

Chapter 4. System Diagnostics and Operating Tips

This section describes several diagnostic tests you can perform once the Tsunami MP equipment is installed. These tests assist you in determining whether the equipment is functioning as expected. In addition, we include some miscellaneous useful information for deploying a Multipoint network.

Radio Diagnostics

Use the diagnostic tools described in this section to determine if your wireless link is stable. You can also use these tools to help fine-tune antenna positions to establish a good link.

BSU and SU Logs

You can display BSU and SU logs to help troubleshoot possible link reliability and interference issues. These tools have no impact on data traffic, and can be used in conjunction with configuration parameters (such as IPC settings, modulation modes, and operating frequencies) and possible antenna relocation to obtain the best possible path. The goal is to maximize the Es/NO ratio.

Displaying the BSU Log

Follow these steps to enable the BSU log:

1. Enter **BSUlog (Terminal ID) <time>** where <Terminal ID> is the Terminal ID of the SU to be monitored and <time> specifies the polling period (in seconds).

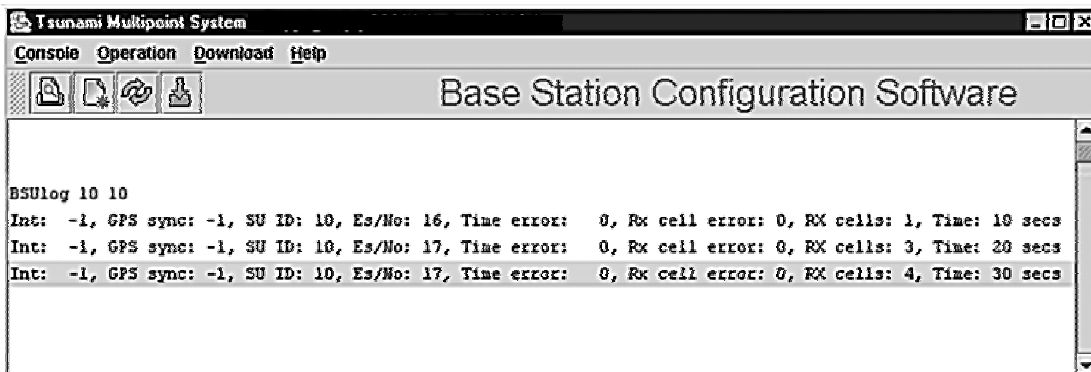


Figure 24. BSU Log in the Base Station Configuration Software

2. When finished, disable the BSU log by entering **BSUlog 0** (zero).

Monitor the Es/No ratio (Es/No reports the energy per symbol-to-noise spectral density ratio (in dB)). Low Es/No or varying Es/No can indicate path or interference problems. The Es/No requirement varies based on the modulation mode:

20 Mbps: Es/No > 4 + IPC value

30 Mbps: Es/No > 5 + IPC value

40 Mbps: Es/No > 9 + IPC value

60 Mbps: Es/No > 12 + IPC value

In addition, the BSU log provides the following information:

Int

Relative interference of the power received at the BSU (a value of 0 (zero) nominally shows no interference)

GPS sync

-1 indicates GPS sync is disabled; 4 indicates GPS sync is enabled. GPS synchronization is used when the system is in Multi Sector mode (multiple BSUs installed in the same location; see "Configuring the System for Multi-Sector Mode" on page 29 for more information).

SU ID

The Terminal ID of the monitored SU

Time error

Shows the uplink (or inbound) ranging error

Rx cell error

Shows the number of lost uplink cells

Rx cells

Shows the total number of uplink cells

Time

Shows the cumulative polling time (in seconds)

Displaying the SU Logs

You can display two different types of SU logs: SUlog1 and SUlog2. To display the SU logs, install the Base Station Configuration Software on the PC used to configure the SU (see "Installing the Base Station Configuration Software" for information) and then execute the commands described below.

Follow these steps to enable an SU log:

1. Enter **SUlog1 <time>** or **SUlog2 <time>** where <time> specifies the polling period (in seconds). (Specify **SUlog1** to display SUlog1; specify **SUlog2** to display SUlog2. See the information below for details about these two logs.)

- When finished, disable the SU log by entering **SUlog1 0** (zero) or **SUlog2 0** (zero) (depending upon which log you displayed).

SUlog1 provides the following information:

SU ID

The Terminal ID of the monitored SU.

RSL

Shows the shows the RSL (receiver signal level) at the output of the antenna (in dBm).

TX Power

Shows the SU's TX power at the input to the antenna (in dBm).

VCO

Shows the relative frequency offset of the VCO (voltage control oscillator) (in Hz).

Time error

Shows the synchronization error (in 1/512 symbol), generally magnitude (should be less than 8).

OB pkt error

Shows the number of out-of-sequence outbound packets.

Range

Shows the SU's distance from the BSU (in meters).

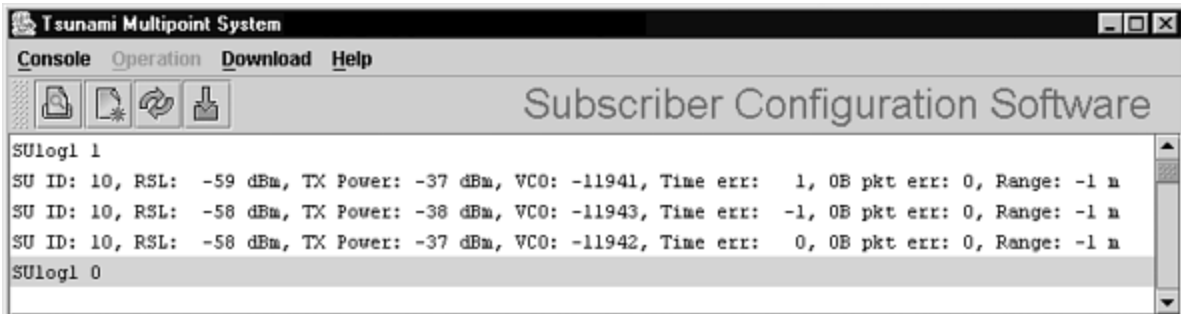


Figure 25. Log 1

SUlog2 provides the following information:

SU ID

The Terminal ID of the monitored SU.

Missed VARSYS

Shows the number of missing downlink control packets.

aloha retx

Shows the number of packets retransmitted due to collisions (collisions are a normal event on contingent channels. An excessive number may indicate a problem).

IB pkts

Shows the number of inbound packets transmitted.

OB pkts

Shows the number of outbound packets received.

OB PE

Shows the number of outbound packet errors.

OB PER

Shows the error rate for outbound packets received.

Time

Shows the cumulative polling time (in seconds).

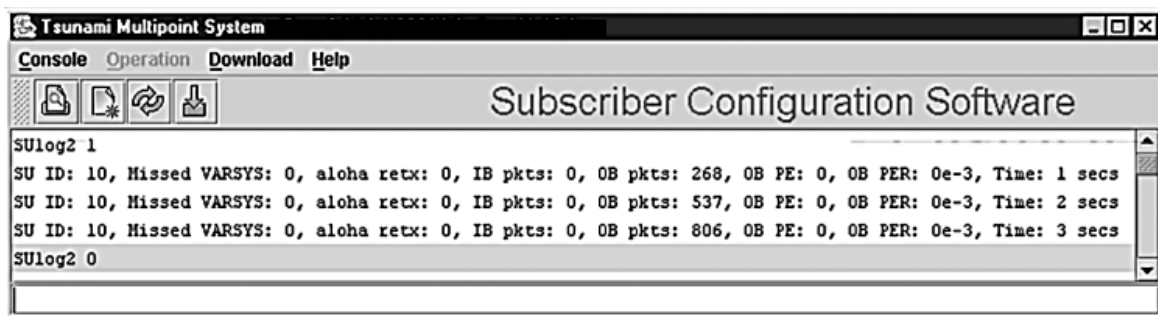


Figure 26. SU Log 2

Uplink BER Test

The Uplink BER Test determines the BER (bit error rate) of the uplink signal. This is an out-of-service diagnostic tool and the data connection is terminated for the length of the test. Use this tool to determine whether the link is stable (that is, there are no bit errors). You can also monitor these test results to fine tune antenna alignment to get the strongest link possible.

Note: Do not run this test if users are sending data across the radio link.

Follow these steps to run the Uplink BER Test:

1. Open the Base Station Configuration Software.
2. Enter **uplber <Terminal ID>** to start the test for a particular SU. <Terminal ID> is the Terminal ID of the SU of interest.
3. Enter **berlog 1** to view the test results.

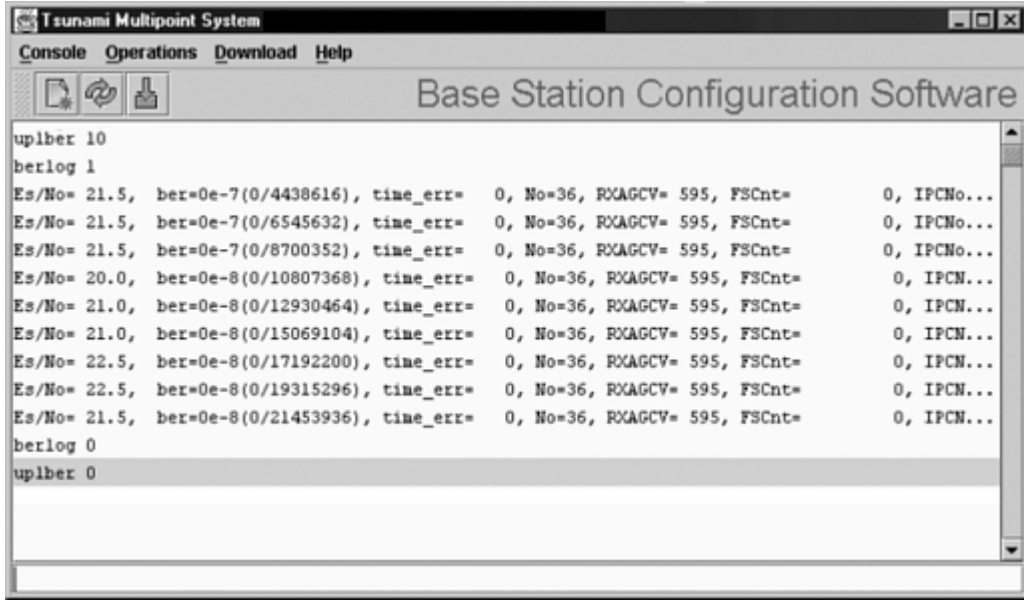


Figure 27. BER Log in Base Station Configuration Software

4. Monitor the BER test results. The Es/No is reported in column 1 and BER is reported in column 2. The BER should initially read **0E-6** or **0E-7** but then change to **0E-8** and finally to **0E-9** while the test is running. This corresponds to 0 (zero) bit errors. The numbers in parentheses indicates the number of errors over the total. **1E-6** indicates a bit error rate of 1 bit error received for every million bits sent.
5. When finished, disable the Uplink BER Test by first entering **berlog 0** (zero) and then entering **uplber 0** (zero).

Note: The data connection does not resume until the **uplber 0** (zero) command has been issued.

Network Configuration Tips

Keep the following points in mind when configuring your PMP network.

Tips for Testing PMP Network Under IP Routing Mode

Make sure to configure the BSU such that:

- If the BSU is connected to a router, make sure the router port to which the BSU is connected is defined as the BSU's default gateway. Also, make sure the BSU is specified as the router port's default gateway.
- The IP addresses of the BSU and the router port reside in the same subnet (this is required).

Make sure that an SU and its directly connected devices are in the same subnet. The subnet address of a device can be obtained by performing a logical “AND” of the device’s IP address with its subnet mask. A subnet mask of 255.255.255.0 implies that there are 255 IP addresses within the same subnet.

If the IP address of a PC connected to a SU is not dynamically assigned:

- Make sure the PC’s IP address appears in the SU’s static IP list (see “addSUIP Command” in the *Tsunami Multipoint Version 1.3 Reference Manual*). Otherwise, if the SU is running in Restricted mode, the PC cannot access the wireless network.
- Configure the PC to point to the SU as its default gateway.

In the latest firmware release, the proxy setting is turned on automatically; do not change this setting.

Tips for Testing VLAN Switching

Before changing the BSU Configuration to VLAN switching, make sure that the BSU and the BSU console are connected to a VLAN switch. Otherwise, if you turn on VLAN tagging, you cannot talk to the BSU because the PC hosting the BSU Console cannot send or receive VLAN frames.

Tips for Anyone Operating the PMP Network

When changing back and forth between Bridging mode and IP Routing mode (see “routingMode Command” in the *Tsunami Multipoint Version 1.3 Reference Manual*), always remember to manually clear the ARP table of your PC.

Do not turn off the power of the Base Station Unit “at-will,” because the Base Station Unit might be saving internal variables or configuration parameters to the flash memory at that moment. Always wait for a minute after entering an operator command before shutting down the BSU.

Always follow the simple proxy rule and fundamental principles concerning subnets and default gateways in planning and analyzing the PMP network. A good understanding of basic IP networking is required, regardless of whether you operate the PMP network in IP Routing or Bridging mode.

If you cannot get the network to work, there is most likely a setup error. Check the network configuration using the tips above and try again.

Protecting the System

Tsunami Multipoint provides ways to prevent unauthorized users from communicating with the BSU and SUs. You can password-protect the system to prevent unauthorized access and use the Range Security option to prevent unauthorized SUs from communicating with a BSU.

Password Protection

Tsunami Multipoint provides two levels of password protection:

- **user level** – lets the user display the system’s current status only.
- **admin level** – lets the user display the system’s status and change its configuration.

The default password is “null.” Password protection for either password level (user or admin) can be turned on and off. By default, password protection is turned off.

Passwords can be from 1 to 16 characters; any combination of alphanumeric characters is allowed, except for these special characters: " , . ' ` ^ { } | \ / ; :] [()

If you forget your password, contact Proxim’s Customer Service department to obtain a new one. See “Appendix F. Technical Support and Training” on page 76 for Proxim’s contact information.

Specifying a User-Level Password

To define the user-level password, from the BSU console enter:

```
setpw user<oldpw><newpw><newpw>
```

where:

<oldpw> = the old password (the default password is “null”)

<newpw> = the new password

After defining the new user-level password, enter **logout**. Log in with the new password (see Logging In on page 47 for information).

Specifying an Admin-Level Password

To define the admin-level password, from the BSU console, enter:

```
setpw admin<oldpw><newpw><newpw>
```

where:

<oldpw> = the old password (the default password is “null”)

<newpw> = the new password

After defining the new admin-level password, enter **logout**. Log in with the new password.

Note: If you specify either level of password without specifying a password for the other level, when you log out or restart the BSU, the system comes up in password-protected mode. Log in and enter the password you specified. For example, if you specify “admin” for the admin-level password and then log out or restart the BSU, enter **login admin** to access the system. This allows access to the admin-level.

Turning Off Password Protection

To turn off password protection, from the BSU console, enter **setpw<level><oldpw><null><null>** where:

<level> = either **admin** or **user**, depending upon which level of password protection you want to remove. For example, if the current admin password is "superuser," to remove the admin password, enter **setpw admin superuser null null**.

<oldpw> = the old password.

If you turn off both display-level and user-level password protection, restart the BSU to refresh its memory.

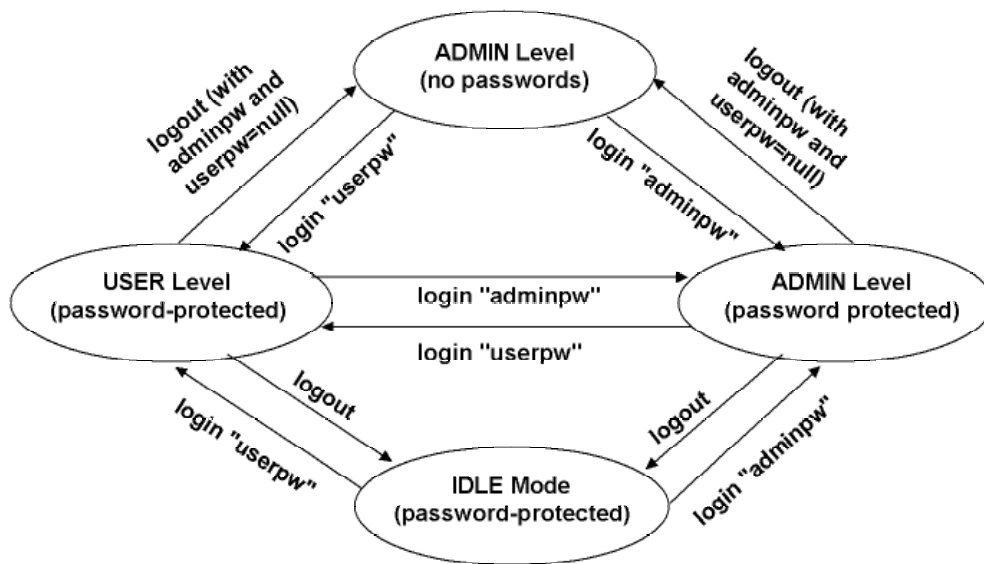


Figure 28. Password Definition/Usage Diagram

Logging In

If password protection is turned on, you must "log in" to the system to either display system status (user-level privileges) or change the system's configuration (admin-level privileges).

To log in, enter **login <password>** where <password> is either the user-level or admin-level password.

Activating Range Security

The Range Security option helps prevent unauthorized SUs from communicating with a BSU. When the Range Security option is on, if an SU attempts to enter the network, the BSU checks the range value reported by the SU. This works as follows:

- The first time the SU tries to enter the network, the SU's range is stored in the BSU's flash memory for future reference.
- Then, if the SU enters the network again (when Range Security is on) and its reported range does not match the range that was previously stored in the BSU's flash memory, the SU is denied network entry and an alarm is sent to the BSU console.

To activate the Range Security option, from the BSU console, enter **rangeSecurity 1**.

Appendix A. Initial Settings

Specify the Desired Modulation (Data Rate)

To configure the BSU to use the modulation setting required by your application (20, 30, 40, or 60 Mbps), from the BSU console, enter **modulation <mode number>**, where:

<mode number> =

0 (zero) = QAM16 (60 Mbps)

1 = QAM8 (40 Mbps)

2 = QPSK3Q (30 Mbps)

3 = QPSK1H (20 Mbps)

The BSU automatically restarts and then comes up with the new modulation setting. The Subscriber Units adopt the new modulation setting (the new modulation setting appears in the **Burst Rate** field on the **Status** page of the Subscriber Utility).

Note: This step is not applicable if the BSU operates at 20 Mbps only.

Specify the BSU's Gateway Address

In general, you should specify the IP address of the router connected to the BSU as its gateway address. If your network does not have a router installed, specify the IP address of the BSU console. To specify the BSU's gateway address, from the BSU console, enter **gateway <gateway address>** where <gateway address> is the IP address of the router attached to the BSU or the BSU console.

Select the Routing Mode

Set the BSU to operate in IP Routing mode or Bridging mode. A BSU is set to IP Routing mode by default. See the "routingMode" command in the *Tsunami Multipoint Version 1.3 Reference Manual* for more information about these modes. After you change the routing mode, the BSU restarts and forces all the SUs in its sector to restart. The BSU and SUs then come up with the new routing mode.

To select Bridging as the routing mode, from the BSU console, enter **routingMode 1**.

To select IP Routing as the routing mode, enter **routingMode 0** (zero).

Change the Frequency Plan and Operating Frequency

Tsunami Multipoint offers several frequency plans and operating frequencies to provide a means for overcoming interference. If one part of the 5.8 GHz spectrum is occupied when you deploy the product, you can select a different frequency plan to bypass the interfering frequency.

To select a frequency plan and operating frequency, specify a frequency plan (4, 5, or 6), then one of the available frequencies (one of four frequencies for plan 4, one of five frequencies for plan 5, one of six frequencies for plan 6). Plan 4 is the default frequency plan. Operating frequencies in the 5 and 6 plans overlap. See "Frequency Plans" on page 57 for details about the available frequency plans and operating frequencies.

To select a frequency plan, from the BSU console, enter **freqPlan<frequency plan>** where <frequency plan> is 4, 5, or 6.

To select an operating frequency, from the BSU console, enter **frequency<frequency ID>** where <frequency ID> is:

For plan 4: A, B, C, or D

For plan 5: A, B, C, D, or E

For plan 6: A, B, C, D, E, or F

For example, to change to the **5e** plan, enter **freqPlan 5**; then enter **frequency e**.

Appendix B. Installing the Configuration Software and Upgrading Firmware

Four major pieces of software are required to install the SU and BSU:

- Tsunami Multipoint Base Station Configuration Software Console, Version 1.5 (BSU 1.5 Console)
- Tsunami Subscriber Utility
- BSU Firmware Version 1.3
- SU Firmware Version 1.3

If the BSU and SU are new from the factory they will be preloaded with BSU Firmware Version 1.3 and SU Firmware Version 1.3, respectively. Proxim recommends that all equipment be upgraded to Firmware Version 1.3, following these steps:

1. Install the new BSU 1.5 Console (**Console1.5/BSU/Install.exe**). This step is optional, but recommended.
2. Install BSU Firmware Version 1.3 (**PMP_SU_release1-3.mot**)
3. Install SU Firmware Version 1.3 (**PMP_BSU_release1-3.mot**)

Methods for upgrading SU equipment from Versions 1.0, 1.1, 1.1A, 1.1B, 1.2, or 1.2B to Version 1.3 follow, including remote over-the-air download and local download instructions.

Base Station Configuration Software Version 1.5

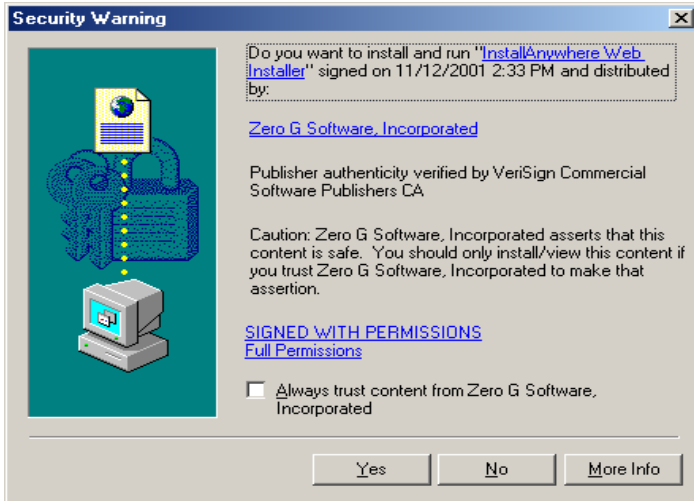
System Requirements

| | |
|------------------------------|--|
| Hardware | Multimedia PC with a Pentium 200 MHz or higher processor (300 MHz recommended) |
| Operating System | Microsoft Windows® 98, NT 4.0, Me, 2000, XP |
| Java 2 Virtual Machine (JVM) | SDK or runtime (1.2.2_12 or later, 1.3.1_03 is provided) |
| Memory | 64 MB for Windows® 95/98 or Windows® Me; 128 MB for Windows® NT 4.0 workstation, Windows® 2000 Professional, or Windows® XP Professional (256 MB RAM is recommended) |
| Hard Drive | 2 GB hard disk with up to 250 MB of available hard-disk space |
| ROM Drive | Double speed (2x) or faster CD-ROM/DVD-ROM |
| Network Interface Card | 10/100 Mbps NIC with RJ-45 input |
| Input Devices | Standard IBM-PC compatible 101-key style keyboard, PS2 or USB compatible mouse, or a compatible pointing device |
| Monitor | Super VGA 16-bit or higher monitor supporting 800 x 600 screen resolution Coordinated video driver for installed video card VGA not supported |
| Graphics Card | PCI, AGP, or on-board graphics card supporting 16-bit 640 x 480 video resolution or higher. Must Support 16 bit color. |
| Video Driver | Must support 16 bit color |
| Browser | Microsoft Internet Explorer 5.0 software or later; other browsers also supported |
| Optional Hardware | 16-bit sound card with speakers or headphones for audible alarm; 6 foot power strip with power surge protection |
| Optional Software | Microsoft Personal Web Server, Internet Information Server (IIS), or Apache 1.3.x can be served by VAR for over the Internet console installation |

Installing the Base Station Configuration Software Version 1.5 Console

To install the BSU/SU 1.5 Console:

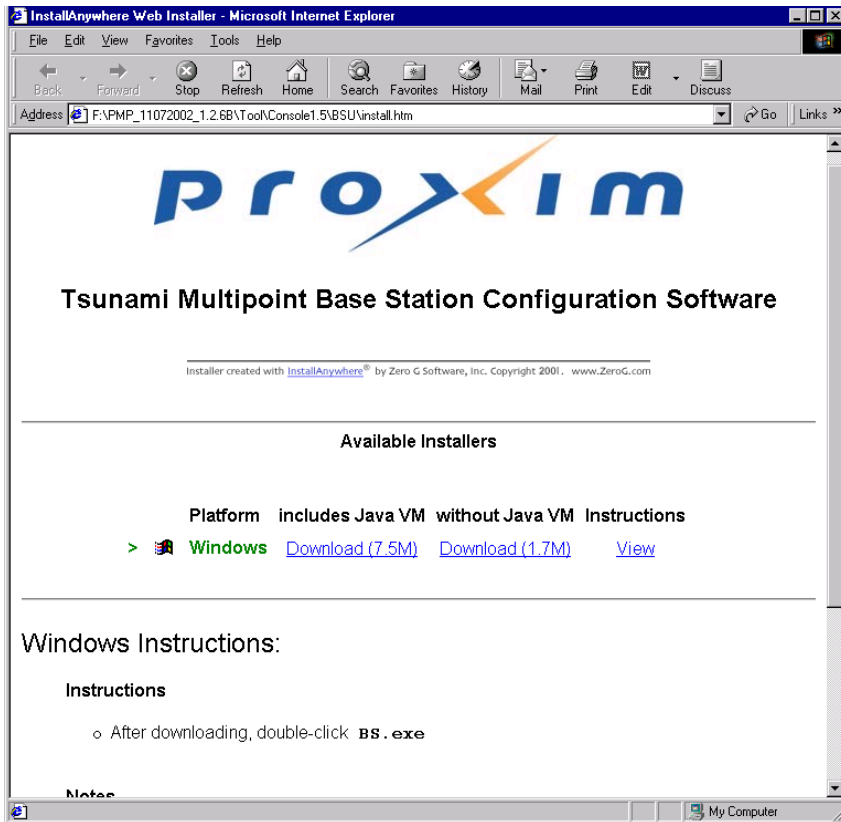
1. From the Windows Explorer Console1.5 directory, double-click on the BSU folder.
2. Double-click on the Install icon. Two windows open simultaneously: **InstallAnywhere Web Installer — Microsoft Internet Explorer** (in disabled mode) superimposed by **Security Warning** (in enabled mode).



Click the **Yes** button on the Security Warning window to close this window and view the Base Station Configuration Software window.

For the remainder of this procedure, only default settings are used. Select the applicable installer for your network environment when performing these steps.

3. Click **Download 7.5M** to download the Tsunami Multipoint Base Station configuration software and Java VM; click **Download 1.7M** to download the Tsunami Multipoint Base Station configuration software without Java VM.



After the download completes, double-click on **BS.exe** to begin installation.

When the Tsunami Multipoint Base Station Configuration Software **Introduction** window is displayed; click **Next**.

4. Click **Next** on the Important Information window once you have completed reading the text. When the License Agreement window is displayed, accept the terms of the License Agreement and click **Next** to proceed with the installation.
5. Click the **Next** button after making your choices on the following windows:
 - **Choose Install Folder** (you can select the default folder or specify another folder)
 - **Choose Java Virtual Machine** (you can select the default machine or specify another machine)
 - **Pre-Installation Summary** (summarizes the installation choices you have made)
6. When the **Install Complete** window is displayed, click on **Done** to return to the Web Installer window; then close the Web Installer window.

Subscriber Utility Software

System Requirements

Same as for Base Station Configuration Software (see "System Requirements" for the BSU on page 51).

Installing the Subscriber Utility Software

System requirements for the Subscriber Utility software are the same as for the Base Station Configuration software.,

To install the utility software:

1. Identify the computer on which you plan to run the Subscriber Utility.

Note: See "System Requirements" for the BSU on page 51 for operating system and hardware requirements.

2. Insert the Tsunami MP CD (provided with the product) into the computer's CD-ROM drive and open the CD's **config software** folder.

Note: If the computer has Microsoft IIS (Internet Information Services) running, disable or uninstall it before running the Subscriber Utility.

3. Double-click SUSEUP.HTM or use a Web browser to open the file.
4. Place a checkmark next to the **Include VM in download** option to install Java Virtual Machine (VM).

Note: You need not add VM if your computer already has a version of VM installed.

5. Click the **Start Installer for Windows** button to begin the software installation.
6. Follow the on-screen instructions to install the software.
7. Click **Done** when the installation is finished to close the installer.
8. Launch the Subscriber Utility.

Firmware Downloads

Firmware can be downloaded to the BSU using the local console. Firmware can be downloaded to the SU either over-the-air or from a local console (by attaching a PC with the Base Station Configuration Software to the SU).

Proxim recommends you download new code as follows:

1. Download the new code to the SU's and verify that they re-enter the network.
2. Next, download new code to the BSU.

Remote Over-the-Air Download to SUs

You can upgrade your SUs to Version 1.3 from the Base Station Configuration Software Console of the BSU. Normally, all SUs in the network are upgraded at the same time. However, if one or more SUs fail to receive the download code correctly, the upgrade is aborted and a second attempt must be made. SUs that have been upgraded successfully ignore reprogramming of the same codes.

To download remotely to SUs:

1. From the BSU 1.4 or 1.5 Console, confirm that SUs have established a link with the BSU by issuing a **dspActiveSU** command. Make note of the SUs in the network.
2. Select the **Download** menu.
3. Select **Remote Firmware**; a **Download – File Selection** window is displayed.
4. From the **Look In** search field, select the binary file to be downloaded (**PMP_SU_release1-3.mot**) from the appropriate directory. The BSU Console automatically processes the selected binary codes and, once finished, displays an output of “Elapsed [time]” in seconds.
5. Let the SUs re-enter the network. It usually takes no more than five minutes for the SUs to enter the network from the start of the download. The following messages are displayed at the BSU Console for each SU as it enters the network:
 - 118 Received NetEntry Request from Eth<SUs Ethernet address>
 - 119 NetEntry completed: Assigned terminal ID <ID#>, IP<SUs IP address>, and VLAN ID <SU VLAN ID#> in VLAN mode.
6. Issue **dspActiveSU** to verify that the SUs have entered the network successfully. If an SU fails to enter the network, use the local download procedure in the following section.
 - If the SU was correctly upgraded, the display reads **ver 20021300**.
 - If the SU failed to upgrade and the link was restored, the display most likely reads **ver 200212B0**.
7. If any SU that re-entered the network failed to upgrade to Version 1.3, repeat steps 2 through 6, or upgrade the failing SUs using the “Local Download to SUs” method.

Local Download to SUs

You can use this method to upgrade SUs that have not been deployed or have failed to successfully download using the remote over-the-air procedure. Using this procedure, individual SUs are upgraded through their Ethernet/Power cable. This procedure requires the Tsunami Multipoint Base Station Configuration Software application be loaded on the PC attached to the SU (SU 1.,4 or 1.5 Console). The window label appears as Tsunami Multipoint Subscriber Configuration Software.

To download locally to an SU:

1. From the SU 1.4 or 1.5 Console, select the **Download** menu.
2. Select **Local Firmware**.
3. From the **Look In** search field, choose the binary file to be downloaded (**PMP_SU_release1-3.mot**) from the appropriate directory and click **Select**. The download requires about 2 minutes. Once the download is complete, the banner indicating **Version 1.3** is displayed.

If the download does not complete successfully, as indicated by a checksum mismatch or a failure to reboot, cycle power to the SU and repeat, starting at step 1.

Local Download to the BSU

Use this download method to upgrade BSUs after the SUs have been upgraded to Version 1.3. The BSU is upgraded through its Ethernet/Power cable using the BSU 1.4 or 1.5 Console.

To locally download to the BSU:

1. From the BSU 1.4 or 1.5 Console, select the **Download** menu.
2. Select **Local Firmware**.
3. From the **Look In** search field, choose the binary file to be downloaded (PMP_BSU_release1-3.mot) from the appropriate directory and click **Select**.
4. Once the upgrade is successful, if there were SUs connected to the BSU, they will re-acquire net entry. For each SU connection, two messages are displayed:
 - 120 Received NetEntry Request from Eth<SU's Ethernet address>
 - 121 NetEntry completed: Assigned terminal ID<ID#>, VLAN ID 1, IP<SU's IP address>

It normally takes less than a minute and a half for the SUs to re-acquire NetEntry with the BSU from the time the local download started.

5. If there were no SUs connected to the BSU, after the upgrade succeeds, the version banner is displayed with version 20021300, following by three messages:
 - 114 Completed flash sector verification
 - 103 DB check completed
 - 107 Save NV configuration Parameters

Once the SUs are re-connected to the BSU, expect the same behavior as specified in step 4.

Appendix C. Technical Specifications

The following technical specification is for reference purposes only. Actual product performance and compliance with local telecommunications regulations can vary from country to country. Proxim Corporation only ships products that are type approved in the destination country.

Burst-Rate Limit

| Product | Burst-Rate Limit | Model Number |
|-------------------|-------------------------------|---|
| Base Station Unit | 60 Mbps 20 Mbps | 40400-65 (also supports 20-40 Mbps burst rates) 40400-25 |
| Subscriber Unit | 60 Mbps 40 Mbps 20 Mbps | 40100-65x (also supports 40-20 Mbps) 40100-45x (also supports 30-20 Mbps) 40100-25x |

Downlink/Uplink Throughput

| Burst Rate | D/L Throughput | U/L Throughput |
|------------|----------------|----------------|
| 20 Mbps | 9 Mbps | 8 Mbps |
| 30 Mbps | 13.5 Mbps | 12 Mbps |
| 40 Mbps | 18 Mbps | 16 Mbps |
| 60 Mbps | 27 Mbps | 24 Mbps |

Note: The above calculations are typical and based upon a 50/50 downlink (D/L) uplink (U/L) division of slots (see "firstinboundSlot Command" in the *Tsunami Multipoint Version 1.3 Reference Manual*). SU throughput may be limited by a provider's Service Level Agreement or other D/L U/L settings.

Frequency Plans

The following table defines the frequencies associated with each plan.

| Channel Plan | Frequency |
|--------------|-------------|
| 4A | 5743.86 MHz |
| 4B | 5764.61 MHz |
| 4C | 5785.36 MHz |
| 4D | 5806.11 MHz |

| Channel Plan | Frequency |
|--------------|-------------|
| 5A | 5742.19 MHz |
| 5B | 5758.79 MHz |
| 5C | 5775.39 MHz |
| 5D | 5791.99 MHz |
| 5E | 5808.59 MHz |

| Channel Plan | Frequency |
|--------------|-------------|
| 6A | 5740.40 MHz |
| 6B | 5754.23 MHz |
| 6C | 5768.07 MHz |
| 6D | 5781.90 MHz |
| 6E | 5795.73 MHz |
| 6F | 5809.57 MHz |

Tx Power

BSU+6 to +17 dBm (into antenna port)
 SU-48 to +15 dBm (into antenna port)

Antenna

BSUIntegrated, LHCP (left-hand circular polarization) 18 dBi
 SUIntegrated, LHCP 21 dBi

Receiver Sensitivity

| Burst Rate | Threshold |
|------------|-----------|
| 60 Mbps | -77 dBm |
| 40 Mbps | -81 dBm |
| 30 Mbps | -86 dBm |
| 20 Mbps | -89 dBm |

Maximum Distance Between Base Station and Subscriber Unit

| BURST-RATE | CLOS ¹ | NLOS ² |
|------------|-------------------|-------------------|
| 60 Mbps | 3 miles/5 km | 1.2 miles/2 km |
| 40 Mbps | 4 miles/6.6 km | 2 miles/3.5 km |
| 30 Mbps | 5 miles/8.3 km | 2.4 Miles/4 km |
| 20 Mbps | 6 miles/10 km | 3 miles/5 km |

¹Clear-Line-of-Sight distance is calculated for 99.995% availability assuming no obstructions in the first Fresnel Zone.

²Near-Line-of-Sight distance is for a typical installation with moderate multipath/shadowing due to terrain and structures.

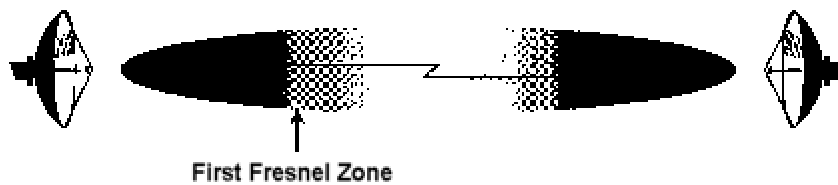


Figure 29. Fresnel Zones

The Fresnel Zone refers to the radio beam. The radio signal's path length and frequency determine the Fresnel Zone's width and shape. When a large part of the Fresnel Zone is blocked, some of the radio signal's energy is lost.

System

| | |
|--------------------------------|--|
| Operating Frequency Range..... | 5725-5825 MHz |
| Radio Access Method | TDMA |
| Duplexing | Time Division Duplex (TDD) |
| Integrated Antenna (BSU)..... | 19 dBi (60° Azimuth. X 6° Elevation) LHCP |
| Integrated Antenna (SU)..... | 20 dBi (10° Azimuth. X 10° Elevation) LHCP |
| Max Subscriber Units/BSU..... | 1,023 |
| Frequency Channels | 4 non-overlapping, 5 and 6 overlapping available |
| Regulatory Compliance | FCC Part 15-400 (U-NII), IC RSS21 0 |

Standards Compliance and Interfaces

| | |
|--------------------------------|---|
| Ethernet Interface..... | 10/100 Base-T |
| Ethernet Connector | RJ-45 female |
| BSU indoor-outdoor cable | Circular plastic connectors with Category 5 cable |
| SU indoor-outdoor cable | RJ-45 (outdoor) and DIN (indoor) over Cat 5 (UV) cable |
| Standards Compliance | IEEE 802.1d Bridging Mode (a subset of the 802.d standard) IEEE 802.1q VLAN |

Configuration and Management

BSU Configuration

| | |
|------------------------|---|
| Configuration | via Ethernet or Wireless Manager (future release) |
| SNMP | AgentMIB II (future release) |
| Security | Authentication, IP/MAC Filtering, passwords |
| Software Upgrades..... | Downloadable Base Station reprogramming |

SU Configuration

| | |
|------------------------|--|
| Configuration | Automatic |
| Security | Authentication, IP/MAC Filtering |
| Software Upgrades..... | Over-the-air Subscriber Unit programming |

Power/Environment Safety

Electrical

| | |
|-------------------------------------|--------------------------------|
| Base Station Unit..... | -36 to -60 Volts DC, 1.25 Amps |
| Base Station Unit Power Brick..... | 100-240 Volts AC |
| Base Station Unit Power Block | 48 Volts DC |
| Subscriber Unit..... | 18 to 28 Volts DC, 0.8 Amps |
| Subscriber Unit Power Brick..... | 115 or 100-240 Volts AC |

Operational Temperature

| | |
|--------------|---------------|
| Indoor..... | 0° to 55° C |
| Outdoor..... | -33° to 65° C |

Humidity

| | |
|--------------------------------|------------------------|
| Indoor..... | 95% non-condensing |
| Outdoor..... | 5% to 100%, condensing |
| EIVIC..... | FCC Class B |
| Safety | UL-1950 |
| Environmental Compliance | ETS 300 019 |

Physical Dimension

Base Station (Outdoor Unit)

| | |
|--------------------|--|
| Size (WxHxD) | 10.2 x 24 x 6.6 inches/25.9 x 61 x 16.8 cm |
| Weight | 20 lbs/9 kg |

Base Station Power Block (Indoor Unit, for up to 6 Base Stations)

| | |
|--------------------|---|
| Size (WxHxD) | 17.2 x 3.5 x 8.25 inches/43.7 x 8.9 x 21 cm |
| Weight | 5 lbs/2.3 kg |

Base Station Power Brick (Indoor Unit, for 1 Base Station)

| | |
|--------------------|--|
| Size (WxHxD) | 37.4 x 70.9 x 24.8 inch/95 x 180 x 63 cm |
| Weight | 1.5 lbs/0.7 kg |

Subscriber Unit (Outdoor Unit)

Size (WxHxD) 10.5 x 10.5 x 6.8 inches/26.5 x 26.5 x 17.4 cm
Weight 10 lbs/4.5 kg

Subscriber Unit Power Brick (Indoor Unit)

Size (SxHxD) 36 x 5.1 x 2.6 inch/92 x 130 x 67 cm
Weight 2.7 lbs/1.2 kg

Installation Details

Base Station Unit (outdoor unit)..... Pole mounting, 1.5-4.5" diameter
Subscriber Unit (outdoor unit) Pole mounting, 1.25-1.75" diameter

Optional Accessories

Base Station Unit

Connector kit Part # ACC-5300

Subscriber Unit

Wall mounting kit Part # ACC-40100
(contact factory for details)
Connector kit Part # ACC-5200

Appendix D. Constructing Power and Ethernet Cables

Subscriber Unit Power and Ethernet Cable

Perform the following steps to construct a Subscriber Unit power and Ethernet cable of the desired length.

CAUTION For best results this cable should be constructed by professional cable manufacturer or by experienced personnel with proper tools. Contact Proxim Customer Service or Sales for recommendations for a manufacturer near your vicinity.

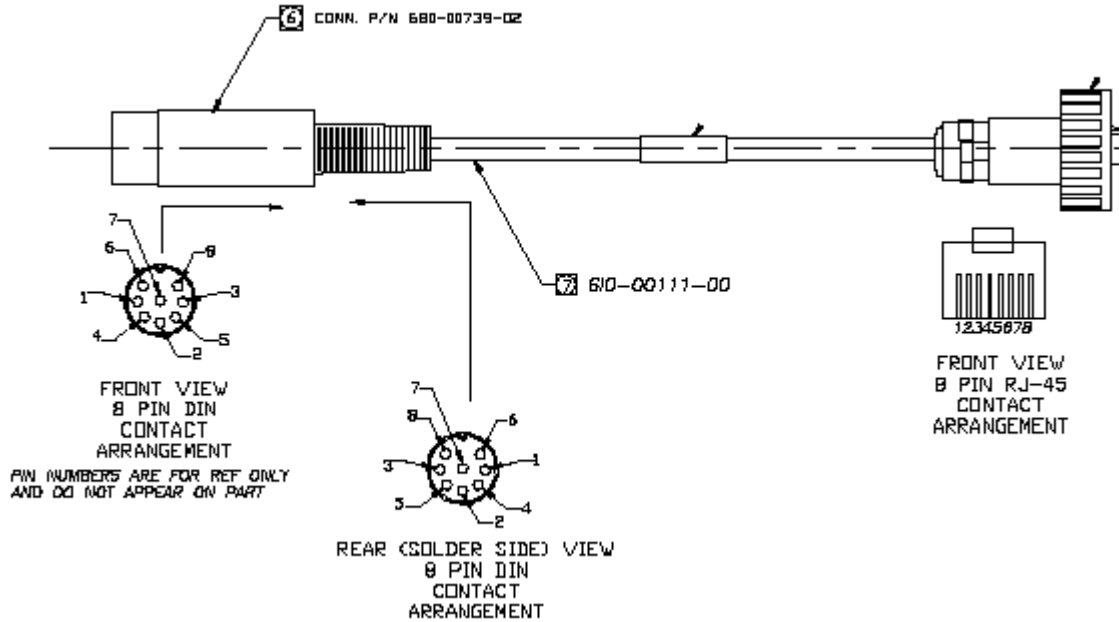


Figure 30. 8-Pin DIN and RJ45 Contact Arrangements

Perform the following steps to construct an interface cable of the desired length.

WARNING! Interface cable length should not exceed 75 m.

Required Materials

The following is a list of the materials required to assemble an interface cable.

- Cat 5 UV cable (75 meters maximum).
- One each 8-pin DIN male connector with cover (solder type) or one each 8-position DIN male connector (crimp type).
- One each Woodhead weatherproof RJ45 connector.

Assembling the 8-Pin DIN Connector

To assemble the 8-pin DIN connector:

1. Slide the jacket of the 8-pin DIN connector over one end of the Cat 5 UV cable.
2. Prepare the Cat 5 cable ends by removing 0.75" of the main jacket. Do not cut the twisted pair wires.
3. Remove 0.06" of insulation from the end of each wire in each twisted pair.
4. Solder each wire prepared in step 3 to the appropriate cup on the DIN connector. Refer to the following table for information.

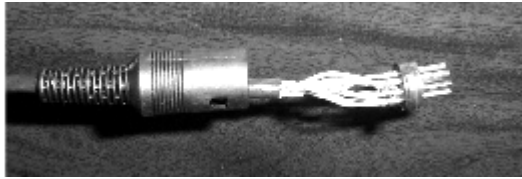


Figure 31. Soldered Wires on 8-Pin DIN Connector

| Interface Cable Pin Assignments | | | |
|---------------------------------|--------------|----------|---------------|
| DIN Pin | Color | Signal | RJ45 Plug Pin |
| ⑧ 2 7 | Orange | +24 VDC | 4 |
| | Orange/White | - 24 VDC | 5 |
| ⑧ 6 8 | Brown | +24 VDC | 7 |
| | Brown/White | - 24 VDC | 8 |
| ⑧ 5 3 | Green | Tx+ | 1 |
| | Green/White | Tx- | 2 |
| ⑧ 1 4 | Violet | Tx+ | 3 |
| | Violet/White | Rx- | 6 |

5. Assemble the metal shell over the DIN connector; make sure the DIN connector fits into the slots of the metal shell.



Figure 32. Metal Shell Placed Over 8-Pin DIN Connector

- Using small pliers, crimp the metal strain relief over the Cat 5 cable. Do not cut into the cable. Slide the jacket over the completed assembly.



Figure 33. Jacket Placed Over 8-Pin DIN Connector

Assembling the RJ45 (Woodhead) Weatherproof Connector

CAUTION For best results this cable should be constructed by professional cable manufacturer or by experienced personnel with proper tools. Contact Proxim Customer Service or Sales for recommendations for a manufacturer in your vicinity.

To assemble the RJ45 (Woodhead) connector:

- Slide the threaded Woodhead cover over the bare end of the Cat 5 cable.
- Slide the body of the Woodhead connector over the bare end of the Cat 5 cable.
- Slide a rubber "O" ring over the ridge of the Woodhead connector's body.
- Remove 0.5" of jacket from the Cat 5 cable. Do not cut the wires of the twisted pairs.



Figure 34. Cat 5 Cable with Insulation Removed

- Insert the ends of the twisted pairs into the RJ45 connector positioning wire color code (see the table on the previous page).
- Crimp the wires into the RJ45 connector using an RJ45 crimp tool.

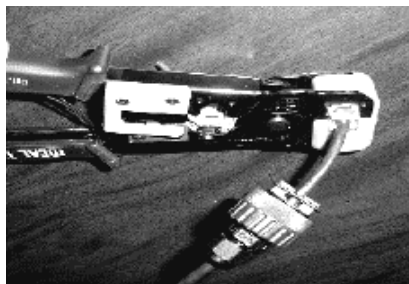


Figure 35. Wires Crimped into RJ45 Connector

- Slide the threaded Woodhead cover over the completed assembly and loosely tighten it down to the cable.



Figure 36. Woodhead Cover Placed Over RJ45 Connector

- When connecting the cable to an SU, insert the RJ-45 connector into the SU's Power and Ethernet port until the locking tang clicks, slide the Woodhead body over the RJ-45 connector until it is seated, tighten the coupling nut to seal the connector to the housing, and tighten the gland to seal the assembly to the cable.

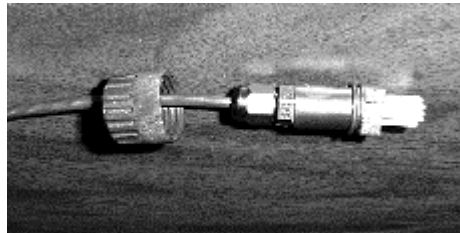


Figure 37. End Nut Seated on RJ45 Connector

BSU Power and Ethernet Cable

This section describes how to construct a Power and Ethernet cable for a BSU. This cable has the following connectors:

- 18-pin Positronic connector
- 8-pin AMP connector

Installing an 18-Pin Positronic Connector

Perform the steps following the figure to install an 18-pin positronic connector on the cable.

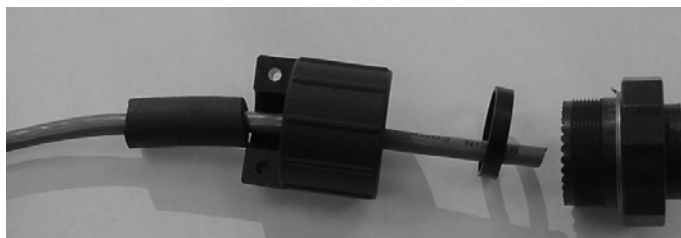


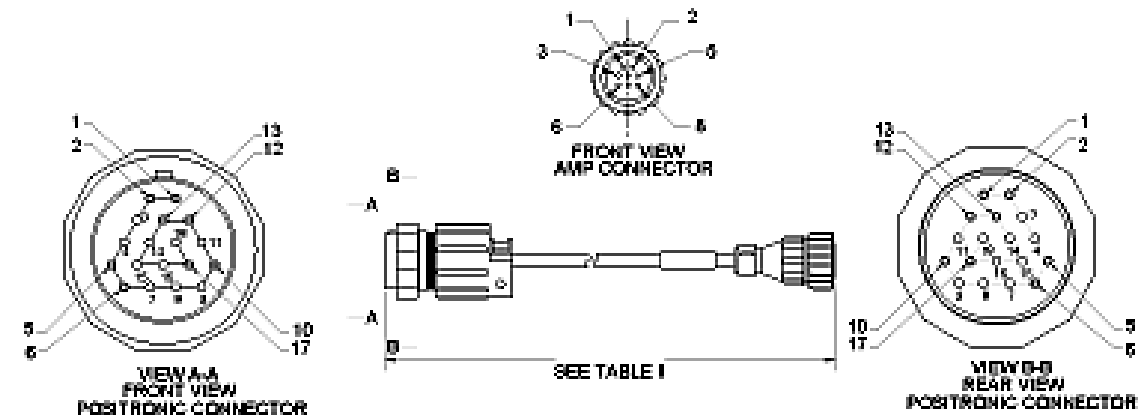
Figure 38. 18-Pin Positronic Connector

Tsunami Multipoint Version 1.3 Installation Guide

1. Cut 750-00891-00 tubing or Proxim approved equivalent to 1.25" +/- 0.1".
2. Using silicone spray or equivalent lubricant, spray the end of the wire, then slide the tubing onto the wire, approximately 4" out of the way.
3. Slide the backshell with the ½" (inside diameter) rubber cable seal onto the wire.
4. Crimp the connector pins onto the individual wires using a Positronic crimping tool 9507 (crimping frame) and 9502-20 (die).
5. Insert the 1.9" (outside diameter) 1/8" wide plastic ring inside the rear of the connector.
6. Insert the crimped pin/wire assemblies in the appropriate holes in the rear of the connector.
7. Attach the backshell to the connector by threading it clockwise onto the connector.

Note: You need a FR19MF1822K0 connector plug (no pins required, housing only) to get a better grip on the connector. A good grip is required to sufficiently torque the backshell to provide a good seal. When torquing the backshell, make sure the CAT5 cable can still rotate freely inside the backshell so it does not get broken.

8. Using silicone spray, slide the tubing into the cable seal inside the backshell until it is flush with the end of the connector.
9. Install the backshell clamp over the tubing and wire.



| Pin Pos | Color | Signal | AMP Pin |
|---------|--------------|--------|---------|
| 17 | orange | 48VDC+ | 1 |
| 10 | white/orange | 48VDC- | 2 |
| 6 | brown | 48VDC+ | 3 |
| 5 | white/brown | 48VDC- | 4 |
| 12 | violet | Rx+ | 7 |
| 13 | white/violet | Rx- | 8 |
| 1 | green | Tx+ | 5 |
| 2 | white/green | Tx- | 6 |

| Dash No | Length |
|---------|---------|
| -01 | 25m-.1m |
| -02 | 50m-.1m |
| -03 | 75m-.1m |

Figure 39. BSU Power and Ethernet Cable Connectors

About Crimping

Loose piece contacts are designed to be crimped with crimp tooling (hand tools, die assemblies, or crimping heads), but can be done with normal hand tools. The applicable crimp tooling for the contacts is described later in this section. Read the documentation included with the crimp tooling for the proper crimping procedure.

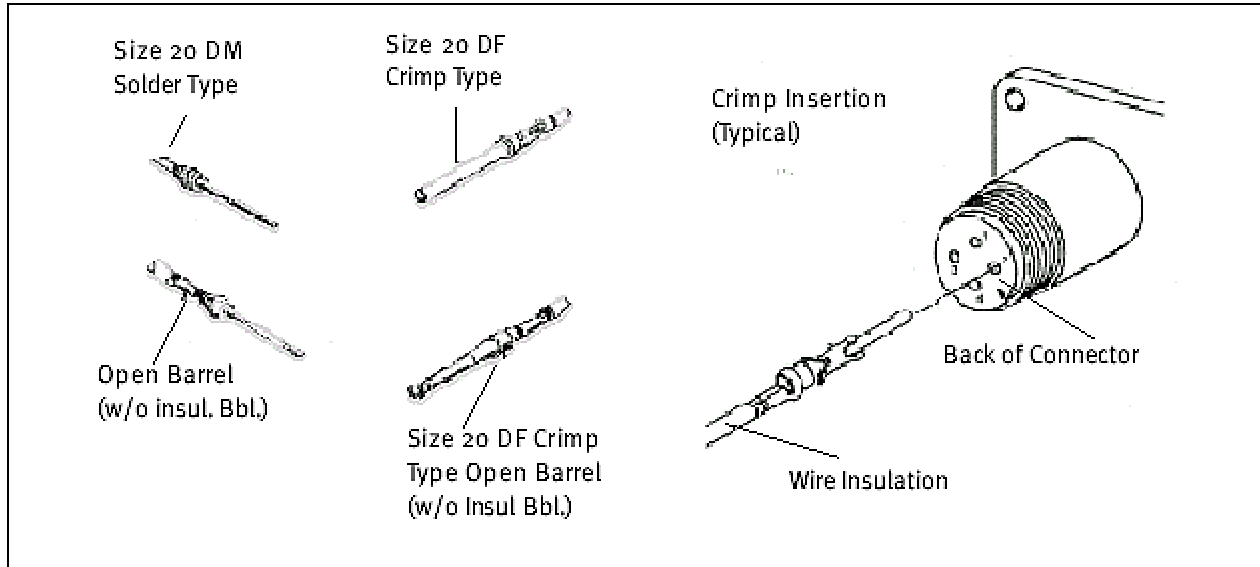


Figure 40. Crimping Styles and Insertion

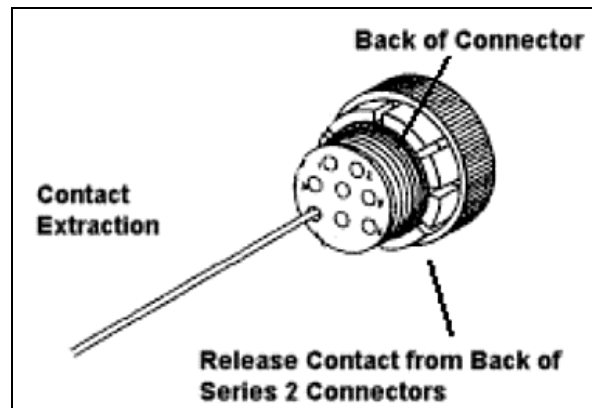


Figure 41. Indoor Portion of Power and Ethernet Cable

Wire Size and Preparation

Contacts are available for the wire sizes specified. Prepare the wire for crimping by stripping the insulation. DO NOT nick, scrape, or cut the stranded or solid wire conductor while stripping the insulation.

Note: When using twisted pair cable, cut one wire shorter than the other.

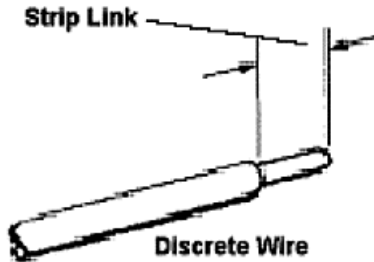


Figure 42. Wire Preparation

Tooling

AMP hand crimping tools and applicators are available for applying crimp type contacts. Also, insertion and extraction tools assist in assembly and repair. See the documentation included with the tool for more information.

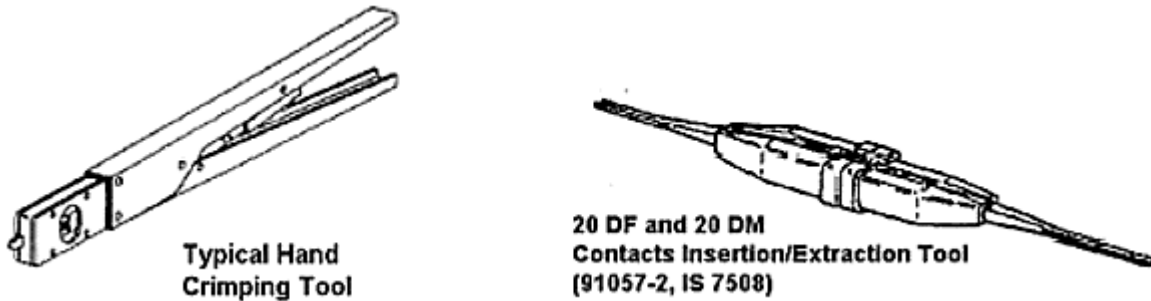


Figure 43. BSU Cable Construction Tools

Installing the AMP CPC Connector with Shield and Strain Relief

The indoor end of the BSU Power and Ethernet cable uses an 8-pin circular plastic AMP connector with crimp contacts. The connector is a reverse sex plug with male connector pins. The plug provided is not weather tight and is meant for indoor use only. The connector uses a shield to cover the pin end of the wires and has a strain relief clamp with two self-tapping screws to clamp the cable sheath to the connector.



Figure 44. 8-Pin AMP Connector

To install the AMP CPC connector on the BSU Power and Ethernet cable:

1. Install the shield on the cable before removing the cable jacket. Slide the shield onto the cable so that the threaded, large-diameter end faces the end of the cable.
2. Crimp the contacts to the wires according to the documentation included with the crimp tooling. Pins are size 20 DM and the wire strip length is 0.100”.
3. Insert the contacts into the housing one at a time by gripping the insulation of the wire directly behind the contact and aligning the contact with the back of the desired contact cavity.
4. Insert each contact straight into the cavity until it bottoms, then pull back lightly on the wire to be sure the contact is locked in place.
5. Thread the shield onto the connector and tighten the shield finger-tight.
6. Screw in the strain relief over the end of the cable using the two supplied Phillips head screws.

Appendix E. Lightning Protection Recommendations

This appendix describes Proxim Lightning Protection Recommendations for:

- Tsunami Multipoint Base Station Unit 40400-25/-65
- Tsunami Multipoint Subscriber Unit 40100-251/-252/-651/-652

Introduction

What is Lightning Protection?

All outdoor electronic equipment is susceptible to lightning damage. Proper grounding to national and local codes is instrumental in providing human safety. Lightning Protection is used when a customer wants to maximize the reliability of the electronic system by diverting the excess energy that can be induced on any transmission lines (data, power) through a series of surge protection devices. The energy is dissipated through heat and also diverted to ground.

What Lightning Protection is Built Into the Tsunami Equipment?

All Tsunami Multipoint and QuickBridge equipment have built-in lightning protection on both the power supply lines and the Ethernet lines. There are TVS diodes that provide protection to IEC 61000-4-5. Proxim Corporation uses “well-design” practices in incorporating these devices in the Tsunami Multipoint and QuickBridge products.

Why is Additional Protection Recommended?

Lightning, even with the built-in protection, can still damage outdoor Tsunami equipment. This can occur for any number of reasons, such as an improperly grounded installation or if the amount of transient energy from nearby lightning exceeds what the devices can handle.

If a Tsunami unit fails due to damage from lightning, the link is out-of-service until the unit is replaced or repaired. An external, revertive protection device can provide a higher level of protection, and greater probability of surviving lightning transients without damage to the Tsunami equipment. If damage does occur, most likely it is to the lightning protection devices and not the Tsunami equipment. Remember, even with external lightning protection, damage can still occur to the Tsunami outdoor unit.

Recommendation

Proxim recommends the following for its Tsunami Multipoint products:

| Proxim Product | Installation Requirement | | |
|--|--------------------------|--|---------------------------------|
| | Industrial | Commercial | SOHO |
| Tsunami Multipoint Base Station Unit (BSU) 20/60 Mbps Models | (1) | (1) | (1) or (2) (up to 50 meters) |
| Tsunami Multipoint Subscriber Unit (SU) 20/40/60 Mbps Models | (1) | (1) or (2) (up to 50 meters) | (1) or (2) (up to 50 meters) |
| (1) PolyPhaser 101-1218W-A.1 CAT5 Data Protector PolyPhaser Corporation 2225 Park Place, Minden, Nevada 89423 | | (2) Transtector 1101-TSU Surge Suppressor Transtector Systems, Inc. 10701 Airport Drive Hayden Lake, ID 83835 | |

PolyPhaser CAT5 Data Protector

This is a heavy-duty aluminum, weather-tight enclosure for outdoor use that serves to protect the Tsunami outdoor unit, as well as the indoor power adapter and connected line equipment inside the roof penetration. This product can be used for all CAT5 cable lengths up to 100 meters from the outdoor Tsunami unit to the indoor power adapter.

The Polyphaser Data Protector uses Cascade Technology. This is a multi-stage technology that is superior to single stage because of high surge current capacity and fast response time. The unit is designed to fit in-line onto the outdoor Cat 5 cable, using two weatherized plug openings for the cable to enter and exit. The existing cable is cut, dressed, and reconnected onto two sets of 8 screw terminals inside the Data Protector.

List Price: \$209/ea.

Delivery: Available from authorized Proxim reseller or installer off-the-shelf.

Transtector Systems Surge Supressor

This outdoor-use, molded plastic, weather-tight enclosure is a surge suppressor designed to protect the Tsunami Multipoint SU and the QuickBridge unit from lightning damage. This product can be used for CAT5 cable lengths up to 50 meters from the outdoor Tsunami unit to indoor power adapter.

The 1101-TSU uses silicon avalanche suppression diodes (SASD) to provide lower voltage protection level (VPL). This technology provides a superior protection level over traditional gas tube type devices. The unit is designed to fit onto a CAT5 cable in a pass-through configuration. The input and output connections can be made at two sets of 8-screw terminals, or two 8-pin DIN style connectors.

This arrangement allows the installation of the connectorized Cat 5 cable directly into the Surge Suppressor, or with a cut cable.

List Price: \$99/ea.

Delivery: Available from authorized Proxim reseller or installer off-the-shelf.

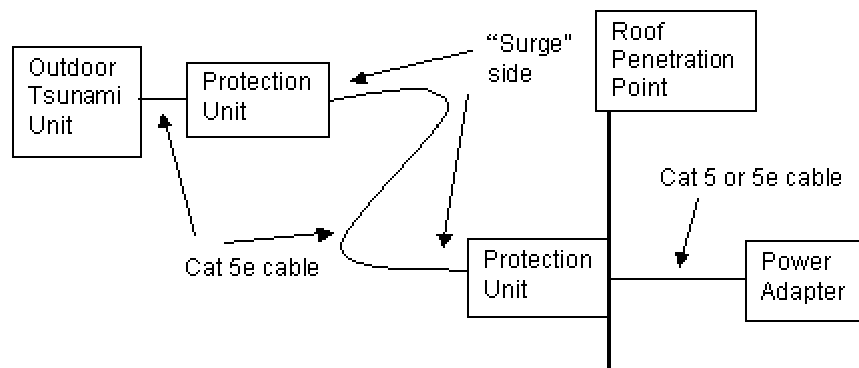
Physical Considerations

How are the Lightning Protection Units Connected to the CAT5 Cable?

The lightning protection units recommended are designed to be installed in-line onto the Cat 5 cable that connectors the outdoor (RF) Tsunami unit (Base Station, Subscriber Unit, QuickBridge) and the indoor power adapter.

The lightning protection device has a **Surge** (cable-facing) side, and an Equipment (equipment-facing) side. The Equipment side faces the outdoor Tsunami unit or the indoor power adapter. The Surge side faces the long length of cable; when installing two lightning protection units, each unit's Surge side face one another.

See Pin-out information for each unit in "Lightning Protection Specifications" on page 73 for connecting the cable to the protection device.



Where Should the Protection Units be Located?

At least one unit should be installed near every outdoor Tsunami unit. General guidelines are:

- Locate protection unit as close to the outdoor Tsunami unit as possible, where the lightning protection unit can be securely mounted to a flat surface **and** grounded properly. Ideally, this should be no further than five feet away from the outdoor unit.
- Locate one unit at the roof penetration point, outside, so that the cable immediately enters the building after the protection unit. This unit is optional if the distance from the first unit to the roof penetration point is relatively short (under 15 feet).

Installing two units provides the maximum protection against lightning damage to the outdoor Tsunami unit and the indoor power adapter, especially if the CAT5 cable length is greater than 15 meters.

Lightning Protection Specifications

PolyPhaser 101-1218W-A.1 Data Protector

Surge: BellCore 1089 10/100 μ sec, 100A

Temperature: -40°C to +65°C storage/operating +50°C

Maximum Characteristics Data:

Turn-on: +7.0 VDC \pm 10%
Resistance: 1 ohm
Capacitance: 15 pf Line to Ground, 30 pf Line to Line
Data Range: Up to 100Mbps (100BT)

Maximum Characteristics DC:

Turn-on: \pm 68 VDC \pm 10%
Resistance: 0.02 ohm
User Current: 2A max.
Size L x W x T: 6.53" x 2.77" x 1.25"

Pinout and Wiring Specifications:

| Surge Side | Equipment Side | Application | Wire Color |
|------------|----------------|-----------------|--------------|
| Vdc in | VDC out | 48Vdc | White/Orange |
| RTN in | RTN out | Ground | Orange |
| Vdc in | VDC out | 48Vdc | White/Brown |
| RTN in | RTN out | Ground | Brown |
| Tx+ in | Tx+ out | Tx + | Green |
| Tx- in | Tx- out | Tx - | White/Green |
| Rx+ in | Rx+ out | Rx + | Violet |
| Rx- in | Rx- out | Rx - | White/Violet |
| GND | GND | Shield, if req. | N/A |

Note: VDC in (out) and RTN in (out) pinouts are based upon applying a negative or positive 48 FDC to the VDC terminal and applying the **dc ground to RTN**.

For additional information, go to www.polyphaser.com.

Contact Information:

Polyphaser Corporation (702) 782-2511
 2225 Park Place (702) 782-4476 (fax)
 P. O. Box 9000
 Minden, Nevada 89424

Transtector Systems ALPU-TSU Surge Suppressor

Surge: IEEE 10/1000 Long Wave, 150 A peak
 Temperature: -40°C to +80°C operating and storage

Ethernet Characteristics:

Transfer Rate: CAT5
 Maximum Continuous Operating Voltage: 20 VDC
 Protection Mode: Line to Line, Line to Ground
 Response Time (max): 5 nanoseconds
 Standby Power (max): <0.5 Watt
 Peak Power: 5000 Watts

DC Characteristics:

Service Voltage: 20 VDC
 Maximum Continuous Operating Voltage: 80 VDC
 Response Time (max): 5 nanoseconds
 Standby Power (max): <0.5 Watts
 Peak Power: 20,000 Watts
 Protection Mode: Line to Line
 Size: L x W x T: 6.13" x 4.5" x 2.5"

Pinout and Wiring Specifications:

| Surge Side | Equipment Side | Application | Wire Color |
|-------------------|-----------------------|--------------------|-------------------|
| VDC in | VDC out | 48 VDC | White/Orange |
| RTN in | RTN out | Ground | Orange |
| VDC in | VDC out | 48 VDC | White/Brown |
| RTN in | RTN out | Ground | Brown |
| Tx+ in | Tx+ out | Tx + | Green |
| Tx- in | Tx- out | Tx - | White/Green |
| Rx+ in | Rx+ out | Rx + | Violet |
| Rx- in | Rx- out | Rx - | White/Violet |
| GND | GND | Shield, if req. | N/A |

For additional information, go to www.transtector.com.

Contact information:

Transtector Systems
OEM Division
10701 Airport Drive
Hayden Lake, ID 83858

(208) 762-6069
(208) 752-6155 (fax)
oem@transtector.com

Appendix F. Technical Support and Training

If you are having a problem using a Tsunami Multipoint and cannot resolve it with the information in "Appendix A. Troubleshooting" in the *Tsunami Multipoint Version 1.3 Reference Manual*, gather the following information and contact Proxim Technical Support:

- What kind of network are you using?
- What were you doing when the error occurred?
- What error message did you see?
- Can you reproduce the problem?

You can reach Proxim Technical Support by phone, fax, e-mail, or mail:

Tel: 1-408-542-5390 (International)
Fax: 1-408-731-3673
Web: <http://www.proxim.com/>
E-mail: support@wmux.com

FTP: <ftp.wmux.com> (to download software)

Proxim Corporation

Attn: Technical Support
510 DeGuigne Drive
Sunnyvale, CA 94085

In addition, Proxim offers technical training courses across the United States throughout the year that are designed to teach customers how to maximize the benefits of Proxim products. These classes are taught by experienced Proxim Systems Engineers and have a technical focus. For class and registration information, visit this Web site at <http://www.wmux.com>.

Be sure to obtain an RMA number before sending any equipment to Proxim for repair.