



ATLAS4900

Point-to-Point

Wireless OFDM Ethernet Bridge

USER MANUAL

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Preface

This manual covers the basic configuration and installation of the ATLAS4900 Wireless Point to Point Broadband System, and applies to the following radio part numbers:

P4900M-INT-18	Atlas4900-INT18 point-to-point radio with integrated 18 dBi panel antenna
P4900M-INT-22	Atlas4900-INT22 point-to-point radio with integrated 22 dBi panel antenna
P4900M-EXT	Atlas4900-EXT point-to-point radio with external h/v polarization antenna connectors

The ATLAS4900-INT-18 and –INT-22 products consist of two radios which have either internal 18 or 22 dBi antennas with electronically selectable polarization. The –EXT radios are designed for use with external dish antennas. All three products contain universal power adapters and mounting hardware for a pole. This device requires professional installation and a license.

FCC Information

This device complies with Part 90 of the FCC Rules and Regulations.

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 these instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in any 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 correct the interference by one of more of the following measures:

- 1) Reorient the antenna.
- 2) Increase the separation between the affected equipment and the unit.
- 3) Connect the affected equipment to a power outlet on a different circuit from that which the receiver is connected to.
- 4) Consult the dealer and/or experienced radio/TV technician for help.

FCC ID: NCYP4900M

IMPORTANT NOTE:

Intentional or unintentional changes or modifications must not be made unless under the express consent of the party responsible for compliance. Any such modifications could void the user's authority to operate the equipment and will void the manufacturer's warranty. To comply with FCC RF exposure requirements, the following antenna installation and device operating configurations must be satisfied. The antenna for this unit must be fixed and mounted on outdoor permanent structures with a separation distance of at least two meters from all persons. Furthermore, it must not be co-located or operating in conjunction with any other antenna or transmitter.

Warranty Information

Radios from Trango Broadband Wireless are warranted for one year from date of purchase. Please see www.trangobroadband.com for a complete description of warranty coverage and limitations.

Chapter 1 Overview

The ATLAS4900 is a point-to-point (PtP) wireless Ethernet transmission system which provides network connectivity at speeds up to 45 Mbps depending on the transmission distance and noise floor. The Atlas4900 utilizes OFDM technology and is designed for use in long range backhaul and wide area data networking applications. The Atlas system is comprised of the following items:

- 1) P4900M-INT18, -INT22 or -EXT (user-configured as Master Unit)
- 2) P4900M-INT18, -INT22 or -EXT (user-configured as Remote Unit)
- 3) Two 24 Volt power adapters for use with 100 to 240 VAC, including various plug adapters
- 4) Two Power over Ethernet Junction Boxes
- 5) Two Port plug covers
- 6) Mounting hardware

The Atlas4900 system consists of two P4900M radio units and uses a common hardware/firmware platform for each end of the wireless link. Users are required to specify one unit type as master unit (MU) and one unit as remote unit (RU). The hardware consists of a high gain dual polarized panel antenna with the radio portion integrated into a cast aluminum case on the back of the antenna, or as a radio unit with external antenna ports. The unit utilizes Power-over-Ethernet (PoE) and is designed for outdoor environments. The cable entry point can accommodate both Shielded twisted pair Cat5 (STP) and unshielded twisted pair Cat5 (UTP), with the addition of conduit for tower mounting.

Range vs. Throughput

The following table shows approximate maximum ranges (at recommended fade margins) achievable with the ATLAS4900 system using various antenna configurations. Longer ranges are achievable, but will result in lower fade margins.

Atlas 4900-INT-22 Range & Throughput

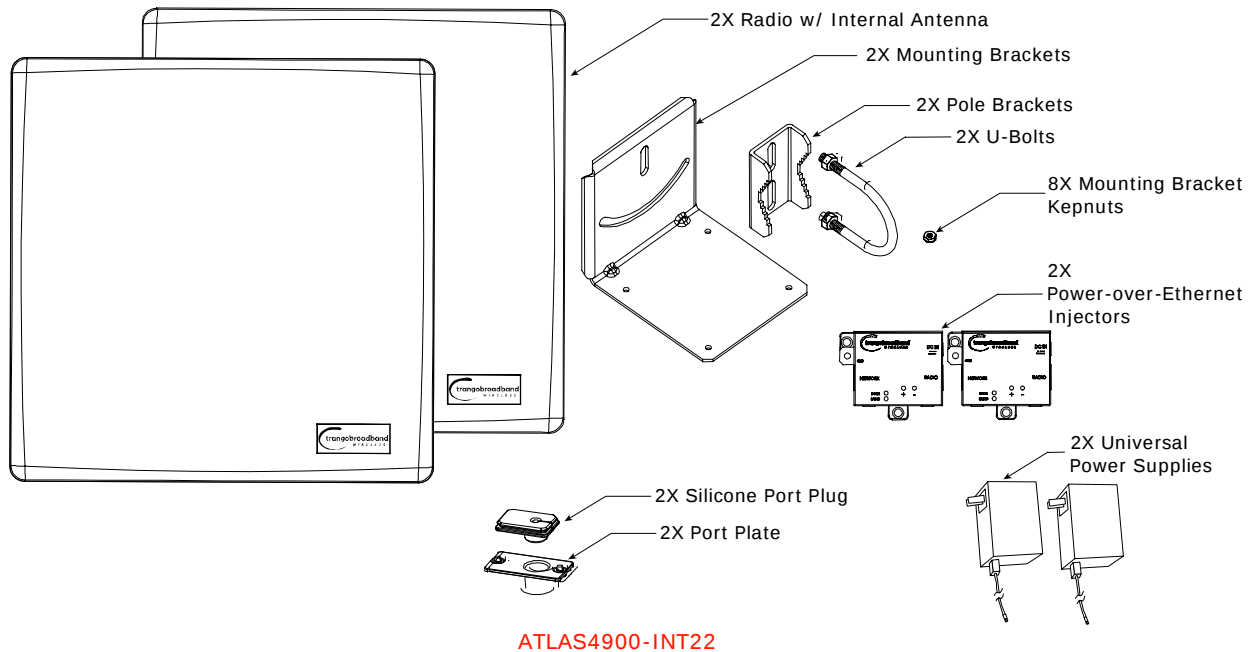
Antenna	3 miles	16 miles	30 miles
Integrated 22 dBi 15" Flat Panel	45 Mbps (10dB fade margin)	20 Mbps (10 dB fade margin)	5 Mbps (11 dB fade margin)
Line-of-sight range			

Atlas 4900-INT-18 Range & Throughput

Antenna	4 miles	6 miles	13 miles
Integrated 18 dBi 8" Flat Panel	30 Mbps (10 dB fade margin)	20Mbps (10 dB fade margin)	5Mbps (10 dB fade margin)
Line-of-sight range			

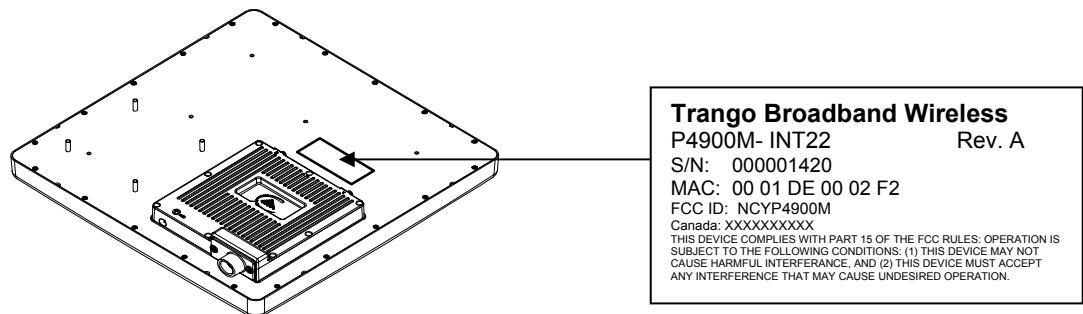
System Contents

Each ATLAS4900-INT kit consists of two P4900M-INT radios, two power-over-Ethernet (PoE) injectors, two AC adapters, port covers, and mounting hardware. A dual-polarized integrated antenna is located behind the radome of the P4900M-INT.



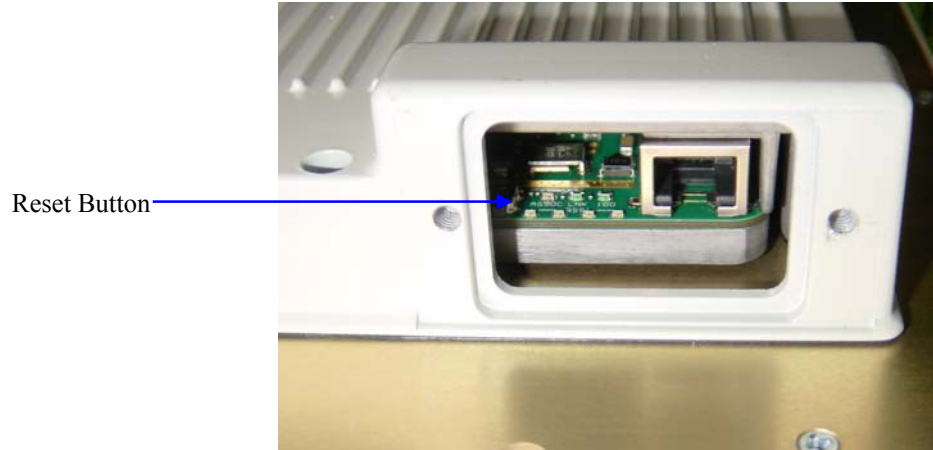
Location of Serial Number & MAC Address

The serial number and MAC address label can be found on the back of each radio. The serial number and MAC address is also provided on the system information screen.



Location of RJ-45/LED Port

The RJ-45 connector, diagnostic LEDs, and reset button are located at the bottom of the radio. Functionality of the LEDs is described later in this text. The reset button resets IP address and password to factory default. Hold the reset button down for 5 seconds (until amber lights flash) while unit is powered on to reset the unit.



Chapter 2 Getting Started

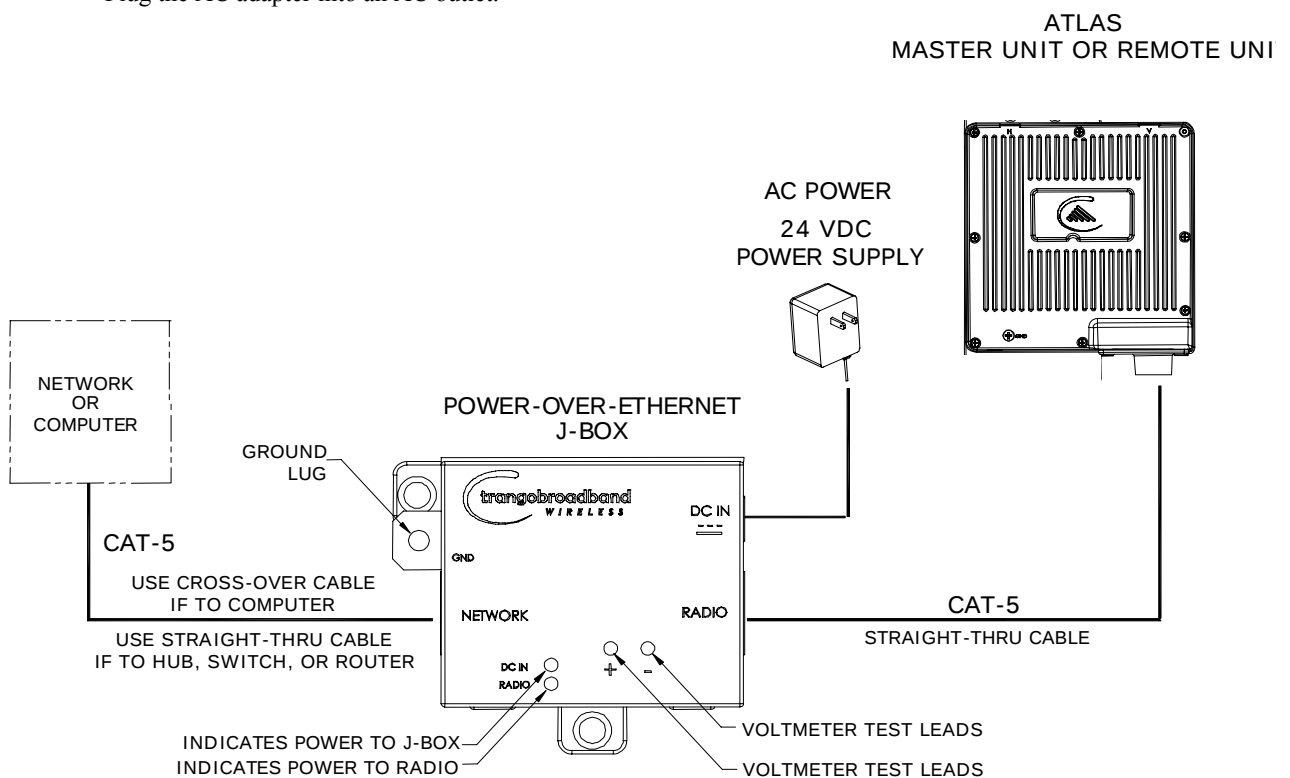
It is recommended that you first provision and test your the radios on the bench before deploying them in the field. This is a particularly useful exercise for the novice user.

Connections and Power

- Connect a Cat-5 (straight through) Ethernet cable (we recommend shielded twisted pair) between the ODU (out door unit) port of the J-box and the RJ-45 connector on the radio. Note that this cable will carry power-over-Ethernet (PoE).
- If connecting to a COMPUTER, use a Cross-Over Ethernet cable from the NET port of the J-box to the computer's Ethernet port.

If connecting to a HUB, SWITCH, or ROUTER, use a Straight-Thru cable.

- Plug the AC adapter into an AC outlet.



Both green LEDs on the J-box should be lighted, indicating power is present at the Power-over-Ethernet box as well as at the radio.

You are now ready to configure the radio via the Ethernet port. The Radio Power LED may take several seconds before lighting. The radio requires approximately 45 seconds to complete its boot process.

Configuration Tools

ATLAS4900 radios can be configured using either the Command Line Interface (CLI), or the Web Browser (HTTP) interface. Although both methods are comprehensive and powerful, the CLI method provides slightly more functionality.

This text covers configuration through the CLI. For HTTP configuration please see Appendix A.

Telnet

Open a command prompt (DOS) session on your PC. Open a Telnet session by typing:

telnet <ip address of radio>

Example:

```
C:>telnet 192.168.100.100
```

 Note: All Trango radios are configured at the factory with a default IP address of 192.168.100.100.

You will be greeted with current hardware and firmware information and prompted for a password. Type in the password and press enter. The factory default read/write password is **trango**.

```
Welcome to Trango Broadband Wireless, Atlas PtP-P4900M 1p0r3D06100301
Password:
Login as read/write.
#>
```

 Note: Type **help** for a listing of all CLI commands. Type **help [<command>]**, for the syntax of a particular command.

Troubleshooting Ethernet Connections

If you cannot telnet into the radio or open an HTTP browser session, check your cable connections to ensure proper use of cross-over vs. straight-through cable, and ensure your PC's subnet is routable to the radio's IP address.

System Information (sysinfo) Page

To display system configuration and status information type the command **sysinfo**.

The sysinfo screen is divided into 7 sections (0 –7)

Section	Description
0	Hardware/Firmware versions & system uptime (since reboot)
1	Mac, serial number, and IP configuration information
2	Opmode, RF info, speed, and peer connection status
3	RF channel table
4	Region Code information denotes which channels and power limits are available based on region code of the radio. Region code is set by the factory and can not be altered by the user.
5	ARQ status, encryption, Auto-rate shift, remarks, and LED RSSI function
6	Ethernet TX/RX statistics.

Sysinfo Example:

#> sysinfo

```
***** 0 *****

[Model] P4900M
[Unit Type] MU
[Hardware Version] 4900
[Firmware Version] 1p0r3D06100301
[System Up Time] 0 day(s) 01:21:16

***** 1 *****

[MAC] 00 01 DE 50 91 29
[S/N] 5280041
[IP] 192.168.100.100 [Subnet Mask] 255.255.255.0 [Gateway] 0.0.0.0

***** 2 *****

[Opmode] off [Default Opmode] off
[Active Channel] 1 h [Freq] 4950 MHz
[Speed] 24 Mbps [Tx Power] 0 dBm [Power Range] 8..17 dBm
[Peer ID] DE1B7850 [Status] disconnected [RSSI] dBm
[Peer IP Config] n/a

***** 3 *****

Channel Table: (MHz, n/a: not available in current area)
[Ch#01] 4950 [Ch#02] 4980 [Ch#03] 5000 n/a [Ch#04] 5000 n/a
[Ch#05] 5000 n/a [Ch#06] 5000 n/a [Ch#07] 5000 n/a [Ch#08] 5000 n/a
[Ch#09] 5000 n/a [Ch#10] 5000 n/a [Ch#11] 5000 n/a [Ch#12] 5000 n/a
[Ch#13] 5000 n/a [Ch#14] 5000 n/a [Ch#15] 5000 n/a [Ch#16] 5000 n/a
[Ch#17] 5000 n/a [Ch#18] 5000 n/a [Ch#19] 5000 n/a [Ch#20] 5000 n/a
[Ch#21] 5000 n/a [Ch#22] 5000 n/a [Ch#23] 5000 n/a [Ch#24] 5000 n/a

***** 4 *****

[Area Code] 0
RF Band #1 (4950..4980 MHz) 8..17/17/17/17/15 dBm

***** 5 *****

[Tx MIR] 50000 Kbps
[ARQ] on
[Encrypt] off [Key] 0011 2233 4455 6677 8899 AABB CCDD EEFF
[Auto Rate Shift] off
[RSSI LED] on

[Remarks] Remarks
***** 6 *****

[Eth In] 31,117 bytes [Eth Out] 54,391 bytes
[RF In] 39,574 bytes [RF Out] 54,391 bytes

[ARQ Retransmission] 1 pkts

Success.
#>
```

To view only a particular section of the sysinfo screen, type sysinfo followed by the desired section number.

Example:

```
#> sysinfo 2
```

```
***** 2 *****
```

```
[Opmode] off [Default Opmode] off  
[Active Channel] 1 h [Freq] 4950 MHz  
[Speed] 24 Mbps [Tx Power] 0 dBm [Power Range] 8..17 dBm  
[Peer ID] DE1B7850 [Status] disconnected [RSSI] dBm
```

Success.

```
#>
```

Chapter 3 Configuration

Key Concepts

Prior to configuring the radios it is important to understand several key concepts:

Master Unit (MU)	The MU is typically considered the primary radio within the link. For management purposes it is recommended to install the MU closest to the head-end of the network.
Remote Unit (RU)	The RU is typically installed at the remote end of the link. The primary distinction between the MU and RU is that when the radios are not associated, the MU will transmit and the RU will listen until the wireless link is established.
Peer ID	Authentication is controlled by the MAC address of each radio. The Peer ID is defined as the MAC address of the opposite radio. In other words, the Peer ID of the MU is the RU's MAC address and the Peer ID of the RU is the MU's MAC address.
Opmode	Operation mode (on or off). The radio will only transmit while set to Opmode ON.
Default Opmode	Opmode (on or off) which the radio enters after reboot. Note: if you telnet into a radio within 30 seconds after reboot, the radio will remain in opmode OFF even if the default opmode is ON.

Essentials to Establish a Wireless Link

Configuration of the Atlas system is simple and at a minimum requires the following settings:

1. Designate one radio as the Master Unit (MU) and one unit as the Remote Unit (RU).
2. Program Peer ID in each radio.
3. Set MU and RU to same channel and antenna polarization
4. Set default Opmode to "ON" so that radio will automatically enter opmode after reboot.
5. Turn radios Opmode "ON".

If all of these parameters are met, and if the MU and RU are within range and properly aligned, the wireless link will automatically establish itself and Ethernet traffic will begin to pass between the radios.

Master Unit Configuration

Start a telnet session with one of the radios. Follow these steps for configuration.

1. Set the Unit Type (utype) to MU in one radio. (default for all radios is RU)

```
#> utype mu  
Success.  
#>
```
2. Set the Peer ID with the MAC address of the RU. Only use the last 8 digits of the MAC address.

```
#> peerid de1B7850  
Success.  
#>
```
3. Set channel and polarization. (in this example set the channel to 1 and polarization to H).

```
#> freq 1 h  
Ch# 1 h (4950 MHz)  
Success.
```
4. Set default Opmode to ON.

```
#> defaultopmode on  
Success.
```
5. Turn Opmode ON.

```
#> opmode on  
Success.
```

Remote Unit Configuration

Configure the RU in the same manner as the MU. Since the default unit type (utype) is RU, you do not need to set this parameter.

1. Set the Peer ID with the MAC address of the MU. Only use the last 8 digits of the MAC address.

```
#> peerid de1B7842  
Success.  
#>
```
2. Set channel and polarization. (in this example set the channel to 1 and polarization to H).

```
#> freq 1 h  
Ch# 1 h (4950 MHz)  
Success.
```
3. Set default Opmode to "ON."

```
#> defaultopmode on  
Success.
```
4. Turn Opmode "ON."

```
#> opmode on  
Success.
```

Establishing a Wireless Link

If the MU and RU are properly configured and in opmode “ON”, the two radios will automatically begin the authentication process and become connected. To determine if the two radios are connected, type the **sysinfo 2** command.

Example:

```
#> sysinfo 2
```

```
***** 2 *****
```

```
[Opmode] on [Default Opmode] on
[Active Channel] 1 h [Freq] 4950 MHz
[Speed] 24 Mbps [Tx Power] 8 dBm [Power Range] 8..17 dBm
[Tx MIR] 50000 Kbps
[ARQ] on
[Encrypt] off [Key] 0011 2233 4455 6677 8899 AABB CCDD EEFF
[Peer ID] DE1B7850 [Status] connected [RSSI] -41 dBm
```

Success.

```
#>
```

The [status] field indicates whether the MU and RU are connected or disconnected. If connected, the MU and RU will automatically start passing Ethernet traffic over the wireless link.

Changing IP Address

Use the **ipconfig** command to change the radio’s ip address, subnet mask and gateway.

Syntax: **ipconfig [<ip> <subnet> <gateway>]**

Example:

```
#> ipconfig 10.8.2.140 255.255.255.240 10.8.2.129
```

```
New configuration: [ip] 10.8.2.140 [subnet mask] 255.255.255.240 [gateway]
10.8.2.129
```

```
save and activate ? (y/n) [ATTN] Telnet session will be terminated in 30
seconds.
```

Success.

```
#>
```

LEDs

LEDs are visible on the unit's PCB between the reset button and the RJ-45 connector. The function of each LED is described below:

LNK (green)

Green: On solid for an established 10BaseT or 100BaseT Ethernet Link.

SPEED

Green: Solid if 100BaseT, Blinks only if there is activity (TX or RX) on the network when a 100 MBit connection is established. Off if a 10BaseT connection is established or if there is 10BaseT activity.

RSSI (4 LEDs)

Amber: Four LEDs

In all modes except "Survey", the unit's four yellow LEDs indicate the level of RF signal being received from a VALID MU or RU as appropriate.

Yellow LED 1 : Begins blinking when RSSI is greater or equal to -90 dBm. On continuously at -85 dBm. This is the Leftmost LED

Yellow LED 2 : Begins blinking when RSSI is greater or equal to -80 dBm. On continuously at -75 dBm.

Yellow LED 3 : Begins blinking when RSSI is greater or equal to -70 dBm. On continuously at -65 dBm.

Yellow LED 4 : Begins blinking when RSSI is greater or equal to -60 dBm. On continuously at -55 dBm. This is the rightmost LED.

If no VALID MU or RU signal is detected the LEDs will not be on.

In addition, these 4 LEDs shall flash ON for 2 seconds, then OFF for 2 seconds to indicate the 'factory reset' button has been activated and the reset successful.

ASSOCiation LED (green):

The ASSOC led blinks at the following rates:

- Once every second when unit is powered on but opmode is OFF.
- Twice per second while in opmode ON and scanning for an MU or RU.
- Solid after unit is associated with the RU or MU.

RF Link Loopback Test (linktest command)

The **linktest** command tests the throughput and packet error rate (PER) on the current channel for each direction at all speeds and reports results. This command also provides RSSI for both ends of the wireless link. The command can be run from either the MU or the RU.

In running the linktest command the user must specify the modulation speed for each end of the link.

Command format: **linktest <loc speed> <peer speed>**

Valid modulation speeds are: 6,12,18,24,36,48, and 54 Mbps.

Example:

```
# linktest 24 24
local tx rate = 24 Mbps
peer tx rate = 24 Mbps
packet size = 1600 bytes
# of packets per period = 1000
# of Cycle = 10
0> [tx] 1000 [rx] 1000 [rssi] -37 peer: [tx] 1000 [rx] 1000 [rssi] -40 -> 22.01 Mbps
1> [tx] 1000 [rx] 1000 [rssi] -37 peer: [tx] 1000 [rx] 1000 [rssi] -40 -> 22.01 Mbps
2> [tx] 1000 [rx] 1000 [rssi] -37 peer: [tx] 1000 [rx] 1000 [rssi] -40 -> 22.01 Mbps
3> [tx] 1000 [rx] 1000 [rssi] -37 peer: [tx] 1000 [rx] 1000 [rssi] -40 -> 22.01 Mbps
4> [tx] 1000 [rx] 1000 [rssi] -37 peer: [tx] 1000 [rx] 1000 [rssi] -40 -> 22.01 Mbps
5> [tx] 1000 [rx] 1000 [rssi] -37 peer: [tx] 1000 [rx] 1000 [rssi] -40 -> 22.01 Mbps
6> [tx] 1000 [rx] 1000 [rssi] -37 peer: [tx] 1000 [rx] 1000 [rssi] -40 -> 22.01 Mbps
7> [tx] 1000 [rx] 1000 [rssi] -37 peer: [tx] 1000 [rx] 1000 [rssi] -40 -> 22.00 Mbps
8> [tx] 1000 [rx] 1000 [rssi] -36 peer: [tx] 1000 [rx] 1000 [rssi] -40 -> 22.01 Mbps
9> [tx] 1000 [rx] 1000 [rssi] -37 peer: [tx] 1000 [rx] 1000 [rssi] -40 -> 22.01 Mbps

--> [tx] 10000 [rx] 10000 [rssi] -36 peer: [tx] 10000 [rx] 10000 [rssi] -40
--> [Local PER] 0.00 % [Peer PER] 0.00 %

Success.
#>
```

In this example the linktest was run at 24 Mbps at each end of the link. The results indicated 10 cycles of 1000 packets were transmitted and received from each end of the link without error. Actual achievable throughput is measured at 22 Mbps.

Link Speed & Power Settings

Users may change the radio's over-the-air data rate and conducted output power using the *speed* and *power* commands. Keep in mind that the lower data rates offer higher receiver sensitivity and higher allowable conducted RF power. The following table shows the relation between speed settings, receiver sensitivity, and allowable maximum power settings. The lowest power setting is in -4 dBm.

Speed Setting (over-the-air rate) (Mbps)	Receiver Sensitivity (dB)	Max Power (dBm)
6	-92	17
12	-87	17
18	-85	17
24	-84	17
36	-80	17
48	-75	17
54	-73	15

In this example the user sets the power to 18dBm and the speed to 24 Mbps:

```
#> power
Execution in progress....
17 dBm (8..17)
Success.
```

```
#> speed 24
24 Mbps
Success.
#>
```

Command Reference Listing

The complete command set reference is provided below. You can also view a complete listing of all CLI commands by typing *help*.

antenna [h v]	Set or display antenna setting. H=Horizontal polarity, V=vertical polarity.
arq [on off]	Enable or disable Auto Retransmit Request (ARQ). With ARQ enabled, the Atlas system will retransmit packets which are detected as missing or corrupted. Default setting=ON.
autorateshift [on off]	Enable or disable automatic rate shift feature. With autorateshift enabled, the radios will automatically renegotiate speed setting to maximize wireless link integrity. Default setting=OFF.
autoscanmu [on off]	Enable or disable auto scan MU (RU only). Default setting=OFF. When autoscanmu is turned on, the RU will automatically scan all channels and polarizations searching for its peer MU. Once the RU detects the MU it will stop scanning and lock onto the channel of the MU. The autoscan feature is useful in cases where the user changes the channel at the MU because the RU will automatically search for the new channel of the MU. Note: auto-scanning may take as long as 5 minutes.
defaultopmode [on off]	Set or display default opmode. Radio must be set to opmode ON to establish wireless link. Default setting=OFF
encrypt [on off]	Enable or disable proprietary 128 bit tx encryption. Default setting=OFF
encrypt key <key>	Change encryption key (128 bits) <key> = xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx
exit	Exit telnet session
freq [<ch#> <antenna>]	Set or display channel and antenna selection
freq writechannel <ch#> <freq>...	Modify channel table, up to 6 channels at a time
freq writechannel default	Restore factory default channel table
help [<command>]	Display command usage and syntax
ipconfig [<ip> <subnet> <gateway>]	Change ip configuration <ip> = ip address <subnet> = subnet mask <gateway> = gateway ip address
linktest <local tx rate> <peer tx rate> [<pkt size> [<# of pkt> [<# of cycle>]]]	RF link loopback test This is the primary loopback test utility for evaluating over-the-air link quality. Provides link reliability information and dropped packet statistics. Standard linktest transmits 1600 byte packets, 1000 packets per second for 10 cycles.

	User can specify packet size, quantity of packets, number of cycles <tx rate> = 6,12,18,24,36,48,54 Mbps
mir [<kbps>]	Set or display tx maximum information rate (MIR). MU and RU can be set with different mir for asymmetric upload and download. <kbps> = 100..50000
opmode [on off]	Set or display operation mode (on or off)
password <ro rw upgrade>	Change password <ro> = for read-only <rw> = for read-write <upgrade> = for upgrading firmware
peerid [<peer device id>]	Set or display peer device id
power [<dBm>]	Set or display tx power <dBm> is limited by area (ref: "sysinfo 4")
reboot	Reboot unit
remarks	Enter user remarks up to 80 characters
reset	Restore all factory defaults except ipconfig and passwords.
rssi	Display RF relative signal strength indication (rssi) from peer radio
rssiled [on off]	Enable or disable rssi LED update
speed [<tx rate>]	Set or display tx rate <tx rate> = 6,12,18,24,36,48,54 Mbps
survey [<sec>]	Display noise floor for current channel <sec> = period 10..3600 default = 10
survey <sec> all	Display noise floor for all available channels
survey <sec> [<ch#> [..]]	Display noise floor for selected channels
sysinfo	Display all system information
sysinfo [[<part #> [<part #> [..]]]]	Display system information and status <part #> = 0..6 part 0: up time and version information part 1: MAC address and IP configuration part 2: RF link status part 3: channel table part 4: region code and power limitations part 5: switch settings and remarks part 6: statistics
syslog	Display system log
tftpd [on off]	Enable or disable tftpd (used for firmware upgrades)
utype [mu ru]	Set or display unit type

Chapter 4 Deployment & Installation

Once you are familiar with the basic operation of the radios you are ready for deployment in the field. The deployment process consists of the following steps:

- Site Selection
- Site survey at MU and RU sites
- MU installation
- RU installation and antenna alignment
- Link test

Site Selection

Proper site selection for your MU will help ensure a successful deployment. Site selection will depend on a wide variety of factors, but from the radio's performance standpoint, please consider the following:

- Path from MU to RU should provide unobstructed line-of-sight (LOS), thus it is advisable to place MU as high as possible on a tall building or tower.
- Ethernet cable limit is 100 meters from Ethernet device (router, switch) to radio.
- Radios should never be deployed without proper grounding.
- Consider nearby sources of interference that could degrade the performance of the radio. Mount radios as far from sources of interference as possible.

Site survey

The radios provide an on-board site survey tool which measures the average and peak noise levels on any given channel.

To use the survey tool, the radio must be in Opmode "OFF." The survey can be performed for any specified amount of time (in seconds), and for either the horizontal or vertical polarization.

Prior to performing the site survey, place the radio in the installation spot, and aim the radio in the desired direction.

After the specified period, the results of this command will provide you with a listing of each channel in the band, the average signal received, and the maximum signal received during the survey period.

Example:

```
#> survey
```

```
Press any key to stop.
```

```
noise floor (peak/avg dBm)  rssi by pkt (peak/avg dBm)
0> -97 / -98                n/a
1> -97 / -98                n/a
2> -97 / -98                n/a
3> -97 / -98                n/a
4> -97 / -98                n/a
5> -97 / -98                n/a
6> -97 / -98                n/a
7> -97 / -98                n/a
8> -97 / -98                n/a
```

```
Ch 1 h 4950 --> -97 / -98  n/a
Success.
```

Channel Planning

Based on the results of the site survey at each end of the link, choose a channel which offers the lowest noise floor. In order to reliably operate in the higher speed modes, clean spectrum is essential.

RSSI Command and Antenna Alignment

Once the site survey is completed, you are ready to install your radios. Typically it is best to install the MU first. To properly align the radios, use the built-in RSSI tool to achieve maximum signal strength.

1. Ensure MU and RU are in Opmode "ON."
2. Connect to the RU.
3. Login and type the command *rss*i. As you read the RSSI, move the antenna in the horizontal and vertical planes until the maximum RSSI reading is achieved
4. If it is not possible to receive an adequate RSSI reading, it may be necessary to reorient the MU (up/down, left/right), to increase the output power of the MU, or to move the RU to a location with better line-of-sight conditions to the MU.
5. Once you are satisfied with the RSSI reading, tighten down the RU in the optimum position.

Example:

```
#> rssi
```

Press any key to stop.

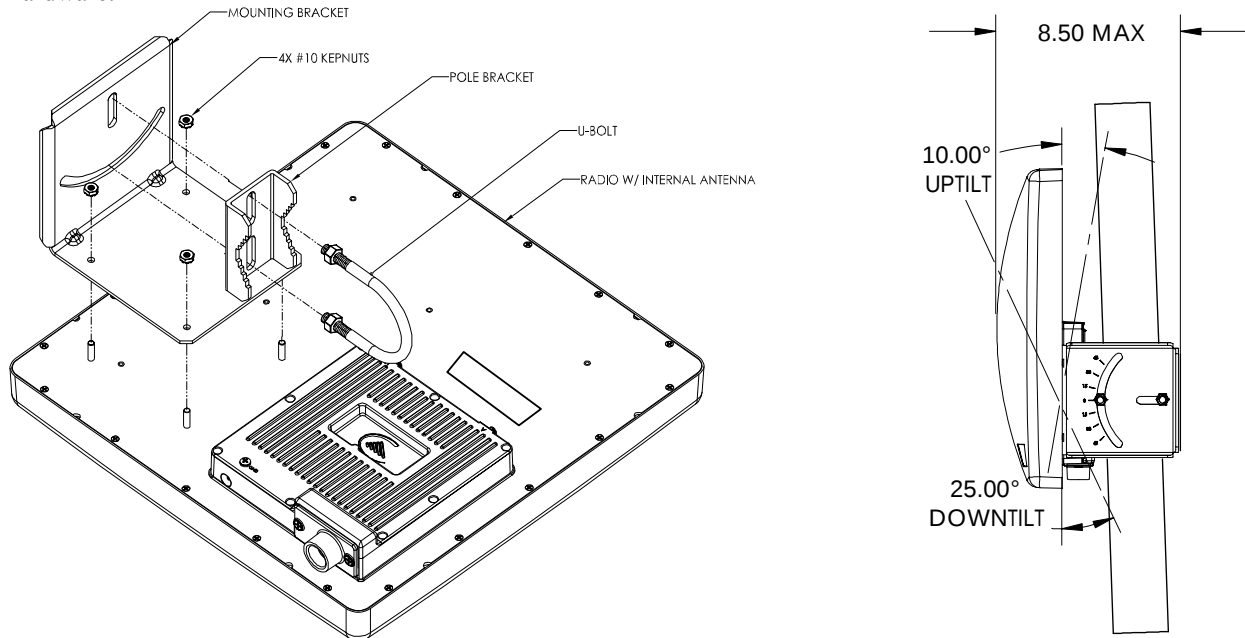
0> MU	-75 dB	RU	-75 dB	Connected
1> MU	-75 dB	RU	-75 dB	Connected
2> MU	-73 dB	RU	-73 dB	Connected
3> MU	-72 dB	RU	-71 dB	Connected
4> MU	-70 dB	RU	-70 dB	Connected
5> MU	-70 dB	RU	-69 dB	Connected
6> MU	-69 dB	RU	-70 dB	Connected
7> MU	-70 dB	RU	-70 dB	Connected
8> MU	-70 dB	RU	-70 dB	Connected
9> MU	-67 dB	RU	-68 dB	Connected
10> MU	-67 dB	RU	-67 dB	Connected

Success.

Users can also view the RSSI LEDs on the bottom of the radio. See the configuration section of this manual for more information.

Mounting Hardware

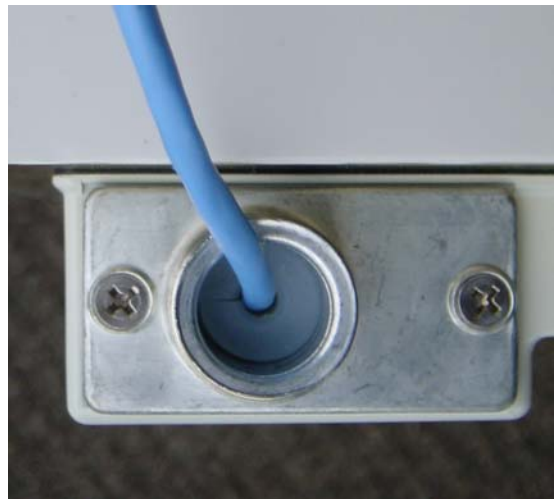
Radios are supplied with mounting hardware for pole installations. See diagram below for proper use of the mounting hardware.



Mounting Hardware Assembly for Integrated Antenna P4900-INT-22

Port Plug and Port Plate

Prior to deployment, insert the silicone port plug around the Cat-5 Cable and insert into the radio's port opening. Next, screw the port plate over the silicone plug as shown in the photographs below.



Grounding

Proper mounting of the radio includes consideration for grounding. Please note that if the radio is attached to a metal pole that is earth-grounded, no other grounding is necessary. If the radio is not earth-grounded via the mounting bracket, you must attach a grounding wire to the grounding stud on the radio as in the adjacent diagram.

Cabling and Weather Considerations

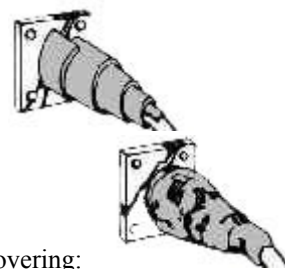
Shielded twisted pair Cat-5 cable is recommended for all installations. The shield within the Cat-5 cable does not need to be grounded if the radio itself is grounded. It is important to consider that most Cat-5 cable will deteriorate over time if exposed to the weather (especially direct sunlight). It is recommended that installers place all Cat-5 cables inside conduit. Plastic conduit is sufficient. If metal conduit is used, it is not necessary to use shielded Cat-5 cable.

Weather Sealing on EXT Model

The Atlas4900-EXT is equipped with two reverse-polarity SMA connectors on the top for attachment to an external antenna. Each SMA connector is labeled with either “V” for Vertical or “H” for Horizontal polarization. Connect each cable to the appropriate “H” and “V” ports on both the antenna and the radio.

It is important to properly seal each antenna connection to protect against moisture and corrosion. Each Atlas radio is shipped with a packet of Coax-Seal® connector sealant which should be applied over each of the SMA connectors. Coax-Seal is a gum-like tape which is applied by wrapping around the connector and then compressed/molded to form a single cohesive protective covering over the connector

To properly apply the Coax-Seal product first wrap the connector as shown:



Secondly, compress the Coax-Seal product to mold into a single protective covering:

Weatherizing



Important! Please note that the silicon strain relief has a small gap when the cable is installed. This is normal.



It is important to provide strain relief and drip loop for STP Cat-5 cables. Do not mount the radio upside down as water will enter the bottom of the radio and cause permanent damage



Important! The Power-over-Ethernet injector is not a weatherized device and must be located either indoors or in a weather-protected cabinet.

Chapter 5 SNMP

The Atlas supports SNMP (Simple Network Management Protocol). Network management consists of the following 3 categories: configuration, Link and Association monitoring and Alarms. Besides this proprietary Management Information Base (MIB) the Atlas also supports a large part of the MIB-II OIDs.

Review the Trango MIB (TRANGO-P5M-MIB.mib) available on our website for the complete listing of all MIB objects available.

These capabilities allow the system administrator to provide superior service through higher network accessibility and integrated performance monitoring.

Depending on your Network Node Manager (NNM) it may be necessary to append a “.0” onto the end of each of the OIDs listed below for proper operation.

Objects for Configuration	Name	Description
1.3.6.1.4.1.5454.1.40.1.1.1	verUnitType	Returns radios unit type (0 = RU, 1= MU)
1.3.6.1.4.1.5454.1.40.1.8.3	sysswAutoScanMUSignal	Returns value of Auto Scan switch (0 = off, 1 = on)
1.3.6.1.4.1.5454.1.40.1.3	sysDefaultOpmode	Returns defaultOpmode setting (0 = off, 1 = on)
1.3.6.1.4.1.5454.1.40.1.4	sysCurrentOpmode	Returns current opmode setting (0 = off, 1 = on)
1.3.6.1.4.1.5454.1.40.1.5	sysActivateOpmode	Turns opmode on
1.3.6.1.4.1.5454.1.40.1.13.1	sysipconfigIpAddress	Sets IP address
1.3.6.1.4.1.5454.1.40.1.13.2	sysipconfigSubnet	Sets subnet
1.3.6.1.4.1.5454.1.40.1.13.3	sysipconfigDefaultGateway	Set default gateway
1.3.6.1.4.1.5454.1.40.1.13.4	sysipconfigChange	Activates IP address change
1.3.6.1.4.1.5454.1.40.2.1	rfPeerDeviceID	Configure PeerID
1.3.6.1.4.1.5454.1.40.2.2	rfActiveChannel	Displays current channel
1.3.6.1.4.1.5454.1.40.2.3	rfActivePolarization	Displays current antenna polarization
1.3.6.1.4.1.5454.1.40.2.4	rfSpeed	Displays current Speed setting
1.3.6.1.4.1.5454.1.40.2.5	rfTxPower	Displays current transmit power (dBm)
1.3.6.1.4.1.5454.1.40.1.14	sysRemarks	Display radios remarks
Objects for Link and Association Monitoring		
1.3.6.1.4.1.5454.1.40.2.12	rfRSSI	Displays RSSI value (dBm)
1.3.6.1.4.1.5454.1.40.2.13	rfAssociated	Displays current association status (0 = disassociated, 1 = associated)
1.3.6.1.4.1.5454.1.40.3.2	ruReboot	Reboots RU
1.3.6.1.4.1.5454.1.40.3.3	ruDistance	Displays current ru distance
Objects for Bandwidth Monitoring		
1.3.6.1.4.1.5454.1.40.1.9.1	systrafficEthInOctets	Displays Ethernet in (bytes)
1.3.6.1.4.1.5454.1.40.1.9.2	systrafficEthOutOctets	Displays Ethernet out (bytes)
1.3.6.1.4.1.5454.1.40.1.9.3	systrafficRfInOctets	Displays RF in (bytes)
1.3.6.1.4.1.5454.1.40.1.9.4	systrafficRfOutOctets	Displays RF out (bytes)
Objects for Alarm Monitoring		
1.3.6.1.4.1.5454.1.40.3.4.1.1	trapTrapDstEntry	Enable/Disable trap Set destination trap IP Set trap community string
1.3.6.1.4.1.5454.1.40.3.4.1.2	trapTrapDstEnabling	
1.3.6.1.4.1.5454.1.40.3.4.2	trapTrapIpAddress	
1.3.6.1.4.1.5454.1.40.3.4.3	trapTrapCommStr	

Chapter 6 Firmware Upgrade Procedure

Trango Broadband Wireless will from time to time release firmware upgrades for the Atlas series radios. The latest released firmware can be downloaded from <http://www.trangobroadband.com/support/downloads.htm>.

Firmware releases consist of two files: Main image firmware and Web (HTTP interface) firmware.

You can update the firmware on your Atlas either over-the-air, or locally via the Ethernet port.

The upgrade package may include two type of files the Main Image and Web Image Firmware Files.

Atlas Main Image Firmware File < P4900m_main_1p0r3D06100301_Pupgrade>

Atlas Web Image Firmware File < P4900m_web_1p0D06041001_Pupgrade>

Before beginning the upgrade procedure, be certain that all of these files have been downloaded and extracted to an easily accessible directory on your local hard drive.

UPGRADE PROCEDURE

1. Place the firmware files in an easily accessible directory path on your computer.
2. Telnet into your unit by clicking on the Start menu and RUN. Type telnet <ip address> to connect to the unit. (figure 1&2) The figures use the default IP address, you must use the correct IP address for you Atlas unit.

Figure 1

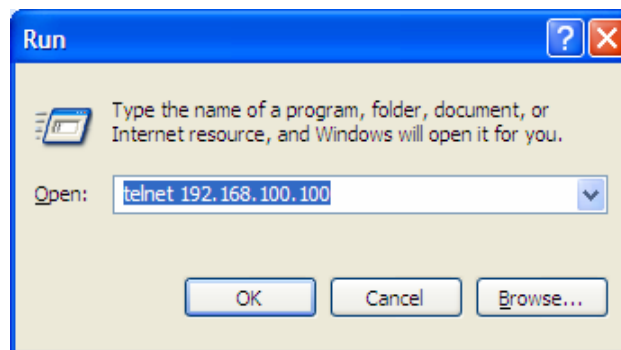
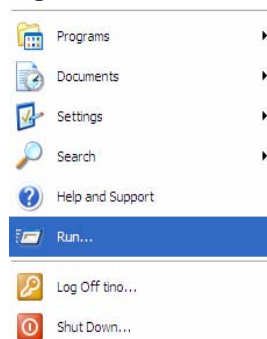


Figure 2

3. At the login enter your password for Read/Write access. The default password is *trango* (figure3)
4. Enable the tftp daemon as shown below. (figure3)
#> tftpd on
5. Once enabled the prompt should show
#>Success.

Figure 3

```
Welcome to Trango Broadband Wireless, Atlas PtP-P4900M 1p0r3D06100301
Password:
Login as read/write.
#> tftpd on
Success.
```

6. Open a MS-DOS prompt window and access the directory containing the extracted firmware files.
Example: C:\CD Firmware C:\Firmware
7. Use the windows TFTP command line tool to upload the firmware file. The tftp syntax and an example are below. (figure 4)

TFTP [-i] host [GET | PUT] source [destination]

Example: *tftp -i 192.168.100.100 put P4900m_main_1p0r3D06100301_Pupgrade*

Figure 4

```
C:\firmware>tftp -i 10.8.2.138 put P4900m_main_1p0r3D06100301_Pupgrade
Transfer successful: 1951744 bytes in 15 seconds, 130116 bytes/s
```

Note: After uploading the firmware, the radio will activate the firmware automatically. DO NOT POWER CYCLE OR INTERRUPT THE PROCESS for 2 minutes as it may result in damaging the unit.

8. Perform the same steps with the Web image files.

Verifying Upgrade

In order to verify that the Main Image firmware upgrade was successful, simply telnet to the unit and the firmware will be displayed in the upper right of the login screen. (figure5)

Figure 5

Welcome to Trango Broadband Wireless, Atlas PtP-P4900M **1p0r3D06100301**
Password

In order to verify that the Web Image firmware was upgraded successfully, login via the web interface and the web version will be displayed in the lower left of the web page. (figure6)

Figure 6

System Information Installation Configuration Site Survey Management Link Test Help Current Status Opmode off Channel 2 h Peer ID DE509124 disconnected RSSI n/a Web Ver 1p0D06041001	<pre> ***** 0 ***** Unit Type MU Hardware Version 4900 Firmware Version 1p0r3D06100301 System Up Time 00:00:28 ***** 1 ***** MAC 00 01 DE 50 91 29 IP 192.168.100.100 Subnet Mask 255.255.255.0 Gateway 192.168.100.1 ***** 2 ***** Opmode off Default Opmode on Peer ID DE509124 Status disconnected RSSI n/a Channel 2 h Tx Power 12 dBm ***** 3 ***** Channel Table (MHz) Ch#01 4950 Ch#02 4980 Ch#03 5000 Ch#04 5000 Ch#05 5000 Ch#06 5000 Ch#07 5000 Ch#08 5000 Ch#09 5000 Ch#10 5000 Ch#11 5000 Ch#12 5000 Ch#13 5000 Ch#14 5000 Ch#15 5000 Ch#16 5000 Ch#17 5000 Ch#18 5000 Ch#19 5000 Ch#20 5000 Ch#21 5000 Ch#22 5000 Ch#23 5000 Ch#24 5000 ***** 4 ***** Area Code 0 </pre>
--	---

FIRMWARE UPGRADE PASSWORD

The firmware filename includes the upgrade password (the characters after the ‘_P’ in the file name). The default upgrade password in the Atlas radios is *upgrade*. Users may change the upgrade password within the radios using the password upgrade command.(figure8) Firmware release files from Trango Broadband Wireless will always use the default upgrade password of *upgrade*. If a user changes the upgrade password in the radio, then the firmware file name must be changed in order to upgrade the radios.

Upgrade Troubleshooting Tips

When upgrading through the wireless link, ensure that your link isn't experiencing any packet loss or latency. If the link is experiencing packet loss or high latency, we recommend the following tips:

1. Configure both the Atlas units to the minimum speed rate (6Mbps) and turn off auto rate shifting.
2. Use a TFTP program that will allow you to change the timeout period and block size.
3. Perform the upgrade via the Ethernet port of the Atlas.

If you experience an error with the tftp program such as

tftp: can't read from local file

1. Ensure that you are running the program from the same directory the firmware is located.
2. Ensure that you are typing the correct file name

Error on server : Fail to upgrade: tftpd is disabled

1. Make sure the tftpd is running on the unit.(figure3)
2. Ensure that firewall settings on your computer are not blocking tftp

Appendix A Using the HTTP Interface

Open a browser session and type in the IP address of one of the radios. Default IP address is 192.168.100.100.



Leave the User name field blank and enter read write or read only Password. Press OK. Default password is trango. After logging on, the system information screen will be displayed.

Atlas PtP MU

System Information

Installation

Configuration

Site Survey

Management

Link Test

Help

Current Status

Opmode on

Channel 2 h

Peer ID DE509124
connected RSSI -78 dBm

Web Ver 1p0D06041001

Trango Broadband Wireless

System Information

```

***** 0 *****
Unit Type MU
Hardware Version 4900
Firmware Version 1p0r3D06100301
System Up Time 00:20:52
***** 1 *****
MAC 00 01 DE 50 91 29
IP 192.168.100.100 Subnet Mask 255.255.255.0 Gateway 192.168.100.1
***** 2 *****
Opmode on Default Opmode on
Peer ID DE509124 Status connected RSSI -78 dBm
Channel 2 h Tx Power 12 dBm
***** 3 *****
Channel Table (MHz)
Ch#01 4950 Ch#02 4980 Ch#03 5000 Ch#04 5000
Ch#05 5000 Ch#06 5000 Ch#07 5000 Ch#08 5000
Ch#09 5000 Ch#10 5000 Ch#11 5000 Ch#12 5000
Ch#13 5000 Ch#14 5000 Ch#15 5000 Ch#16 5000
Ch#17 5000 Ch#18 5000 Ch#19 5000 Ch#20 5000
Ch#21 5000 Ch#22 5000 Ch#23 5000 Ch#24 5000
***** 4 *****
Area Code 0
***** 5 *****
Tx MIR 50000 Kbps
[ARQ] on
[Encrypt] off [Key] 0011 2233 4455 6677 8899 ABB CCDD EEFF
[Auto Rate Shift] off
[RSSI LED] on
Remarks Remarks
***** 6 *****
Eth In 382,277 bytes Eth Out 27,692 bytes
RF In 285 bytes RF Out 735,859 bytes

```

Navigation links are shown on the left side of the browser screen. Navigable links include:

[System Information](#)
[Configuration](#)
[Site Survey](#)
[Link Control](#)
[Help](#)

The lower left portion of the screen shows the unit's current opmode, connection, channel, and antenna status.

The main body of the System Information displays most of the key parameters. To alter these parameters use the [Configuration](#) page.

Description of System Information entries. To view this information within the radio, click the [Help](#) link.

Model:	Model number.
Unit Type:	Atlas unit type either MU (master) or RU (remote).
Hardware Version:	Hardware version is factory-set and can not be changed by user.
Firmware Version:	Current firmware version loaded in the radio.
System Up Time:	Time since radio was last rebooted or powered.
MAC:	MAC address of the radio.
IP, Subnet Mask, Gateway:	IP, subnet mask, and gateway of radio
Opmode:	Current operation of the radio. \"On\" indicates transmitting. \"Off\" indicates not transmitting.
Default Opmode:	Opmode which radio enters after reboot or power cycle.
Peer ID:	User entered MAC address of the peer unit. In the MU, Peer ID is the MAC address of the RU. In the RU, Peer ID is the MAC address of the MU.
Status:	Status of Remote Unit. Connected (wireless link established) or disconnected (wireless link not established).
RSSI:	Relative Signal Strength Indicator. Displays signal strength received from the Remote Unit. 'n/a' indicates Remote Unit is not connected.
Tx MIR:	Transmit Maximum Information Rate to the peer unit.
Channel:	RF Channel
Tx Power:	Transmit power
Channel Table:	Set of channels based on the Country Code setting.
Area Code:	Country information elements. It consists of the country code and a set of channels with maximum power.

Auto Rate Shift:	See definition in Configuration section .
Auto Scan MU:	See definition in Configuration section.
RSSI LED:	See definition in Configuration section.
Remarks:	See definition in Configuration section.
Eth In:	Counter for Ethernet packets which entered via the Ethernet port of the radio.
Eth Out:	Counter for Ethernet packets which exited via the Ethernet port of the radio.
RF In:	Counter for Ethernet packets which entered over-the-air into the radio.
RF Out:	Counter for Ethernet packets which exited over-the-air out the radio.
Configuration Page	
IP Address:	The IP address of this radio; used to manage the radio's application layer.
Subnet Mask:	The subnet mask of the radio.
Gateway:	The default gateway of the radio.
Default Opmode:	Operation mode of the radio after power cycle. When Opmode is \"On\" the radio will attempt to make a wireless connection. When Opmode is \"Off\" the radio is not transmitting, but can be managed from the wired side. In addition to setting Default Opmode to \"Off\", Opmode can be set to \"Off\" by interrupting the radios boot-up cycle in the first 30 seconds after power up
Peer ID:	User entered MAC address of the partner unit.
Switch:	Checked means active
Auto Rate Shifting	When enabled, radio will automatically shift TX rate up or down depending on link quality.
Autoscan MU	(RU Only). If this switch is enabled, when not connected to MU, the RU will automatically automatically scan all available channels and frequencies
RSSI LED	Enables and disables RSSI LEDs. Disabling the LEDs provides slight improvement to radio performance. Typically RSSI LEDs should be enabled during alignment and disabled during normal operation.
Active Channel/Polarization:	The current channel and polarization of the radio when Opmode is \"On\".
Speed:	Transmit over-the-air raw data rate.
Power:	Transmit RF power setting.
Range:	Allowable range of the transmit power based on the current settings of the active channel and the speed.

Remarks:	A descriptive text field for general use (i.e. the location of the unit). It does not affect system performance.
MIR:	Set Maximum Information Rate for network traffic.
ARQ: .	Auto Retransmit Request. When enabled, dropped packets are detected at the receiver and retransmitted by the transmitter.
Encrypt: .	Encryption. Enables and disables proprietary 128 bit over-the-air encryption.
Key: .	128 Encryption Key. Must match in both MU and RU.
Activate Opmode On:	Activates radio's Opmode to \"On\"-transmitting.
Activate Opmode Off:	Activates radio's Opmode to \"Off\" not-transmitting.
Reboot:	Reboot the unit.
Close All Telnet Sessions:	Close all the active telnet sessions.

Configuration Screen

Atlas PtP MU		Configuration		Trango Broadband Wireless	
System Information Installation Configuration Site Survey Management Link Test Help Current Status Opmode on Channel 2 h Peer ID DE509124 connected RSSI -78 dBm Web Ver 1p0D06041001		Unit Type ☒ MU ☐ RU Change Unit Type			
		IP Address 192.168.100.100 Subnet Mask 255.255.255.0 Gateway 192.168.100.1 Change IP Config			
		Default Opmode ☒ On ☐ Off Peer ID DE509124 Switch ☐ Auto Rate Shifting Enable ☐ Auto Scan Master Unit Signal Enable (RU Only) ☒ RSSI LED Flashing Enable Active Channel Ch#2 4980 Polarization ☐ V ☒ H Speed 24 Mbps Power 12 dBm Remarks Remarks Save and Activate Settings			
		MIR 50000 Kbps (100..50000) ARQ ☒ On ☐ Off Encrypt ☐ On ☒ Off Key 0011 2233 4455 6677 8899 AABB CCDD EEFF Save and Activate Settings			
		Activate Opmode On Activate Opmode Off Reboot System			

Users may enter all primary configurable parameters using the Configuration Screen.

Site Survey Page

The site survey function measures overall noise floor as well as in-band noise containing data packets. Noise is reported in terms of average and peak dBm for the period tested. The user specifies duration of the test in minutes as well as the antenna port.

Atlas PtP MU		Site Survey		Trango Broadband Wireless																													
System Information																																	
Installation																																	
Configuration Site Survey																																	
Management																																	
Link Test Help																																	
Current Status																																	
Opmode off																																	
Channel 2 h																																	
Peer ID DE509124																																	
disconnected RSSI n/a																																	
Web Ver 1p0D06041001																																	
		Status Finished Polarization h Duration 1 min(s)																															
		<table border="1"> <thead> <tr> <th colspan="4">[Noise Floor]</th> <th colspan="2">[rssi-by-packet]</th> <th></th> </tr> <tr> <th>Ch#</th> <th>Freq</th> <th>Avg dBm</th> <th>Peak dBm</th> <th>Avg dBm</th> <th>Peak dBm</th> <th>Clear</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4950</td> <td>-96</td> <td>-97</td> <td>n/a</td> <td>n/a</td> <td></td> </tr> <tr> <td>2</td> <td>4980</td> <td>-94</td> <td>-95</td> <td>n/a</td> <td>n/a</td> <td></td> </tr> </tbody> </table>				[Noise Floor]				[rssi-by-packet]			Ch#	Freq	Avg dBm	Peak dBm	Avg dBm	Peak dBm	Clear	1	4950	-96	-97	n/a	n/a		2	4980	-94	-95	n/a	n/a	
[Noise Floor]				[rssi-by-packet]																													
Ch#	Freq	Avg dBm	Peak dBm	Avg dBm	Peak dBm	Clear																											
1	4950	-96	-97	n/a	n/a																												
2	4980	-94	-95	n/a	n/a																												
		Trango Broadband Wireless, a division of Trango Systems, Inc. http://www.trangobroadband.com Email: techsupport@trangobroadband.com																															

In this example the site survey function was performed for 1 minute on the vertical polarity. The 4900 band is reported to be relatively clean with a noise floor in the range of -94 to -96 dBm. In this example, channel 2 is the noisier than channel 1. Either channel can be used

Link Control

The Link Control page features the RF Link Loopback / Speed Test. In this test, the user specifies the transmission rate (in Mbps) in both the local radio and the peer radio as well as the duration time (in minutes) for the test. During the test, the local radio will transmit packets across the wireless link. The peer radio will retransmit equivalent packets back to the local radio. The test will measure and report error rate and actual throughput as measured in Mbps. The following link test was run for 60 seconds with a specified TX rate of 6 Mbps per end.

Atlas PtP MU System Information Installation Configuration Site Survey Management Link Test Help Current Status Opmode on Channel 2 h Peer ID DE509124 connected RSSI -85 dBm Web Ver 1p0D06041001	Trango Broadband Wireless														
	Link Control														
	RF Link Loopback / Speed Test Warning! Some traffic may be dropped during testing														
	Local Tx Rate	6 Mbps	Peer Tx Rate 6 Mbps												
	Duration	1 min(s) (1 to 10)	Loopback Test												
Test Results: Duration: 1 min(s)															
<table border="1"> <thead> <tr> <th></th> <th>Tx Rate</th> <th>Tx Bytes</th> <th>Error Rate</th> </tr> </thead> <tbody> <tr> <td>MU to RU</td> <td>6</td> <td>12800000</td> <td>0.00</td> </tr> <tr> <td>RU to MU</td> <td>6</td> <td>12800000</td> <td>6.00</td> </tr> </tbody> </table>					Tx Rate	Tx Bytes	Error Rate	MU to RU	6	12800000	0.00	RU to MU	6	12800000	6.00
	Tx Rate	Tx Bytes	Error Rate												
MU to RU	6	12800000	0.00												
RU to MU	6	12800000	6.00												
Aggregated Bandwidth: 5.51 Mbps															
Trango Broadband Wireless, a division of Trango Systems, Inc. http://www.trangobroadband.com Email: techsupport@trangobroadband.com															

In this example, the error rate was 6 packets from RU to MU and 0 packets from MU to RU. Measured aggregate bandwidth is 5.51 Mbps.

Appendix B Specifications

Data Parameters

Modulation Format	Orthogonal Frequency Division Multiplexing
Certification/Compliance	FCC Part 90, FCC Part 15
Receiver Sensitivity	-71 dBm (54 Mbps) to -90 dBm (6 Mbps)
User Data Throughput	45 Mbps
Format 10/100 BaseT	10/100 BaseT
Network Protocols	All IEEE 802.3 / 802.3u compliant protocols
Configuration and Management	Telnet, SNMP, TFTP, HTTP
Upstream/Downstream Throughput	Dynamic, automatically adjusts to suit demand or manually set

Physical Interfaces

Ethernet Speed (via RJ45 shielded)	10/100 BaseT, Auto-sensing
Ethernet Packet	Up to 3600 byte long packets (supports VLAN/VPN pass through)

Power Parameters

Power Method	Power-over-Ethernet (PoE). DC Voltage injected at PoE J-Box
Voltage input limits into PoE J-Box	12 VDC - 24 VDC, 24 VDC Nominal
Voltage input limits into Radio	10.5 VDC - 24 VDC
Standard Power Supply (included)	90 – 240 VAC to 24 VDC Universal Power Supply
PoE Cat-5 Max Cable length	100 meters on 24 AWG STP Cat-5 Cable
Current Draw/Power	750 mA max. (12 W), using 24V standard adapter

Environmental

Radio Enclosure	All-weather, powder coated, aluminum case/back with UV stabilized ABS radome
Temperature Range	-40° to 60° C (-40° to 140° F)
NEMA Rating	NEMA 4
Radio Dimensions	14.5 in. x 14.5 in. x 3.75 in.
Radio Weight	7 Lbs. (INT-22), 5 lbs (INT-18) , 3 lbs (-EXT)
User Interfaces	RJ45 (shielded)