. The Ethernet cable between the AP and the PoE must be Cat5E (or better) and should have a UV-rated outer jacket. It is recommended that the outdoor section of cable be installed in ½-inch or larger EMT or PVC conduit for added protection.

The AP is provided with a cable gland to provide a weatherproof seal where the Ethernet cable plugs into the RJ45 connector housing on the AP. If the Ethernet cable is run inside conduit, an M 20 X 1.5 male to ½-inch NPT female adapter is needed between the RJ45 connector housing of the AP and a section of PVC flexible, liquid tight, ½-inch conduit.

NOTE: The total length of the Ethernet cable between the AP and the RJ45 connector of the backhaul device may not exceed 100 meters or 328 feet.

Prior to connecting the Ethernet cable, it should be tested with a Cat5E cable tester.

Plug the Ethernet cable into the RJ45 connector on the front of the AP. After the base station shelf is mounted as shown in section 2.5, plug the other end of the cable into the RJ45 connector on the PoE injector labeled **DATA and PWR**.

2.4 Base Station Shelf Power Configuration

If the base station will be powered by an existing 48 VDC power system, proceed to section 2.5 to mount the base station shelf.

If the base station will be powered by the included 120/240VAC input 48 VDC power supply, perform the following steps:

- Remove the four screws attaching the 48VDC terminal strip to the shelf. Cut the wire tie that attaches the power cable of the terminal strip to the shelf and unplug the cable from the PoE injector. These items will not be used in this configuration.
- Locate the provided 120/240VAC input 48VDC power supply and attach it with the provided Velcro to the shelf between the PoE injector and the rear edge of the shelf. Using small wire ties attach the excess DC power cable to the shelf and plug the connector in to the PoE injector.

2.5 Mounting the Base Station Shelf

Mount the base station shelf into an existing 19-inch rack or cabinet. The four 10-24 x ½-inch screws provided should work with most 19-inch racks and some cabinets. If the screws provided are not suitable, install four screws of the proper size and type.

2.6 Installing the AP Antenna and Cable

The AP antenna must be securely attached using the appropriate clamps, brackets, and hardware for the specific type of installation.

NOTE: The clamps provided with the AP antenna work with pipes up to a 2-inch outside diameter (OD). Pipe size is specified by inside diameter (ID). The supplied clamps will work with a maximum pipe size of 1-1/2 inches.

The antenna has a type-N female connector. When an antenna cable larger than ½-inch Heliax is specified a 3-foot jumper cable, of ½-inch Heliax with type-N male connectors on each end, should be used between the antenna and the antenna cable. The jumper is required to avoid mechanical strain that could damage the antenna's connector.

The antenna cable should be routed and clamped following the manufacturer's recommendations for bending radius, clamp type, and clamp spacing.

If an indoor AP is being installed, the antenna cable should be terminated with a type-N female connector where it enters the building. The surge suppressor should be installed at this location. A jumper cable of ½" Heliax cable with male connector should be installed between the surge suppressor and the "Antenna" connector on the AP.

If an outdoor AP is being installed the antenna cable should be terminated with a type-N male connector for connection to the surge suppressor which is attached to the "Antenna" connector on the AP.

All outdoor antenna cable connections must be weather sealed using an industry-approved method. These methods include, adhesive-lined shrink tubing, self-amalgamating tape, self-bonding silicone tape, or butyl mastic tape and electrical tape.

2.7 Installing the GPS Antenna and Cable

The PCTEL GPS antenna is supplied with a bracket and two band clamps that are suitable for clamping it to a section of pipe up to 6 inches in diameter. The excess length of the bands should be cut when used with a smaller diameter pipe.

The GPS antenna has an integral surge suppressor and does not require an external surge suppressor. If the GPS antenna is not attached to a well-grounded metal structure, it must be grounded with a #6 AWG or larger ground wire. A 5/16-inch ground stud is provided on the antenna.

The GPS antenna must be mounted at or near roof level with a clear view of the sky. It should not be shadowed by buildings or trees.

It is recommended that the GPS antenna cable be installed using ½-inch Heliax-type cable, such as Andrews LDF4-50A, with type-N male connectors. If the GPS antenna cable run is 25 feet or less LMR-400 cable may be used with type-N male connectors.

The GPS antenna cable is connected to the "GPS" connector on the AP. The GPS antenna cable connection at the GPS antenna must be weather sealed.

2.8 Installing the AP Antenna Surge Suppressor

2.8.1 Indoor AP

If an ***indoor AP*** is being installed the antenna surge suppressor should be connected to the antenna cable where it enters the building. The type-N male connector on the end labeled "Surge" is connected to the female connector on the antenna cable. A ½ inch Heliax cable with type-N male connectors should be connected between the type-N female connector on the surge suppressor and the "Antenna" connector on the AP. See the following section for grounding information.

2.8.2 Outdoor AP

If an ***outdoor AP*** is being installed, the male connector of the antenna surge suppressor is connected to the "Antenna" connector on the AP and the male connector on the antenna cable is connected to the female connector (labeled "Surge") on the surge suppressor. See the following section for grounding information.

2.9 Grounding

The AP antenna mount must be grounded. If the antenna mount is not attached to a well-grounded metal structure, the mount must be grounded with a #6 AWG or larger ground wire. If the AP antenna is installed on a tower, antenna cable ground kits should be installed on the antenna cable at the top and bottom of the tower and at 100-foot intervals between the top and bottom.

NOTE: Always follow customer-specific grounding guidelines and policies

2.9.1 Indoor AP

If installing an ***indoor AP***, a #6 AWG wire should be crimped to the ground ring terminal provided and attached to the surge suppressor with the washer and nut provided. The other end of the ground wire should be connected to a ground buss bar where the antenna cable enters the building. The antenna buss bar must be properly grounded to the building's ground ring or another suitable ground point for lightning protection.

A #10 ground screw is provided in the right rear corner of the base station shelf for grounding. The shelf should be grounded with a #10 AWG (or larger) stranded, green ground wire to the nearest equipment grounding point.

2.9.2 Outdoor AP

If installing an ***outdoor AP***, a #6 AWG wire should be crimped to the ground ring terminal provided and attached to the surge suppressor with the washer and nut provided. The other end of the ground wire should be connected to a suitable ground point nearby.

A #10 ground screw is provided in the right rear corner of the base station shelf for grounding. The shelf should be grounded with a #10 AWG (or larger) stranded, green ground wire to the nearest equipment grounding point.

2.10 Power Connections

Connect power to the base station shelf after the AP antenna and the GPS antenna have both been connected and all grounding is complete.

If the base station will be powered by 48 VDC, see section 2.10.1.

If the base station will be powered by 120/240VAC, see section 2.10.2.

2.10.1 48 VDC Powered Base Station

Most 48VDC power systems installed for microwave or telephone equipment use a positive 48 VDC ground. With these systems, it is important to install new 48VDC power cable matching the existing site's power wiring color code. Determine whether a positive or negative ground is being used and the polarity using a digital voltmeter (DVM).

1. Install red and black or red and brown #16 or #14 AWG power cable between the power terminal strip of the base station and the customer's 48 VDC power distribution panel.
2. Observe the polarity being used and connect the cable at the base station first, using crimped-on ring terminals.

   NOTE: The AP is not polarity-sensitive but polarity should be observed to minimize confusion and the chance of an accidental short circuit.
3. Carefully connect the base station shelf to an available fuse or circuit breaker on the power distribution panel of the customer-provided 48 VDC power system. A 1 amp fuse or circuit breaker is recommended for powering the base station.
4. Install the fuse or turn on the circuit breaker after all connections have been made.

2.10.2 120/240 VAC Powered Base Station

Connect the AC power cord on the provided power supply to a 120VAC or 240VAC power outlet. If the circuit being used does not have protected power, consider using a rack-mounted UPS that is sized for the required number of hours of backup power.

2.11 Backhaul Ethernet Data Cable Connection

1. Connect the Cat5E (or better) Ethernet cable from the device providing backhaul to the TRN Gateway.

   NOTE: The total length of the Ethernet cable may not exceed 100 meters or 328 feet.
2. Connect the other end of the backhaul cable to the RJ45 connector on the PoE injector labeled **DATA**.
3. If the AP has not been configured with the proper IP address, Netmask, and default router settings for your backhaul network, disconnect the backhaul cable from the PoE **DATA** port and connect a laptop PC to configure the AP. Refer to the *Access Point Deployment Guide* for details.

3 Operation

After the installation is complete, ensure that the base station powers up properly by following the procedure below.

1. Verify that the AP's Status LED is on or flashing. If it is not, refer to chapter 4 to troubleshoot the issue.

2. The system is now ready for configuration and commissioning. For details, refer to the *Access Point Deployment Guide*.

4 System Troubleshooting Guidelines

The following table provides system troubleshooting guidelines.

CAUTION: BEFORE performing any work on the base station shelf, disconnect power to the shelf.

Table 2. System Troubleshooting Guidelines

Problem	Action
AP does not power up on an indoor or outdoor AP (The Status LED on the AP does not illuminate or flash)	When the AP is powered on, the Status LED illuminates. If this fails to happen: 1. Verify that power is connected to the base station shelf. 2. Verify that the PoE cable is properly connected to the AP Ethernet port. 3. Verify that the power plug for the PoE injector is fully inserted. 4. Verify that the backhaul cable from the Data connector on the PoE injector is connected to a router, backhaul device or laptop that is powered up. Connectivity is not required but the port must be active.
AP does not power up on the outdoor AP	1. Disconnect the Ethernet cable between the AP and the PoE injector. 2. Test the cable with a suitable Cat5E cable tester. Repair or replace the cable if necessary.
AP does not acquire GPS	Verify that the GPS and AP antenna cables are connected and have not been swapped.

If the steps above do not resolve the problem, please contact the On-Ramp Wireless Technical Support team for assistance at (858) 592-6008 or email support@onrampwireless.com.

5 Preventive Maintenance

The following table shows the recommended preventive maintenance schedule for the TRN-1031 and TRN-1032 Base Stations.

CAUTION: When performing annual maintenance, take appropriate precautions to avoid electrical shock.

Table 3. Preventive Maintenance Schedule

Task	Frequency
1. Verify all antennas and brackets are securely attached.	Annually
2. Verify all outdoor antenna cable connectors are weather sealed.	Annually
3. Verify all grounds are in place and connections are tight.	Annually
4. Verify all indoor antenna cable connections are tight.	Annually

Appendix A AP Antenna Cable Information

The table below shows the maximum antenna cable length recommended for each type of cable based on the total cable loss. Longer cable lengths may be acceptable depending on coverage requirements.

Table 4. Maximum Recommended Antenna Cable Length by Cable Type

Cable Type	Manufacturer	Size	Cable Loss/100 ft	Maximum Length in Feet	Total Loss in dB
LMR-400	Times	.40 inch	6.8	55	3.9
LDF4-50A	Commscope	1/2 inch	3.7	80	4.0
AVA5-50	Commscope	7/8 inch	2.0	135	4.0
AVA6-50	Commscope	1-1/4 inch	1.5	185	4.0
AVA7-50	Commscope	1-5/8 inch	1.2	300	4.9

This table is based on the following assumptions:

- The AP transmit power at the antenna connector is 30 dBm.
- Antenna gain is 9 dBi.
- The maximum radiated power allowed by the FCC is 36 dBm.
- All cable types accept LMR-400 and LDF4-50A include a 3-foot antenna jumper and a 20-foot equipment LDF4-50A jumper in the total loss.
- Total loss includes connectors and the RF surge suppressor.
- Loss at 2.5 GHz