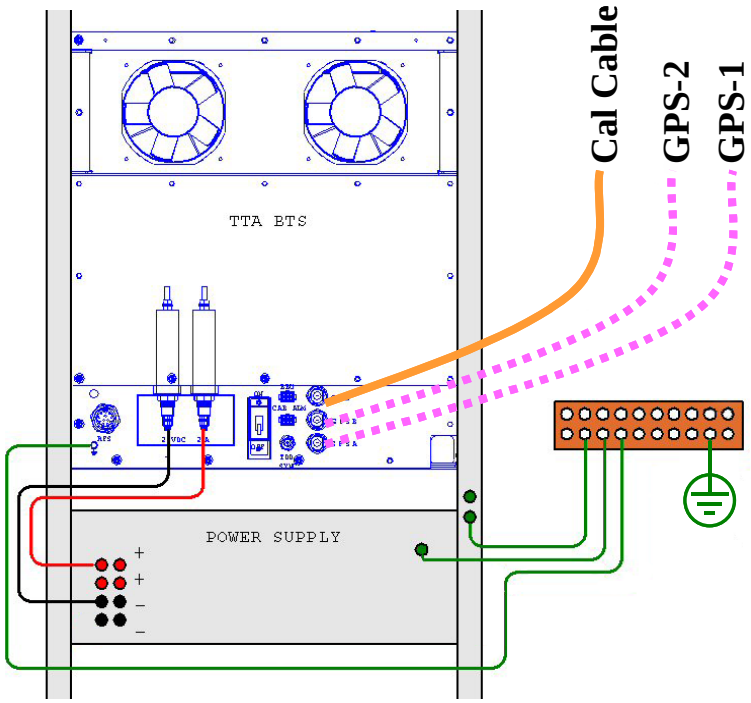
## Connect RF Cables & Alarms to BTS

Connect all of the cables to the BTS. The connection points are shown in Figures 39, 40, 41, and 42. Torque the cable connectors to 20-24 inch-pounds. If applicable, connect the cabinet alarm connector and Battery Backup connector (Cabinet Alarm and BBU) to the back of the chassis. More information on connecting alarms, rectifiers, and battery backup equipment are provided in Appendix L and Appendix F, respectively.

**Figure 42: TTA Chassis Digital Shelf Rear View**




NOTE: Do not ground the negative terminal of the rectifier for the TTA installation.

## Omni Antenna

The RFS Omni antenna is installed on a structure, such as a tower or a pole, which is defined in the site survey and design. Following are the steps to complete the installation of the panel antenna. Refer to the Regulatory Information in Chapter 1, Page 8 prior to installing.

Assemble the Antenna Mount per the instructions that come with it (Figure 43). Use a compass to determine which direction is true East (incorporating declination angle - see Figure 31).

Position the Antenna Mount in a direction to provide accessibility to the RFS after it is installed. Position and install the Antenna Mount on the mounting structure so that any one of the eight mounting hole pins is facing East. Tighten the Antenna Mount hardware to secure it to the structure (Figure 44).

Sweep the RFS antenna inputs for dB loss. Record all results for later calculations. Position the RFS on the Antenna Mount, ensuring that the arrow on the bottom of the Antenna Mount faces true East. Secure the RFS antenna to the Antenna Mount (Figure 45). Install surge protectors on the 8 antenna and 1 cal connectors.
Connect the eight antenna cables, cal cable, and Data/Power cable to the RFS antenna. Attach the ground wire to the ground stud. Install grounding kits from RF cables to buss bars. Sweep the antenna and cables from the RF cable connectors that attach to the BTS. Record all measurements. Weatherize all connections (Figure 46).

# Verify Installed Circuit Cards

**WARNING!** Ensure that power to the BTS chassis is off before installing the circuit cards or any of the RF Power Amplifiers in the chassis.

FUSES ARE NOT FIELD-REPLACEABLE. In case of need to replace a fuse on a CHP (F1), CC (F33, F17-32), SYN (F3), MDM (F1) or PA (F1) contact Navini Networks Technical Support

**CAUTION!** For continued protection against risk of fire, replace only with the same type and rating of fuse.

**ATTENTION**! Pour ne pas compromettre la protection contre les risques d'incendie, remplacer par un fusible du même type et des mêmes caractéristiques nominales.

**CAUTION**! - Please contact Navini Technical support before attempting to exchange cards between chassis of different type and frequency to verify compatibility.

The circuit cards, including the RF/PA cards, normally come seated in the BTS chassis. If they

are already installed, verify that the correct cards are placed and seated properly. The RF/PA modules may be installed in any position on the top (RF) shelf. For the Digital shelf, refer to Figure 47 for correct card placement. Table 4 describes the name of each type of card in the Digital shelf.

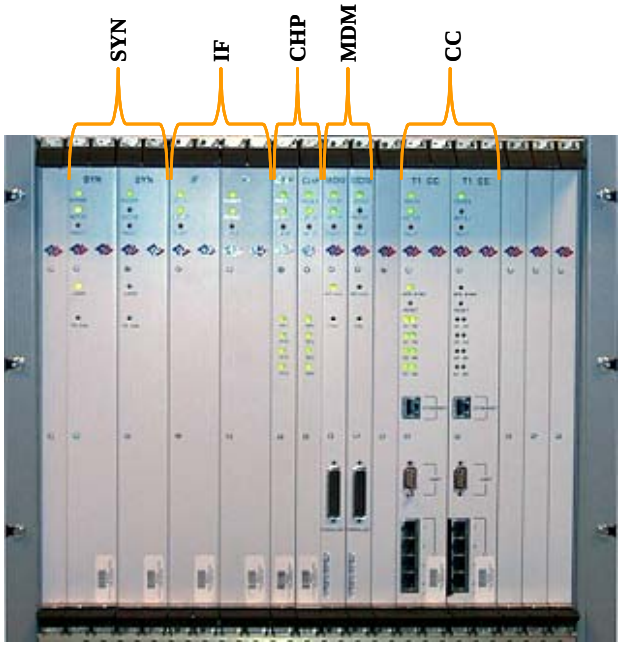
Tighten the screws to secure the RF/PAs into the RF shelf. For the circuit cards, follow the markings on the backplane for the position of each card in the Digital shelf. Make sure the ejectors on all cards are engaged in the chassis. Figure 46 represents a fully populated Digital shelf. If the BTS is not fully populated, blank panels are installed to fill in the empty card space. They are also used to fill in the empty space between the circuit cards and the end of the cabinet.

**Table 4: Digital Card Names**

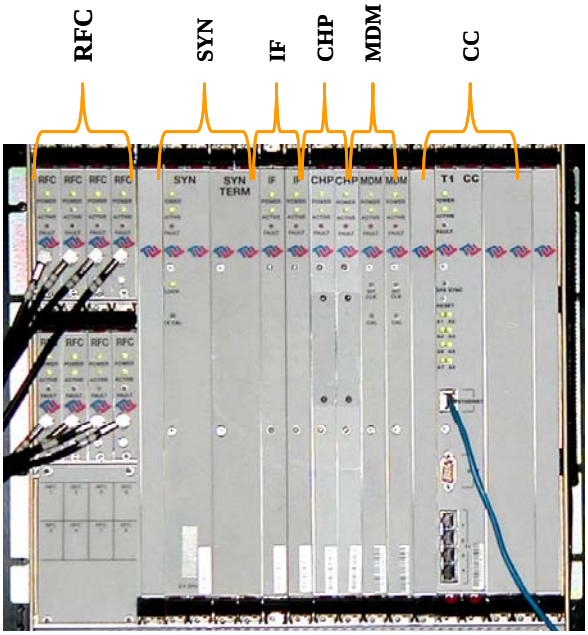
| Abbreviation | Card Name | Number of Cards |
|---|---|---|
| SYN | Synthesizer | 1 or 2 |
| IF | Intermediate Frequency | Always 2 |
| CHP | Channel Processor | Always 2 |
| MDM | Modem | Always 2 |
| CC | Communications Controller | 1 or 2 |

**Figure 47: Digital Shelf**

**Combo/Split Chassis**




**TTA**



# Base Station Installation Certification

When the installation of the equipment is complete, the Base Station Installation Certification form needs to be completed and signed off by both the installer and the customer. A copy of the first part of this form (check-up list) may be found in Appendix O. The second part (serial numbers) is contained in the "I&C Closeout Tool" described in Appendix V.

# Chapter 3: Commissioning

This chapter provides post-installation instructions on provisioning, configuring, calibrating, testing, and commissioning the Ripwave Base Station.

## Review Customer Network Plans

As part of preparing to put the BTS into commission, it is important to review the actual installed site against the customer Network Architecture Plan - i.e., checking that all equipment and software are installed and available for use. Verify that all routers are installed and IP addresses are correct. Finally, make sure the installation is approved and signed off by all responsible parties.

## Install EMS Server

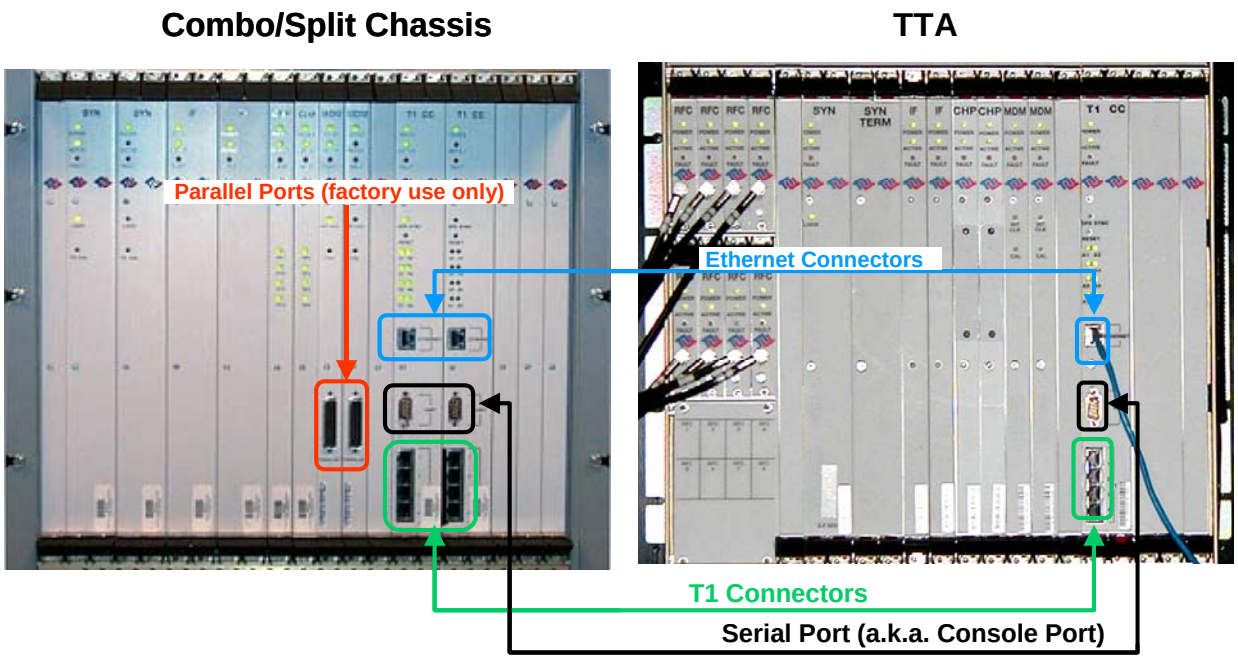
The EMS is the management interface for all elements in the Ripwave system. The EMS Server has to be installed on a computer that is connected directly to the Base Station (called the Test EMS) or through the system backhaul (customer EMS).

For testing purposes, the Test EMS Server is connected through an Ethernet hub or switch to the Ethernet port found on the front of the BTS (Figure 48). Note that the EMS Server does not support more than one Network Interface Card (NIC).

The other port on the front of the CC card is a Serial (Universal Data) Port, also known as the Console Port. Using a laptop/portable computer connected through the data port, an on-site technician can communicate directly with the BTS using a terminal emulation software package. However, this is not recommended. It is always best to rely on the EMS interface for BTS information.

When connecting the Ripwave equipment to the backhaul, refer to the Regulatory Information in Chapter 1, Page 8 – specifically regarding cabling to Ethernet or T1 backhauls. Ethernet connections require a UL497B listed protection device to be installed between the BTS and the first network device. T1 connections must be routed from the BTS through a UL497 listed protection device at the demarcation point. The interconnect cables for T1 backhauls must be a minimum #26 AWG wire, in accordance with NEC/CEC standards.

**Figure 48: Ports on CC and MDM Cards**




If the customer's EMS is installed and can be accessed through the backhaul, it can be connected via T1 or Ethernet to the BTS and used for testing purposes. The EMS software installation procedures can be found in the *EMS Software Installation Guide*, P/N 40-00017-00.

After the EMS Server and Client applications are installed, the EMS database needs to be configured with the settings that are designated for the Base Station. The settings are found in the Network Architecture Plan provided by the customer.

# Verify Cable Connections

Before proceeding, verify that all power is connected and present. Ensure that all T1 or Ethernet connections are installed correctly and are active. Verify that the BTS and the RFS are properly installed and that all cables are connected.

# Configure & Power Up the BTS

## Overview

During initial power up a minimal set of configuration parameters have to be input to the BTS through the serial port on the CC card. These early configuration parameters are referred to as the “boot parameters”. They are required to get the BTS to communicate with the EMS Server so that all the configuration data can be downloaded from EMS to the BTS.

The PC used at this point is a Test EMS Server (i.e., laptop). If the customer’s actual EMS Server is available, a separate Test EMS (i.e., laptop) may not be necessary. For simplification, whether it is a Test EMS laptop or the customer’s EMS Server, we refer to the device at this stage as the Test EMS. Datafill planning forms are provided in Appendix P.

## Set Up the Test EMS

Typically, in order to keep a constant link an Ethernet hub (10/100 Base-T) connects the Test EMS to the BTS via a male to female RS-232 cable connected to the CC serial port. A connection between the serial port on the CC and the serial port on the Test EMS is also used. Standard communication software, i.e., a standard terminal emulation program, such as Windows HyperTerm or TeraTerm, is used during these early configuration stages.

**Step 1.** Verify all RF cables going to the BTS are securely connected to the proper connector.

**Step 2.** Connect an Ethernet cable to the Ethernet connector located on the CC card and to an Ethernet hub. Connect another Ethernet cable from the Ethernet hub to the Ethernet connector on the PC containing the Test EMS Server and Client applications.

**Step 3.** Connect an RS-232 cable (DB-9 male to female) to the serial port (UART) located on the CC card to the serial port connector on the Test EMS computer.

**Note**: A VT 100 terminal or any standard Windows based ASCII terminal emulation program can be used for connecting to the serial port. The connection for HyperTerminal is explained here. The steps to get to the HyperTerminal program may be different due to variances in the Operating Systems and in the setup of the PC.

**Step 4.** Power on the Test EMS Server.

**Step 5.** On the desktop, go to **Start** > **Programs** > **Accessories** > **HyperTerminal** > HyperTerminal (using whichever terminal emulation program you are running).

**Step 6.** In the COM1 Properties window (Figure 49), under the Port Settings tab, enter the following configuration options. Click **OK**.

**Step 7.** On the Test EMS Server, click on the Server icon to start the EMS Server. NOTE: This step assumes you have loaded and configured the EMS Server & Client applications.

**Step 8.** Click on the EMS Configuration & Alarm Manager (CAM) icon to start the EMS Client GUI.

**Step 9.** At the EMS Configuration & Alarm Manager login screen, enter the user name and password. The defaults are both **emsAdmin**.

# Add BTS in EMS

Once you have the CAM application running on the Test EMS server, you will need to click on the BTS element tab to add the new BTS. Only the minimal configuration parameters have to be completed at this time - i.e., BTS name, ID, IP address, subnet mask, and gateway. Follow the Network Architecture Plan designed for this system.

Also configure the GPS offset time. The default is 0 minutes, indicating the BTS would be located in the same time zone as Greenwich Mean Time (GMT). Change this value to whatever time is appropriate to the location of the BTS in relation to GMT time zone. For example, if the BTS is located in Dallas, Texas, which is 6 hours behind GMT time zone, you would enter –360. As you will see in the section that follows, you will also configure the RFS splitter loss at this time. For more details about configuring a BTS, refer to the *Ripwave Configuration Guide*.

# RFS Configuration (Power Splitter Loss and W0 Values)

Each RFS shipped is pre-programmed for the customer's specific operating environment. An RFS Configuration floppy disk accompanies the RFS equipment when it is shipped. This floppy disk includes an RFS script and a Quick Guide with procedures on selecting the appropriate splitter loss values to be entered into the EMS database for the given Base Station. Each Configuration disk is unique to the individual RFS that is shipped. You cannot use the same disk on other RFS equipment.

## RFS Configuration Procedure

**Step 1.** Remove the RFS Configuration disk from the RFS packaging, and insert it in the floppy drive of the Test EMS.

**Step 2.** Copy the folder named "RFS" that is on the disk to the Test EMS Server: <ems install dir>/scripts.
It will take approximately 20 seconds to complete.

**Step 3.** Open the new folder on the EMS server. You will see a list of file names. The format of the file names is as follows:

*RFS_serial number_frequency.cli*

Example: "RFS_024300001_2402500.cli" - This example of the configuration file is for an RFS with serial number 024300001 and a center frequency of 2.4025.

Verify the correct serial number in the file name against the serial number of the RFS equipment. The equipment serial number may be found on the back of the RFS panel or on the side of the bottom cylinder of the omni antenna.

Determine which file you need to run, depending on the provisioned frequency of your BTS.

**Step 4.** NOTE: For 2.6 GHz systems, select the frequency that is closest to your provisioned center frequency. To find the provisioned center frequency for your BTS, open the EMS Configuration & Alarm Manager (CAM) application. Select the BTS tab and specific BTS, then Air Interface / Layer 2 / Carrier Data / Show Configuration. This will display the center frequency information.

**Step 5.** Open the selected CLI file for editing using any text processing application program. Note the power splitter and W0 values listed there (i.e., write them down or print them out).

**Step 6.** Modify the line that starts with "bts" by changing the BTS ID for your BTS. The default is "BTS 1". For example, if the ID for your BTS is 252, change the "1" to "252".

**Step 7.** Save this file as text, and then close it.

**Step 8.** Start the EMS CONFIG CLI application. To configure your BTS with the RFS information, enter the following commands
>enable <user name> <password>
>configure
>script scripts/rfs/rfs_<serial number>_<7-digit frequency>.cli

NOTE: For Unix operating systems, the CLI text is case sensitive and the slash marks should be backward slashes instead of forward slashes

**Step 9.** View the Power Splitter values in EMS to verify that the CLI script ran as expected. The Power Splitter values may be found under Layer 1 / Show Configuration > Antenna Table. You will need to "Refresh" the active screen to view the updated information.

**Step 10.** View the w0 Table values in EMS to verify that the CLI script ran as expected. The w0 values may be found under Layer 1 / Show Configuration > w0 Table. You will need to "Refresh" the active screen to view the updated information.

**Step 11.** Type "Exit" twice to exit the Config CLI edit mode.

# Power Up BTS

Now you are ready to power up the BTS.

**Step 1.** Ensure that input power has been connected to the BTS.

**Step 2.** Switch the Power to ON. If the BTS is a Combo Chassis, the switch is located on the top right front of the BTS. The green Power On light next to the switch will illuminate (Figure 50).

If the BTS is a Split Chassis, the Power ON switch is located on the back lower middle of the Digital shelf. The green LEDs on the RF/PA modules and the circuit cards in the BTS chassis should illuminate.

The Power switch for the TTA is located on the lower middle back of the chassis.

**Step 3.** Watch for the auto-boot countdown command. Type in **config** on the computer keyboard to interrupt the standard boot sequence. The window of time to type in "config" after auto-boot starts is 20 seconds.

# BTS Bootup

The BTS is shipped with a default value of a 20-second countdown to interrupt the standard bootup sequence. You can escape the standard bootup when the display shows the following:

**autoboot countdown : quick [quick|delayed]**

To escape the initialization sequence, type in **config** before the 20-second counter reaches zero.

**Note**: Under the next section, "Boot Prompt", you will see how to disable the 20-second countdown in lieu of a shorter, 1-second countdown. This will minimize downtime during unattended restart conditions, for example, if there is a power outage and the BTS is recovering.

## Boot Prompt

After you have escaped from the automated boot sequence, the console will display a rudimentary Boot prompt:

**[Navini Boot]:**

This prompt offers the ability to perform a small set of operations. Enter '**?**' or '**h**' followed by the Enter key to display a list of commands (Exhibit 1). To invoke any of the commands, simply enter the single letter command with optional parameters, followed by the Enter key.

.

**Exhibit 1: Boot Commands**

```
[Navini Boot]: ?

 ?                      - print this list
 @                      - resume boot sequence
 p                      - print boot params
 c                      - change boot params
 d adrs[,n]             - display memory
 m adrs                 - modify memory
 f adrs, nbytes, value  - fill memory
 t adrs, adrs, nbytes   - copy memory
```

**@** – Use this command once all parameters have been set as desired. This will resume the boot initialization sequence that you escaped from previously.

**p** – This command displays a concise representation of the current parameters used for boot configuration.

**c** – Use this command to alter the current boot parameters. Once selected, a detailed sequence of options is prompted, and is covered in detail later. After all of the items in this list are completed, you return to the *[Navini Boot]:* prompt. This option sequence allows you either to accept the current value by pressing the Enter key or to enter a new value from the range or values listed, followed by the Enter key. Additionally, you can enter '**.**' followed by the Enter key to erase the current value of an item and return it to a default state. If you make an error, you can choose '**-**' (hyphen) followed by the Enter key to return to the previous item in the list. Alternatively, you can fix an error by proceeding with the selections and select '**c**hange' when you return to the *[Navini Boot]:* prompt.

**d** – Display memory allows you to display portions of the BTSs memory with user-defined values. It should only be performed with the assistance of a certified Navini service technician.

**m** – Modify memory allows you to alter portions of the BTSs memory with user defined values. It should only be performed with the assistance of a certified Navini service technician.

**f** – Fill memory allows you to alter portions of the BTSs memory with a fixed pattern. It should only be performed with the assistance of a certified Navini service technician.

**t** – Fill memory allows you to alter portions of the BTSs memory with a pattern from another area of memory. It should only be performed with the assistance of a certified Navini service technician.

## Ethernet Configuration

The Ethernet configuration is grouped into three sections: general, EMS, and traffic path. An example of the Ethernet configuration parameters is shown in Exhibit 2.

**Exhibit 2: Ethernet Configuration**

```
[Navini Boot]: c
date and time        : 01/09/2003[10:19] MM/dd/yyyy[hh:mm]
autoboot countdown   : delayed [quick|delayed]
ems inet             : 172.16.0.10
snmp community       : public
traffic path         : enet [enet|atm]
mac address          : 00:04:6a:00:01:20
ip on enet (active)  : 172.16.23.181
ip on enet (standby) : 172.16.23.182
netmask on enet      : 255.255.0.0
ip on backplane      : 10.0.0.1
gateway on enet      : 172.16.0.100
```

### General

The general section offers you the ability to change the date and time manually. If a GPS has been installed, the BTS will automatically set the date and time:

**date and time : 08/21/2002[13:21] MM/dd/yyyy[hh:mm]**

When this line is displayed, the current date (08/21/2002) and time [13:21] are displayed. Accept the defaults by pressing the Enter key, or enter “date” at the console and a new value using the format indicated in military time (Hours 1-24). All 5 fields must be entered as specified. Leading zeroes can be omitted.

Previously, it was mentioned that the 20-second auto-boot countdown timer can be disabled and a 1 second countdown can be used instead. To enable this feature, change the autoboot countdown item from “delayed” (which is 20 seconds) to “quick”, which is 1 second:

**autoboot countdown : delayed [quick|delayed]**

### EMS

This section concerns the configuration of the EMS Server itself. First, the Internet (inet) IP address of the Server is specified. Make sure to fill this field with the address of the Server used to configure this BTS. Your BTS is shipped with this field un-initialized. You must provide a valid 4-digit IP address before you can proceed. For example:

**ems inet : 172.16.0.10**

The second parameter that you must specify to allow the EMS Server to recognize this BTS is a community string for the EMSs Simple Network Management Protocol (SNMP) interface. The default community string shipped with the BTS is “public”. Press the Enter key to accept this default, or type in a new value and press the Enter key to alter it:

**snmp community : public**

**Traffic Path**

The last major block of configurations required for an Ethernet backhaul to the BTS is the traffic path parameters. The first prompt instructs the BTS to use the Ethernet as the WAN (backhaul) configuration. It must be set to “enet” for an Ethernet backhaul.

If “atm” is selected, proceed with the description in the ATM or IMA sections. The BTS is pre-configured to use Ethernet for the WAN connection. Press the Enter key to accept this default:

**traffic path : enet [enet|atm]**

The BTS address is specified next. Every BTS must be uniquely addressed and have values that equate in the EMS configurations. This address information defines the Layer 2 parameters first, and then it defines the Layer 3 parameters. For Layer 2, you are only given an opportunity to see the Ethernet Media Access Control (MAC) address used by this BTS. This is a unique number programmed in the BTS. You cannot alter it. However, situations may develop in which you need to know the MAC address and, therefore, need to display the information. For example:

**mac address : 00:04:6a:00:01:20**

Next are the IP addresses that represent this BTS: one for the active CC card and one for the standby CC card. Enter the IP for the active controller card, for 172.16.23.181, and the next IP (172.16.23.182) is automatically assigned to the Standby card.

**ip on enet (active) : 172.16.23.181**
**ip on enet (standby) : 172.16.23.182**

The standby field is only displayed for your convenience and cannot be altered. Note that the BTS automatically handles switching the address when a failure occurs on an active Controller card, requiring the standby Controller to go into service. However, the MAC addresses remain fixed.

Coupled with any IP configuration is a need to specify the corresponding subnet mask. Refer to common network administration literature for guides on addresses, networks, masks, and gateways. In short, the subnet mask identifies the portion of the IP address that is common to those devices connected to the same Ethernet. The most important “other” device is the BTSs

default gateway (specified later).

The portion is identified using a logical “and” of the mask with the address. For example, a subnet mask of 255.255.0.0 and with an IP address of 172.16.23.182 yields a network of 172.16.x.x. In this case, the default gateway must also be on the 172.16.x.x network. The BTS requires that this association be met. If not, you will be asked to try again.

**netmask on enet : 255.255.0.0**

The BTS uses a high-speed Serial Line Internet Protocol (SLIP) connection to communicate with the redundant T1/Controller Card. This interface is only used internally and has a fixed subnet mask of 255.255.255.252.

The host portion of the address –that is, the least significant 2 bits– is automatically provided by the software based upon slot ID. However, you may want to alter the default network address to avoid conflict with your network.

The BTS is shipped with the 10.0.0.0 network as the internal network. This is a reserved network not used on the Internet. However, if your private network utilizes this private address space, you may need to change it to avoid the conflict.

**ip on backplane : 10.0.0.1**

As for the default gateway for the BTS, all traffic routed outside the directly connected Ethernet port goes through the gateway. Furthermore, the gateway must be reachable on the directly connected Ethernet port. Therefore, the BTS will prevent you from entering a default gateway address that fails the logical “and” test discussed previously. This address is specified on the line item shown below:

**gateway on enet : 172.16.0.100**

## ATM/T1 Configuration

For an ATM/T1 configuration, the items shown in Exhibit 3 are identical to Ethernet with the exception of the traffic path, which must show “atm” for this type of configuration.

**Exhibit 3: ATM/T1 Configuration**

```
date and time        : 01/09/2003[10:22]
autoboot countdown   : delayed
```

```
ems inet             : 172.16.0.10
snmp community       : public
traffic path         : atm
mac address          : 00:04:6a:00:01:20
ip on atm (active)  : 172.16.23.181
ip on atm (standby) : 172.16.23.182
netmask on atm      : 255.255.0.0
```

When ATM is selected for the WAN interface using the traffic mode parameter, an additional set of parameters is required (Exhibit 6). First of all, another IP address must be identified for the ATM interface. The ATM IP address cannot be the same as the Ethernet IP address. In this case, the Ethernet IP address is only used for debug purposes and is a non-routed interface. This means that the BTS can only reach other computers directly connected to the Ethernet port of the BTS.

The only routed interface available is through the ATM port. This routed interface address is specified with the "ip on atm" line item and the corresponding netmask parameter (Exhibit 4). The information on network address specifications from the Ethernet Configuration section of this chapter applies to ATM as well. For ATM, the only gateway allowed for the BTS is on the ATM interface, as specified here.

**Exhibit 4: Additional ATM Parameters**

```
ip on atm (active)   : 172.17.0.101
ip on atm (standby)  : 172.17.0.102
netmask on atm       : 255.255.0.0
ip on backplane      : 10.0.0.1
gateway on atm       : 172.17.0.100
```

For an ATM system, the BTS must have some additional configuration for the Management Private Virtual Channel (Management PVC). Recall the boot parameter philosophy discussed before. The boot parameters only identify those settings required to allow the BTS to reach the EMS. Note that the boot parameters only allow specification for one PVC (the Management PVC), which is used to reach the EMS.

All user traffic PVC parameters are specified in the EMS configuration. Ensure that the EMS parameters for the Management PVC match those being set here through the boot prompt. If not, as soon as connection is made with the EMS, the Management PVC will be reconfigured and can potentially disconnect the BTS from the network.

The PVC configuration is broken into 3 sections: ATM layer parameters; optional Inverse Multiplexing over ATM (IMA) parameters, and T1 physical layer parameters. The first item selects which ATM interface will be used for the Management PVC. If IMA is not selected, you may select from one of the 8 T1 ports numbered 1-8 using the option t1-N, where N is the port number. This is the same interface port number specified in the EMS. If IMA is desired, reference the following section:

**pvc type-atm i/f : t1-0 [t1-(1-8)|ima-(1-2)]**

The circuit identifier for this segment of the Management PVC is the next item specified. The first parameter identifies the maximum number of bits for any PVCs identifier Virtual Path Identifier/ Virtual Channel Identifier (VPI/VCI) pair. The BTS restricts the available set to 13 total bits. However, you are free to divide those 13 bits between the VPI and VCI as needed, with the VPI having a maximum allocation of 8 bits. You can choose the number of bits for each by selecting two values separated by a "**:**". Or you may select the BTS default of 3 VPI bits and 10 VCI bits by pressing the Enter key:

**pvc id size vpi:vci : 3:10 [1-8:1-13]**

Having specified the number of significant VPI and VCI bits, now select the actual identifier. The BTS will restrict the values entered for the VPI and VCI to the ranges you selected in the previous size specification. For instance, if 3:10 is selected as a size allocation, the VPI must be between 0 and 7.

Again, you can select the values for the VPI and VCI separated by a "**:**" or accept the default value of VPI = 1 and VCI = 100 by pressing the Enter key. Be careful not to use the reserved VCI values from 0-15 that are often used in ATM networks for Operation, Administration, and Maintenance (OAM) purposes.

**pvc vpi:vci : 1:100 [0-255:16-8192]**

The service category for the Management PVC is specified next. The choices are Unspecified Bit Rate (UBR) or Constant Bit Rate (CBR). Other ATM service categories are available for traffic PVCs, but those are specified in the EMS configuration. UBR and CBR both require a set data rate and delay variation parameter. The data rate is specified in cells per second in the ATM Traffic Contract's Peak Cell Rate (PCR) field. The delay variation is in the ATM Cell Delay Variation Tolerance (CDVT) in the ATCs CDVT field. Specify the PCR and the CDVT values separated by a "**:**" or chose the default by pressing the Enter key.

**pvc service category : ubr [cbr|ubr]**
**pvc atc pcr:cdvt : 3641:100 [1-3641:0-100]**

The final set of values is used to configure the T1 parameters. The line type allows you to select Extended Super-Frame (ESF) or D4. ESF format is the standard format for ATM/T1 applications. D4 format is supported as an alternate; however, T1 signaling capabilities may be limited. Check your network plans for a definition for your specific application.

**line type : esf [esf|d4]**

Additionally, you must choose a line coding type:

**line coding : b8zs [b8zs|ami]**

The approximate length of the T1 line is specified next. It is used to control the signal conditioning used on the T1:

**line length (ft) : 500**

Finally, the T1s timing source must be specified. A T1 uses only one timing source either at the near-end or far-end of the line. You may select the BTS as the originator of the timing source by selecting “local”, or you may select the far-end as the timing reference by selecting “loop”.

**line clock source : loop [loop|local]**

## IMA Configuration

If you decide to utilize IMA groups to pool the T1 resources, then the same parameters described for the ATM/T1 Configuration above also apply to configuring IMAs. Refer to Exhibit 5.

**Exhibit 5: IMA Configuration**

```
date and time        : 08/21/2001[10:22]
ems inet             : 172.16.0.10
snmp community       : public
traffic path         : atm
mac address          : 00:04:6a:00:01:20
ip on enet (active)  : 172.16.23.181
ip on enet (standby) : 172.16.23.182
netmask on enet      : 255.255.0.0
ip on atm (active)   : 172.17.0.101
ip on atm (standby)  : 172.17.0.102
netmask on atm       : 255.255.0.0
ip on backplane      : 10.0.0.1
gateway on atm       : 172.17.0.100
```

In addition, the ATM interface must be specified as IMA and reference one of two IMA groups used for the Management PVC. This IMA group must match what is identified in the EMS. Use “0” for the first group and “1” for the second group.

Each group identifies a set of T1 ports that are being combined to form one larger virtual port. For the sake of boot parameter specification, ALL T1 interfaces for the Management PVCs IMA group are assumed to be identical. So the parameters for T1 specifications apply to all T1s of the IMA group:

**pvc type-atm i/f : ima-0**

Once the IMA interface is selected, a set of IMA parameters must be specified for the IMA group used by the Management PVC. An IMA group inherently supports dynamic addition and drops of individual T1 facilities from the group to facilitate fault tolerance to failed T1 facilities.

The minimum number of T1 ports, or links, that must exist for the IMA group to function is specified here. A value from 1-7 is required for each one of the receive and transmit directions. Separate the values with “**:**”. You can increase the values from the default of 1 link in each direction or accept the default by pressing the Enter key.

**ima min rx:tx links : 1:1 [1-7:1-7]**

Next, specify which T1 ports are used to form the IMA group. This is a list of T1 port identifiers (1-8), each separated by commas. The BTS makes sure you enter at least as many links as you specified for the minimum requirements above:

**selected ima links : 1,2,3,4,5,6,7,8**

The near- and far-end IMA protocols use an ID number to identify each other. This value must agree with that provisioned at the far-end of the IMA link. The BTS defaults to a value of 0, but you can specify any value from 0 to 255:

**ima group id : 0 [0-255]**

Group symmetry modes allow symmetric or asymmetric operation of IMA links:

**ima symmetry : sym [sym|asym|asym-cfg]**

IMA frame length specifies the size of the IMA frames that are being transmitted:

**ima frame length : 128 [32|64|128]**

The IMA alpha/beta/gamma parameters are used by the IMA frame synchronization mechanism.:

**ima alpha:beta:gamma : 2:2:1 [1-2:1-5:1-5]**

The IMA clock mode selects either a common or independent IMA clock mode (Exhibit 6). It is the same as for ATM/T1.

**Exhibit 6: IMA Clock Mode**

```
ima clock mode       : ctc [ctc|itc]
pvc id size vpi:vci  : 3:10
pvc vpi:vci          : 1:100
pvc service category : ubr
pvc atc pcr:cdvt     : 3641:100
line type            : esf
line coding          : b8zs
line length (ft)     : 500
line clock source    : loop
```

## Standard Boot Sequence

The first items in Exhibit 7 (Ethernet) and Exhibit 8 (ATM) illustrate the BOOTROM loading and launching of the core application. This is a fixed process that cannot be altered in the field.

Auto-booting is the process that can be escaped by user intervention, (i.e., enter “config”), in

order to enter the boot prompt. Without user intervention, the remaining sequence occurs automatically; hence, “auto-boot”.

### Exhibit 7: Standard Ethernet Boot Sequence - Example

```
                          System Boot

Copyright 2000-2001  Navini Networks, Inc.
Copyright 1984-1998  Wind River Systems, Inc.

CPU: CC (PPC860P)
Kernel Version: 5.4
BSP version: 1.0/110501
Creation date: Nov  5 2001, 13:09:12

Attaching to TFFS... done.
Loading /tffs0/LOADS/BTSA/core...5249740
Starting at 0x10000...

Auto-booting.............................Done
Starting File System.....................Done
Mounting Drive /tffs0....................Done
Mounting Drive /dev0.....................Done
Mounting Drive /dev1.....................Done
Starting TCP/IP Stack....................Done
Starting ARP.............................Done
Starting motfec I/f......................Done
Attaching sl(0) I/f......................Done
Attaching motfec(0) I/f..................Done
Attaching lo(0) I/f......................Done
Mounting Remote Filesystem...............Done
Starting Telnet Daemon...................Done
Starting Load Monitoring Tools...........Done
Loading Target Shell Symbols.............Done
Starting WDB Tools.......................Done
Starting Target Shell....................Done
Initializing System Logger...............Done
Starting Application.....................Done
Starting LLC I/f.........................Done
Starting LLC Proxy.......................Done
Starting Lpbk Proxy......................Done
Starting CDI.............................Done
Starting CAM I/f.........................Done
Starting MME.............................Done
Starting EtherBridge.....................Done
Starting DHCP Relay Agent................Done
Starting Peer ARP Proxy Agent............Done
Starting Host ARP Proxy Agent............Done
Starting Mobile IP Proxy Agent...........Done
Starting LLC Proxy.......................Done
Selecting Config Data Source as EMS ......Done
Loading LLC..............................Done
Initializing NvRam Mib ..................Done
Initializing SNMP Agent .................Done
Pinging EMS (172.28.79.30)...............Done
Loading MTMG.............................Done
Loading MDSW.............................Done
Loading MBSW.............................Done
Loading CAP..............................Done
Loading AUX_.............................Done
Loading LLC..............................Done
Loading MTMG.............................Done
Loading MDSW.............................Done
Loading MBSW.............................Done
Loading CAP..............................Done
Loading BAUX.............................Done
Loading BMCB.............................Done
Loading MACA.............................Done
Loading MACB.............................Done
```

```
Loading CHAD.............................Done
Loading CHTT.............................Done
Loading CDSW.............................Done
Loading BDSC.............................Done
Loading CHSL.............................Done
Loading CHMA.............................Done
Loading AUX_.............................Done
Loading LLC..............................Done
Stopping LLC Proxy.......................Done
Evaluating bootload status...............Done
Initializing DSP(s)......................Done
Starting LLC Proxy.......................Done
Starting LLC Proxy.......................Done
Updating Slot Table......................Done
Requesting EMS for Configuration Data ....Done
Configuring BTS from EMS ................Done
Starting LLC Proxy.......................Done
Configuring Diag Feature(s)..............Done

!!!!!!!! BTS Initialization Complete !!!!!!!!!

                      Z   (TM)
           NNNN      ZZZ
          NNNNNN    ZZZZZ                 N     N              i       i
         NNNNNNNN   ZZZZZZ                NN    N
        NNNNNNNNNN   ZZZZZZ               N N   N   aaa  v   v i n nn  i
       NNNNNNNNNNNN   ZZZZZZ              N  N  N      a v   v i nn  n i
      NNNNNN  NNNNNN   ZZZZZZ             N   N N   aaaa v   v i n   n i
     NNNNNN    NNNNNN   ZZZZZZ  ZZ        N    NN  a   a  v v  i n   n i
    NNNNNN   Z  NNNNNN   ZZZZZZZZZZ       N     N   aaaa   v   i n   n i
   NNNNNN   ZZZ  NNNNNN   ZZZZZZZZZ
  NNNNNN   ZZZZZ  NNNNNN   ZZZZZZZ               N E T W O R K S (TM)
 NNNNNNN   ZZZZZZ  NNNNN   ZZZZZZ
NNNNNNNNN   ZZZZZZ  NNN   ZZZZZZ
NNNNNNNNNN   ZZZZZZ  N   ZZZZZZ         Internet at the Speed of Thought (TM)
 NN  NNNNNN   ZZZZZZ    ZZZZZZ
      NNNNNN   ZZZZZZ  ZZZZZZ  Copyright (c) Navini Networks, Inc.    2000-2002
       NNNNNN   ZZZZZZZZZZZZ   Copyright (c) Conexant, Inc.           2000-2001
        NNNNNN   ZZZZZZZZZZ    Copyright (c) NComm, Inc.              1997-2001
         NNNNNN   ZZZZZZZZ     Copyright (c) RSA Data Security, Inc.  1991-1992
          NNNNN    ZZZZZZ      Copyright (c) SNMP Research, Inc.      1989-1999
           NNN      ZZZZ       Copyright (c) Texas Instruments, Inc.  2000-2001
            N                  Copyright (c) Wind River Systems, Inc. 1984-2000
                                KERNEL : 5.4(WIND version 2.5)
                               BSP    : 1.0/01.19.00.00
                              CPU: CC (PPC860P).  Processor #0.
                             Memory Size: 0x3f80000.
                            WDB: Ready.

Last reset caused by a power on condition.
Current time is FRI JUL 12 14:48:29 2002

bts-4 [Active]%
```

## Exhibit 8: Standard ATM Boot Sequence - Example

```
                            System Boot

Copyright 2000-2001  Navini Networks, Inc.
Copyright 1984-1998  Wind River Systems, Inc.

CPU: CC (PPC860P)
Kernel Version: 5.4
BSP version: 1.0/110501
Creation date: Nov  5 2001, 13:09:12

Attaching to TFFS... done.
Loading /tffs0/LOADS/BTSB/core...5249740
Starting at 0x10000...
```

```
Auto-booting.............................Done
Starting File System.....................Done
Mounting Drive /tffs0....................Done
Mounting Drive /dev0.....................Done
Mounting Drive /dev1.....................Done
Starting TCP/IP Stack....................Done
Starting ARP.............................Done
Starting motfec I/f......................Done
Starting wec I/f.........................Done
Attaching wec(0) I/f.....................Done
Attaching sl(0) I/f......................Done
Attaching motfec(0) I/f..................Done
Attaching lo(0) I/f......................Done
Mounting Remote Filesystem...............Done
Starting Telnet Daemon...................Done
Starting Load Monitoring Tools...........Done
Loading Target Shell Symbols.............Done
Starting WDB Tools.......................Done
Starting Target Shell....................Done
Initializing System Logger...............Done
Starting Application.....................Done
Starting LLC I/f.........................Done
Starting LLC Proxy.......................Done
Starting Lpbk Proxy......................Done
Starting CDI.............................Done
Include CME Starting T1 I/f..............Done
Starting CAM I/f.........................Done
Starting MME.............................Done
Starting EtherBridge.....................Done
Starting DHCP Relay Agent................Done
Starting Peer ARP Proxy Agent............Done
Starting Host ARP Proxy Agent............Done
Starting Mobile IP Proxy Agent...........Done
Starting PCI Bridge......................Done
Starting Network Processor...............Done
Starting LLC Proxy.......................Done
Loading LLC..............................Done
Selecting Config Data Source as EMS ......Done
Initializing NvRam Mib ..................Done
Booting Network Processor ...............Done
Configuring T1(s)........................Done
Configuring ATM Interface................Done
Configuring IMA Group....................Done
Configuring IMA Link.....................Done
Configuring PVC(s).......................Done
Configuring Management PVC...............Done
Initializing SNMP Agent .................Done
Pinging EMS (172.28.79.30)...............Done
Loading MTMG.............................Done
Loading MDSW.............................Done
Loading MBSW.............................Done
Loading CAP..............................Done
Loading AUX_.............................Done
Loading LLC..............................Done
Loading MTMG.............................Done
Loading MDSW.............................Done
Loading MBSW.............................Done
Loading CAP..............................Done
Loading BAUX.............................Done
Loading BMCB.............................Done
Loading MACA.............................Done
Loading MACB.............................Done
Loading CHAD.............................Done
Loading CHTT.............................Done
Loading CDSW.............................Done
Loading BDSC.............................Done
Loading CHSL.............................Done
Loading CHMA.............................Done
Loading AUX_.............................Done
Loading LLC..............................Done
```

```
Stopping LLC Proxy.......................Done
Evaluating bootload status...............Done
Initializing DSP(s)......................Done
Starting LLC Proxy.......................Done
Starting LLC Proxy.......................Done
Updating Slot Table......................Done
Requesting EMS for Configuration Data ....Done
Configuring BTS from EMS ................Done
Starting LLC Proxy.......................Done
Starting AtmMgmt.........................Done
Configuring Diag Feature(s)..............Done


!!!!!!!! BTS Initialization Complete !!!!!!!!!


                      Z   (TM)
           NNNN      ZZZ
           NNNNNN    ZZZZZ                  N     N              i       i
          NNNNNNNN   ZZZZZZ                 NN    N
         NNNNNNNNNN   ZZZZZZ                N N   N   aaa  v   v i n nn  i
        NNNNNNNNNNNN   ZZZZZZ               N  N  N      a v   v i nn  n i
       NNNNNN  NNNNNN   ZZZZZZ              N   N N   aaaa v   v i n   n i
      NNNNNN    NNNNNN   ZZZZZZ  ZZ         N    NN  a   a  v v  i n   n i
     NNNNNN   Z  NNNNNN   ZZZZZZZZZZ        N     N   aaaa   v   i n   n i
    NNNNNN   ZZZ  NNNNNN   ZZZZZZZZZ
   NNNNNN   ZZZZZ  NNNNNN   ZZZZZZZ               N E T W O R K S (TM)
  NNNNNNN   ZZZZZZ  NNNNN   ZZZZZZ
 NNNNNNNNN   ZZZZZZ  NNN   ZZZZZZ
 NNNNNNNNNN   ZZZZZZ  N   ZZZZZZ         Internet at the Speed of Thought (TM)
  NN  NNNNNN   ZZZZZZ    ZZZZZZ
       NNNNNN   ZZZZZZ  ZZZZZZ  Copyright (c) Navini Networks, Inc.    2000-2002
        NNNNNN   ZZZZZZZZZZZZ   Copyright (c) Conexant, Inc.           2000-2001
         NNNNNN   ZZZZZZZZZZ    Copyright (c) NComm, Inc.              1997-2001
          NNNNNN   ZZZZZZZZ     Copyright (c) RSA Data Security, Inc.  1991-1992
           NNNNN    ZZZZZZ      Copyright (c) SNMP Research, Inc.      1989-1999
            NNN      ZZZZ       Copyright (c) Texas Instruments, Inc.  2000-2001
             N                  Copyright (c) Wind River Systems, Inc. 1984-2000
                                 KERNEL : 5.4(WIND version 2.5)
                                BSP    : 1.0/01.19.00.00
                               CPU: CC (PPC860P).  Processor #0.
                              Memory Size: 0x3f80000.
                             WDB: Ready.

Last reset caused by a power on condition.
Current time is FRI JUL 12 14:26:59 2002

bts-4 [Active]%

Attaching to TFFS... done.
Loading /tffs0/LOADS/BTSB/core... 4337576
Starting at 0x10000...

Auto-booting.............................Done
```

The line items in Exhibit 9 are the ones that create and initialize the core components to the BTSs on-board file system. This file system is used to store operating code images, configuration data, and log files. The BTS Operating System software handles the images, data, and files and does not require operator assistance.

There are three on-board file systems' FLASH and RAM drives. The FLASH drive is at /tffs0 and the two RAM drives use /dev0 and /dev1. All on-board file system drives have dedicated functions and should not be altered or used through manual operations.

**Exhibit 9: On-board File Systems**

```
Starting File System.....................Done
Mounting Drive /tffs0....................Done
Mounting Drive /dev0.....................Done
Mounting Drive /dev1.....................Done
```

The sequence shown in Exhibit 10 initializes the TCP/IP stack on the BTS. The TCP, UDP, IP, and ARP protocol stacks are created. Interfaces for the stack are then created and attached to the stack. Three or four interfaces are created depending on the selection for “traffic path” in the boot parameters.

The Fast Ethernet Controller, fec (0), is created and attached for the 10/100 Ethernet ports on the BTS. If “atm” is selected, then a WAN Ethernet Controller, WEC (0), is also created and attached to the stack to perform RFC1483 Ethernet bridging onto the ATM interface. Internally, the BTS utilizes a high-speed SLIP interface, sl (0), to provide communication between redundant devices. Finally, a debug local loopback interface, lo (0), is created and attached.

**Exhibit 10: TCP/IP Stack**

```
Starting TCP/IP Stack....................Done
Starting ARP.............................Done
Starting fec I/f.........................Done
Starting wec I/f.........................Done
Attaching wec(0) I/f.....................Done
Attaching sl(0) I/f......................Done
Attaching fec(0) I/f.....................Done
Attaching lo(0) I/f......................Done
```

Next, the user interface through the console port on the BTS is activated. It should be noted however, that once the Telnet Daemon has been started, this same interface is available remotely through a password protected telnet session. You can access the remote shell service by telnetting directly to the well-known Telnet port (23) of the BTS:

**Starting Telnet Daemon.....Done**

This invokes a suite of tools accessible by the Navini developers to assess runtime loads of various components in the system:

**Starting Load Monitoring Tools.....Done**

This creates a database of commands that can be issued from the shell:

**Loading Target Shell Symbols.....Done**

This in turn invokes a suite of tools accessible by the Navini software developers to access runtime debugging of the system:

**Starting WDB Tools.....Done**

This starts the actual interface for the console command interface:

**Starting Target Shell.....Done**

The BTS is equipped with a rich suite of logs that are automatically collected for analysis by Navini developers in the unlikely event a crash occurs. This line item invokes the automatic log collection:

**Initializing System Logger.....Done**

The core software is separated into operating system initialization and Ripwave application software that provides OAM and bridging functionality. This line item identifies the transition point from OS initialization to the point where the OS begins spawning application level tasks:

**Starting Application.....Done**

The next task provides an interface to the Logical Link Control (LLC) on the MDM card and forms a conduit for all message and user traffic from the CC to MDM card.

**Starting LLC I/f.....Done**

A Command and Debug Interface is initialized to extend rudimentary target shell capabilities for Navini developers to diagnose problems with the Digital Signal Processors on the MDM and CHP cards:

**Starting CDI.....Done**

The Content Addressable Memory (CAM) is used to provide mappings of users to channels. This mapping interface is started at this point:

**Starting CAM I/f.....Done**

The management entity for Modem mobility, nomadicity, and access control security is handled by the MME application that is started at this point:

**Starting MME.....Done**

The protocol bridging performed by the BTS for user traffic is handled by the EtherBridge component. Depending on the traffic mode selected, the EtherBridge will perform varying

protocol encapsulation methods, such as RFC1483 bridging over ATM. The bridge is started at this point:

**Starting EtherBridge.....Done**

Network layer protocol security and mobility applications are handled by specialized protocol handler components. Various modes of operation are configurable through the EMS and provide such services as DHCP address learning and authentication assistance via the DHCP Relay Agent, Proxy ARP broadcast security, and network layer mobility support. These components are started at this point:

**Starting DHCP Relay Agent.....Done**
**Starting Peer ARP Proxy Agent.....Done**
**Starting Host ARP Proxy Agent.....Done**
**Starting Mobile IP Proxy Agent.....Done**

An LLC Proxy is an object that provides relay service via the LLC IF conduit to the MDM card. Objects on the CC card can communicate with an object on the MDM card directly using such a proxy. Several such proxied objects exist and are created with this message:

**Starting LLC Proxy.....Done**

As the CC card downloads and initializes the DSPs on the MDM and CHP cards, each component is identified with a “Loading” message:

**Loading LLC.....Done**

The next item that appears notifies the user of the location where the BTS is retrieving its Management Information Base (MIB). After initial installation and provisioning through the boot line, “EMS” is selected as the Config Data Source. In this case, all remaining parameters are downloaded from the EMS.

Once the BTS and EMS have synchronized and ownership of individual elements in the MIB negotiated, subsequent reboots of the BTS will indicate the local “BTS” copy of the MIB is being used. This reduces the burden and start-up time of a system-wide restart:

**Selecting Config Data Source as BTS .....Done**

Once the MIB information is identified, the SNMP agent is initialized. At this point, the EMS can begin communicating with the BTS via this agent:

**Initializing SNMP Agent .....Done**

The BTS tests that a path through the WAN exists to its EMS Server. That test is identified next in the sequence. If the EMS is selected as the Config Data Source, the initialization cannot continue. If the “BTS” is selected as the data source, the BTS can continue to initialize.

However, it will be unmanaged, as the EMS cannot communicate with the BTS.

**Pinging EMS (172.16.0.10).....Done**

A status message appears indicating that all DSPs have been downloaded and are now beginning the initialization process:

**Bootload is a success.....Done**

Initialization can take a significant period of time, with progress through the DSP initialization shown by a growing string of "**.**" on this line. Initialization is complete with "Done" on this line, and the configuration data is passed to the application entities on each device:

**Initializing DSP(s).....Done**

**Configuring LLC Bandwidth Management.....Done**
**Configuring MAC Carrier Data.....Done**
**Configuring MAC Bandwidth Management.....Done**
**Configuring Layer 1.....Done**
**Configuring CPE Descriptor Table .....Done**

The final step in the BTS initialization is to start up the GPS subsystem. With the GPS, the BTS will remain time synchronized with the other BTSs in the network:

**Configuring GPS.....Done**

The BTS is now provisioned with minimal data. This is enough data to be able to calibrate and test the BTS. Power cycle the BTS for the changes to take place. An example of a reboot is shown in Exhibit 11.

**Exhibit 11: BTS Reboot - Example**

```
!!!!! Shutdown Started. Terminating all interfaces!!!!!!
Stopping Ime.............................Done
Stopping Cme.............................Done
Stopping EtherBridge.....................Done
Stopping CAM I/f.........................Done
Stopping Lpbk Proxy......................Done
Stopping LLC Proxy.......................Done
Stopping LLC I/f.........................Done
!!!!!!!!!!!! Shutdown Completed. Rebooting !!!!!!!!!!!!!
.

Attaching to TFFS... done.
Loading /tffs0/LOADS/btsb/core...5569208
Starting at 0x10000...

Auto-booting.............................Done
Starting File System.....................Done
Mounting Drive /tffs0....................Done
Mounting Drive /dev0.....................Done
Mounting Drive /dev1.....................Done
Starting TCP/IP Stack....................Done
Starting ARP.............................Done
```

```
Starting motfec I/f.....................Done
Attaching sl(0) I/f.....................Done
Attaching motfec(0) I/f.................Done
Attaching lo(0) I/f.....................Done
Mounting Remote Filesystem..............Done
Starting Telnet Daemon..................Done
Starting Load Monitoring Tools..........Done
Loading Target Shell Symbols............Done
Starting WDB Tools......................Done
Starting Target Shell...................Done
Initializing System Logger..............Done
Starting Application....................Done
Starting LLC I/f........................Done
Starting LLC Proxy......................Done
Starting Lpbk Proxy.....................Done
Starting CDI............................Done
Starting CAM I/f........................Done
Starting MME............................Done
Starting EtherBridge....................Done
Starting ARP Conflict Detection.........Done
Starting DHCP Relay Agent...............Done
Starting Peer ARP Proxy Agent...........Done
Starting Host ARP Proxy Agent...........Done
Starting Mobile IP Proxy Agent..........Done
Starting LLC Proxy......................Done
Selecting Config Data Source as BTS ....Done
Initializing SNMP Agent ................Done
Loading BLLC............................Done
Pinging EMS (172.16.100.9)..............Done
Loading MTMG............................Done
Loading MDSW............................Done
Loading MBSW............................Done
Loading CAP.............................Done
Loading AUX_............................Done
Loading BLLC............................Done
Loading MTMG............................Done
Loading MDSW............................Done
Loading MBSW............................Done
Loading CAP.............................Done
Loading BAUX............................Done
Loading BMCB............................Done
Loading MACA............................Done
Loading MACB............................Done
Loading CHAD............................Done
Loading CHTT............................Done
Loading CDSW............................Done
Loading BDSC............................Done
Loading CHSL............................Done
Loading CHMA............................Done
Loading AUX_............................Done
Loading LLC.............................Done
Stopping LLC Proxy......................Done
Evaluating bootload status..............Done
Initializing DSP(s).....................Done
Starting LLC Proxy......................Done
Starting LLC Proxy......................Done
Updating Slot Table.....................Done
Configuring LLC Bandwidth Management....Done
Configuring MAC Carrier Data............Done
Configuring MAC Bandwidth Management....Done
Configuring Layer 1.....................Done
Configuring CPE Descriptor Table .......Done
Starting LLC Proxy......................Done
Configuring Diag Feature(s).............Done
Configuring GPS.........................Done

!!!!!!!! BTS Initialization Complete !!!!!!!!!

                      Z   (TM)
           NNNN      ZZZ
          NNNNNN    ZZZZZ                 N     N             i       i
```

```
          NNNNNNNN   ZZZZZZ                NN    N
         NNNNNNNNNN   ZZZZZZ               N N   N   aaa  v   v i n nn  i
        NNNNNNNNNNNN   ZZZZZZ              N  N  N      a v   v i nn  n i
       NNNNNN  NNNNNN   ZZZZZZ             N   N N   aaaa v   v i n   n i
      NNNNNN    NNNNNN   ZZZZZZ  ZZ        N    NN  a   a  v v  i n   n i
     NNNNNN   Z  NNNNNN   ZZZZZZZZZZ       N     N   aaaa   v   i n   n i
    NNNNNN   ZZZ  NNNNNN   ZZZZZZZZZ
   NNNNNN   ZZZZZ  NNNNNN   ZZZZZZZ               N E T W O R K S (TM)
  NNNNNNN   ZZZZZZ  NNNNN   ZZZZZZ
 NNNNNNNNN   ZZZZZZ  NNN   ZZZZZZ
 NNNNNNNNNN   ZZZZZZ  N   ZZZZZZ     Internet at the Speed of Thought (TM)
  NN  NNNNNN   ZZZZZZ    ZZZZZZ
       NNNNNN   ZZZZZZ  ZZZZZZ  Copyright(c)Navini Networks,Inc.2000-2002
        NNNNNN   ZZZZZZZZZZZZ  Copyright(c)Conexant,Inc. 2000-2001
         NNNNNN   ZZZZZZZZZZ  Copyright(c)Free Sw Foundation,Inc.1988-1999
          NNNNNN   ZZZZZZZZ   Copyright(c)NComm, Inc.1997-2001
           NNNN     ZZZZZZ    Copyright(c)RSA Data Security,Inc.1991-1992
            NNN      ZZZZ     Copyright(c)SNMP Research,Inc.1989-1999
             N        ZZ      Copyright(c)Texas Instruments,Inc.2000-2001
                              Copyright(c)Wind River Systems,Inc.1984-2000
                                 KERNEL : 5.4(WIND version 2.5)
                                BSP    : 1.0/RW1.19.1.3
                               CPU: CC (PPC860P).  Processor #0.
                              Memory Size: 0x3f80000.
                             WDB: Ready.

Last reset caused by a user request from the console.
Current time is FRI JAN 10 14:38:36 2003

bts-120 [Active]% TimerHandler called for port /tty/2
--> 1/10/2003 14:38:38
Position fix: latitude: 32:58:42, longitude: -96:42:4, height: 188.78
```

# Calibrate the Base Station

Calibrating the Base Station detects the phase differential between the antenna elements and matches the output power across all antenna elements in the RFS. In TTA BTSs, if the “Calibration Coefficients” feature is enabled, the transmit power level for all the subcarriers is also equalized. The calibration procedure must be performed at least **three times** to verify consistency of the returned values. Ensure that the BTS has been powered on **with the power amplifiers on for at least fifteen minutes** to allow them time to warm up and stabilize (**twenty minutes in the case of a TTA BTS** to allow enough time for the new software to be loaded in all the RFCs)

## Calibration Procedure

To calibrate the BTS, follow the steps in the procedure below. Refer to the *Ripwave Configuration Guide*, as needed.

**Step 1.** On the Test EMS, click on the Server icon to start the EMS Server.

**Step 2.** Click on the EMS Configuration icon to start the EMS Client GUI.

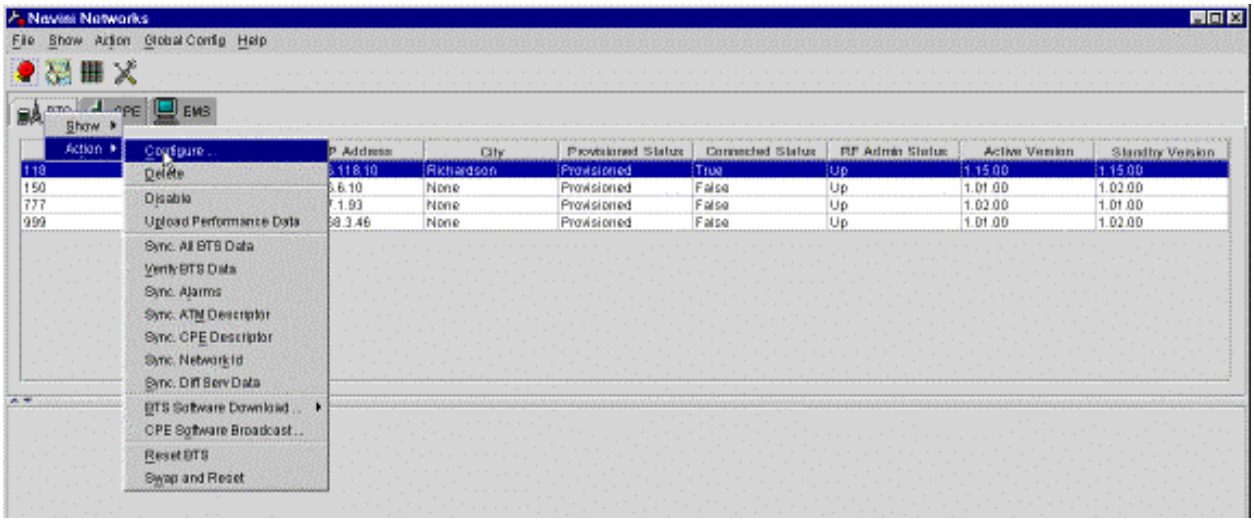
**Step 3.** At the EMS Configuration & Alarm Manager login screen, enter the user name and password. The defaults are **emsAdmin** / **emsAdmin**.

**Step 4.** Verify that Antenna Power, RX Sensitivity, and Cal Cable Loss values are entered in

the fields in the EMS. NOTE: The Power Splitter Loss was entered when you performed the RFS configuration earlier.

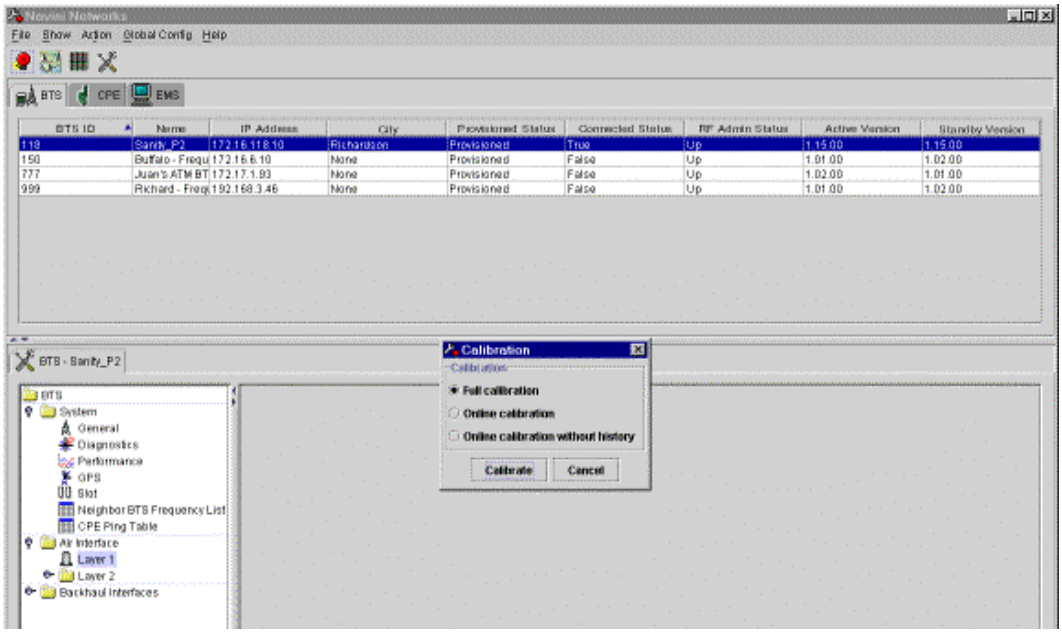
**Step 5.** Click on the BTS that is being installed to select it. Right-click on the highlighted BTS and select **Action > Configure**. Refer to Figure 51.

**Figure 51: Select BTS**



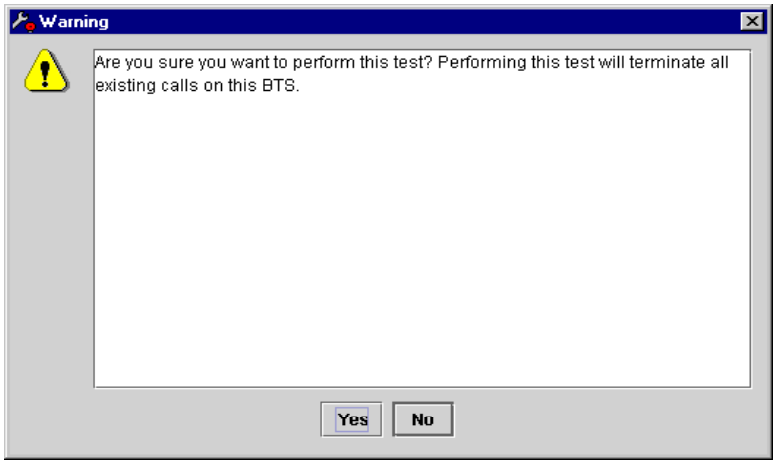

**Step 6.** Click on **Air Interface > Layer 1**, and then click **Calibrate**. In the resulting dialog box (Figure 52), select FULL CALIBRATION and **Calibrate**.

**Figure 52: Calibrate BTS**



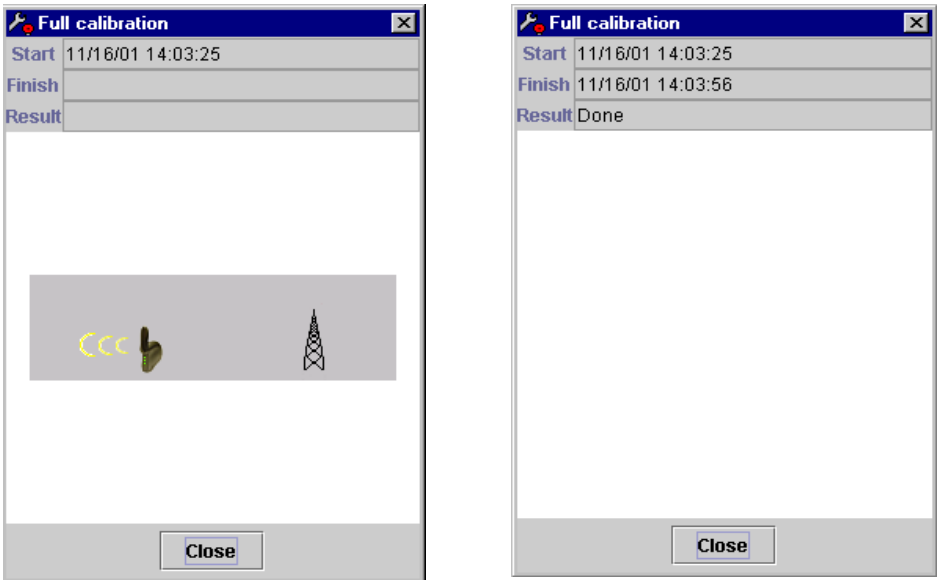

**Step 7.** When the Warning window appears (Figure 53), click **Yes**.

**Figure 53: Warning Window**



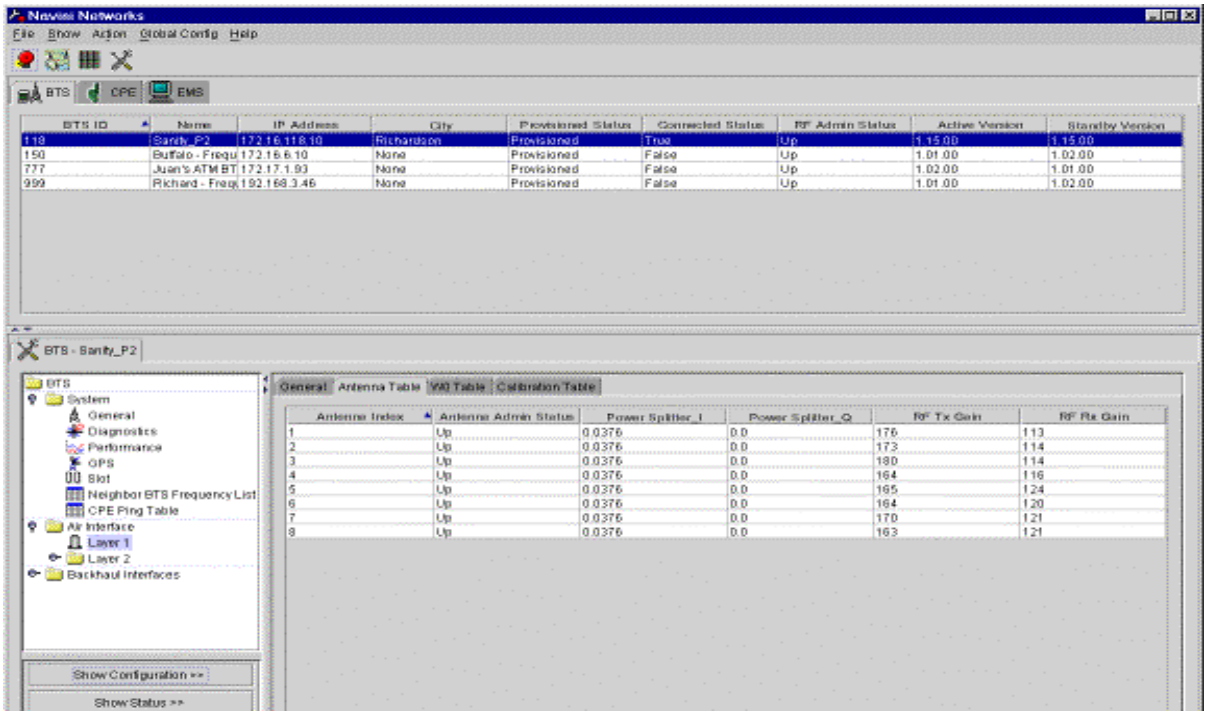

**Step 8.** The Full Calibration window appears during system calibration (Figure 54). When calibration is complete, the Full Calibration window changes and displays the finish time and the result. Click the **Close** button to close the Full Calibration window. Note that the result of "Done" does not mean that the system passed calibration.

**Figure 54: Full Calibration Window**



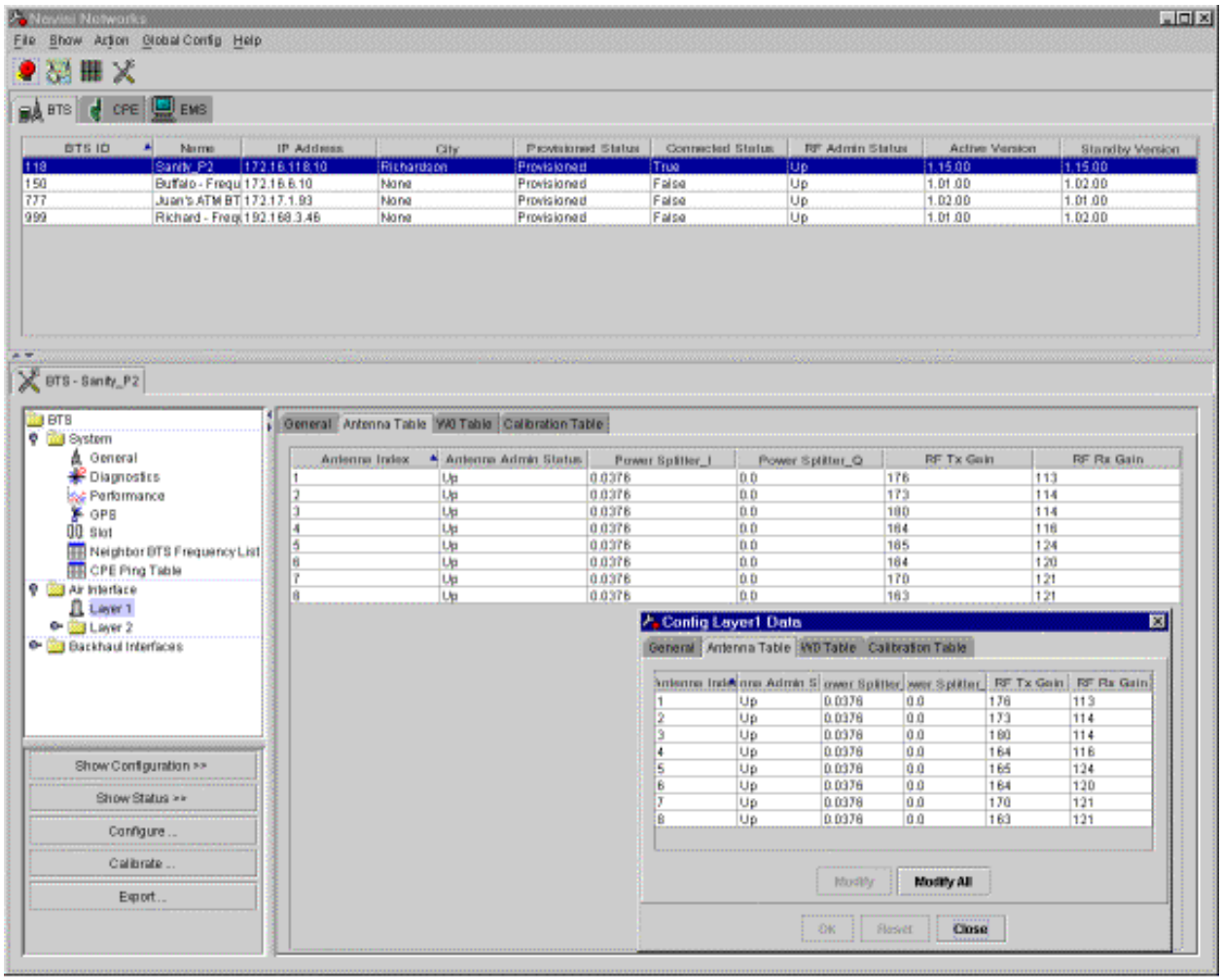

**Step 9.** Click **Show Configuration** and select the Antenna Table tab (Figure 55). Check the Tx Gain and Rx Gain columns (the last two columns in the table) for transmit and receive results. The transmit and receive results for all the eight antennas must be between 1 and 254. The eight values in each column should be relatively close to each other. A value of zero indicates a problem with the associated antenna path.

**Figure 55: Show Configuration/Antenna Table**




**Step 10.** Perform the calibration function two more times. Ensure each time that the values remain relatively stable (+/- 3), and that none of the results is zero. After you perform the second calibration, click on **Configure**. The Config Layer 1 Data window (Figure 56) shows the data from the second calibration. The values in the main screen from the Show Config selection are from the first calibration. Compare the values from the two calibrations to ensure that they are stable, and not equal to zero.

**Figure 56: Config Layer 1 Data Window**




**Step 11.** Close the Config Layer 1 Data window. Update the main screen by clicking the Show Configuration button.