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# Snaplink Radio Prototype User Guide

By

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For

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Trusted Design Services

## Revision History

Revision	Author	Release Date	Description of Change
0.1	D.R.	01/25/2007	First Draft
0.2	D.R.	05/18/2007	Added FCC warning statements

## Table of Contents

<b>1.</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	SCOPE .....	1
1.2	FCC WARNING.....	1
1.3	PRODUCT OVERVIEW .....	1
1.4	CAUTION: SAFETY WARNING .....	3
<b>2.</b>	<b>INSTALLATION INSTRUCTIONS .....</b>	<b>3</b>
2.1	ASSEMBLING THE POLE BRACKET AND MOUNTING THE RADIO .....	3
2.2	INSTALLING THE CABLE PLUG ASSEMBLY .....	8
2.3	POWERING THE RADIO.....	9
2.4	AIMING PROCEDURE .....	10
2.5	LAN CONFIGURATION .....	10
2.6	NORMAL OPERATION.....	11
<b>3.</b>	<b>CARE AND MAINTENANCE .....</b>	<b>11</b>

# List of Tables

Table 1: LEDs in Normal Mode..... 11

## List of Figures

Figure 1: Anatomy of a Snaplink Radio Transceiver .....	2
Figure 2: Power and Data Connection (Amphenol ID750) .....	2
Figure 3: 4" Pole Mounting Kit .....	4
Figure 4: Top view of collar bracket assembly .....	5
Figure 5: Collar bracket assembly .....	5
Figure 6: Pole Interface Bracket assembly.....	6
Figure 7: Pole radio bracket attachment.....	7
Figure 8: Attachment of WLAN bracket to interface bracket .....	8
Figure 9: Exploded view of cable plug assembly.....	9
Figure 10: Installing the Cable Plug Assembly .....	9
Figure 11: RSSI LED Window .....	10
Figure 12: LAN Configuration Window .....	11

## 1. INTRODUCTION

### 1.1 Scope

This document is intended for engineers and sales/marketing personnel who wish to install and commission a communication link for the purpose of product evaluation, testing, and customer demonstrations. This is not intended to be used with production systems as it does not contain proper safety warnings.

### 1.2 FCC WARNING

This equipment has been tested and found to comply with the limits for a Class A 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:

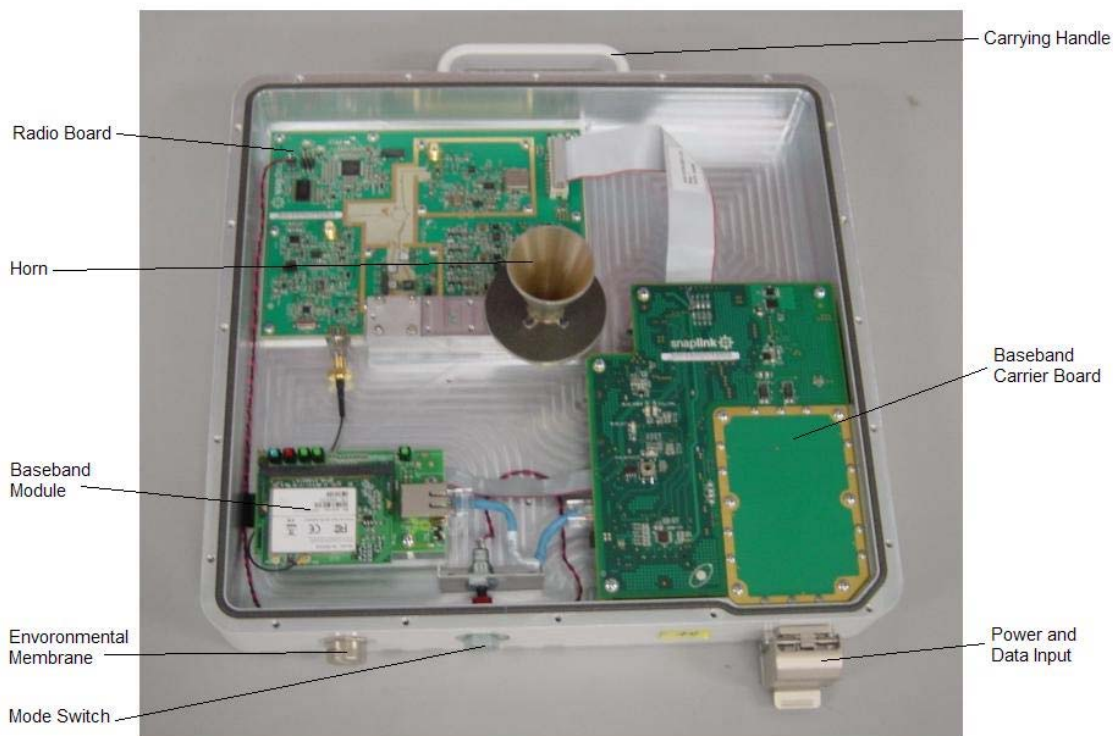
- (i) Reorient or relocate the receiving antenna
- (ii) Increase the separation between the equipment and receiver
- (iii) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- (iv) Consult the dealer or an experienced radio/TV technician for help

In addition, changes or modifications to this product which are not expressly approved by Shieldtech Systems, LLC., could void the user's authority to operate the equipment.

### 1.3 Product Overview

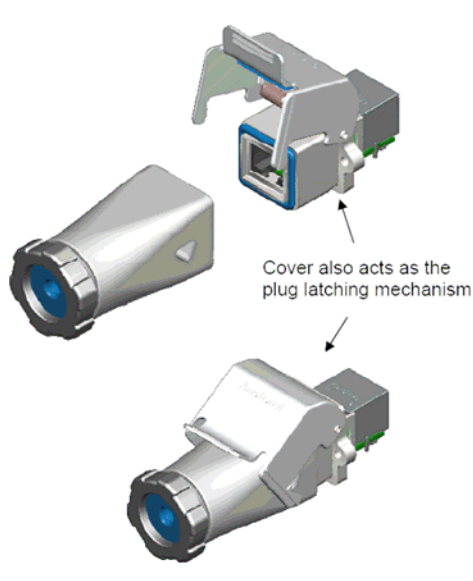
This product is a microwave radio transceiver that operates in the North American 24 GHz unlicensed frequency band (24.05 – 24.25 GHz). This product is intended to operate within FCC and Industry Canada (IC) emission limits for in band and out of band radiated emissions as well as total output power.

Figure 1 (below) illustrates all the major components in the radio. It is strongly recommended that the user DOES NOT remove the cover. There are delicate components and cables that risk getting damaged if the cover is removed. It should only be removed by qualified technicians in an indoor, statically controlled, environment.



**Figure 1: Anatomy of a Snaplink Radio Transceiver**

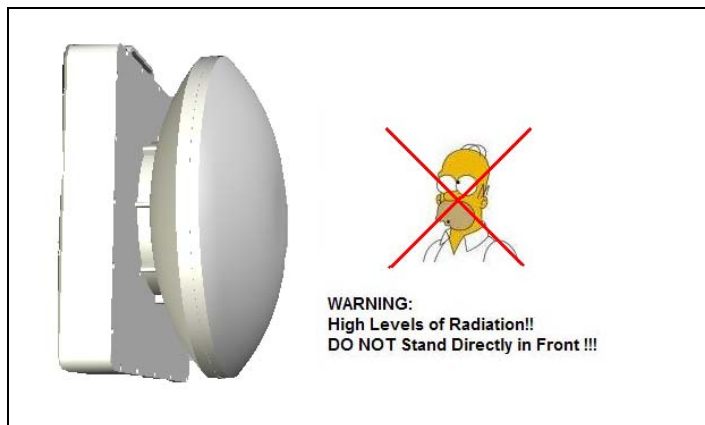
To set up a link, two transceivers are required to be aimed at each other in a point-to-point configuration. Power can be provided to each transceiver **either** over spare **or** signal pairs of the Ethernet cable and this system has been designed to accept power from both an IEEE 802.3af PSE or a non-standard power inserter. The Ethernet cable is connected to the system using a rugged industrial Ethernet connector (Amphenol) and plug assembly for superior environmental sealing and durability and is shown in Figure 2.



**Figure 2: Power and Data Connection (Amphenol ID750)**

When the system is completely installed, the link is automatically commissioned upon power-up so no user intervention is required the power is cycled. The maximum data rate is 54 Mbps providing an end-to-end throughput of up to 30 Mbps, depending on the distance and the weather conditions.

#### 1.4 CAUTION: Safety Warning



**This device emits high amounts of radiation at high frequencies. DO NOT stand directly in front of the antenna. Stand at least 2 meters away from the front of the antenna at all times. Failure to do so will pose a health risk to the user.**

## 2. INSTALLATION INSTRUCTIONS

Please read this document completely including the safety warning in the previous section. Before attempting to assemble and install this product, please be sure to unpack all parts and visibly inspect them to ensure they are not damaged.

This product has been designed to be mounted with a pole bracket. The first step should be to assemble the pole bracket on the pole, and attach the radio after the pole bracket has been tightly secured. Before power is applied, the cable plug assembly needs to be installed at the end of the cable that will be plugging into the radio. The aiming procedure requires two people – one person at each end of the link – to put the transceivers into the proper installation mode and to monitor the RSSI LED display and communicate status back to the other installer. Lastly, the user should ensure that the devices are properly configured for the specific network in which this will operate in. The following sections describe each of these steps in detail.

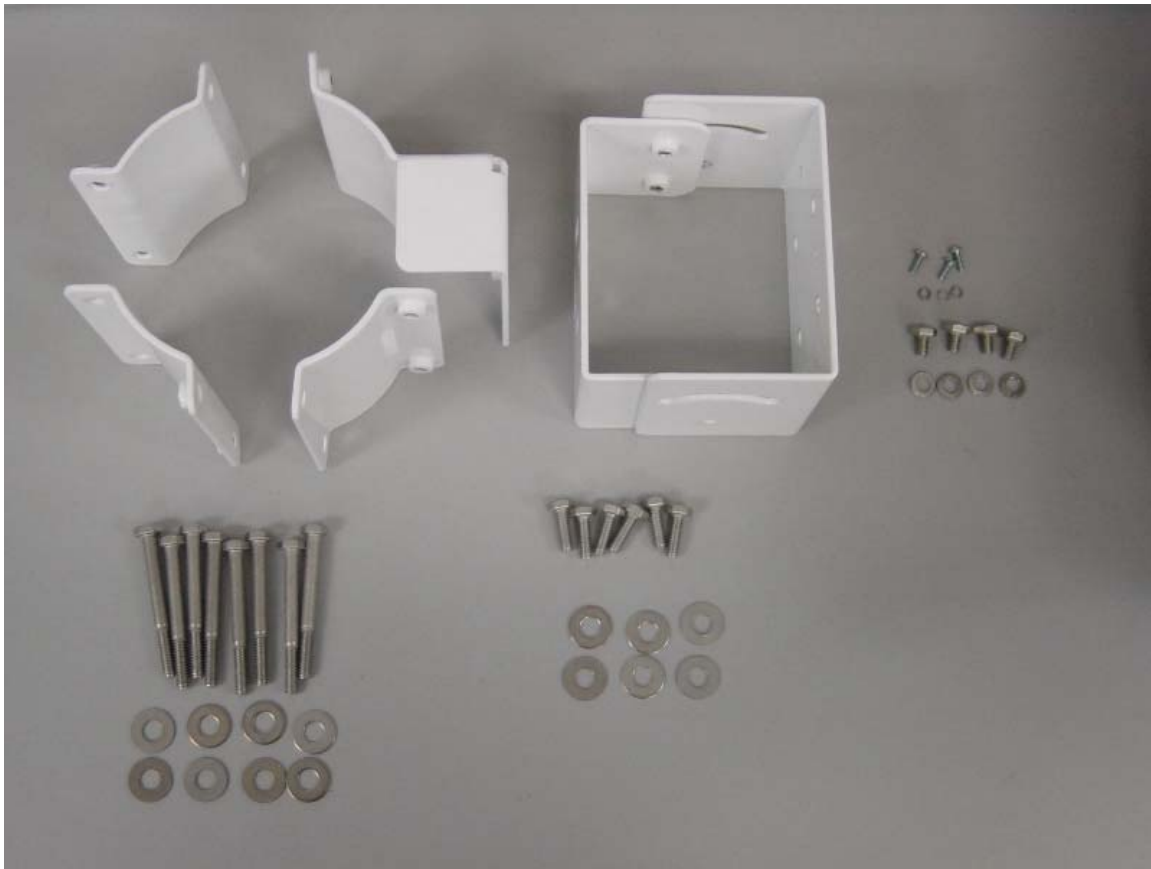
Tools and Materials Required for Assembly and Installation:

- Robertson or Slotted screwdriver
- Socket wrench with various sized sockets
- Torque wrench (recommended)
- Thread Locking Compound (optional)

### 2.1 Assembling the Pole Bracket and Mounting the Radio

Figure 3 (**below**) illustrates all the components included in the 4" pole mount kit.



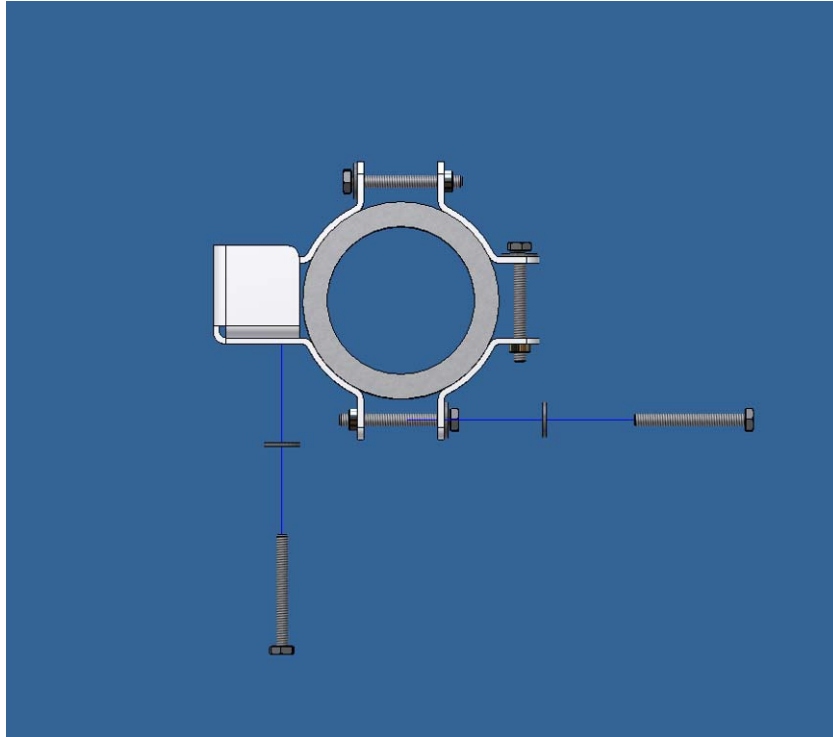


**Figure 3: 4" Pole Mounting Kit**

This instruction is a guideline for the assembly and positioning of the pole mount brackets such that the radio is positioned in the **horizontal** position. It can be installed **vertically** by rotating pole interface bracket (Figure 6). Screws provided can accommodate pole diameter variation from 2" to 6" nominal diameters.

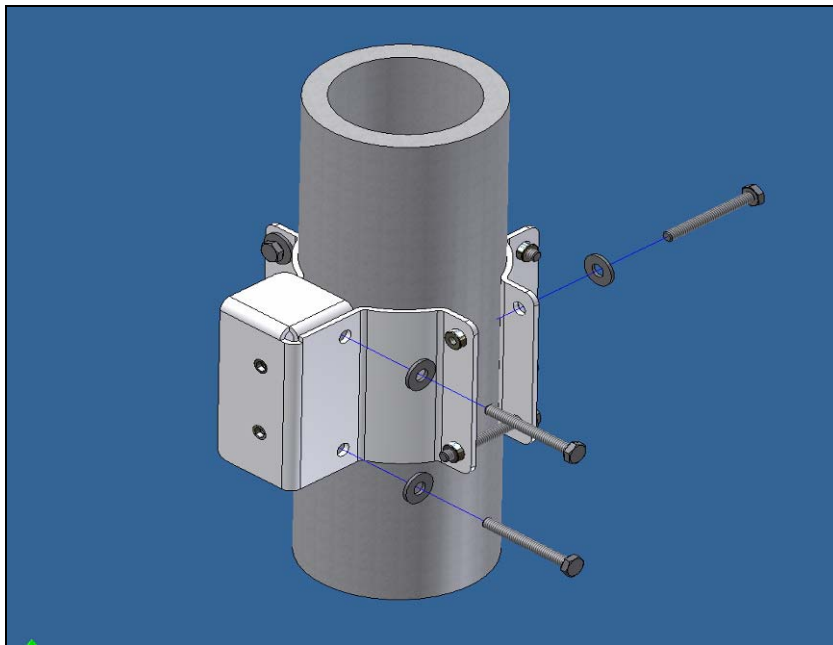
**To attach to a 4" diameter pole**

1. Locate the 8 cap head screws 1/4UNC20 x 2.25" long. The collar around the pole consists of 3 pole collar brackets (FD1000-017) and 1 pole collar base (FD1000-016). Note the orientation of the bracket as shown in Figure 4 (looking down the pole from the top).



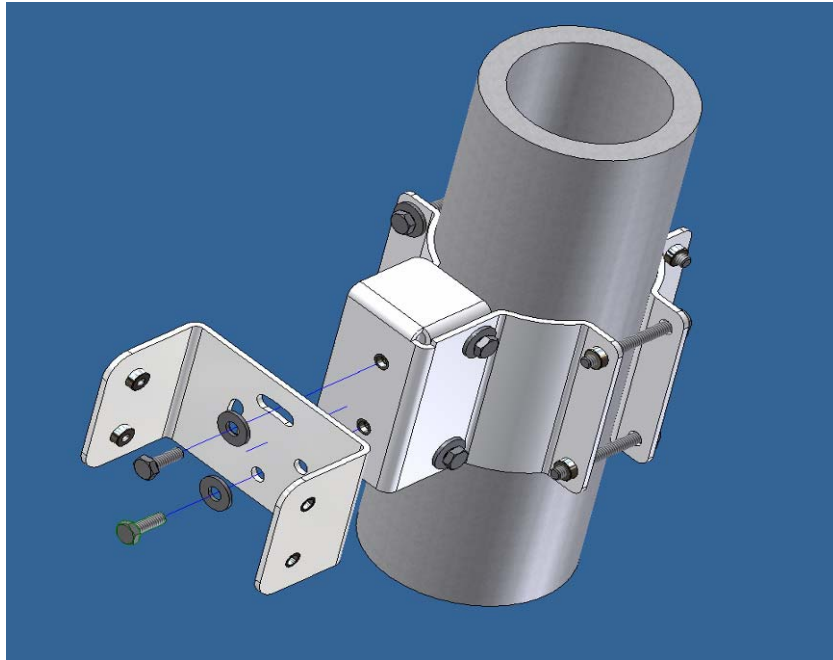
**Figure 4: Top view of collar bracket assembly**

2. Attach the pole collar bracket assembly around the pole using 2.25" long cap screws and flat washers as shown in Figure 5. Eight screws and 8 washers will be required.
3. Orient the assembly in the general direction of the other radio. Tighten only so the assembly will not move easily from position on the pole.



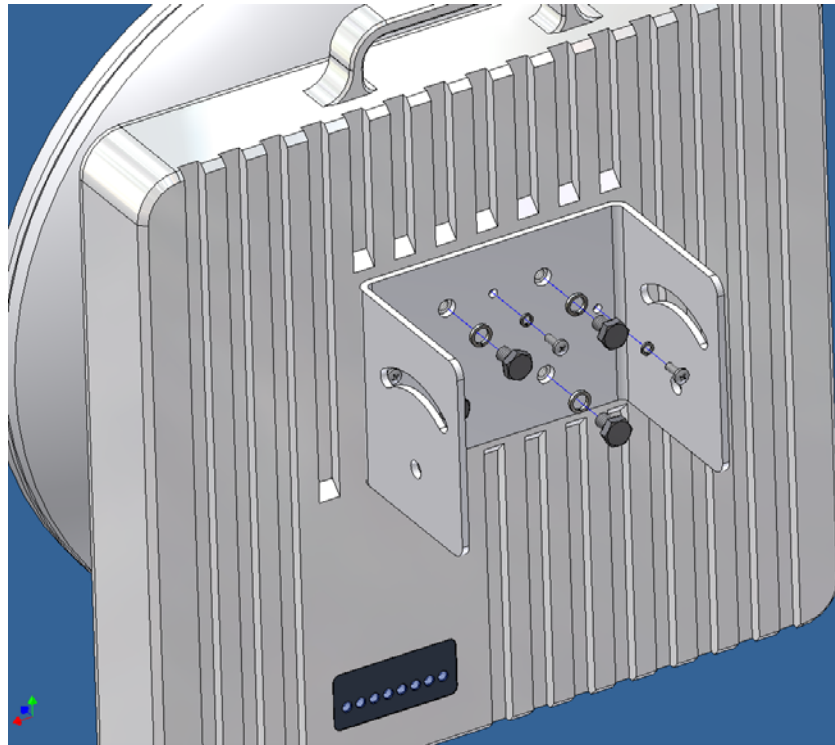
**Figure 5: Collar bracket assembly**

4. Attach the pole interface bracket (FD1000-015) as shown in Figure 6. Use two  $\frac{3}{4}$ " long cap screws and 2 flat washers provided.



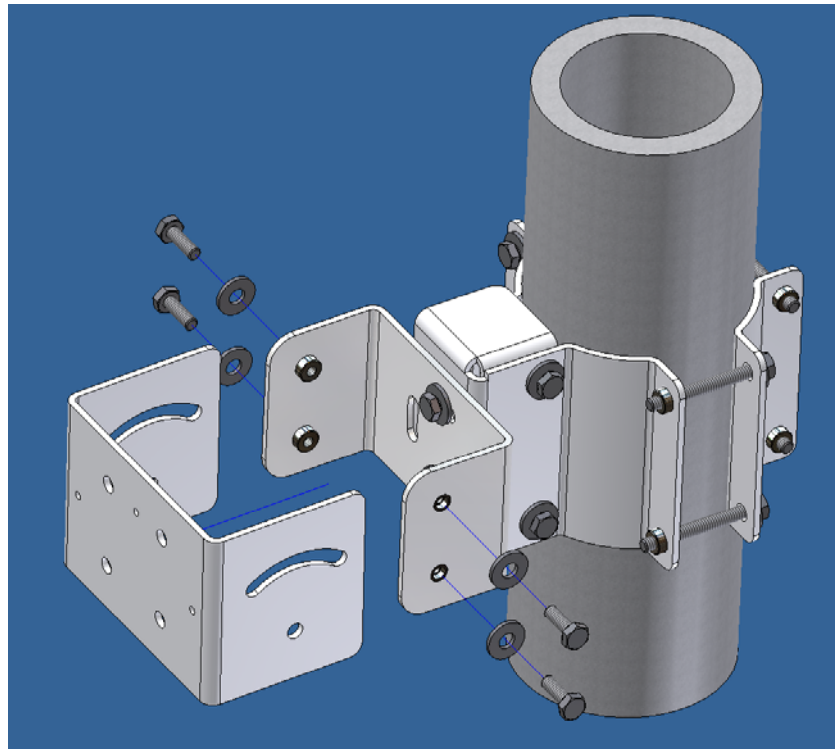
**Figure 6: Pole Interface Bracket assembly**

5. Note orientation of interface bracket. There are two slots for pitch adjustment. The diagram shows horizontal installation only. Tighten such that fine adjustment can still be made when the radio is attached.
6. Attach the pole radio bracket (FD1000-014) to the radio using four  $\frac{3}{8}$ " long cap screws, three #6 pan head screws and corresponding lock washers. Note orientation of bracket relative to radio. See Figure 7.



**Figure 7: Pole radio bracket attachment**

7. Attach the radio to pole interface bracket as shown in Figure 8. The radio is not shown for reasons of clarity.
8. Use four  $\frac{3}{4}$ " long cap screws and flat washers as shown. Note the slot in the bracket is to be used for altitudinal adjustment.
9. Fine adjust entire assembly and begin the aiming process to optimize signal strength.



**Figure 8: Attachment of WLAN bracket to interface bracket**

Once the aiming process is complete and the optimum signal strength has been achieved, tighten all screws so that it cannot be moved. It is recommended to use a torque wrench to tighten to 200lbs. For added security, thread locking compound on the screws can be used.

## **2.2 Installing the Cable Plug Assembly**

This product uses a rugged industrial Ethernet RJ-45 jack made by Amphenol (ID750) to connect power and data to the unit. To connect a standard Category 5 cable with an RJ-45 plug, you must first install the Cable Plug Assembly provided as a kit with this product. The cable Plug Assembly goes together as illustrated in Figure 9 and step by step assembly instructions are illustrated in Figure 10.

## Amphenol

## ID550-XXX ASSEMBLY PROCEDURE

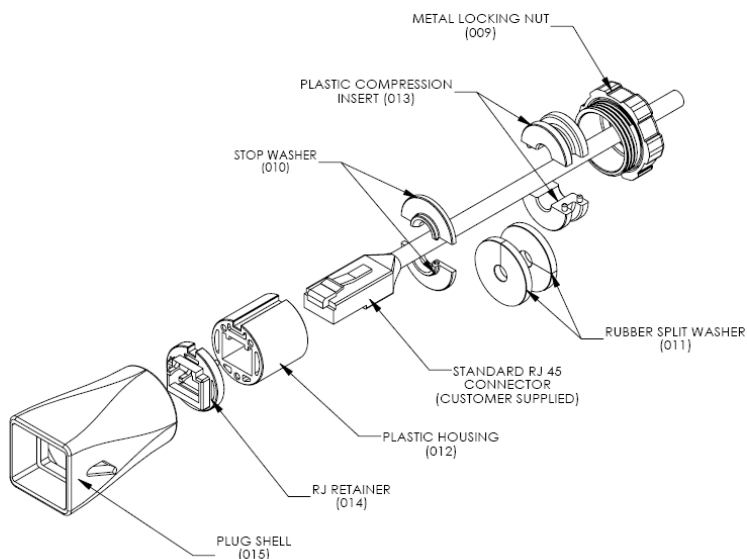


Figure 9: Exploded view of cable plug assembly

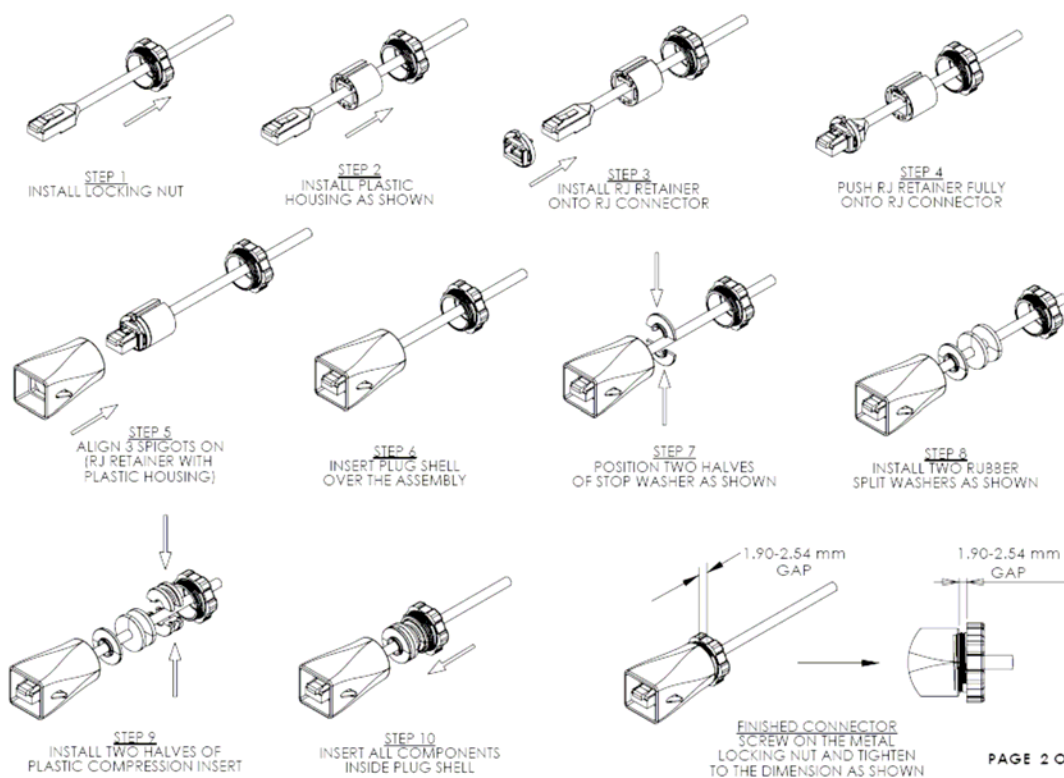


Figure 10: Installing the Cable Plug Assembly

### 2.3 Powering the Radio

Since the radio is powered by Power over Ethernet (PoE), a PoE compliant PSE or a non-standard power inserter must be used in-line with the data cable connecting to the unit. With a consumption

of approximately 9 Watts, the radio has been designed to comply with the IEEE 802.3af standard with an operating voltage of **40 – 57 Vdc**. In addition, the maximum cable length between either the PSE or a connecting network device (switch or hub) and the radio should not exceed 100m.

## 2.4 Aiming Procedure

The radio uses a built-in aiming function that allows the user to achieve close to ideal link loss without needing a computer or expensive and heavy test equipment. The RSSI LED window on the back of the radio serves as an indicator of both status and received signal strength (Figure 11).



**Figure 11: RSSI LED Window**

During aiming, one radio should be in TRANSMIT mode and the other radio should be in RECEIVE mode. It is recommended that one person be present at each end of the link to perform the setup and have the ability to communicate to each other during the process via mobile phone or two way radio. The following is a step by step procedure for aiming the radios:

1. Remove the Mode push-button cover (bolt and washer) on the bottom of the radio between the pressure/humidity membrane and the power/data connector. This must be placed back on after installation to protect the electronics from the outside environment. So be sure to keep it in a safe place until the installation procedure is complete.
2. Power up the radio by connecting power to the power inserter, or by plugging the power/data cable into the unit.
3. Within ONE MINUTE of applying power push and hold the MODE button, using a screwdriver, for 1-2 seconds. This should place the radio in TRANSMIT Install Mode. LED “G” should be on solid to indicate that it has entered TRANSMIT Install Mode. To place the radio in RECEIVE Installation Mode, press the Mode button a second time and verify that it has entered the proper mode by observing LED “F” is illuminated.
4. Ensure one radio is placed in TRANSMIT Install Mode and one radio is placed into RECEIVE Install mode.
5. At the radio in RECEIVE Install Mode, LED “A” should be blinking to indicate that it is getting valid signal. Adjust the position such that the other LEDs begin to illuminate. As the received power increases, the LEDs will light up in the direction from “B” to “H”.
6. Once the signal strength is optimized, place the RECEIVING radio in TRANSMIT mode and the TRANSMITTING radio in RECEIVE mode and repeat the process.
7. When satisfied that the optimum RSS has been achieved, replace the cover (bolt and washers) back on the mode button opening and tighten using a torque wrench or socket driver.
8. Reset the power on both radios to begin normal operation

## 2.5 LAN Configuration

Sometimes the radios may need to be configured for the specific LAN in which it is connected.

1. To access the configuration page, connect the radio to the LAN and using PC on the LAN, search for the radio using the locator software. The locator software will display all Snaplink

radios found on the network. Double-click one to open a web browser and view the configuration page.

- Click ok on the login window.
- Select the “Basic” tab and click on “LAN” and the window in Figure 12 will be displayed.
- Select either DHCP or Static IP Address Mode. If using DHCP mode, the radio will behave as a DHCP client on the network and accept IP address from a DHCP server. If using “Static” the user must set the IP address, the Subnet Mask, and the Gateway IP address.
- Click Save Settings and wait for the browser window to count down as the device re-boots.
- When complete, cycle the power on the radio.

Figure 12: LAN Configuration Window

## 2.6 Normal Operation

Under normal operation, the RSSI LEDs display status of the radio. The following is a description of LEDs when NOT in Installation Mode:

LED Location	Status	Description
E	ON	LAN Link
F	Blinking	LAN Activity
G	Blinking	Radio Activity
H	Blinking/ON	System Error

Table 1: LEDs in Normal Mode

## 3. CARE AND MAINTENANCE

Although this is an outdoor enclosure, care should be taken to avoid dropping the radio and scratching the paint. If the paint gets scratched off, there will be a high likelihood that the exposed area will corrode over time.

Before installing power and data connections, the user should ensure that the RJ-45 connector is clean and free of debris and dirt to ensure a reliable connection. The Ethernet cable should be



secured to the pole so it does not pose a safety hazard or interfere with other equipment. The radio was tested for EMI/EMC compliance with a shielded Ethernet cable. In the case where an unshielded Ethernet cable will be used, the cable has to be protected by a metal enclosure.