

BP 400 / BP 4500 Big Pipe STL System Quick Installation Guide

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1. About this Quick Installation Guide

Please note that the instructions in this Quick Installation Guide have been abbreviated to provide a brief overview of the Big Pipe STL System and should be used in conjunction with the BP 4500 Radio User's Guide as well as system drawings and information for your specific configuration. **It is highly recommended that you connect up your system in a lab environment and verify operation prior to field installation.**

2. Tools/Items Required for Installation of the Big Pipe System

The following are needed to successfully install a Big Pipe System:

- Wire Stripping and Crimping Tool (for AC Power and RG59 cables)
- Screw drivers (both Flat and Phillips)
- Voltmeter / Ohmmeter
- Ground Cable / Strap
- Sealing Tape
- Cable Strapping
- Laptop Computer
- Download Java interface application for communicating to the Radios.
- CAT-5 Crossover Cable for connecting a Personal Computer directly to a Multiplexer
- CAT-5 Straight Thru Cable for connecting a Personal Computer to a Multiplexer via a switch or a hub.
- Qty (1) 8mm wrench or nut driver (for installing the Radio Brackets)
- Qty (2) 13mm wrenches or nut driver (for installing Pole Mounting Brackets and Clamps)

3. Verify Shipping Package Contents from B.E.

Depending on the type of system you have purchased, the equipment from B.E. will vary. However, there are some simple checks you should perform to ensure you received the proper pieces of the system.

Radios and related items:

- TX HI and TX LO Radio Pair:** The radio pair may be on 5.8GHz or 5.3GHz depending upon your system. However, it is important to note that a 5.8GHz TX LO can only be connected to a 5.8GHz TX HI and the same for a 5.3GHz system.
- Ethernet Outdoor Cable:** Standard RJ45 to weather-tight Conxall connector (two per radio pair).
- Data Outdoor Cable:** Standard BNC to weather-tight TNC DS3 connector (four per radio pair; not used if your Radios are configured for Ethernet Only operation).
- Outdoor Power Cable:** Un-terminated cable with weather-tight Conxall connector on one end for connection to radio (two per radio pair).
- AC Adapter:** Un-terminated 48V Cable and AC Power cord with adapter (two per radio pair).
- Radio Mounting Bracket Kit:** Each Radio comes with a mounting bracket kit.



- Antenna Cable:** Outdoor 50Ω coax cable with weather-tight N type connectors for connecting the radios to the external antennas (2 per radio pair).

Multiplexers and related items:

- BP 400 INT Chassis:** Multiplexer Frame with Power Supply and Fan (number per link depends upon your system's configuration).
- BP 400 DS3 NAU:** Network Card with DS3 Connections to Radio along with Ethernet, 4DS1, and Craft connections (one per BP 400 INT Chassis).
- SIM Module:** Service Interface Modules (ASIM, AVSIM, SMPTE310) (number per BP 400 INT Chassis depends upon your system's configuration).

4. Verify Frequency of the Radio Pair

- Inspect the ID Sticker on both Radios to ensure that they are in the same frequency band (5.8GHz or 5.3GHz). Please note that Radios of different frequency bands will not communicate. As such, a 5.8GHz radio will only talk to another 5.8GHz radio, while the same is true for the 5.3GHz radios.
- Inspect the ID Sticker on both Radios to ensure that the pair consists of a TX HI (TX High) and TX LO (TX Low) radio. Radios pairs transmit (TX) and receive (RX) on 2 different frequencies with their respective frequency bands, therefore a HI Band radio must be paired with a LO Band radio.



5. Typical Big Pipe System

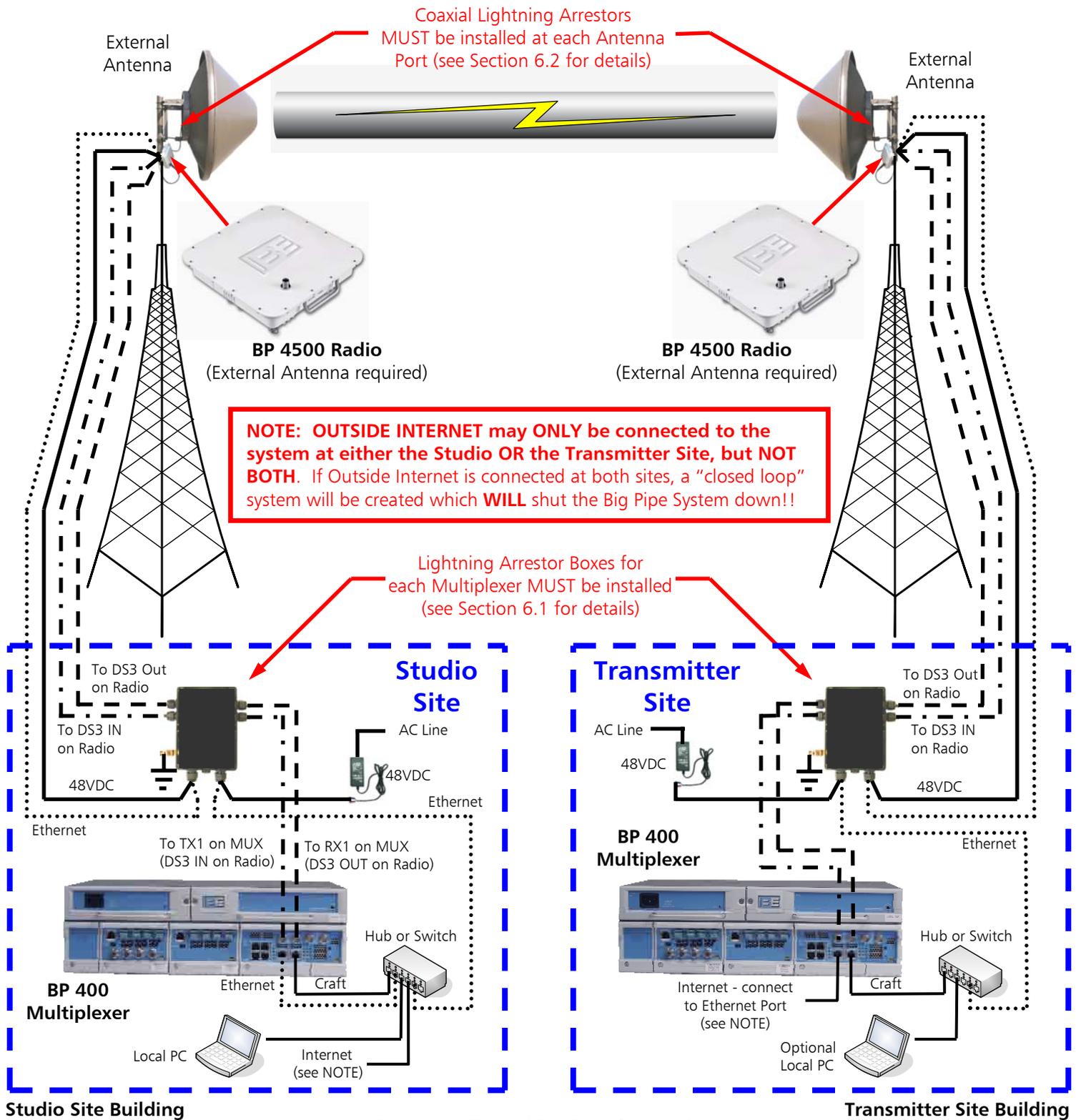


Figure 1 – Typical Big Pipe System Installation



6. Lightning Protection Kit

The Big Pipe System comes with Lightning Protection Kits (979-4500-001), (2) per link. Included in this kit is a Lightning Arrestor Box (141-1010) that connections from the Multiplexer to the Radio pass thru. Also included in the kit is an In-Line Coaxial Lightning Arrestor (141-1001) for the Radio to Antenna connection. It is very important that all lightning arrestor devices be properly installed.

Lightning Protection Kit (979-4500-001) contents:

- 141-1001 Lightning Arrestor, N-Type Coaxial
- 141-1010 Lightning Arrestor, DS3/E3 Connector
- 417-9079 Connectors, TNC, RG-59, 75 Ohm Male
- 550-048 Connector, UG-57B/U N Adapter



6.1. Lightning Arrestor Box (for Multiplexer to Radio Connections)

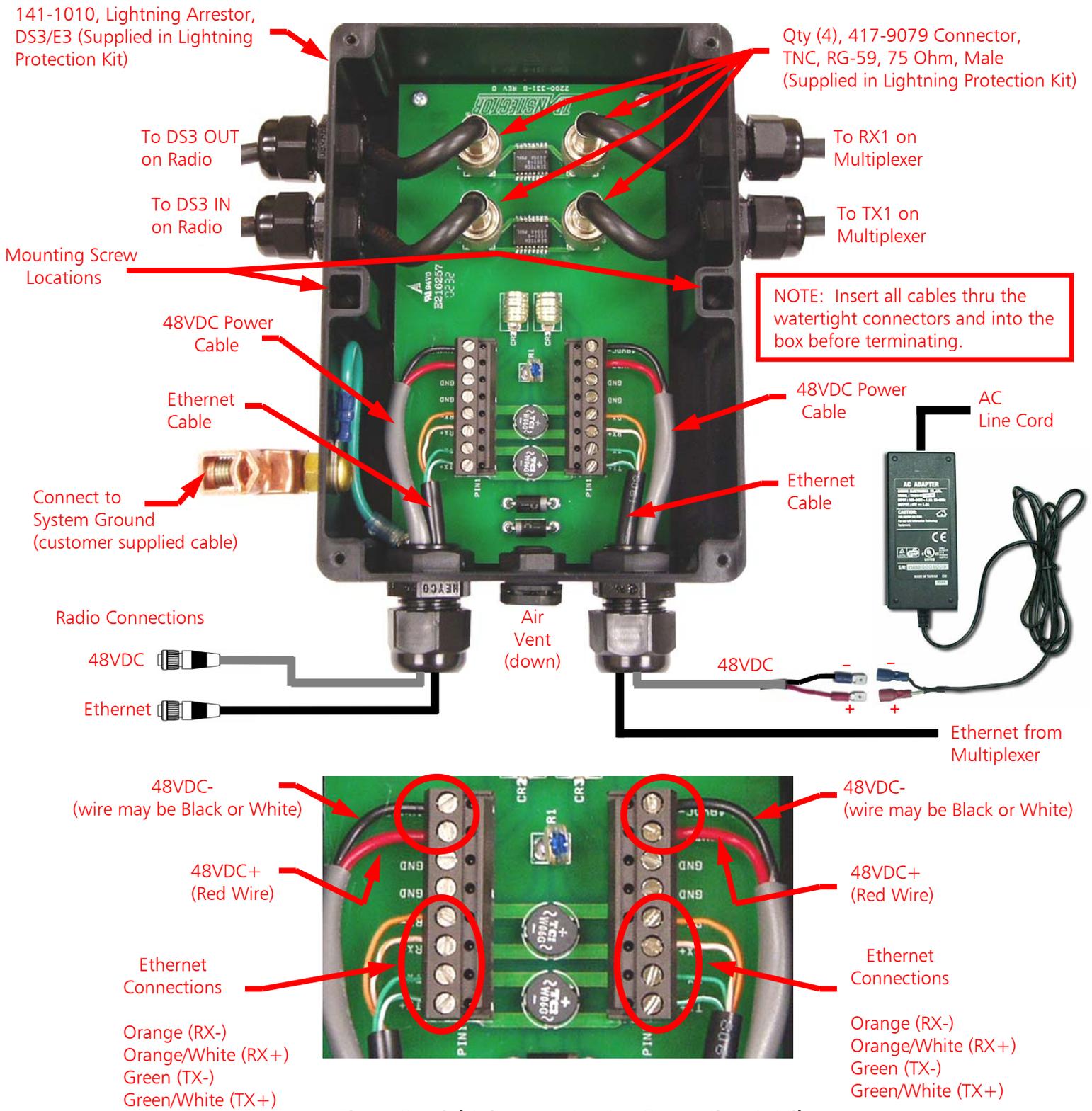


Figure 2 – Lightning Arrestor Box Connection Details



6.2. Coaxial Lightning Arrestor (Radio to Antenna Connection)

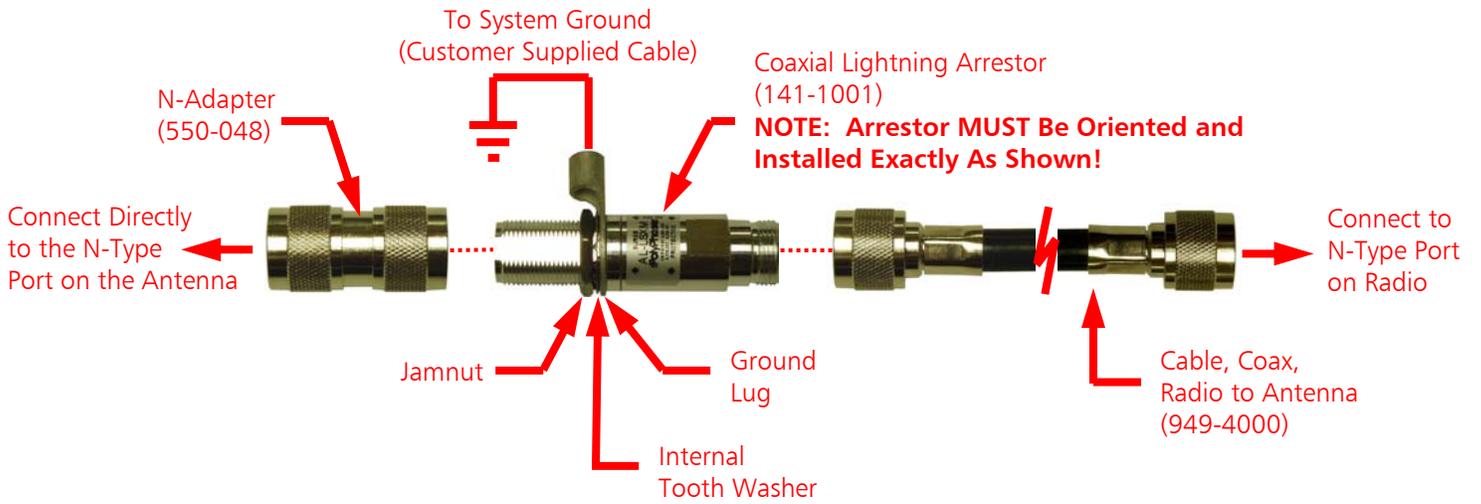
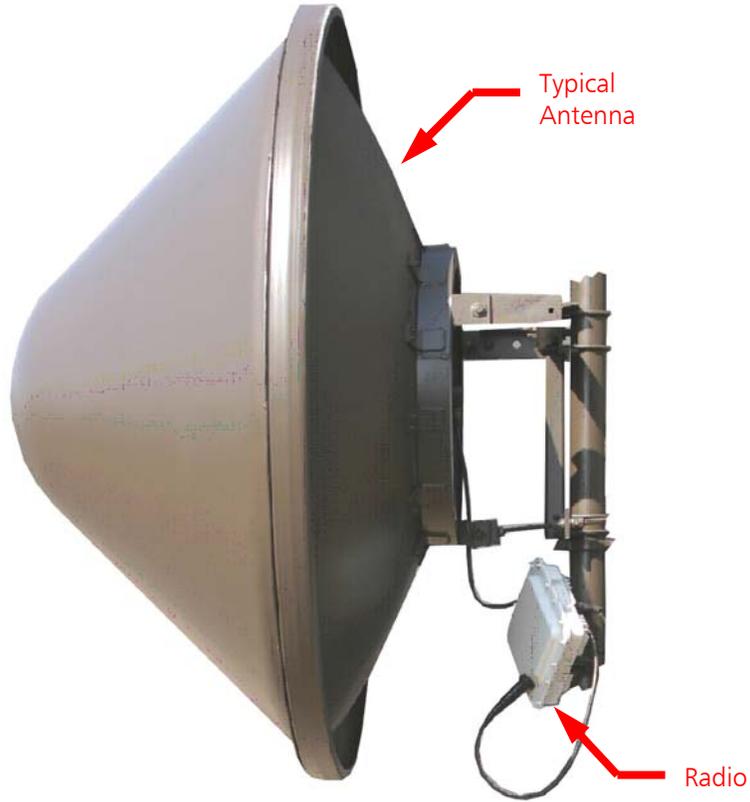


Figure 3 – Coaxial Lightning Arrester Connections (Typical Each End of the Link)



7. Radio Pole Mounting Brackets

Each radio comes with a **Pole Mounting Bracket Kit**. The Pole Mounting Bracket (installed as shown below) will accept pole diameters ranging from 1.75" – 3.00". By flipping the Pole Clamp over, the unit may then be mounted on smaller pole diameters ranging between 1.0" – 1.75". Prior to mounting the radios on the tower near the antennas, most of the bracket assembly (Steps 1 & 2) may be completed on the ground. See the instructions included in the Pole Mounting Kit for additional information.

Please note that Radios operate at a High Frequency and cable length MUST be minimized to avoid RF loss (supplied RF Output Cable is 6 feet in length). The Azimuth Orientation of a Radio is NOT critical, only the Azimuth Orientation of the External Antenna.

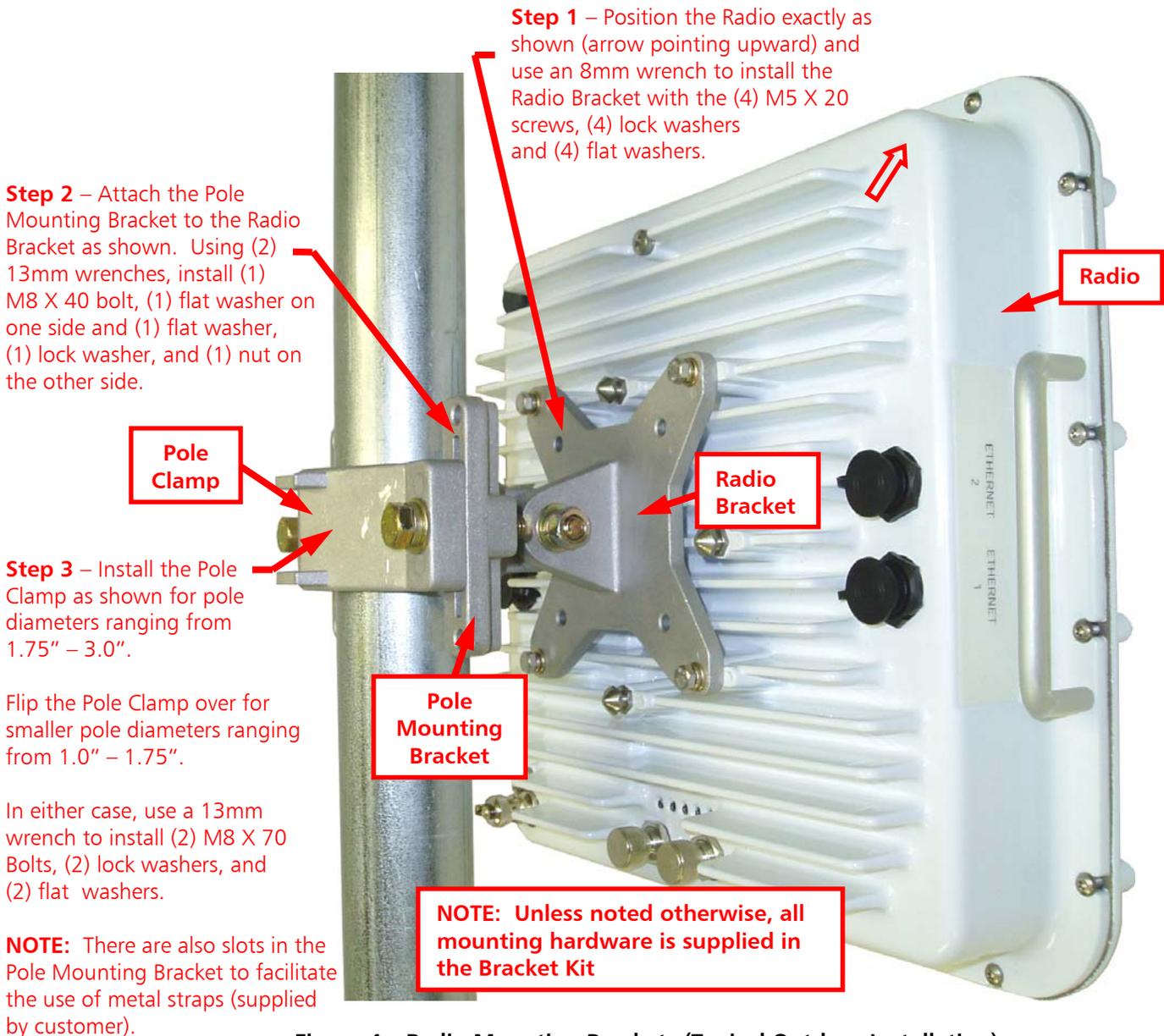


Figure 4 – Radio Mounting Brackets (Typical Outdoor Installation)

8. Radio Connections

The following diagram should be used as a reference for connecting up the radios in your system.

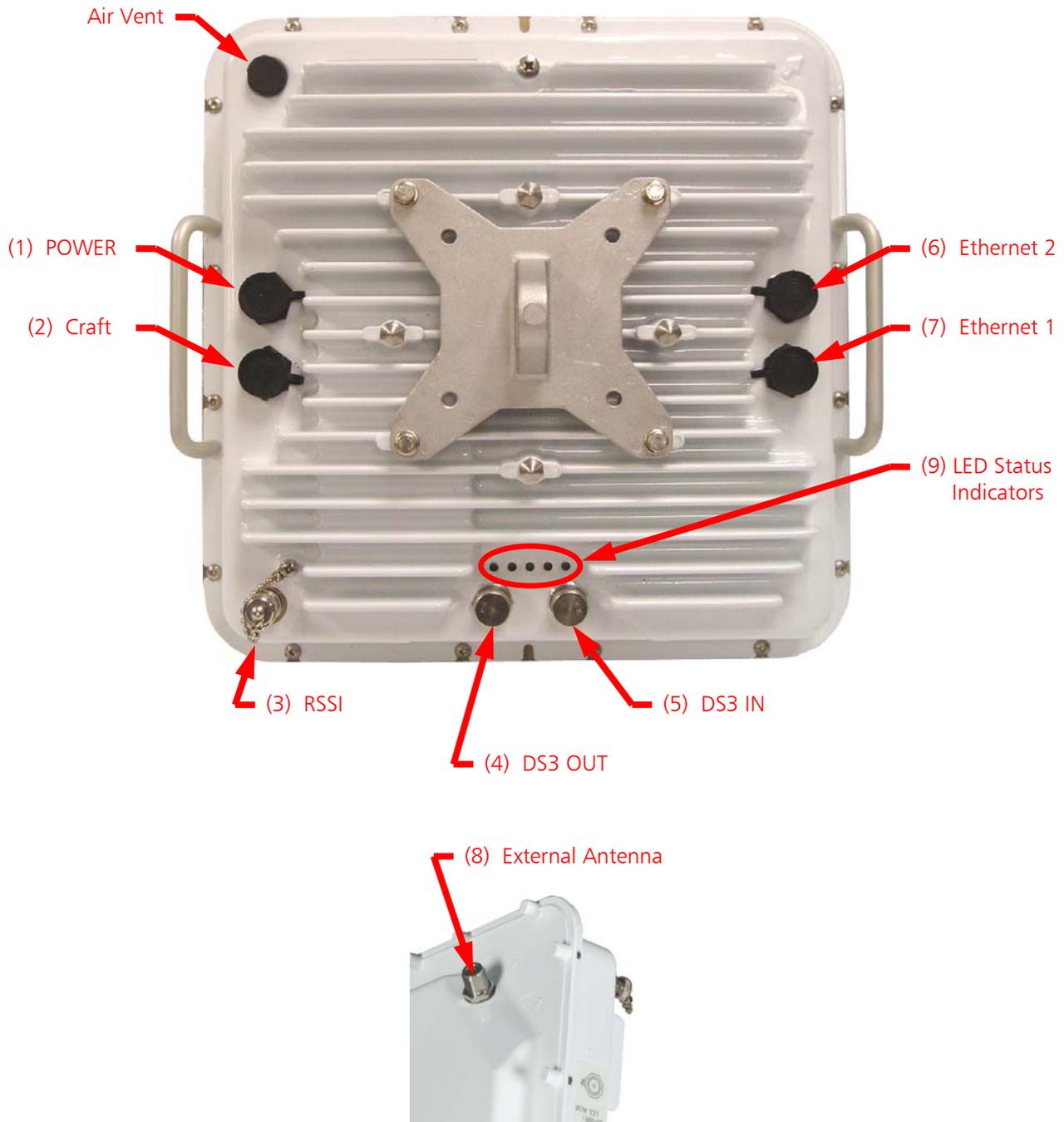


Figure 5 – Radio Connections



1. POWER Connector – Ensure that the following steps are taken before connecting power to the Radios.

Step 1 – The weather-proof connector connects to the radio. The un-terminated end must be connected to the AC Adapter (see **Figure 6**).

Step 2 – Determine the location of the Lightning Arrestor Box. Refer to **Figure 2** of this document for the Lightning Arrestor Box Connection Details. Additionally, refer to Section 2.13 of the BP4500 User's Guide for details. The Lightning Arrestor must be placed near the system ground and connected with customer supplied materials.

Step 3 – On the AC Adapter, crimp the female blue colored connector to the black wire and the female red colored connector to the white wire

Step 4 – Connect the blue female to blue male connector and the red female to the red male connector.

Step 5 – Cut the un-terminated end of the power cable to the desired length and strip the red and white or black wires.

Step 6 – Connect the blue female to blue male connector and the red female to the red male connector.

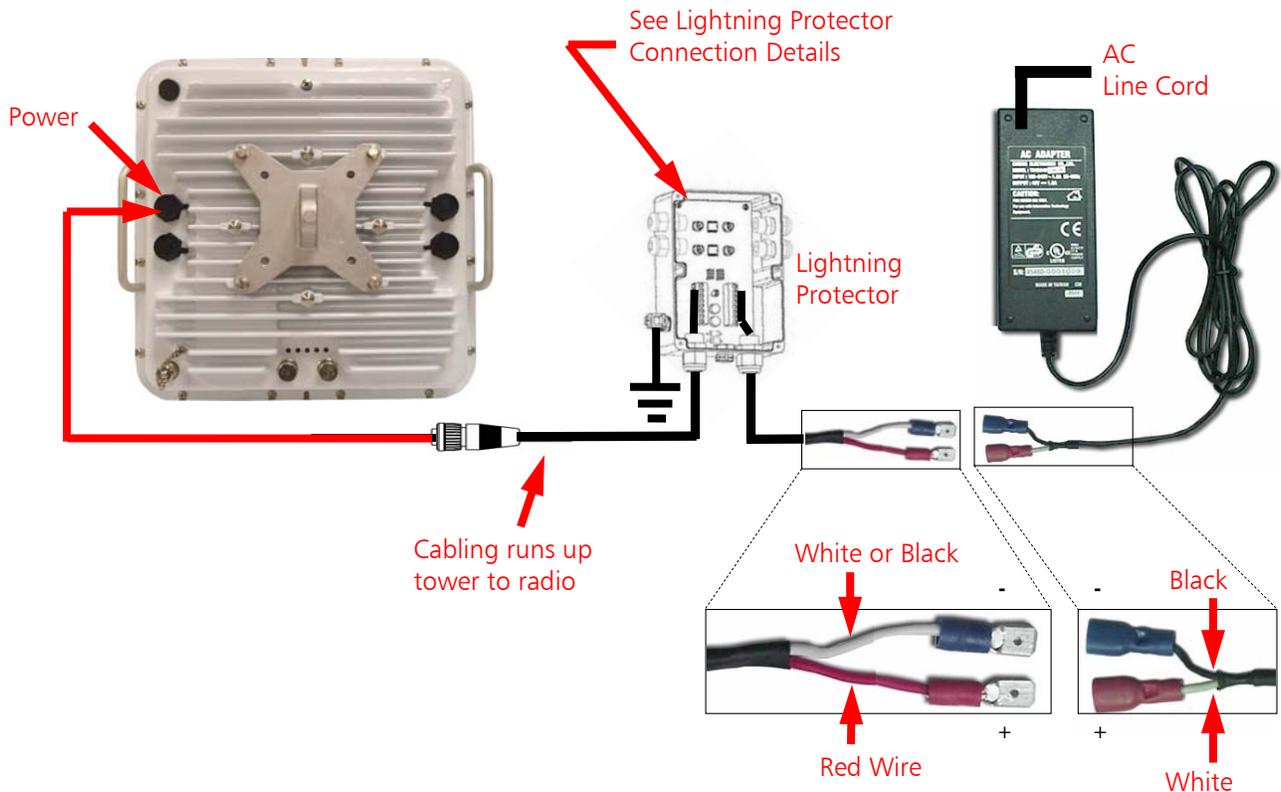


Figure 6 – Connecting Power to the Radio

2. **CRAFT Connector** – The Craft connection is only to be used by service technicians and is not intended for use during the operation of the radio. No craft cabling is provided with the system.
3. **RSSI Connector** – The RSSI connector is a BNC connection and is intended to be used in the aligning of the antennas. During the installation on a tower or building, a voltmeter should be connected to this port and the voltage peaked for the best signal strength. This voltage should be around **2.0V** which is approximately **-58dB** signal level. This level or stronger is desired for a good quality link.
4. **DS3 OUT Connector** – This TNC connector should be connected with the supplied Belden 8241 RG-59 cables to the RX 1 BNC connector on the multiplexer equipment.
5. **DS3 IN Connector** – This TNC connector should be connected with the supplied Belden 8241 RG-59 cables to the TX 1 BNC connector on the multiplexer equipment.

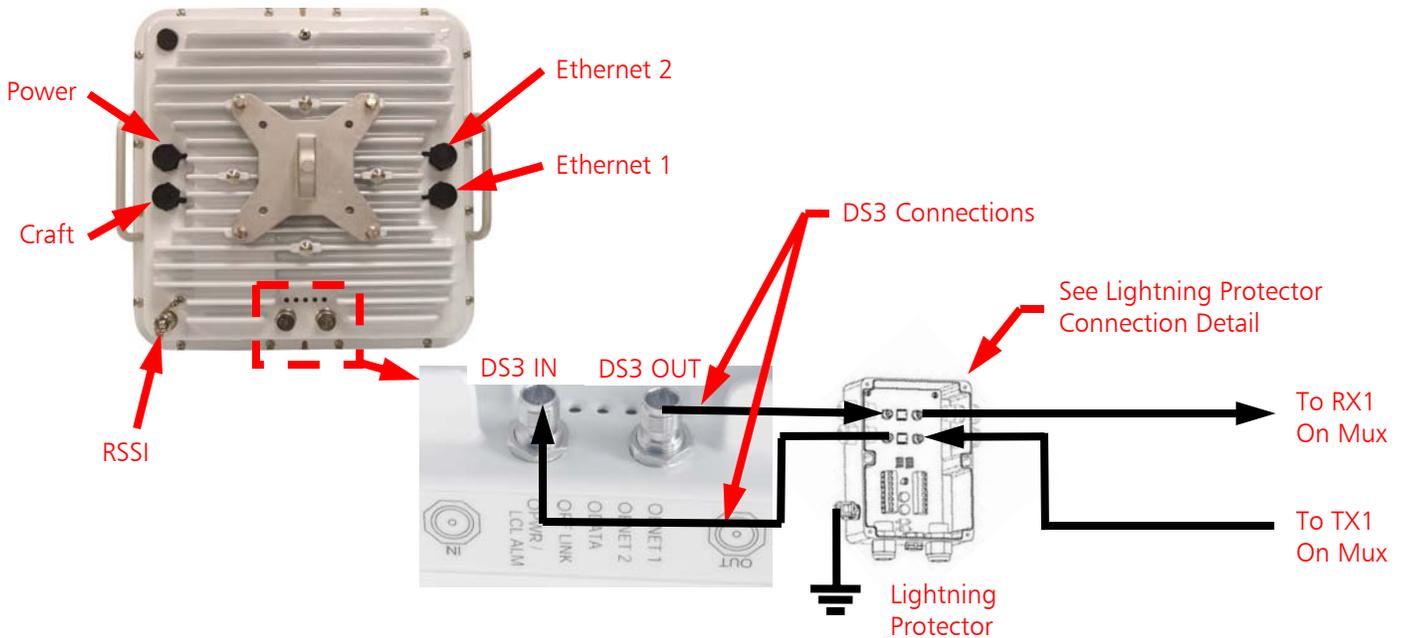


Figure 7 – DS3 IN and DS3 OUT Radio Connections

6. **ETHERNET 2 Connector** – When the radio is used in conjunction with the BE Multiplexer, this connection may be used for monitoring and commissioning the radio. RSSI, Power Level, Self Tests, and Monitoring of the remote radio can be accomplished through this connection or the Ethernet 1 connector. Connect to this port using the Belden Data twist CAT-5E cables.
7. **ETHERNET 1 Connector** – When the radio is used in conjunction with the BE Multiplexer, this connection may be used for monitoring and commissioning the radio. RSSI, Power Level, Self Tests, and Monitoring of the remote radio can be accomplished through this connection or the Ethernet 2 connector. Connect to this port using the Belden Data twist CAT-5E cables.

Note: Only one ETHERNET port is typically used.



8. **EXTERNAL ANTENNA Connector** – This N Type connection is used to connect an External Antenna to the Radio via a supplied 50Ω coax cable. **Please note that Radios operate at a High Frequency and cable length MUST be minimized to avoid RF loss (the supplied RF Output Cable is 6 feet in length).**
9. **LED Status Indicators** – The LEDs indicate Ethernet 1, Ethernet 2, Data, RF Link, and Power / Local Alarm status. Refer to Table 1.2 in the BP 4500 User Guide for detail.

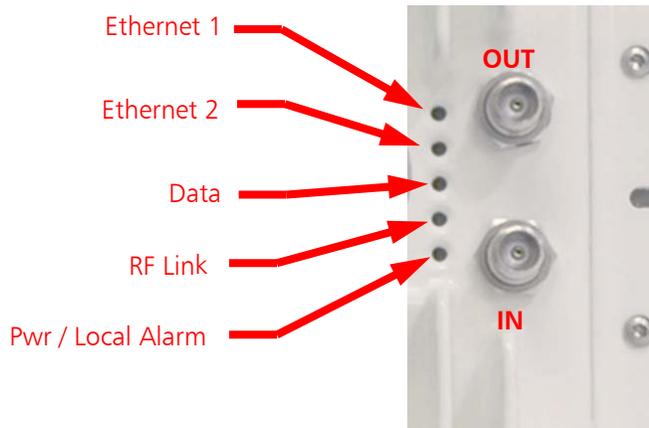


Figure 8 – Radio LED Status Indicators

9. Radio Setup, Monitoring, and Provisioning

Follow these steps to power on and then provision the radio:

Step 1 – It is highly recommended that you connect up your system in a lab and verify operation prior to installation on the tower.

Step 2 – If in a lab environment, connect cable with attenuators (minimum of 50dB) to the antenna connection on both radios. For outdoor installations, connect to the provided antenna. Be sure to install the coaxial lightning protector as shown in Figure 2.

Step 3 – If you do not already have Java installed on your computer, download Java to your computer by performing Steps 3a-3f prior to trying to connect to the radio through the Ethernet port for setup and monitoring of the radio. If you already have Java installed, proceed to Step 4.

Step 3a – Go to www.java.com

Step 3b – Click on “Java Software Download”



Figure 9 – Java Software Download

Step 3c – Click on “Download Now”



Figure 10 – Java Software Download Now

Step 3d – Click on “Begin Download”



Figure 11 – Java Begin Download



Step 3e – Click on “Manual Download”

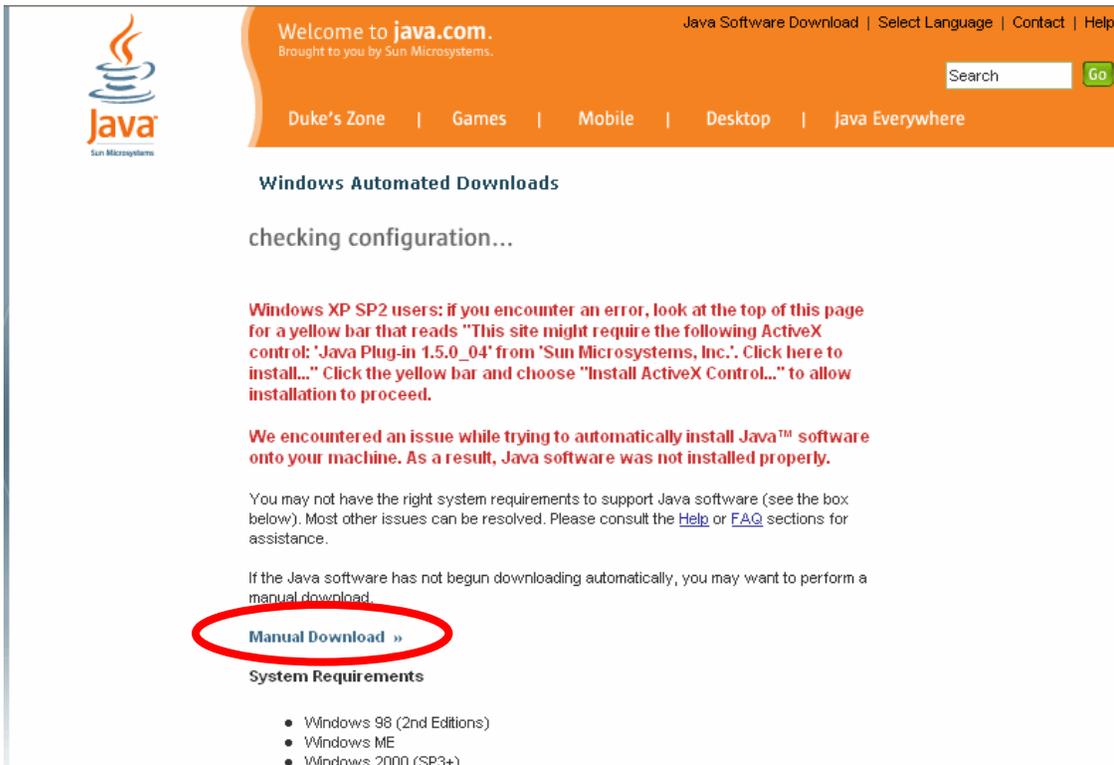


Figure 12 – Manual Download

Step 3f – Click on desired download option and follow prompts to complete installation.



Figure 13 – Manual Download Options



Step 4 – Connect the Ethernet Cable to Ethernet connection labeled **ENET 1** or **ENET 2**. Either port can be used to manage the radio.

Step 5 – Connect the assembled power cable to the power input (refer to **Figure 6**).

Step 6 – Wait up to 60 seconds and verify solid green LED for **PWR/LCL ALM, RF LINK**, and **DATA**. The **ENET 1** and **ENET 2** LEDs will only light when you have Ethernet traffic connected to these ports such as a computer for monitoring or actual Ethernet to a network.

Step 7 – Connect the Radio to your Personal Computer using the provided Ethernet Cable.

Step 8 – Setup your PC with the following information: 10.0.0.1 as IP address and Subnet mask as 255.0.0.0

On the PC go to **Start -> All Programs -> Accessories -> Communications -> Network Connections**. Next, select the **Local Area Connection** icon, then select **Properties** and the menu on the left will appear.

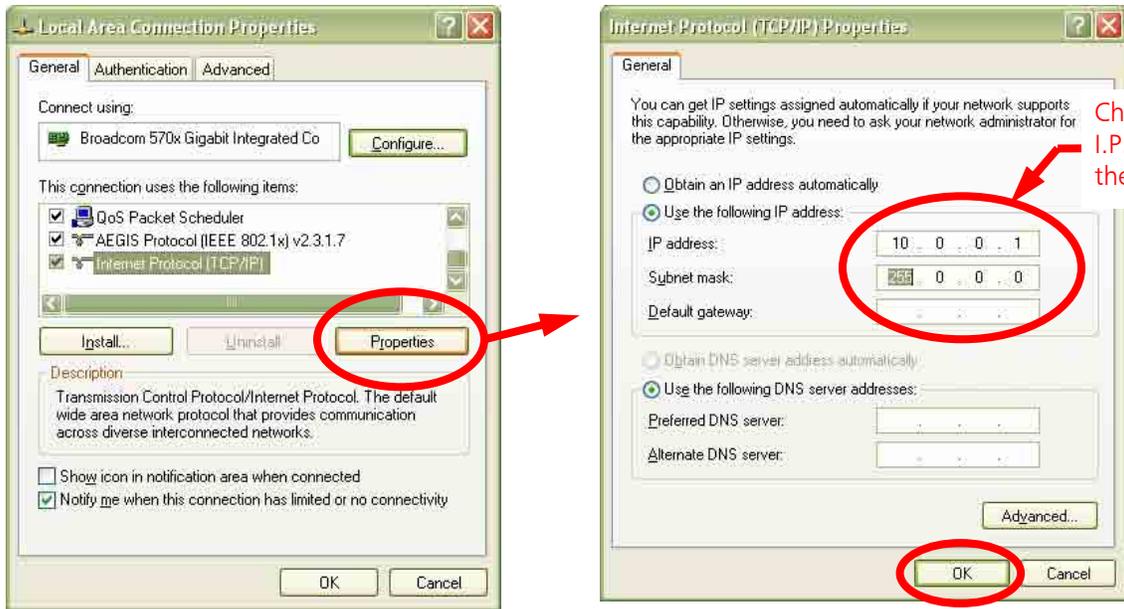


Figure 14 – Configure the I.P. Address of the Personal Computer

NOTE: The High band (TX HI) radio IP address is 10.0.0.3 and mask is 255.0.0.0
The Low band (TX LO) radio IP address is 10.0.0.2 and mask is 255.0.0.0

Step 9 – Launch your web browser and enter either 10.0.0.2 or 10.0.0.3 to provision the radios.



NOTE: In order to provision the remote radio through the local radio there must be a good link. The default username is **root** and the default password is **rootpass** (all lowercase).



Default username = root
Default password = rootpass

Figure 15 – Password Menu

NOTE: A second user login may appear for users with certain versions of Windows Explorer. If a second login screen does appear, simply re-enter the same username and password.

Step 10 – If the following message appears click on **“Yes”** or **“Always”**



Figure 16 – Security Warning Menu

NOTE: The radios are sent from the factory with the power set for +16dBm output power for 5.8GHz radios and +8dBm for 5.3GHz radios.



Step 11 – To get an overview of the radio and its performance go to the **Information** menu tab and select **Current Configuration**. Access this menu to monitor RSSI Level, BER, DS3 Input Status, TX and RX frequency, TX Power and other key operating parameters of the radio.

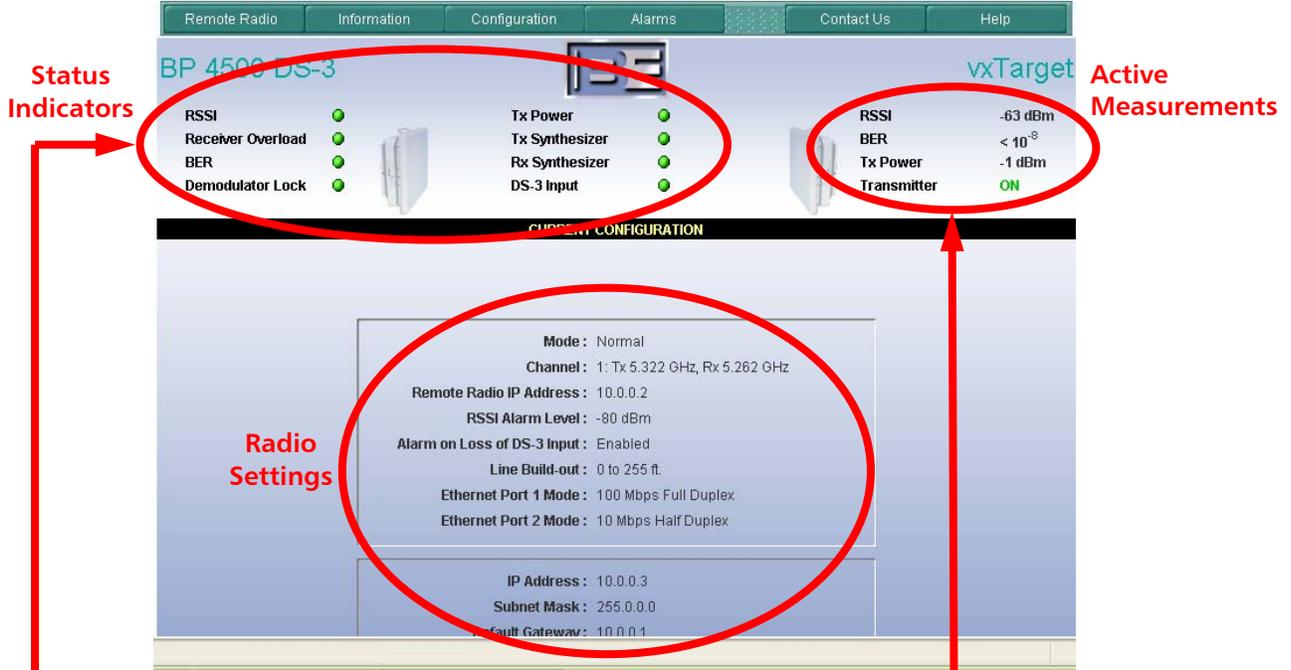


Figure 17 – Current Configuration Menu

NOTE: A good RF link should have the following:

- RSSI should be Normal (indicator should be green)
- Receiver Overload should be Normal (indicator should be green)
- BER should be Normal (indicator should be green)
- Demodulator Lock should be Normal (indicator should be green)
- RSSI level of -58dBm or better
- BER of $< 10^{-8}$ or better
- When the multiplexer equipment is connected to the Radio, the DS-3 Input Status should be Normal, if it is not connected the DS-3 Input Status will be Alarm.
- If any of these items are red, then there may be an issue with the alignment of the radio dishes and / or the connections to the multiplexer equipment.



Step 12 – If you desire to change any parameters, go to the **Configuration** menu tab, select **Commission Radio**, and then click **Submit** for the changes to take effect.



Figure 18 – Accessing the Commission Radio Menu

Step 13 – If you desire to change your **Username** and **Password** from the default, go to the **Commission Manager** page under the **Configuration** menu and setup your **Username** and **Password** for security and click submit changes. The default username is **root** and the default password is **rootpass** (all lowercase).

Step 14 – To Access the Remote Radio go to the **Remote Radio** menu tab and select the address. This address must match that of the remote radio and is set in the Commission Radio menu.

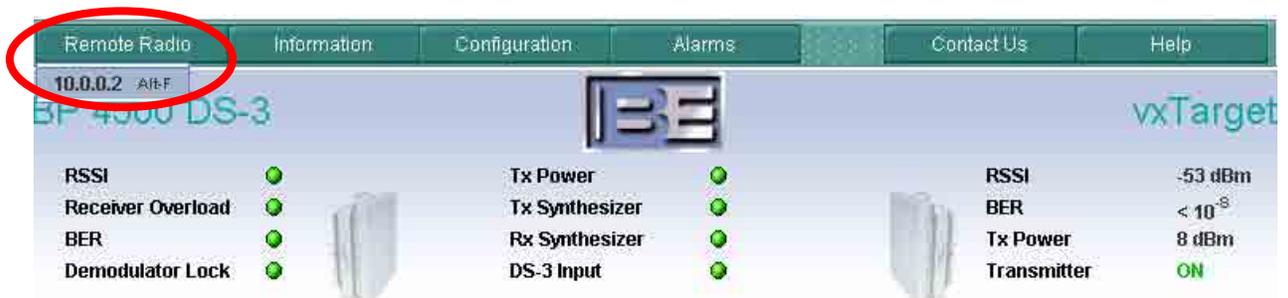


Figure 19 – Accessing the Remote Radio Menu

Step 15 – To get back to the radio Monitor page, click on the **Information** menu tab and then select **Current Configuration**.



Figure 20 – Accessing the Current Configuration Menu



10. Alignment of the Link

10.1. Checking for Interference

Step 1 – Power OFF the radio at the far end and look at the signal strength on the near end. With the far end OFF, the RSSI should be -70dB or lower.

Step 2 – Power OFF the radio at the near end and look at the signal strength on the far end. With the near end OFF, the RSSI should be -70dB or lower.



Figure 21 – RSSI Value

10.2. Antenna Alignment

Step 1 – If there are other links as part of the system ensure ONLY the pair of radios you are aligning are powered ON.

Step 2 – Ensure that both Antennas are pointed at each other.

Step 3 – Ensure that both radios are on the same channel.

Step 4 – Ensure that both antennas are polarized the same.

Step 5 – When a person is on the tower aligning an Antenna, the RSSI level may be monitored by using a voltmeter on the Radio's RSSI port. The RSSI voltage should be ~2.0V (-50 to -60dB) for a good link.

Note: The RSSI port on the radio is broadband so you can get fooled.

Step 6 – If there are no other signals on in the area, the tower person should adjust the antenna until the RSSI voltage peaks. The antenna adjustments should be done as follows:

Step 6a – Coarse sweep horizontal to find the voltage peak.

Step 6b – Fine sweep horizontal to further define the peak and center within the peak.

Step 6c – Coarse sweep vertical to find the voltage peak.

Step 6d – Fine sweep vertical to further define the peak and center within the peak.

Step 6e – Repeat process at the other end of the link.



10.3. Resolving Antenna Alignment Problems

In the event that a good link can not be established there are some things that can be done to try to improve it.

- 1) Change the frequency of your radio pair. Within the band that your radio pair is set to operate at, there are 3 frequencies to choose from. **Be sure to change the remote radio first or link will be lost.**



Figure 22 – Changing Frequency of the Radios

- 2) Change the polarization of the antennas.
- 3) Switch Hi and Lo Band Radios end for end of the link.
- 4) In a Multiple link system, **DO NOT** put a Hi and a Lo Band Radio next to each other on the same tower.

11. Multiplexer to Radio Connections

The following defines how to connect the Multiplexer to the Radios and also where to connect your inputs to the Multiplexer.

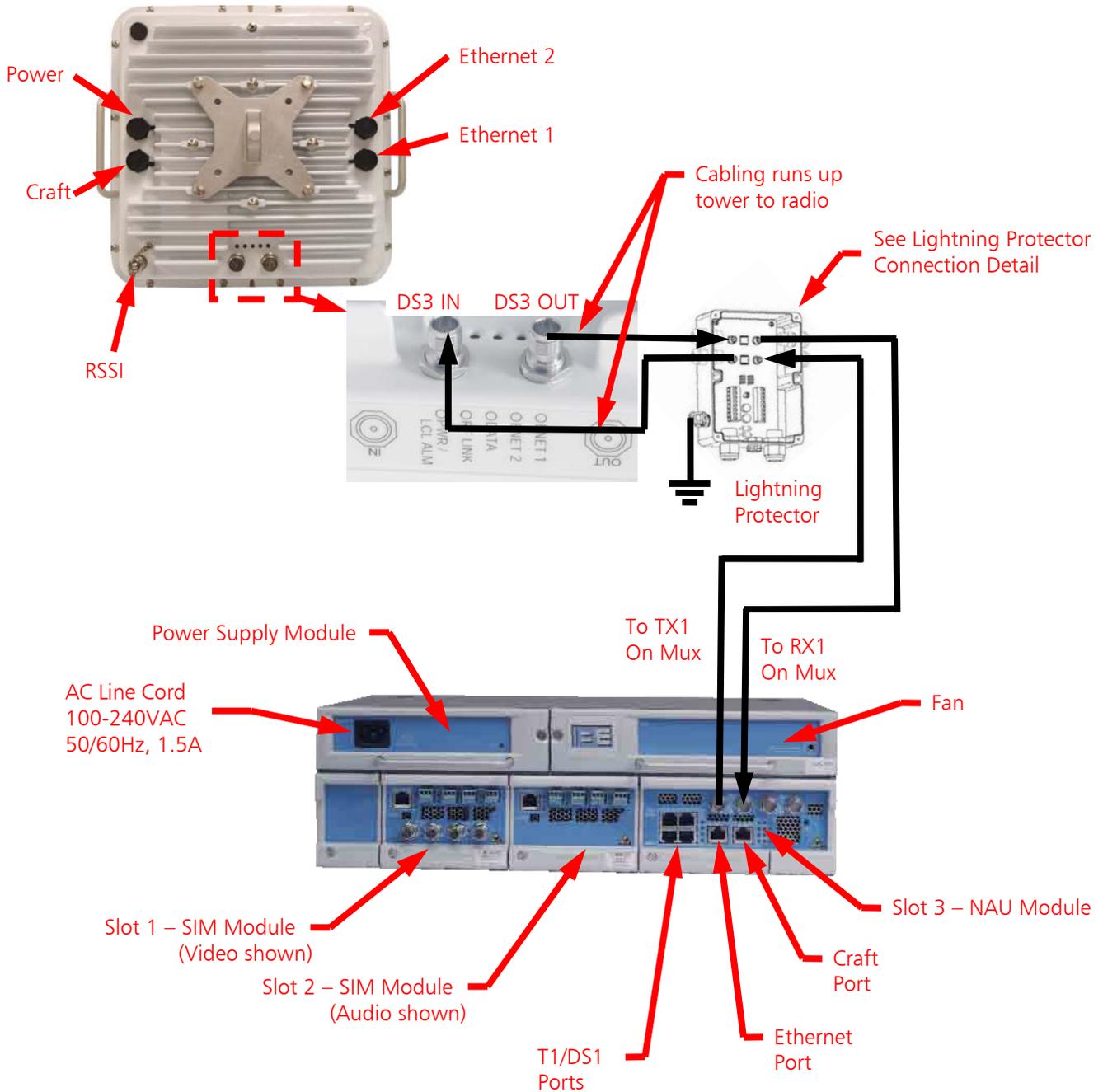


Figure 23 – Multiplexer to Radio Connections



12. Network Access Unit (NAU) Connections

The following shows the connections to the NAU module in the Big Pipe Multiplexer if configured with this module.

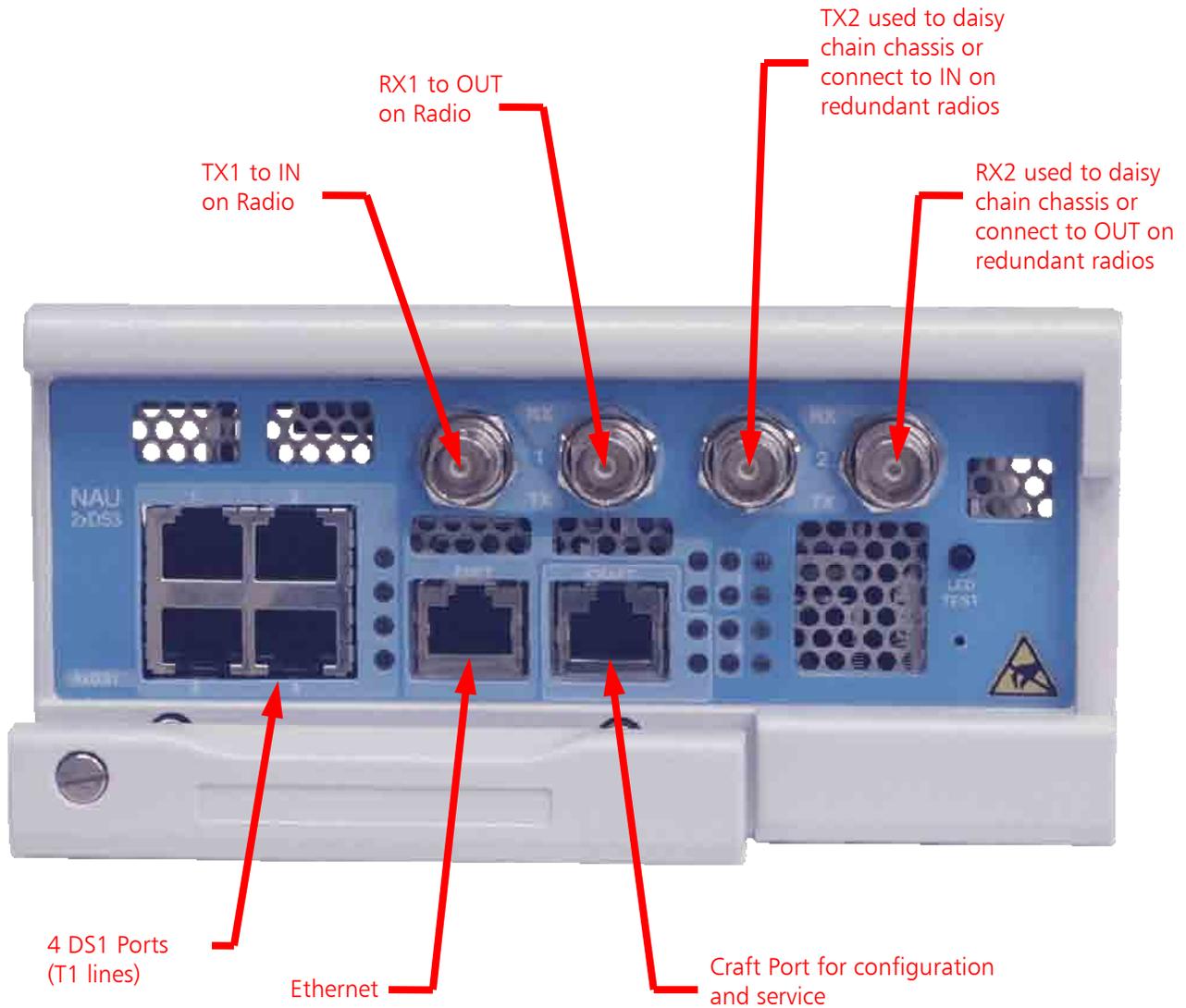


Figure 24 – NAU Connections

13. AES Audio Service Interface Module (ASIM) Connections

The following shows the connections to the ASIM (Audio Only) module in the Big Pipe Multiplexer if configured with this module.

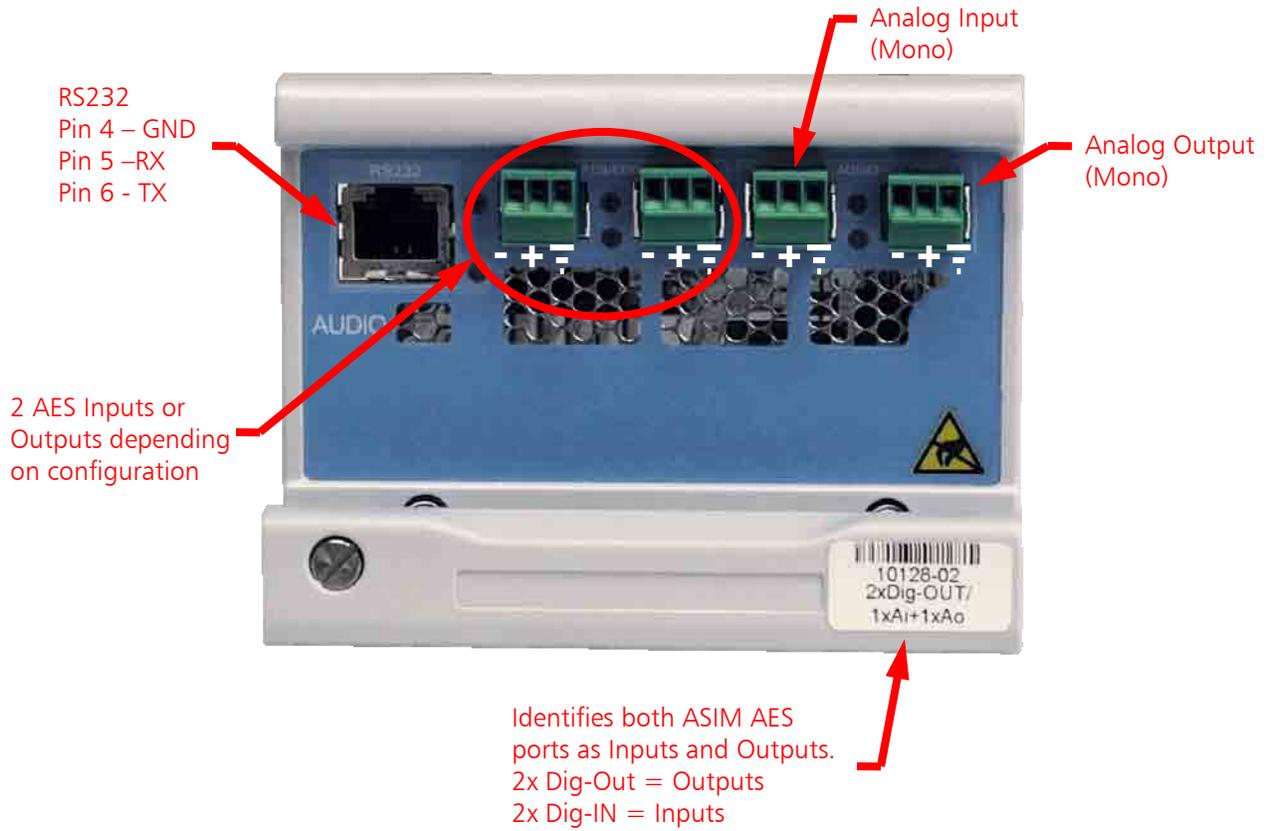


Figure 25 – ASIM Connections

14. Video/Audio Service Interface Module (VSIM) Connections

The following shows the connections to the VSIM (Video and Audio) module in the Big Pipe Multiplexer if configured with this module.

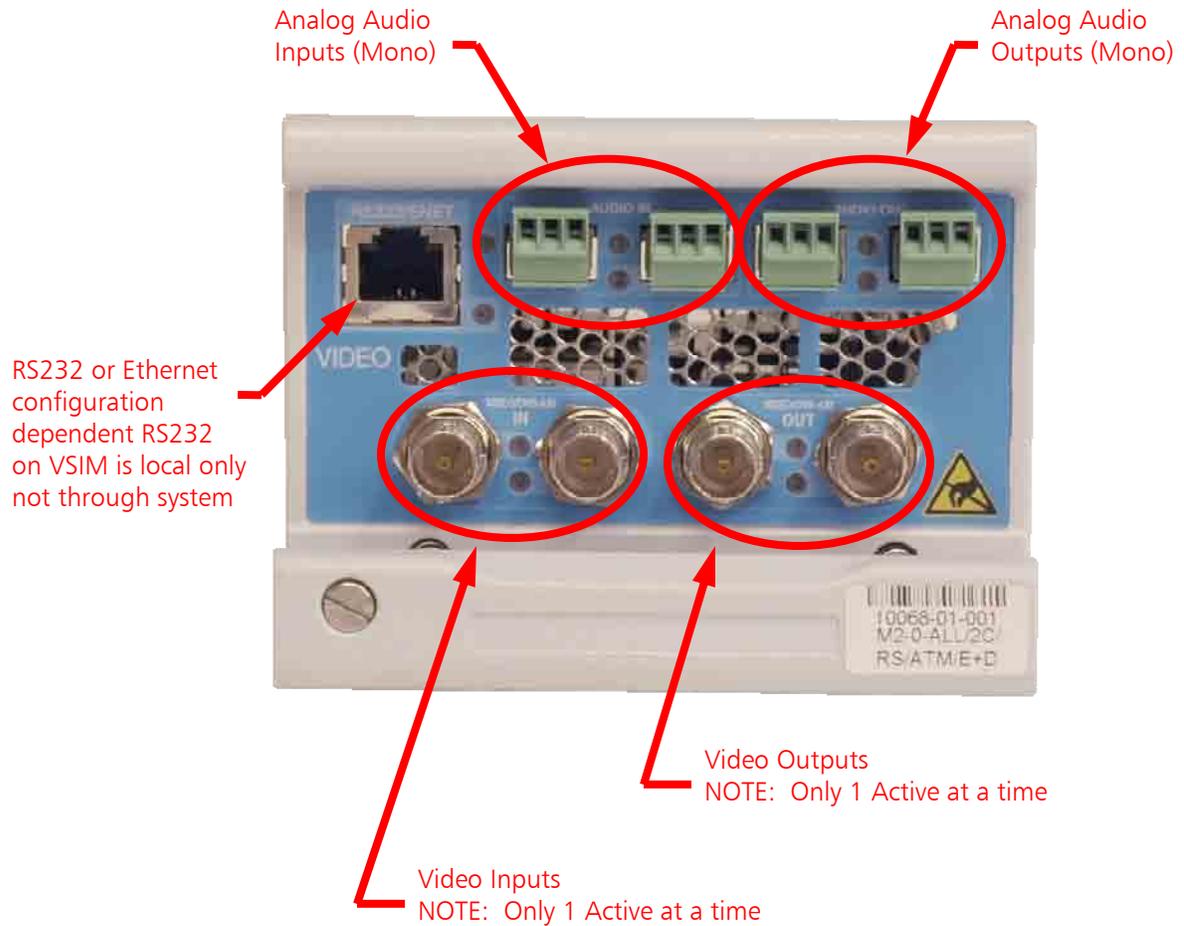


Figure 26 – VSIM Connections

15. Monitoring the Multiplexer

15.1. Connecting a Personal Computer to the Multiplexer

The Craft Port on the Multiplexer may be used to monitor and change its parameters. The Craft I.P. address of the unit is usually labeled on the Multiplexer. The Subnet Mask is always 255.255.255.0.

Step 1 – Connect a personal computer to the Multiplexer. If connecting directly to the Multiplexer, a crossover cable is required. If connecting through a switch or a hub, a straight through cable is needed.



Figure 27 – Connecting to the Multiplexer Craft Port

Step 2 – In order to establish communication between the PC and the Multiplexer, the PC has to be configured in the same I.P. address family as labeled on the front of the Multiplexer or 10.0.0.1 which will always allow you to connect.

On the PC go to **Start -> All Programs -> Accessories -> Communications -> Network Connections**. Next, select the **Local Area Connection** icon, then select **Properties** and the menu on the left will appear.

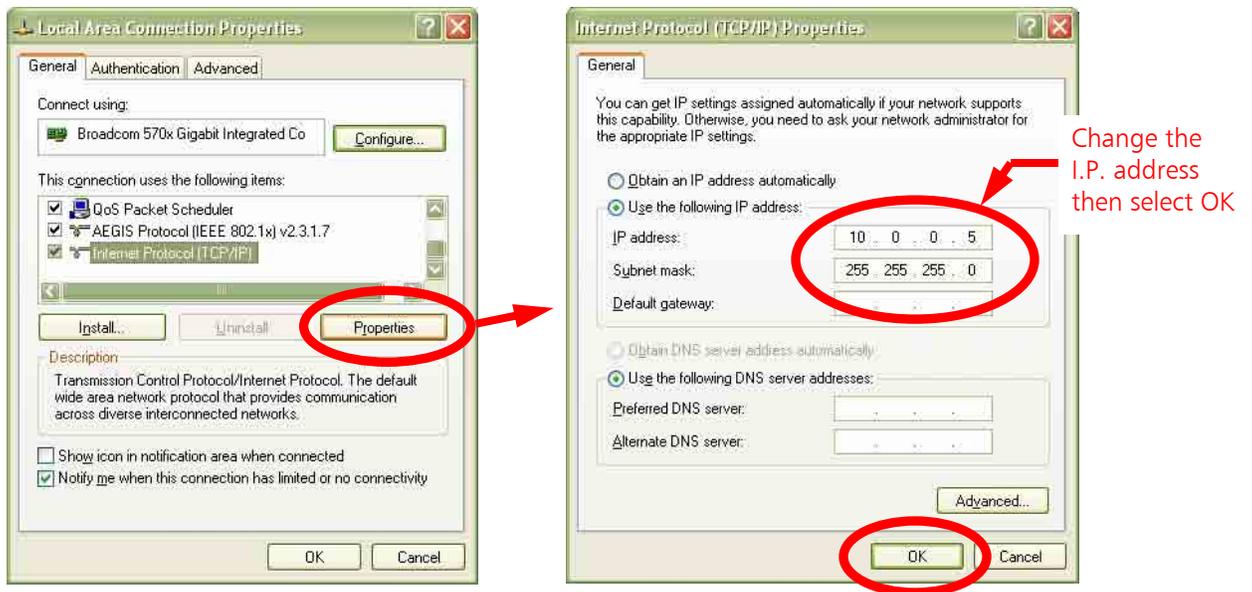


Figure 28 – Configure the I.P. Address of the Personal Computer



Step 3 – In an Internet Explorer address bar, depending on which you set up your PC in Step 2, enter either the I.P. address labeled on the front of the Multiplexer or 10.0.0.1.



Figure 29 – Accessing the Multiplexer through Internet Explorer

Step 4 – To login with administrative permissions, enter the following **User Name** and **Password** and then select **Login**.

User Name = **default**
Password = **welcome**

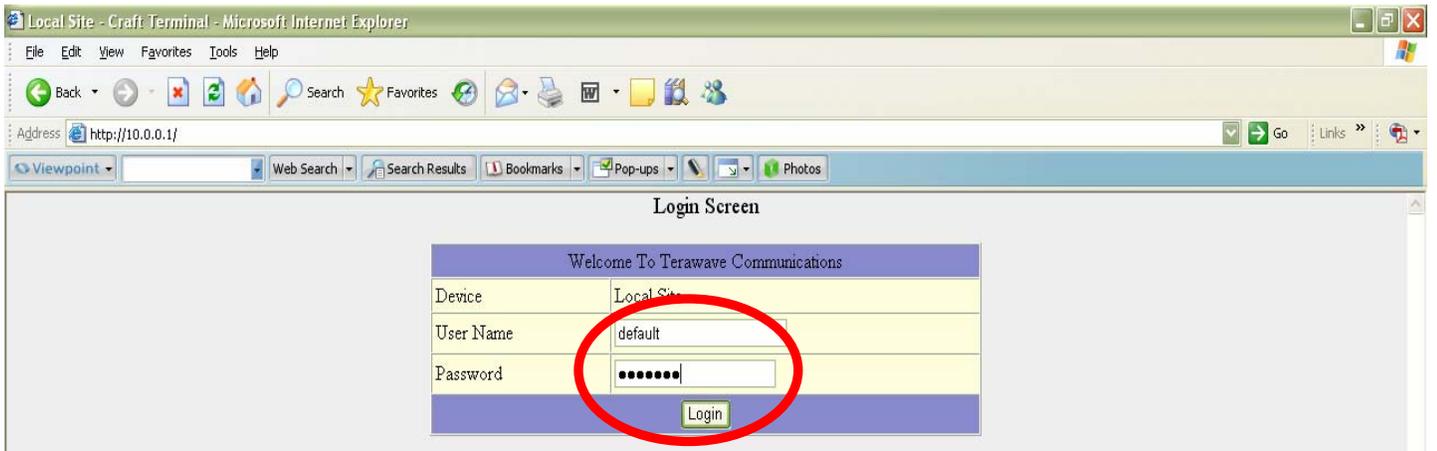


Figure 30 – User Login Menu

Step 5 – Once you are logged in, you will get a screen similar to the following.

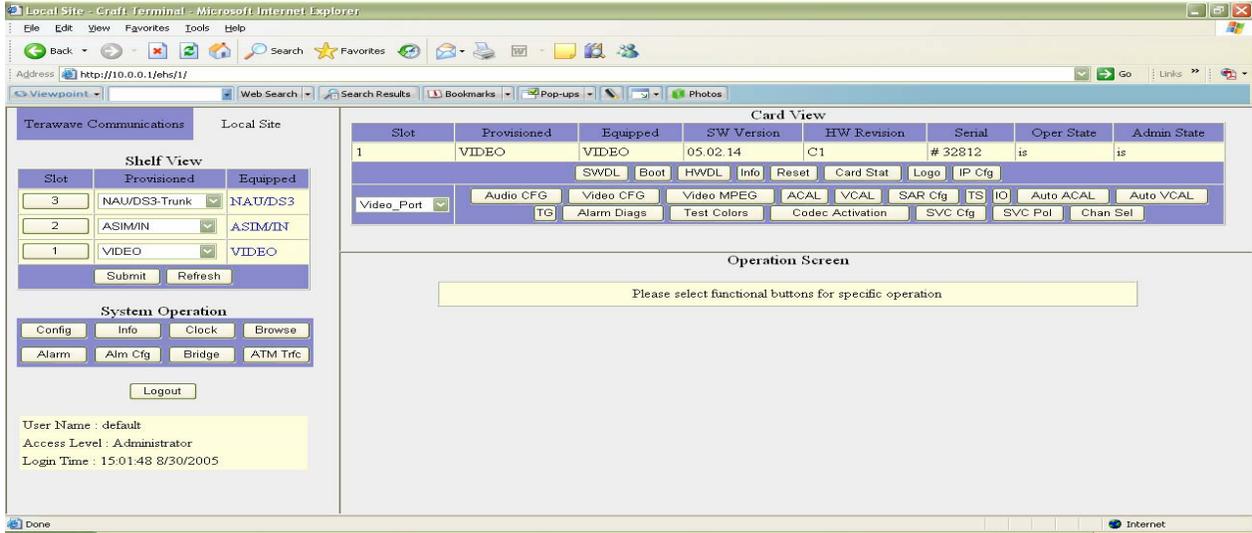


Figure 31 – Multiplexer Operation Menu

15.2. Changing the Craft I.P. Address of the Multiplexer

From the Operation Menu, select **Config**, and the System Configuration menu will appear. To change the Craft I.P. address simply type in the new one and click submit.

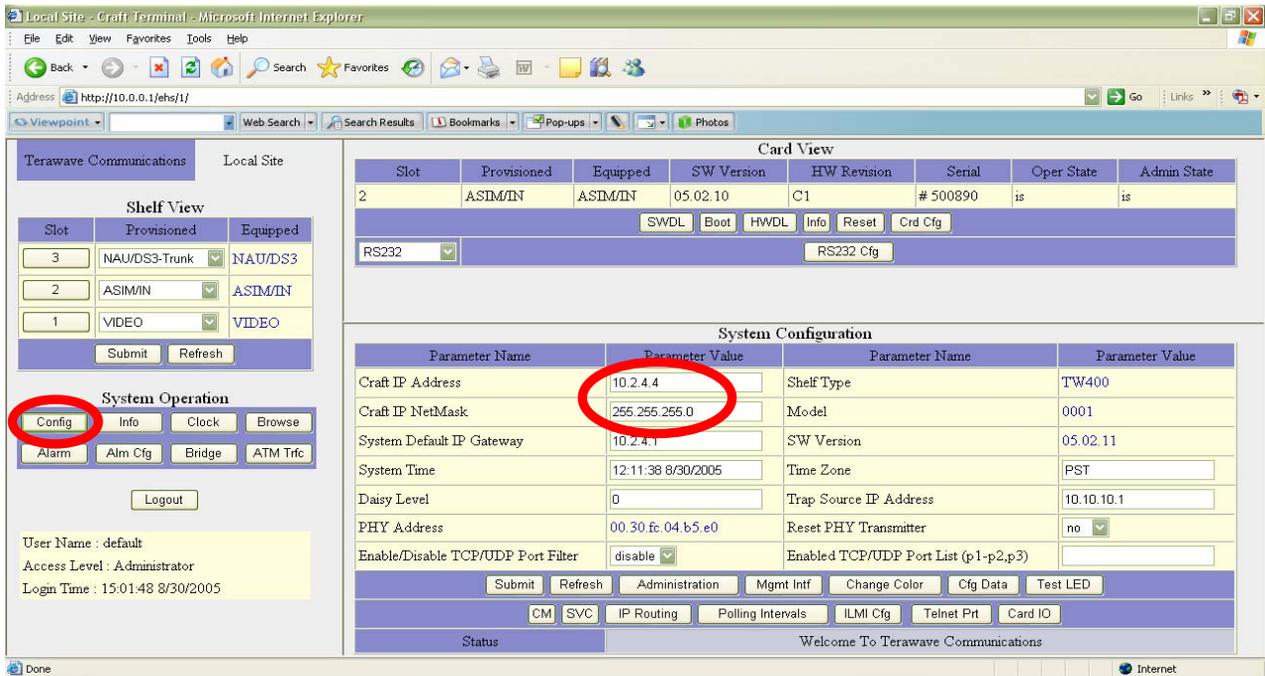


Figure 32 – Craft I.P. Address

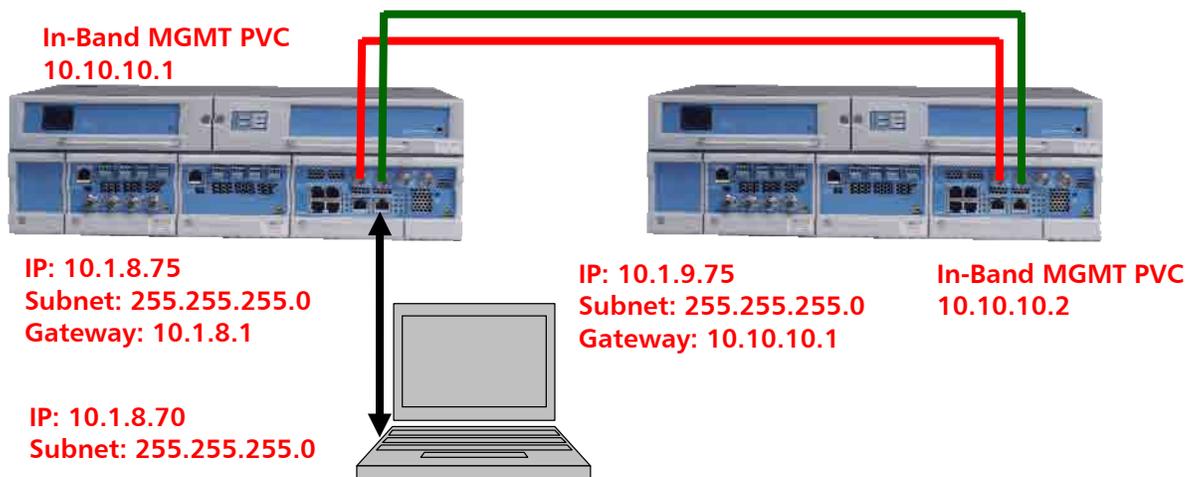


15.3. MGMT PVC (Management Private Virtual Connection)

A MGMT PVC is a connection on the Local Multiplexer that allows the operator to access the Remote Multiplexer through the Local Multiplexer's Craft port. The MGMT PVC is setup in the units prior to shipment and should not need to be changed. Access to a remote Multiplexer requires the user to perform a "route add" on the computer interfacing to the Local Multiplexer. Most MGMT PVCs are setup at the factory to allow access as follows:

- 10.10.10.1 Local; 10.10.10.2 Remote
- 10.10.10.101 Local; 10.10.10.100 Remote

The MGMT PVC is documented as part of your system as illustrated below.



Enter the following command in a command prompt window of the computer:

```
route -p add 10.10.10.0 mask 255.255.255.0 10.1.8.75
```

Figure 33 – MGMT PVC Documentation Example

15.4. Identifying the MGMT PVC without documentation

Step 1 – Log into the Local Multiplexer.

Step 2 – Click on **Slot 3** in the Shelf View.

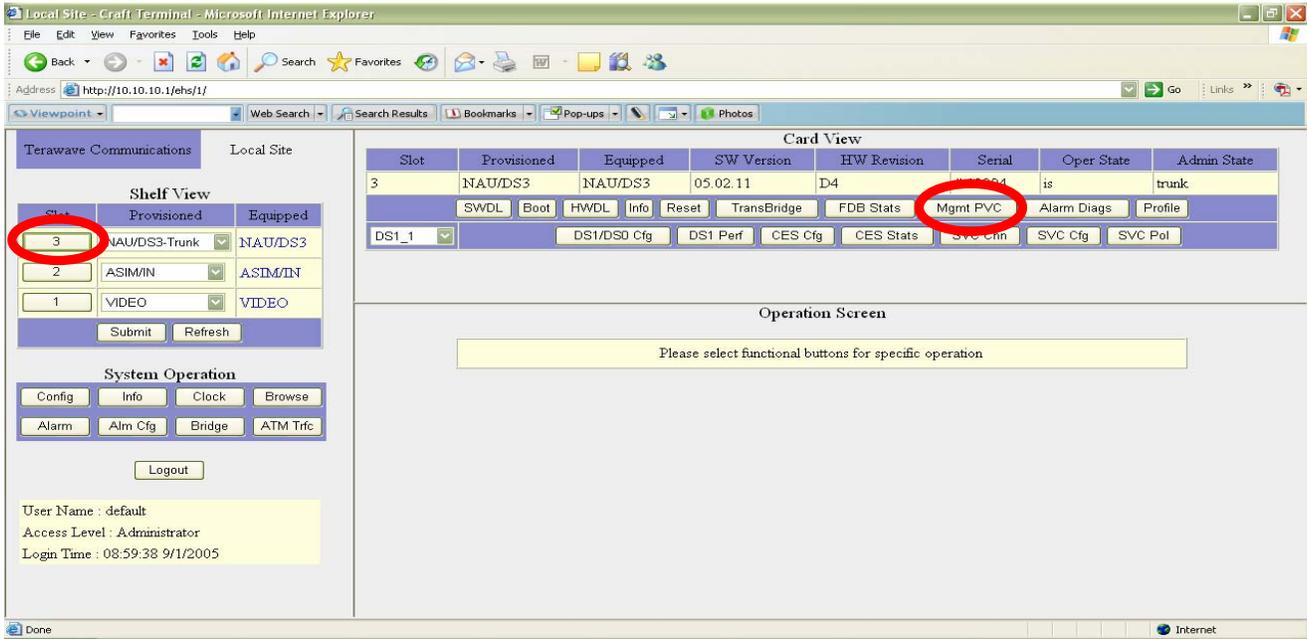


Figure 34 – Accessing the MGMT PVC Menu

Step 3 – Select MGMT PVC Number 1 and click Modify at the bottom of this menu.

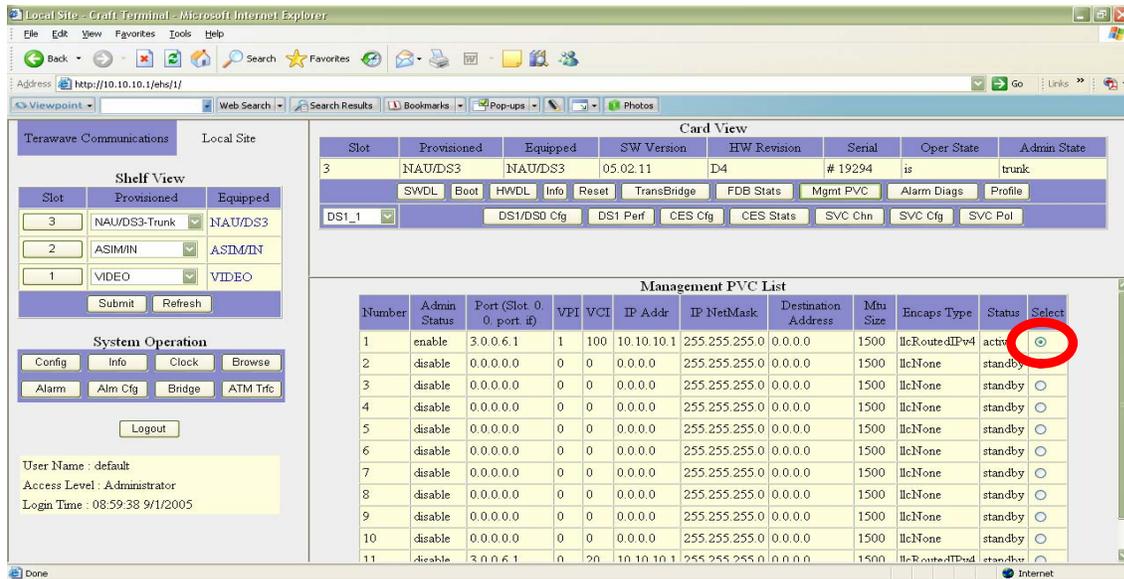


Figure 35 – MGMT PVC Menu



Step 4 – The I.P. address shown is the MGMT PVC address of the Local Multiplexer.

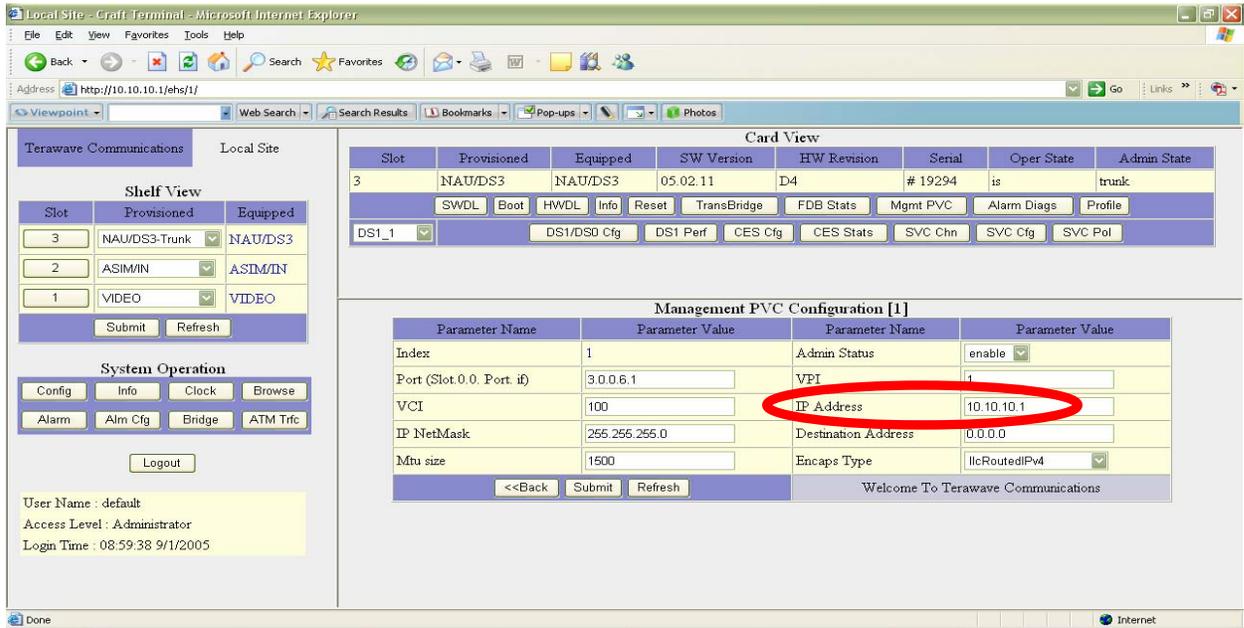


Figure 36 – MGMT PVC I.P. Address of the Local Multiplexer

Step 5 – Repeat the process for the Remote Multiplexer.

15.5. Perform a "route -p add" on your Personal Computer

Access to the Remote Multiplexer requires the user to perform a "route -p add" on the personal computer that is being used to interface to the Local Multiplexer. The "route -p add" command is issued from a Command Prompt as shown below.

On the PC, go to **All Programs -> Accessories -> C:\ Command Prompt**

For information on your Big Pipe System's specific configuration, see the In-Band Management section of the "XXXX (your stations call letters) Big Pipe Configurations" document included in the shipment.

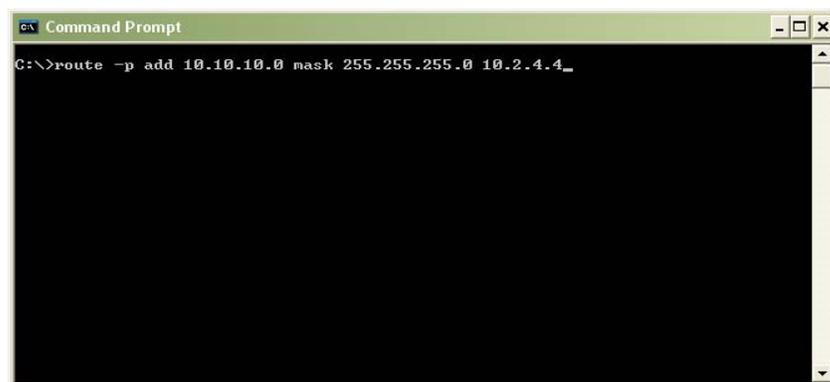


Figure 37 – Example of the "route -p add" command



15.6. Check the added "route"

Check the added route by issuing the "route print" from the Command Prompt as shown.

```
C:\>route print
=====
Interface List
0x1 ..... MS TCP Loopback interface
0x2 ..00 11 43 60 b4 c5 ..... Broadcom 570x Gigabit Integrated Controller - Pa
cket Scheduler Miniport
=====
Active Routes:
Network Destination    Netmask          Gateway         Interface       Metric
0.0.0.0                0.0.0.0         10.2.1.1       10.2.2.66      20
10.2.0.0              255.255.0.0     10.2.2.66     10.2.2.66      20
10.0.0.0              255.255.0.0     127.0.0.1     127.0.0.1      1
10.10.10.0            255.255.255.0   10.2.4.4      10.2.2.66      1
10.255.255.0          255.255.0.0     10.2.2.66     10.2.2.66      20
127.0.0.0             255.0.0.0       127.0.0.1     127.0.0.1      1
224.0.0.0             240.0.0.0       10.2.2.66     10.2.2.66      20
255.255.255.255      255.255.255.255 10.2.2.66     10.2.2.66      1
Default Gateway:     10.2.1.1
=====
Persistent Routes:
Network Address        Netmask          Gateway Address  Metric
10.10.10.0            255.255.255.0   10.2.4.4         1
```

Figure 38 – Example of the "route print" command

15.7. Deleting a "route" from your Personal Computer

To delete a route, issue the "route delete" command from the Command Prompt.

```
C:\>route delete 10.10.10.0 mask 255.255.255.0
```

16. Technical Support

For technical support, contact the RF Customer Service Department at:

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