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ipBTS C30 Installation and Commissioning

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ipBTS C30 Installation and Commissioning

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About this document

The ipBTS C30™, or Base Transceiver System is a 1xEV-DO Radio Access Node (RAN) that is quickly deployable to provide temporary wireless coverage to a geographic area.

This chapter describes in general how you use the customer documentation supplied by Airvana to install, configure, and maintain a ipBTS base station.

Audience

This guide is intended for use by equipment operators, system planners, and related personnel responsible for installing and managing the ipBTS C30 and its network elements.

Purpose

This guide provides a functional description of the hardware components provided by Airvana that supports the ipBTS communications system and the specifications and procedures needed to install and configure a 1xEV-DO base station. An ipBTS C30 consists of a 1xEV-DO Channel Card and a single-sector Radio Module plus interfaces, cables, and connectors installed in a rack-mountable chassis 2U high.

What you need to know

As a reader of this guide, you should be familiar with 1xEV-DO specifications, the UNIX® operating system and CLI conventions.

Related documents

The following table lists the ipBTS C30 and ipRNC 1610 customer documentation suite.

Table 1. Related documentation

Title	Contents
ipRNC 1610 Installation and Commissioning (910135)	Describes how to install the ipRNC 1610, including mounting the rack and setting up the backhaul network. Lists physical, environmental, and cable specifications, and pinouts.
ipBTS C30 Installation and Commissioning (910136)	Describes ipBTS C30 hardware features and installation. Describes how use the CLI to run the configuration script to commission the device.
ipBTS C30 Upgrade Procedures R4.0.0.x to R4.0.0.y (910137)	Describes how to use the CLI to upgrade the ipBTS C30 software from R4.0.0.0.x to R4.0.0.y. Also includes rollback procedures.
ipRNC 1610 Upgrade Procedures R4.0.0.x to R4.0.0.y (910138)	Describes how to use the CLI to upgrade the ipRNC 1610 software from R4.0.0.0.x to R4.0.0.y. Also includes rollback procedures.
Airvana CLI Reference for ipRNC 1610 and ipBTS C30 (910139)	Describes all CLI commands for the ipBTS C30 and ipRNC 1610 modules. Includes command and parameter descriptions, command syntax, and sample output for each command.
Airvana Logs Reference for ipRNC 1610 and ipBTS C30 (910140)	Describes all log messages for the ipBTS C30 and ipRNC 1610 modules. Includes message and parameter descriptions, format, severity, sample output, and suggested actions for each error message.
Airvana Configuration Parameters for ipRNC 1610 and ipBTS C30 (910141)	Describes the configurable parameters for ipRNC 1610 and ipBTS C30. Provides parameter descriptions, SNMP values, CLI names, and information about persistence and intrusiveness.

Conventions

This guide uses the following text conventions, as applicable.

Table 2. Conventions

Convention	Description
Syntax symbols	
< >	Enclose a required parameter or set of parameters. For example: **>band-class *<class>*** ***<class>*** is a required parameter.
< >	Enclose a named keyboard key. For example: Press <**ENTER**> to continue. You must press the Enter key to continue.
[ ]	Enclose an optional parameter or set of parameters. For example: **>activate image *<version>* [reboot]** **[reboot]** is an optional parameter.
|	Separates items on a list of parameters, only one of which can be used. For example: **>channel-included <yes|no>** A valid command is: **>channel-included yes**
Font usage	
Bold CLI input font	Indicates text that must be entered exactly as shown. For example: Enter **ping 192.23.10.12**.
Italic CLI input font	Indicates a variable parameter for which you must provide an actual value. For example: **>authentication key *<aukey>*** ***<aukey>*** is a variable parameter. A valid command is: **>authentication key 9782503000**
`Plain CLI output font`	Indicates system output in a command line or system-generated file. For example: `IP address 192.23.10.12 is alive.`
`Italic CLI output font`	Indicates a variable in system output in a command line or system-generated file. For example: `Installation of release <release> is complete.`

Table 2. Conventions (continued)

Convention	Description
Plain italic font	Indicates file names, directory paths, book titles, chapter titles, user accounts, and emphasized words.
Bold font	Indicates text that appears on screen exactly as shown, for example, names of screens, names of buttons, items on menus, and items on pull down lists.
blue text	Indicates a hypertext link.
Other conventions	
>	Indicates graphical user interface (GUI) menu path. For example: Select **Edit > Add Network** to open the Add Network screen.

Notes, cautions, and warnings

Notes provide additional information about the subject text.

Tips provide suggestions for task improvements, including shortcuts and other helpful hints.

The wrist strap icon appears in procedures that require you to wear a wrist strap to protect equipment from electro-static discharge.

Cautions indicate that procedures, if performed incorrectly, can cause equipment damage or data loss.

Warnings indicate that procedures, if performed incorrectly, can harm you.

Chapter 1

ipBTS system overview

This guide describes the installation and commissioning of an ipBTS™ Radio Node (RN).

- *Installation* covers all physical tasks, such as inserting modules, connecting power, and connecting antennas. Perform the installation steps first.
- *Commissioning* covers all configuration and testing that must be performed by a technician at the site. Commissioning is performed after installation is complete.

The ipBTS system, when used in conjunction with the ipRNC 1610, comprises part of a Deployable BTS which provides wireless access to 1xEV-DO enabled access terminals (ATs), PCs, and laptop computer systems.

CAUTION

This device complies with Part 24 of the FCC Rules. Changes or modifications not expressly approved by Airvana Inc. could void the user's authority to operate the equipment.

This chapter describes the features and components of the ipBTS and consists of the following sections:

Deployable BTS overview

Figure 1-2 shows a system diagram of the Deployable BTS that consists of the following components:

- **Radio Node (ipBTS C30)** – which includes the 1xEV-DO channel card module (ADCC), Radio module, cooling fans and filter tray.
- **Radio Node Controller (ipRNC 1610)** – one of the core networking elements connecting the Radio Access Network (RAN), PSTN, and Core IP Network. Each ipBTS connects to the ipRNC 1610 using backhaul link consisting of a 10/100 BaseT Ethernet interface.

- The ipRNC 1610 consists of a chassis containing Service modules and a System Controller module.
- The ipRNC 1610 connects to the Internet through a packet data serving node (PDSN) which carries all of the data communications between the access terminals and the Internet.

ipBTS RN overview

The radio node components are installed in a modular 2U-high chassis which fits a standard EIA 19-inch universal server rack. The chassis dimensions are 3.25 in (8.3 cm) high, 19 in (48.3 cm) wide and 18.5 in (47 cm) deep.

An ipBTS C30 system supports three radio sectors and consists of one ADCC module, one Radio module, two replaceable fan trays and an air filter.

Modules

This section describes the components installed in the 2U rack.

Front View

Figure 1-2 shows a front view of an ipBTS system. Figure 1-2 shows a block diagram that explains module functions.

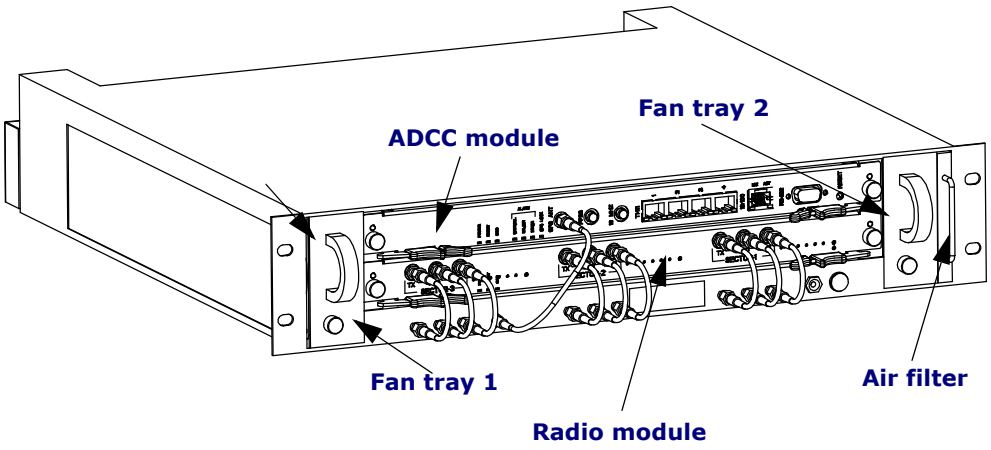


Figure 1-1. ipBTS C30 - front view

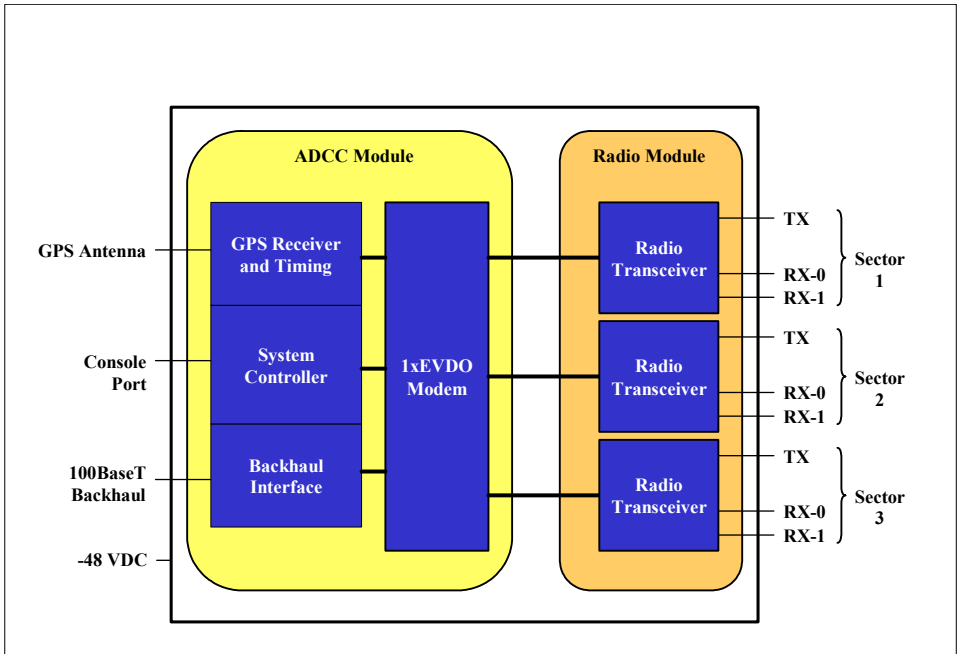


Figure 1-2. ipBTS C30 module functions

Rear view

Figure 1-3 shows the hardware components visible when you view the ipBTS from the rear. .

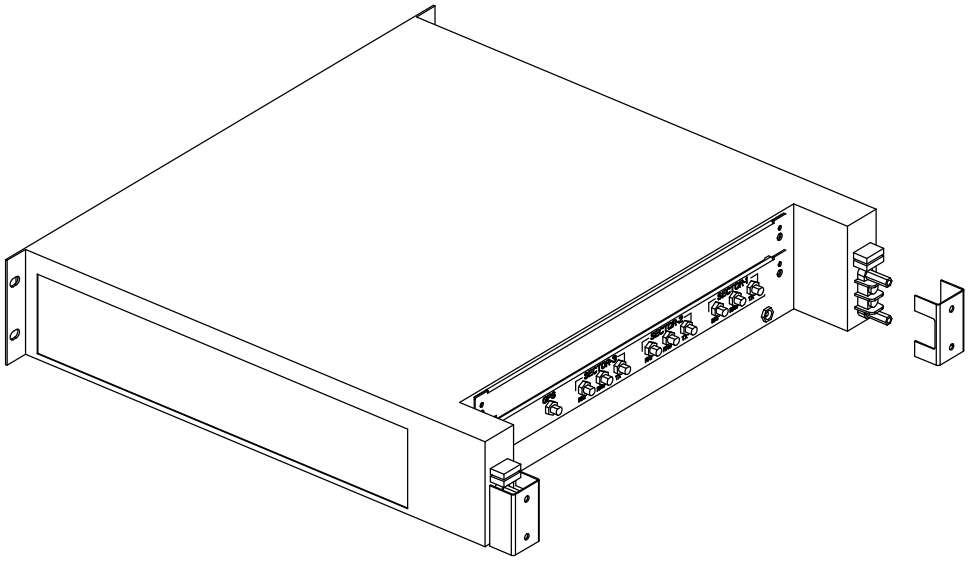


Figure 1-3. Rear view of a three sector ipBTS

ipBTS RN chassis functions

The ipBTS chassis (or enclosure) is a rack mount with built-in redundant cooling fan trays. Air inlets are located on the front of the chassis and air outlets are located on the rear of the chassis. The ipBTS C30 chassis provides power and interconnections for the radio modules and ADCC modules

ipBTS RN chassis components

The RN shelf chassis, installed in the communications rack, is capable of supporting the field replaceable modules shown in Table 1-1.

Table 1-1. RN shelf replaceable components

ipBTS C30 RN configuration	Component	Number	Installed
three radio sectors	fan trays	two	Either side of chassis
	ADCC module	one	Top slot
	Radio module	one	Bottom slot
	air filter	one	Right side of the chassis

Replaceable RN modules

This section describes whether modules and other components are “field replaceable” or “hot-swappable,” and whether replacing them involves a service disruption. See Table 1-2 for the list of replaceable items in the ipBTS. We define the terms this way:

- “Field-replaceable” means the item can be replaced without returning the entire network element to Airvana. Field-replaceable items may or may not be hot-swappable.
- “Hot-swappable” means the item can be replaced without powering down other modules or the rack as a whole. Hot swappable items may or may not cause service disruption when swapped out.
- “Service disrupting” means replacing the item causes some break in the continuity of service to at least some user sessions.

Table 1-2. Replaceable RN modules

Module	Option	Part Number
Fan tray	Field replaceable unit and not service disrupting	64075

Table 1-2. Replaceable RN modules (continued)

Module	Option	Part Number
ADCC Module	Field replaceable unit and service disrupting	800144
Radio Module (Sector Radio Kit)	Field replaceable unit and service disrupting	800149
Air filter	Field replaceable unit and hot-swappable	140490

Chapter 2

Planning

Installing and commissioning a ipBTS C30 involves some preparation. This chapter discusses preparation and has the following sections:

Requirements

This chapter describes the requirements for installation of an ipBTS system. It contains information about:

Power requirements

The ipBTS C30 requires only one power supply but supports dual DC input power feeds for power redundancy. Table 2-1 provides the voltage specifications for input power.

Table 2-1. Input power interfaces

Terminals	Functions
-48VDC-A	Input power, -48VDC Input power feed A
-48RTN-A	Input power, -48VDC return Input power feed A

Table 2-1. Input power interfaces (continued)

Terminals	Functions
-48VDC-B	Input power, -48VDC Input power feed A
-48RTN-B	Input power, -48VDC return Input power feed B

Ground requirements

Airvana requires the installation of a primary surge protection system. Qualified professionals must design the primary surge protection system compliant with applicable local codes and requirements and with the *TIA J-STD-607-A-Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications* standards.

Ground

Operators connect the site ground connector on the rear of the ipBTS to a sufficient ground source in the primary external surge suppression system.

Environmental requirements

Table 2-2 and Table 2-3 list the ipBTS environmental requirements.

Table 2-2. ipBTS operating and storage temperature specification

Specification	Value
Operating	Normal conditions: +5°C to +40°C Short-term conditions: -5°C to +50°C
Storage and transportation	-40°C to +70°C

Table 2-3. ipBTS humidity specifications

Specification	Value
Operating relative humidity	Normal conditions: 5 to 85 percent Short-term conditions: 5 to 90 percent

Table 2-4. ipBTS altitude specification

Specification	Value
Altitude	Normal conditions: 1,800 m. (below 5,900 ft.). Operating temperature ranges will be derrated above 1,800 m. At altitudes between 6,000 feet (1,829 m) and 12,000 feet (3,658 m), the specified upper limit for operational temperature (+40 degrees C) is reduced by 2 degrees C every 1,000 feet.

Chapter 3

ipBTS C30 installation

This chapter describes the ipBTS C30 installation process, from unpacking the hardware through installing the modules, cabling, connecting to a backhaul network and a power source and then powering on the system. Specifically, it contains the following sections:

The installation process consists of the following high-level steps:

1. Planning for the installation (see Chapter 2, Planning)
2. Preparing for the installation
3. Unpacking and installing the chassis.
4. Connecting the ground.
5. Unpacking and installing the modules.
6. Connecting the backhaul network.
7. Connecting to a power source.
8. Powering on the ipBTS C30 system.

Preparing for the installation

This chapter contains unpacking, inspection, and installation instructions for all components of the ipBTS. Review the preparation requirements documented in Chapter 2, Planning before proceeding with the installation.

Verify the contents of each shipping container with the packing list before beginning the installation.


NOTE

All of the equipment has been tested, and calibrated at the factory. Retain all packing material in the event that the unit must be returned to the factory due to damage during shipping.

Tools required for the installation

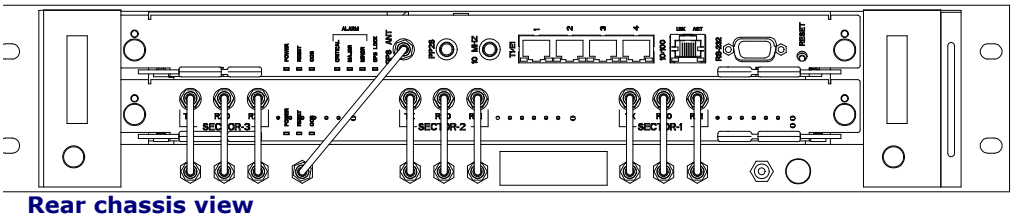
Before beginning the installation, have the following tools on hand:

- Utility knife or box cutter
- Appropriate wrenches to secure the ipBTS chassis to the equipment rack.
- Appropriate RF and GPS cable connector stripping and crimping tools.
- Appropriate stripping and crimping tools for the power and ground connections.
- #2 Phillips head screwdriver
- Torque wrench with appropriate SMA connector attachment for SMA cables
- Voltage meter

Installing the chassis

The ipBTS consists of the chassis, ADCC and RF modules, and cables. Each chassis supports three radio sectors. The chassis is a 2U configuration that can be used as a table top unit or can be mounted in any cabinet or rack that supports standard 19 in. EIA mounting rails.

Front chassis view



Rear chassis view

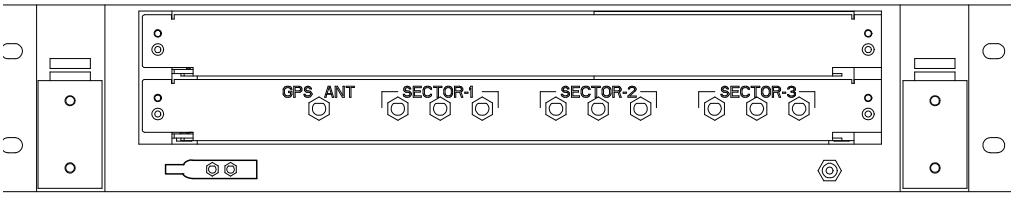


Figure 3-1. Front and rear views of the ipBTS C30

Unpacking the chassis

Use a box cutter or blade to carefully open the chassis shipping container. Remove the packing material. Store the shipping container and packing material in the event that the chassis needs to be shipped back to manufacturing for replacement or repair.

CAUTION

Each chassis weighs approximately 35 lbs. (15.8 kg) as shipped and should be moved with care to prevent damage to the equipment or personal injury.

Verifying shipping contents

As you unpack each component, match the contents with the packing list to verify that you have all of the parts before proceeding.

Visually inspect each component for damage that may have occurred during shipment. Look for evidence of water damage, bent or dented chassis, loose screws or nuts or foreign material in the connectors.

CAUTION

Inspect each electronic component carefully to look for damage caused by rough handling during shipping.

Installing the chassis

Position the chassis in the main rack, or cabinet and use the supplied 1/4 in. screws to securely attach the chassis to the rack.

Unpacking and installing modules

All modules are tested and calibrated at the factory before being packed and shipped. Follow the steps in this section to unpack, inspect, and install each component of the ipBTS.

WRIST STRAP

Use a wrist strap while performing the procedures documented in this section to safely discharge static electricity and prevent damage to the equipment.

Chassis front

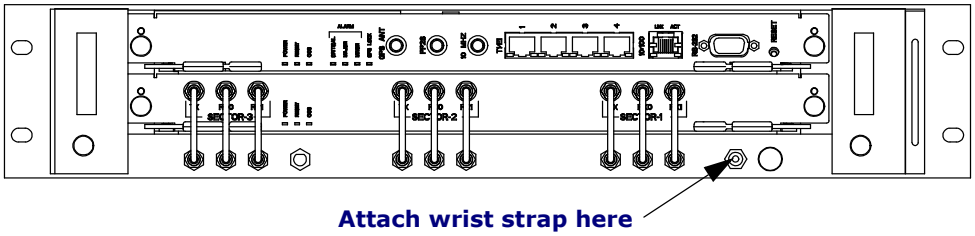


Figure 3-2. Wrist strap connection point

NOTE

All shelf interconnect cables are included with the shipment. Make the external cables like power, ground, backhaul, GPS, and RF connections at the site.

Connecting the ground

Ground the chassis by attaching the earth ground wire to the return bus as shown in Figure 3-3.

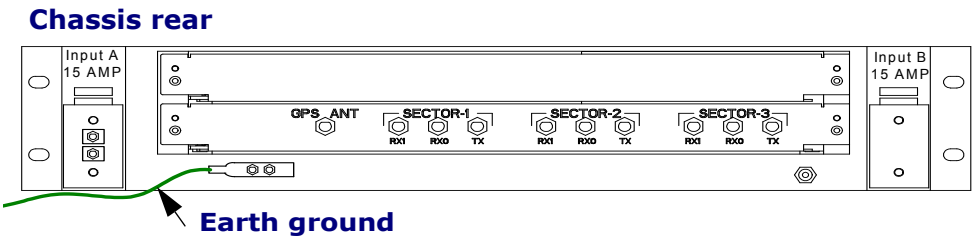


Figure 3-3. Attaching the ground

Installing modules

Airvana packs and ships all Field Replaceable Units (FRUs) individually to prevent damage during shipping. Each module must be unpacked, inspected, and installed in the chassis before applying power and commissioning the ipBTS system.

This section provides instructions for installing the following FRUs:

- Module locations on page 3-5
- Installing the Radio module on page 3-5
- Installing the ADCC module on page 3-6

Module locations

The following figure shows the location of the ADCC and Radio modules in the ipBTS C30 shelf.

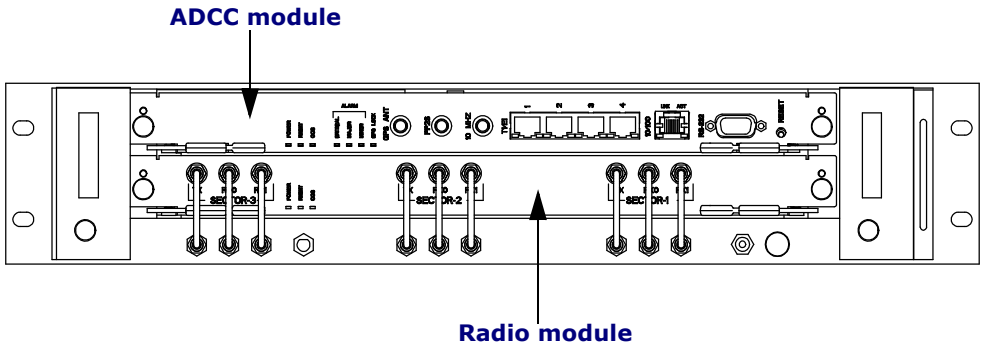


Figure 3-4. Module locations

Installing the Radio module

Airvana packs radio module in a cardboard container measuring approximately 16 in. (40.6 cm) square, and 3 in. (7.6 cm) deep. The package weighs approximately 3.9 lbs. (1.8 kg).

Install one radio module in the bottom chassis slot.

Procedure

1. Use a box cutter to carefully open the radio module box.
2. Remove the radio module from its protective electrostatic bag and verify that the pins located on the rear of the module are straight and have not been damaged in shipping.
3. Insert the radio module in the bottom slot of the RN chassis and push in until the connector engages the backplane and the locking latches (see Figure 3-5) on the left and right close securely.
4. Use a phillips head screwdriver to engage and tighten the captive screws on the left and right to hold the radio module in place.

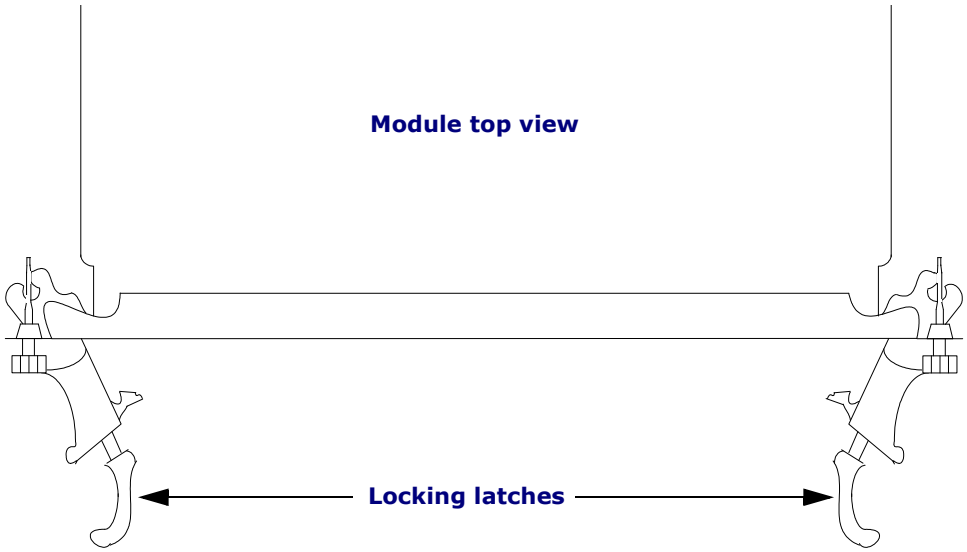


Figure 3-5. Module latch detail

Installing the ADCC module

Airvana packs the ADCC module in a cardboard container measuring approximately 16 in. (40.6 cm) square, and 3 in. (7.6 cm) deep and weighs approximately 5.6 lbs. (2.5 kg)

Install one ADCC module in the top chassis slot.

Procedure

1. Use a box cutter to carefully open the ADCC module box.
2. Remove the ADCC module from its protective electrostatic bag and verify that the pins located on the rear of the module are straight and have not been damaged in shipping.
3. Insert the ADCC module in the top slot of the RN chassis and push in until the connector engages the backplane and the locking latches on the left and right close securely.
4. Use a phillips head screwdriver to engage and tighten the captive screws on the left and right to hold the ADCC module in place.

Connecting to the backhaul network

3The ADCC module supports one 100BaseT backhaul interface for a three sector configuration.

See RN Specifications on page A-1 for the specifications of each connector.

NOTE

Backhaul network cables are not provided. Use standard 100BaseT Ethernet cables to make the backhaul network connections.

Connecting backhaul cables

Connect to the 100BaseT backhaul network by cabling to the 100BaseT connection on the ADCC module.

Connecting to the backhaul network through an aggregation router

Use a 100BaseT Ethernet cable to connect one end to the 100BaseT port on the ADCC module and the other end to the RJ-45 port on the router (see Figure 3-6).

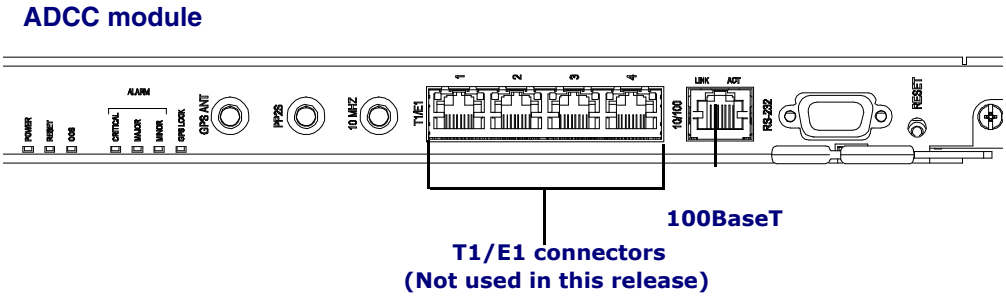


Figure 3-6. Connecting to a backhaul network through a router

Connecting GPS antenna cables

Connect the GPS coaxial cable SMA connectors.

Procedure

1. Locate the GPS antenna jumper cable and connect one end to the port labelled GPS Antenna on the ADCC module.
2. Connect the other end of the jumper cable to the SMA port on the chassis directly below the ADCC LED indicators (see Figure 3-7).
3. Use the torque wrench to tighten the SMA connectors securely to between 5 and 9 inch-pounds.aking RX connections for sector 2Making RX connections for sector 3.

ADCC front

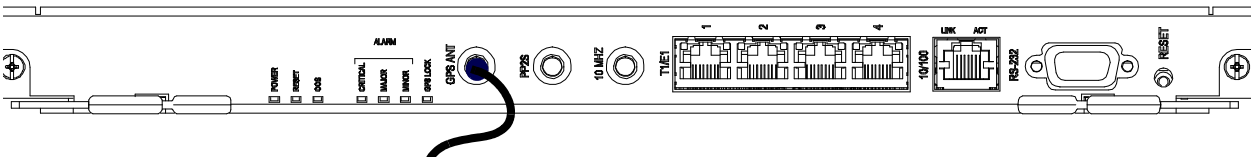


Figure 3-7. GPS connection - front of chassis

Chassis rear

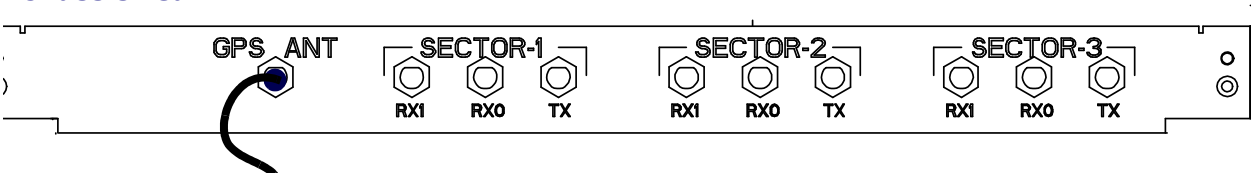


Figure 3-8. GPS connection - rear of chassis

Connecting radio module sector ports

The radio module has three SMA connectors per sector on the front and rear of the module. Below the radio module there are matching SMA connectors in the chassis that are pre-wired at the factory. This procedure connects the nine short jumper cables to the SMA connectors on the front and rear of the chassis.

Procedure

1. Connect one end of a jumper cable to an SMA port on the radio module.
2. Connect the other end of the jumper cable to the SMA port on the chassis directly below the first connection.
3. Repeat step 1 and step 2 for the remaining eight SMA connectors.
4. Use the torque wrench to tighten each SMA connector to 1 N-m (9 in-lbs).

Connecting to a power source

Before connecting the ipBTS to the -48V power source follow the instructions in this section to verify that all pre-power up steps have been completed.

Pre-power on checklist

Before connecting and applying power to the ipBTS verify that the following tasks have been completed:

- Connect chassis to ground
- Connect all cables and tighten to specifications.
- Connect to power source.

Powering on the RN

The shelf is prewired to distribute power to the installed components like the ADCC, Radio module and fan tray. The equipment rack containing the ipBTS C30 shelf must have a suitable power supply and circuit breakers.

Connecting to the power source and powering on the ipBTS

Follow these steps to connect power to the ipBTS C30 RN and to power on the modules.

Procedure

1. Verify that the circuit breaker supplying power to the ipBTS shelf is in the OFF position.
2. Connect to your -48VDC power source at the rear of the shelf as shown in Figure 3-9

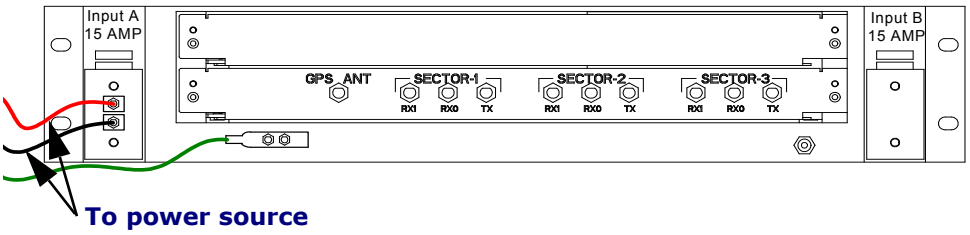


Figure 3-9. Connecting to a power source

3. After you connect the ground and power feeds and have tested the connections set the circuit breaker to ON to power up the components of the ipBTS.
4. Monitor the ADCC and Radio module LED indicators to verify that the module is operating normally. See the following sections, ADCC LED indicators and Radio module LED indicators for more information.

This completes the ipBTS installation process. Go to RN commissioning on page 4-1 to connect the RN to the CDMA network.

Verifying module status

As the ipBTS powers up look at the LED lights on the front of each module to verify that the system powers up normally.

ADCC LED indicators

There are seven indicator LEDs on the front of the ADCC module. The LEDs provide the following status information:

- POWER - On (green) indicates bulk power is available to the module.
- RESET - On (green) indicates the module is in a reset state.
- OOS - On (red) indicates the module is Out Of Service due to fault or not ready.
- CRITICAL - Summary alarm: Critical
- MAJOR - Summary alarm: Major
- MINOR - Summary alarm: Minor
- GPS LOCK - On (green) indicates the GPS receiver is in a locked state.

10/100 Ethernet backhaul

Two LED indicators on the RJ45 connector provide the following information:

- LNK - On (green) indicates that Link is established.
- ACT - On (green) indicates transmit and receive activity.

Radio module LED indicators

There are three indicator LEDs on the front of each radio module. The LEDs provide the following status information:

- POWER - On (green) indicates bulk power is available to the module.
- RESET - On (green) indicates the module is in a reset state.
- OOS - On (red) indicates the module is Out Of Service due to fault or not ready.

Chapter 4

RN commissioning

This chapter explains the steps required to commission the ipBTS C30. Specifically, it contains the following sections:

Requirements

The ipBTS C30 must be completely installed and powered up. Follow the procedures in Chapter 3, ipBTS C30 installation before proceeding with the steps in this chapter.

Hardware requirements

Commissioning requires the following hardware:

- Laptop running Microsoft Windows 2000 or Windows XP.
- An Ethernet network interface card (NIC) on the laptop.

  The software is transferred to the ipBTS C30 over the Ethernet.
- A cross-over ethernet cable with standard RJ-45 connectors.

- The cross over cable is required to connect the laptop Ethernet port directly to the ADCC Ethernet port without going through an Ethernet switch. If you bring an Ethernet switch, then two straight-through Ethernet cables are also required (laptop to switch, and switch to ADCC).
- Serial cable with male DB-9 connector for attaching to the female DB-9 on the ADCC side and a connector on the laptop side that is correct or the laptop's serial port.
  - For information on the DB-9 pin-out, see Appendix A.
- Power meter with a power sensor to test and set RF transmission power during commissioning with connector/adapter appropriate for the antenna cables exiting the Rox System rack seal.
- 30 dB attenuator pad with connector appropriate for antenna jumper cable rated for a maximum of 50 watts.
- A power splitter to split the transmit signal for use by the power meter and the AT, with appropriate cables and connector adapters.
- A 13/16 inch open ended wrench.
- A torque wrench with 13/16 inch open ended bit.
- A 5/32 slotted screw driver.
- A thread tapping kit with 1/4-20 thread bit at 3/4 inch depth.
- 1xEV-DO access terminal (AT) for testing purposes.

Software requirements

Commissioning requires the following software:

- Commissioning script created by network planning personnel.

  The commissioning script comprehensively configures the ipBTS C30 for normal operations.

The following software and hardware is also required if the field technician needs to change the software release running on the ipBTS C30:

- SFTP client software to transfer the software release to the ipBTS C30. You can choose to use one of the open-source clients like WinSCP, PuTTY, or PSFTP, or any other third party application that supports these protocols. An SFTP connection is similar to a standard FTP connection but uses a secure communications tunnel. On a Windows computer connected to the network that includes the ipBTS C30, open a command prompt session. Examples in this guide use the PSFTP client. Type **`PSFTP IP.ADDRESS`** to open the connection.

  The ADCC software has an SFTP server that is used to transfer the release to the ipBTS system.
- Terminal emulation software, such as HyperTerminal installed on the laptop.
- The technician must configure the IP address of the laptop Ethernet NIC.

  IP must be configured on the laptop Ethernet NIC and on the ADCC Ethernet port in order to use SFTP to transfer the software release from the laptop to the ADCC.

- The new software release.

CLI connection

The command line interface (CLI) enables text-based, command-oriented management of the ipBTS. You can access the CLI in three ways:

Connecting to the serial port

This is a direct connection to the serial port on the ADCC control card. This is the simplest form of CLI connection. It is only available when you are local to the serial port. This form of CLI connection is required during initial phases of commissioning. For example, you must use a CLI serial connection to set the Ethernet IP address if you then want to SSH using the Ethernet ports.

The CLI/serial connection is made by connecting a laptop running terminal emulation software to the serial port on the ADCC module.

You can only have a single serial connection to a ipBTS C30 when using a serial port. The serial connection requires a cable to link the serial port on the network element to a serial port (typically a COM port) on a laptop or other device. Launch a terminal emulation program on the laptop (such as HyperTerminal) and configure the communications settings appropriately.

SSH using Ethernet port

This connection mode uses a laptop's Ethernet adapter to connect to the Ethernet port on the ADCC module. Configure the IP address on the laptop attached to the Ethernet port, and establish an SSH session for CLI access.

Make the CLI/SSH/ Ethernet connection by connecting an Ethernet adapter on your laptop to the Ethernet port on the ADCC module, directly using a straight through cable. You must configure appropriate IP addresses and masks on the ADCC Ethernet port (using the serial port) and on the laptop Ethernet port. Establish an SSH session and open a CLI session with the ipBTS C30 using the node IP address or the Ethernet IP address.

Because you can open multiple CLI sessions at a time using SSH, this method is required during certain phases of the commissioning procedure.

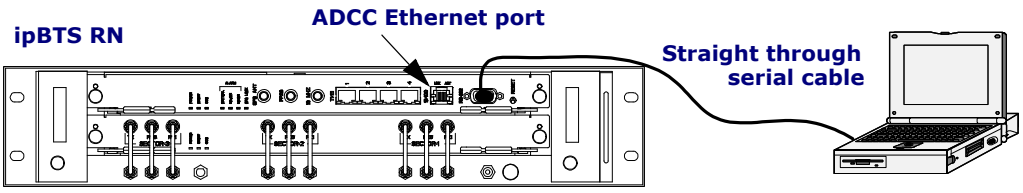


Figure 4-1. Ethernet connection

Establishing a console connection

This procedure explains how to connect the laptop's COM port to the active ADCC serial port and how to start the CLI/serial session. The ipBTS C30 must be powered on.

Requirements

This procedure requires the hardware and software shown in the table below.

Table 4-1. Required hardware

<table>
<tr><th>Component</th><th colspan="4">Function</th></tr>
<tr><td>Laptop or PC running Windows 2000 or XP, with a serial port and an Ethernet port</td><td colspan="4">Provides a physical connection to the ipBTS C30.

Note: The Ethernet port is necessary only if you are downloading software using an Ethernet connection, which is recommended.</td></tr>
<tr><td>RS-232 serial port cable, with a 9-pin DE female connector</td><td colspan="4">The RS-232 serial port cable (female to female, straight through cable) is a standard cable required to connect the laptop's serial port to the ipBTS C30's serial port.</td></tr>
<tr><td rowspan="4">Ethernet Loopback connector</td><td colspan="4">Allows you to perform Loopback tests on the Ethernet port. The wiring assignments for an Ethernet Loopback connector are shown below.

Note: The Ethernet Loopback connector is necessary only if you are testing the Ethernet port.</td></tr>
<tr><td>Pin From</td><td>Description</td><td>Pin To</td><td>Description</td></tr>
<tr><td>1</td><td>Transmit, positive</td><td>3</td><td>Receive, positive</td></tr>
<tr><td>2</td><td>Transmit, negative</td><td>6</td><td>Receive, negative</td></tr>
<tr><td>Ethernet (RJ-45) cross-over cable</td><td colspan="4">Connect your laptop's Ethernet port to the ipBTS C30's Ethernet port.

Note: The Ethernet cross-over cable is necessary only if you are downloading software using an Ethernet connection, which is recommended.</td></tr>
</table>

Table 4-2. Required software

Component	Function
Terminal emulation program, such as HyperTerminal which comes standard with Microsoft Windows	The terminal emulation program allows you to download and upload software, as well as access the CLI (command line interface).
An open-source client like WinSCP, PuTTY, or PSFTP, or any other third party application that supports these protocols.	Required to connect to modules using SFTP and SSH protocols.
Version of software that should be on the ipBTS C30	Enables you to determine if the version of software currently on the ipBTS C30 needs to be upgraded. **Note**: For more information, contact your network planner.
Commissioning script	Configures the ipBTS C30 with necessary attributes to commission the device. **Note:** The configuration script is necessary only if you are using a script to commission the device. In this guide, the Commissioning script is referred to as <*script_filename*>. For more information about the Commissioning script, contact your network planner.
ipBTS C30 software release	Enables you to download the most recent version of software to the ipBTS C30. **Note:** The software release is necessary *only* if you need to upgrade the version of software currently on the ipBTS C30. In this guide, the software release image file is referred to as <*software_image* >.*tar*. For more information about the software image, contact your network planner.

Configuration parameters

This section describes the configuration information you must have to commission the ipBTS C30. To commission the ipBTS C30, you must know the following:

- ipBTS C30's node IP address
- ipBTS C30's Ethernet port IP address
- Laptop's Ethernet port IP address

NOTE

The Ethernet port IP addresses are necessary *only* if you are downloading software using an Ethernet connection, which is recommended. For more information, contact your network planner.

Table 4-3. Configuration parameters

Object	Parameter	Description
Interfaces	*ifAdminStatus*	The desired state of the interface: up (1), down (2), or testing (3). **Note:** The testing (3) state indicates that no operational packets can be passed.
	ifPhysAddress	The address at the protocol layer immediately "below" the network layer in the protocol stack. **Note:** For interfaces that do not have such an address, for example, a serial connection, the ifPhysAddress has a length of zero (0).
SectorElements	*TimingAdvance*	The timing advance for the SectorElement. Range {0..255} with default 0.
	ControlChannelRate	The data rate of the Control Channel of the SectorElement. Range: unknown (1), 38.4 Kbps (5), 76.8 Kbps (6) with default value unknown (1).
	PNOffset	The pn offset for the SectorElement. Range: {0..511} with a default (0).
	CountryCode	The country code with which the SectorElement is associated. Range: {0..255} with a default (0).
	SubnetMaskLength	The length of the subnet mask used to extract the subnet from the sector ID. Range: {0..127} with a default (0).
	RouteUpdateRadius	The distance measured between the serving sector and the sector that triggered a new route update. Range: {0..2047} with a default (0).
	SectorIndex	The sector index number of the sector. Range {1..65535}.
	CarrierIndex	The index of the carrier object to which this SectorElement is bound. Range: {1..65535} **Note:** The value of this attribute can be changed *only* when the status of this SectorElement object is down (1).
	AdminStatus	The administrative status for the SectorElement. Range: down (1), up (2),upTest (3)

Table 4-3. Configuration parameters (continued)

Object	Parameter	Description
Sectors	*sectorIndex*	The index of the sector to which this SectorElement is bound. Range: {1..65535}. **Note:** The SectorIndex can be changed *only* when the status of this SectorElement object is down (1).
	sector Latitude North	The geographic latitude of the center of the antenna array serving the sector. Range: {-90,000 to 90,000} 1/1000 of a degree North and South of Equator. When configuring this attribute from the EMS, a negative value denotes South and positive denotes North. When configuring from the CLI, specify North or South. Default (0).
	sector Longitude East	The longitude of the center of the antenna array serving this sector. {-180,000 to 180,000} 1/1000 of a degree East and West of the Prime Meridian.When configuring this attribute from the EMS, a negative value denotes West and positive denotes East. When configuring from the CLI, specify East or West. Default (0).
Carriers	*ChannelNumber*	The channel number within the BandClass on which the carrier is to operate. The default value is (2047).
	CellRadius	The size of the cell corresponding to the SectorElement, specified in chips. Range: {0...512} with the default value (0).
	AccessCycleDuration	The access cycle duration, measured in slots. Values: (8, 16, 32, 64, 128) with the default value (64).
Modem	*Mode*	The mode of the modem. Range: unknown (1), other (2), oneCarrierOneSector (3), oneCarrierThreeSector (4), twoCarrierBiSectorOmni (5).
ipBTS C30	*OperStatus*	The operational status of the ipBTS C30. Range: unknown (1), other (2), down (3), up (4), test (5), fault (6).
	AdminStatus	The administrative status. Range: down (1), up (2), test (3).
	LastChangeTime	The last time the operational status changed.
RNC	*Priority*	The priority of the RNC. Range: {0..1000} with the default (0).

Connecting the laptop to the ipBTS C30

Follow this procedure to establish a serial connection between your laptop and the ipBTS C30.

1. Verify the ipBTS C30 is powered on. (See Table 3 on page 1-8.)
   - If the ipBTS C30 is powered on, continue with step 2.
2. Connect one end of the RS-232 serial cable to your laptop's serial port and the other end to the ipBTS C30's serial port.
3. Power on your laptop..

Downloading and activating new software

This section describes how to download software from your laptop to the ipBTS C30 using a serial connection and an Ethernet connection. Specifically, it contains the following sections:

NOTE

Downloading software over an Ethernet port is faster than downloading over a serial port. Therefore, Airvana recommends you have an Ethernet connection when downloading software.

Establishing a serial connection

This section describes how to download the new image file from your laptop to the ipBTS C30, as well as how to activate the new image file using a serial connection. Specifically, it contains the following sections:

NOTE

If you are using a serial connection and cancel the download task at any time, you must enter **<Ctrl C>** on the console three (3) times. Otherwise, the command line interface (CLI) is in a frozen state.

Downloading the new image file

Follow this procedure to download the <*software_image*>*.tar* file from your laptop to the ipBTS C30.

1. Start the HyperTerminal client.

   The HyperTerminal window shown below displays.

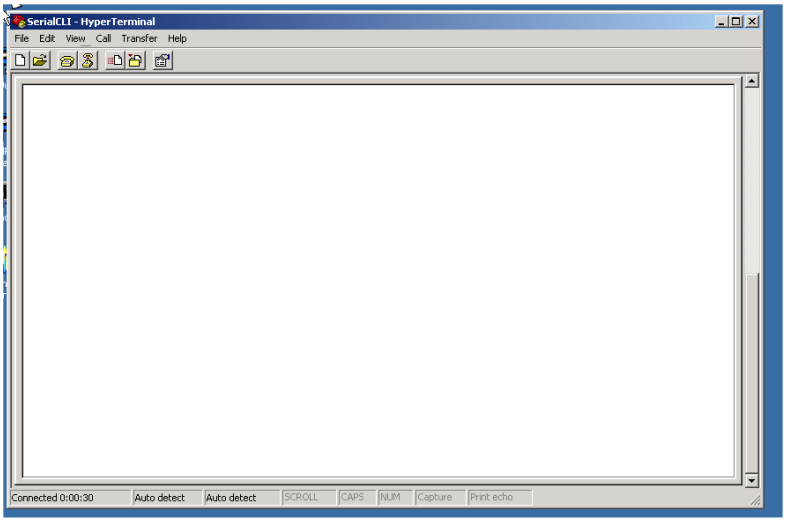


Figure 4-2. HyperTerminal window screen

2. Click the `Call` icon on the toolbar.
3. Click the `Call using` pulldown menu and select `TCP/IP (Winsock)` as the connection method.
4. Log in with the Username and `Password`.

   The `ipBts-XXX>` prompt displays.
5. At the `ipBts-XXX>` prompt, enter the following commands to transfer the new image file to the ipBTS C30:

   ```
   ipBts-XXX>shell
   ipBts-XXX(shell)(disk0:/)>cd images
   ```
6. SFTP the new image file.
7. From the `ipBts-XXX(shell)(disk0:images)>` prompt, enter the following commands:

   ```
   ipBts-XXX(shell)(disk0:images)>cd ..
   ipBts-XXX(shell)(disk0:)>exit
   ipBts-XXX>
   ```
8. Close the HyperTerminal window.

   A message displays confirming you want to disconnect.
9. Click **Yes** to disconnect or **No** to not disconnect.

Expanding and activating the new image file

Follow this procedure to expand and activate *<software_image>.tar*. This procedure assumes you have an active CLI/serial connection to the ADCC module.

1. Enter the following commands to enter Global Commissioning Mode in the CLI:

```
ipBts-XXX>enable
ipBts-XXX#
```

2. Enter the following command to reset the node using the software release you just transferred to the node:

   ```
   ipBts-XXX#activate image <release>
   ```

   Where ***<release>*** is the filename of the release that was transferred to the node.

   For example:

   ```
   ipBts-XXX#activate image rn.4.0.0.tar
   ```

   This command:

   - Extracts the rn.4.0.0.0.tar release into the disk0:/active directory
   - Reboots the node using the 4.0.0.0 release

   This step takes about four minutes to complete.

Establishing an Ethernet connection

This section describes how to transfer the new image file from your laptop to the ipBTS C30, as well as how to activate the new image file using an Ethernet connection. Specifically, it contains the following sections:

Establishing an Ethernet connection between your laptop and the ipBTS C30

Follow this procedure to establish an Ethernet connection between your laptop and the ipBTS C30.

1. Verify you have a valid serial connection.
2. Connect one end of the Ethernet cross-over cable into your laptop's Ethernet port and the other end of the Ethernet cross-over cable into the ipBTS C30's Ethernet port.
3. Configure your laptop's Ethernet port IP address/mask and the ipBTS C30's Ethernet port IP address/mask.

   NOTE: The laptop's Ethernet port IP address/mask and the ipBTS C30's Ethernet port IP address/mask *must* be on the same subnet. For example, if the ipBTS C30's Ethernet port IP address is 10.10.32.101 and mask is 255.255.255.0, then the laptop's Ethernet port IP address should be 10.10.32.102 and mask should be 255.255.255.0.

   - You configure your laptop's Ethernet port IP address using the Control Panel.

     For additional information about configuring the laptop's Ethernet port's IP address, contact your system administrator.

   - You configure the ipBTS C30's Ethernet port IP address using the CLI.

Verifying SNTP time

Follow this procedure to verify the ipBTS C30 is receiving the correct timing information from the BTS.

1. From the CLI console, enter `ipBts-XXX>` **`show sntp time`** to display the current UTC time and output similar to this:

```
Sntp Time Details - UTC

Timing Source = 10.10.50.4
Base Secs     = 3219347575 (bfe35877)
Base Nsecs    = 820540580 (30e874a4)
Base TBH      = 11 (0000000b)
Base TBL      = 3003409790 (b304657e)
Current Secs  = 3219347773 (bfe3593d)
Current Nsecs = 863521250 (337849e2)
Num Leap Secs (since 1980) = 13
Date = 2007:1:6
Time = 23:16:13.863
```

2. Verify that the date and time are correct.

Commissioning the ipBTS C30

This section describes how to configure the ipBTS C30 using the Commissioning script. Specifically, it contains the following section:

- Using the Commissioning script on page 4-11

Using the Commissioning script

Follow this procedure to configure the ipBTS C30 using the Commissioning script.

For more information about the Commissioning script, contact your network planner.

1. Download the Commissioning script from your laptop to the ipBTS C30's `disk0:/config` directory.
2. From the tool-bar, select the **CLI** button.
3. Press **<Enter>**.

   The `ipBts-XXX>` prompt displays and indicates you are in EXEC Mode.

4. Enter the following commands to enter Privileged EXEC Mode and run the Commissioning script (<*script_filename*>).

```
ipBts-XXX> enable
ipBts-XXX# copy disk0:/config/<script_filename>
system:running-config
```

- **copy** is the CLI copy command
- **disk0:/config/<*script_filename*>** specifies the source file to copy (in this case, the Commissioning script file name including the full path to the commissioning script)

  In the above example, the Commissioning script is located on **disk 0** in the **config** directory.
- **system:running-config** is the destination file

  You always specify **system:running-config** as the destination file when using the CLI copy command to run the commissioning script.

The ipBTS C30 runs the Commissioning script. When the script finished executing, the following message displays:

```
ipBts-XXX# script done
```

If the script fails to execute successfully or encounters errors, the CLI displays the appropriate error message.

5. Enter the following commands to return to EXEC Mode:

   ```
   ipBts-XXX# exit
   ipBts-XXX>
   ```

6. Close the CLI console.

Performing Loopback tests

This section describes how to run Loopback tests on the Ethernet port. Specifically, it contains the following sections:

The loopback test process

This is the process you should follow for performing loop back tests. Be sure to read and understand this material before continuing.

1. Understanding the backhaul loopback process.
2. Install external loopbacks on each backhaul cable.

   This section describes how to create and install loopback connectors on each backhaul cable.

   - For information about looping back Ethernet backhaul link(s), see Looping back Ethernet backhaul links on page 4-14
   - For information about looping back at the Ethernet port, see Looping back at the Ethernet port on page 4-15
3. Preparing for loopback tests.

   This section describes how to enter CLI diagnostic mode and configure the test parameters.

   For more information, see Entering diagnostic mode and configuring test parameters on page 4-15.
4. Running loopback tests on each backhaul.

   This section describes how to perform the loopback test for all backhaul links.

   For more information, see Performing external loopback tests on backhaul links on page 4-16.
5. Troubleshooting failed backhaul link(s).

   This section describes how to take additional steps to troubleshoot and correct any backhaul link(s) that failed the external loopback tests.

   For more information, see Troubleshooting failed backhaul links on page 4-17.
6. Removing physical loopbacks.

   This section explains the external loops at the far end of all cables must be removed once the Loopback testing is complete.

   For more information, see Removing physical loopbacks on page 4-19

Once you have reviewed and understand the Loopback test process, continue with Backhaul loopback testing.

Backhaul loopback testing

Loopback testing each backhaul link is a critical step that must be completed before the technician leaves the site. These tests ensure the node is functional, the backhaul link(s) are properly wired into the backhaul and (optionally) that the backhaul cables and any external equipment to which they attach (up to the loop back point) are operational.

NOTE

This testing does not include backhaul *circuits*, only physical layer functionality at the cell site. Backhaul *circuits* must undergo end-to-end testing and acceptance at the time they are brought up by the service provider.

The extent of the loopback test (the amount of equipment and cabling that is tested) depends on where the physical loop back is installed. The farther away from the ipBTS C30 the loopback is installed, the greater the extent of the test, although Ethernet loopbacks cannot be installed at the far side of a router, switch, FRAD, or other edge device.

NOTE

If a loopback is installed directly on the backhaul, a bare minimum is tested. For example, the backhaul cable exiting the ipBTS C30 is not tested.

Airvana recommends installing the loopback at least as far as the far end of each backhaul cable exiting the ipBTS C30. Installation at that point includes the backhaul cable's wiring into the Ethernet port and the backhaul cable itself.

Maximum cable lengths must be considered when installing loopbacks. Loopbacks double the length of a cable (the cable length now equals the outgoing leg plus the return leg, or twice the physical cable length). Failure to consider this factor can result in failed loopback tests for cables that are flawless.

The technician must have appropriate equipment and materials for installing and performing loopbacks.

Ethernet loopbacks

The Ethernet loopback test has two parts:

- Physically loopback the Ethernet
- Run the loopback test

The loopback can be done externally on the cable or on the Ethernet port by physically connecting the receive wires (RXs) to the transmit wires (TXs). The loopback can also be done internally on the hardware transceiver chip. Looping back internally on the transceiver chip only tests limited hardware functionality and does not test the cable connection or the Ethernet port. Looping back externally tests more. The Ethernet loopback test is not a standard function of Ethernet, but is a value-added proprietary feature.

Looping back Ethernet backhaul links

This section explains how to install the physical loopbacks when Ethernet backhaul links are used. Install the loopback as far as possible along the length of the Ethernet. This increases the extent of the test. You cannot loopback the Ethernet at the far side of most network devices, including switches, routers, and FRADS. However, if the Ethernet backhaul cable is connected to a patch panel (or another passive, pass-through device), you can install the loopback at the far side of it and thereby include the patch panel in the test.

Because Airvana does not specify the Ethernet cable/connector types, the details of looping back the Ethernet cables are site-dependent. Typically, Ethernet backhaul cables installed into the backhaul punch block have an RJ-45 jack at the far-end. This section provides the pin-out for the RJ-45 jack.

Physical loopbacks are created by physically connecting the positive transmit wire to the positive receive wire and connecting the negative transmit wire to the negative receive wire.


NOTE

Loopbacks must be installed on all Ethernet backhaul cables. There is one Ethernet backhaul cable on non-redundant systems; there are two on redundant systems.

1. Create the Loopback connector.
   - If the Ethernet at the point of the loopback installation has an RJ-45 connector on the far end, create a loopback connector using the pin-out in Table 4-1 on page 4-4.
   - If the Ethernet backhaul(s) have a different connector, create a loopback connector as appropriate.
2. Install the loopback connector onto the far end of each Ethernet cable.

Looping back at the Ethernet port

To install a physical loopback at the Ethernet port in preparation for running external loopback tests on Ethernet backhaul links, simply connect the loopback connector to the appropriate port.

For information about how to create Ethernet loopback connectors, see Table 4-1 on page 4-4.


NOTE

When looping back at the port, the loopback test does not test the cable wired into the port or the or backhaul cables. This is the least desirable location to install the loopback and should only be used if the other options are not available.

Entering diagnostic mode and configuring test parameters

This procedure explains how to initiate a hard reset and use the CLI to enter diagnostics mode.


NOTE

To perform Loopback tests, you must have a serial connection to the ipBTS C30.

Follow this procedure to enter diagnostics mode and configure test parameters.

1. Press the <**Enter**> key on your laptop to ensure the CLI session is active.

   The command prompt displays, which indicates the session is active.
2. Enter **`reboot`** to reboot the ipBTS C30.

   The CLI console displays the ipBTS C30's booting sequence. There is a three-second window during which you can select diagnostics mode. Prior to starting the three-second

window, the system displays a count that counts down to zero and the following message displays:

```
Press the <Esc> key followed by the Space Bar key three times
to Enter Diagnostic Mode
```

NOTE: If you do not press a key before the three-second window passes, the power on self-tests run and normal operation initiates.

3. Press the `Space Bar` key three times during the count down, to display the diagnostics banner.

   The `>ipBTS C30_SC>` prompt displays, indicating you are currently in diagnostics mode and you can now perform Loopback tests.

4. Resetting the ipBTS C30 causes a warm reboot. Enter the diagnostics mode during that countdown as you did in step 3.

Performing external loopback tests on backhaul links

Follow this procedure to perform external loopback tests on backhaul links.

NOTE

The T1/E1 ports are not supported in this release of the ipBTS.

1. Enter the following command to start the loopback test:

   `>ipBts-XXX_SC>`**`commsend <number of tests> <ports>`**

   Where:

   - <*number of tests*> specifies the number times each port is to be tested. The valid range is between (0 – 100000).
   - <*ports*> specifies the names of the ports to be tested. See Table 4-4.

Table 4-4. Backhaul links to be tested

<ports>	**Indicates the following ports to be tested**
T1	The first T1 or E1 backhaul
T2	The second T1 or E1 backhaul
T3	The third T1 or E1 backhaul
T4	The fourth T1 or E1 backhaul
FENET1	The primary Ethernet backhaul

   For example, the following command would start the loopback test for a system with two E1 backhaul links: `>ipBts-XXX_SC>`**`commsend 10 T1 T2`**

2. Evaluate the results.

After the test is complete, the following data table displays for each backhaul tested.

```
Number of Transmitted Frames : x
Number of Received Frames    : x
Number of Error Frames       : x
Frames without valid Test ID : x
Frames with invalid Data     : x
Frame Error Rate             : x
Error Counters
Rx Frame Length Violations ... x
Rx Non-octet alignment     ... x
Rx Abort Frames            ... x
Rx CRC Errors              ... x
```

- If the `Number of Received Frames` equals the `Number of Transmitted Frames`, proceed to Removing physical loopbacks on page 4-19.
- If the `Number of Received Frames` does not equal the `Number of Transmitted Frames`, or if there are any errors counted, you need to troubleshoot the backhaul. Continue with Troubleshooting failed backhaul links on page 4-17.

Troubleshooting failed backhaul links

This procedure explains how to run the internal loopback test on backhaul links that failed the external loopback test. This section also outlines what to do based on the test results: If the internal loop back passes, troubleshoot the cables and loopback devices.


NOTE

If the internal loopback fails, the node may be faulty and you should call Airvana's Technical Assistance Center.

Follow this procedure to perform basic troubleshooting on failed backhaul links.

1. If the backhaul links are T1 or E1, enter the following CLI command to specify the backhaul links you want to set to internal loopback mode:

   `>ipBts-XXX_SC>`**`mmb <port memory locations> 04`**

   Where: <***`port memory locations`***> are the backhaul links to place into internal loopback mode. See Table 4-5.

Table 4-5. Specifying backhaul links for internal loopback mode

<port memory location>	**Indicates the following ports to be set to internal loopback mode**
f500000a	The first T1 or E1 backhaul
f500010a	The second T1 or E1 backhaul
f500020a	The third T1 or E1 backhaul
f500030a	The fourth T1 or E1 backhaul

For example, the following command sets the second T1 or E1 backhaul to internal loopback mode: `>ipBts-XXX_SC>`**`mmb f500010a 04`**

2. If the backhaul links are Ethernet, enter the following CLI command:

   `>ipBts-XXX_SC>`**`poke874 fenet1 13 803c`**

3. Run the internal backhaul test on the interface(s) you have set to internal loopback mode with the following CLI command:

4. Enter the following command to start the loopback test:

   `>ipBts-XXX_SC>`**`commsend <number of tests> <ports>`**

   Where:

   - *<number of tests>* specifies the number times each port is to be tested. The valid range is between (0 – 100000).
   - *<ports>* specifies the names of the ports to be tested. See Table 4-6.

Table 4-6. Specifying backhaul links to be tested

<ports>	**Indicates the following ports to be tested**
T1	The first T1 or E1 backhaul
T2	The second T1 or E1 backhaul
T3	The third T1 or E1 backhaul
T4	The fourth T1 or E1 backhaul
FENET1	The primary Ethernet backhaul

For example, the following command would start the loopback test for a system with two E1 backhaul links: `>ipBts-XXX_SC>`**`commsend 10 T1 T2`**

5. Evaluate the results.

   After the test is complete, the following data table displays for each backhaul tested.

   ```
   Number of Transmitted Frames : x
   ```

```
Number of Received Frames    : x
Number of Error Frames       : x
Frames without valid Test ID : x
Frames with invalid Data     : x
Frame Error Rate             : x
Error Counters
Rx Frame Length Violations ... x
Rx Non-octet alignment     ... x
Rx Abort Frames            ... x
Rx CRC Errors              ... x
```

- If the `Number of Received Frames` does not equal the `Number of Transmitted Frames`, or if there are any errors counted, the node has a fault and you need to contact Airvana's Technical Assistance Center. This is the end of this procedure.
- If the `Number of Received Frames` does equal the `Number of Transmitted Frames` and there are no errors, you must troubleshoot the following:
  - the backhaul cable
  - the physical loopback installed earlier in the loopback testing process
  - the backhaul wiring into the punch block
  - any external equipment the backhaul cable is attached to, for example the DSX

6. Enter `>ipBts-XXX_SC>`**`reset`** to reset the ipBTS C30 and return to operational mode.

   The `ipBts-XXX>` prompt displays.

   Allow the ipBTS C30 to reboot to completion, skipping the diagnostic mode required for loopback testing.

Removing physical loopbacks

After Loopback testing is complete, remove all external, physical loopbacks installed earlier to restore the system to operational mode.

Failure to remove any loopbacks installed earlier results in failed backhaul links.

The Loopback testing process is also complete.

Procedure

1. Place the laptop on a secure surface.

2. Boot up the laptop.
3. Retrieve the CLI cable.
4. Check the *ACTIVE* LED to determine if the ADCC module is active
5. Connect the male DB-9 end of the serial cable to the female DB-9 port on the active ADCC module.
6. Connect the other end of the serial cable to the COM port of the laptop.
7. Launch the terminal emulation program.

   You can use HyperTerminal, which comes with windows, or any terminal emulation program of your choice.
8. Open a terminal connection as appropriate for the terminal emulation software.
9. Set the terminal connection parameters to those shown in Table 4-7.

Table 4-7. Terminal settings for CLI/serial connection

Setting	Value
Terminal emulation type	VT220 or VT100
Bits per second (BAUD)	38400
Data bits	8
Parity	None
Stop bits	1
Flow control	None

NOTE: If you are establishing CLI/serial connection the serial ports on the RM or TFU modules, you must set the Bits per second to 115200.

10. Press **<ENTER>** on the laptop.

    The CLI command prompt displays as follows:

    ```
    ipBts-XXX>
    ```

Configuring IP on the Ethernet port and laptop

This procedure explains how to configure IP addressing so that you can use SFTP to transfer a new release from the laptop Ethernet port to the node over the ADCC Ethernet port.

This procedure requires an active CLI/serial connection to the ADCC.

Procedure

1. Enter the following commands to set the IP address on the Ethernet port of the active ADCC:

```
ipBts-XXX>enable
ipBts-XXX#configure
ipBts-XXX(config)#interface ethernet1/0/1
ipBts-XXX(config-if)#ip address 10.0.0.1/24
ipBts-XXX(config-if)#no shutdown
ipBts-XXX(config-if)#exit
ipBts-XXX(config)#exit
ipBts-XXX#exit
```

   NOTE: Ethernet1/0/1 identifies the Ethernet interface on the ADCC in slot 1 as follows: The "1" indicates *this node.* The "0" indicates *slot 0, (a virtual slot)*. The final "1" indicates the *Ethernet port number.* This IP address and mask and the IP address and mask configured in the next step form a subnet. You can use any two IP addresses that are in the same subnet.

2. Enter the following IP configuration into the Ethernet network interface card (NIC) on your laptop:
   - IP address: **10.0.0.2**
   - Subnet mask: **255.255.255.0**
   - Default gateway: no default gateway is required — leave it blank.

3. Verify the connection information using the **show int** command:

```
ipBts-XXX>enable
ipBts-XXX#show int
Name            Connection IP Address  In Octets  Out Octets Admin Oper
-------------------------------------------------------------------------
ethernet1/0/1    10.40.192.222/16      169137221   7312611   Up    Up
mgmt1/0/1          0.0.0.0/0                 0         0    Down  Down
node1/0/1           10.6.190.222/32          0         0    Up    Up
```

   NOTE: Airvana does not specify the laptop operating system and cannot specify the exact steps you need to take to configure the IP information for the Ethernet NIC.

This procedure is complete. Go to Establishing the CLI/SSH/Ethernet connection on page 4-21.

Establishing the CLI/SSH/Ethernet connection

This procedure explains how to physically connect the laptop to the node through the Ethernet

Requirements

This procedure requires the following hardware:

- A cross-over RJ-45 Ethernet cable or two straight-through Ethernet RJ-45 cables and an Ethernet switch with a power supply. See Ethernet connection on page 4-4 for a connection illustration.

Procedure

1. Plug one end of your RJ-45 cable into the Ethernet port on the ADCC module.

   The *Active* LED is lit on the ADCC module.)

2. If you are using a cross-over RJ-45 cable and no Ethernet switch to connect the laptop to the node:

   a. Plug the free end of the cable into the laptop Ethernet.

   b. Skip step 3 and go to step 4.

3. If you are using two straight-through cables and an Ethernet switch to connect the laptop to the node:

   a. Connect the free end of the cable into a switch port

   b. Connect one end of the second cable into another switch port

   c. Connect the free end of the second cable into the laptop Ethernet port

   d. Power on the Ethernet switch.

   The switch LED for the Ethernet port lights indicating an operational Ethernet link.

4. On the laptop, open an SSH session to the node using the node's Ethernet IP address (or to the IP address of another Airvana device, for example the ipRNC 1610 to which this node is homed), as follows:

5. Use an SSH-enabled client (such as PuTTy shown below) to open an SSH CLI session from the PC to the ipRNC 1610, as follows:

   a. From the PC command line window, open the SSH client:

   NOTE: The following example uses a random IP address. You must use the one configured previously for the active SC module's auxiliary port.

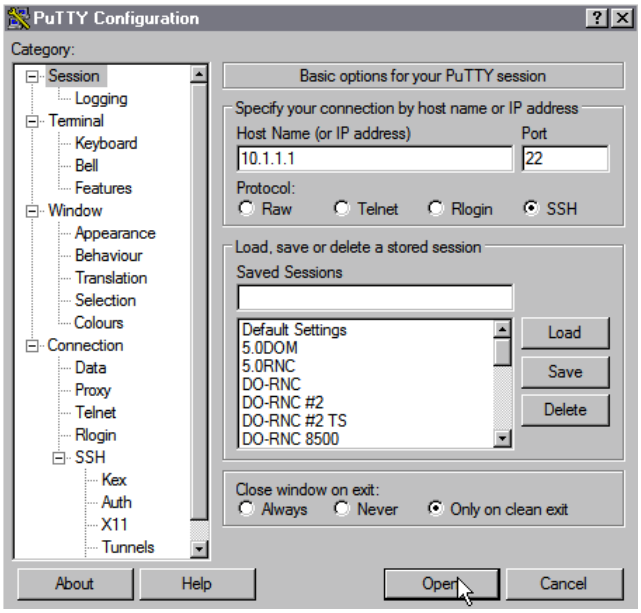


Figure 4-3. Establishing an SSH connection

The following displays indicating a CLI/SSH session is active:

```
ipBts-XXX>
```

Updating node software

This section describes how to verify the node's software version and, if necessary, update the software.

Verifying the current release and free disk space

The following procedure shows you how to use the CLI to verify the currently active software release on the node, how to verify the amount of free disk space on the node, and how to remove files if more free space is needed before transferring a new release to the node. The procedure assumes that you have an active CLI session.

If there is no need to update the node's software release the ipBTS commissioning is complete.

NOTE

The node's software release can be updated later from a centralized network location using the ipBTS C30 user interface or the CLI through an SSH session.

Procedure

To verify the current software version and check for free disk space, do the following:

1. Enter the **`show version`** command as follows:

   ```
   ipBts-XXX>show version
   ```

   The CLI output displays the currently executing release. Make note of whether you need to update the release.

2. Use the **`shell`** command to enter the CLI shell as follows:

   ```
   ipBts-XXX#shell
   The following prompt displays:
   ipBts-XXX(shell)(disk0:/)>
   ```

3. Enter the **`ls`** command to check how much free space there is on the node's disk as follows:

   ```
   ipBts-XXX(shell)(disk0:/)>ls
   The following displays with data values as appropriate for the
   node. Note the "Free MBytes" at the bottom. This indicates the
   amount of free space on the disk.
   size       date   time  name
   ---------- ------ ----- ---------------
        32768 May 23 14:43 active/
        32768 May 23 14:18 images/
          511 May 15 15:23 config.bin
        32768 May 23 14:49 logs/
        32768 May 20 12:56 backup/
        32768 Apr 10 07:52 dcbackup/
       524288 May 13 21:18 leofs
       Free MBytes  38136
   ```

4. If there is less than 30 Mbytes free, use the **`xrm`** command as follows to delete all files in the disk0:/images directory:

   ```
   ipBts-XXX(shell)(disk0:/)>xrm images
   The following displays, indicating the files being deleted from the
   c:\images directory.
   deleting file images/rn8500.2.0.0.tar
   deleting file images/version.txt
   ...
   ```

   Re-verify that enough space is available on the disk

5. Enter the **`exit`** command to leave the shell and return to the normal CLI prompt.

   ```
   The following prompt displays:
   ipBts-XXX#
   ```

This procedure is complete.

Transferring software from the laptop to the node

The following procedure explains how to use SFTP to transfer the new software release from the laptop to the node over the IP/Ethernet connection. The software release must be on the laptop.

Requirements

You must establish a CLI/SSH/Ethernet connection from the laptop to the node of the ADCC Ethernet port.

See Establishing an Ethernet connection between your laptop and the ipBTS C30 on page 4-10

Procedure

To transfer software from the laptop to the node, do the following:

1. On the laptop, open a command line window:
   a. Select **Start** > **Run**
   b. Type **cmd** in the text box
   c. Click the **OK** button

   The command line application window opens and the command prompt displays as follows:

   ```
   C:\>
   ```
2. Launch the Windows SFTP client in the command line window by entering the following

   ```
   C:\>psftp 10.0.0.1
   ```

   The following displays:

   ```
   Connected to 10.0.0.1:
   220 VxWorks (5.4) SFTP server ready
   User (<IP ADDRESS):(none)):
   ```
3. Press the **<ENTER>** key.

   The following displays:

   ```
   Password required:
   ```
4. Press the **<Enter>** key.

   The following displays:

   ```
   sftp>
   ```
5. Enter the following to enable hash mark printing.

   ```
   sftp>hash
   ```
6. Enter the following to change the FTP directory on the node to the *images* directory:

   ```
   sftp>cd images
   ```

   The following displays:

   ```
   sftp>Hash mark printing On  sftp: (2048 bytes/hash mark).
   ```


NOTE

SFTP outputs a number sign (#) to the DOS SFTP command prompt for every 2048 bytes transferred. This enables you to watch the progress of the file transfer.

7. Enter the following to change the SFTP file transfer mode to **binary**:

   `sftp>`**`binary`**

   You are now ready to transfer the software release from the laptop to the node.

8. Enter the following to transfer the release from the laptop to the node disk0:/images directory:

   `sftp>`**`put <path and release filename>`**

   Where <path and release filename> is the complete path and filename for the release on your laptop.

   For example, if the release is in the c:\releases\skyBTSRN\ directory and if the release filename is rn.4.0.0.tar, enter the following

   `sftp>`**`put c:\releases\`**`skyBTSRN`**`\rn.4.0.0.tar`**

   SFTP displays a long series of hash marks `("###########...)` indicating the file transfer is progressing.

   The following displays to indicate a successful file transfer:

   ```
   (line #): Transfer completed
   ```

   The release is now on the node in the following directory: disk0:/images

Go to Activating the new release.

Activating the new release

Follow this procedure to use the activate command to make the transferred software the current active release. This procedure assumes you have an active CLI/serial connection to the ADCC module.

1. Enter the following commands to enter Global Commissioning Mode in the CLI:

   `ipBts-XXX>`**`enable`**

   `ipBts-XXX#`

2. Enter the following command to reset the node using the software release you just transferred to the node:

   `ipBts-XXX#`**`activate image <`*`release`*`>`**

   Where ***<release>*** is the filename of the release that was transferred to the node.

   For example:

   `ipBts-XXX#`**`activate image rn.4.0.0.tar`**

   This command:

   - Extracts the rn.4.0.0.0.tar release into the disk0:/active directory

- Reboots the node using the 4.0.0.0 release

This step takes about four minutes to complete.


NOTE

If you also need to update the boot code, add the **`updateboot`** switch to the command as follows: **`activate image <release>`**.

The ipBTS C30 commissioning process is complete.

Chapter 5

RN hardware components

This chapter describes the components and shelf-mounted modules that make up the ipBTS C30 and provides an illustration of each module in the system.

An ipBTS system can be configured to support three sector Radio Kits and requires one shelf for a three sector system. A shelf is a standard 2U, 19-inch TELCO universal server rack, or similar cabinet. This chapter contains the following sections:

RN shelf components

All components in the ipBTS RN shelf are Field Replaceable Units (FRUs). This section describes the functions of each module.

ADCC module

The ADCC is the 1xEvDO Channel Card in the ipBTS C30 system. One ADCC module controls three radio sectors and is responsible for the following functions:

- System Controller
- Timing
- 1xEvDO Modem
- Power conditioning and power supply

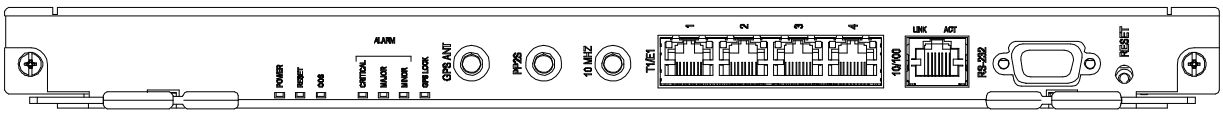


Figure 5-1. ADCC module

Radio module

The Radio Module (Figure 5-2) for three sectors is contained in the ipBTS C30 RN chassis.

The Radio Module main functions are:

- Modulation of the RF signal provided by the ADCC (I/Q baseband signals), amplification and emission.
- Two-way diversity reception and amplification of the RF signal, demodulation to I/Q baseband signals and provided to the ADCC.

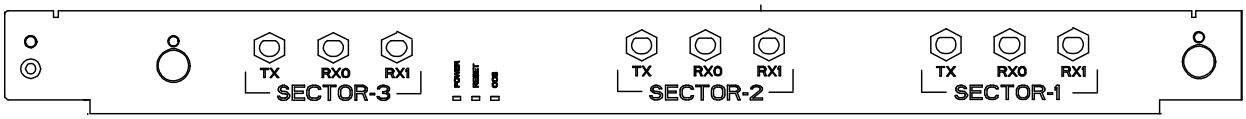


Figure 5-2. Radio module

Fan trays

The ipBTS contains two redundant cooling fan trays which are part of the RN chassis assembly. Fay trays are field replaceable. A fan cover (shown in Figure 5-3) protects the front of the fan tray assembly and can be removed to replace a fan by loosening the captive screws.

See Module locking latch detail on page B-3 for replacement instructions.

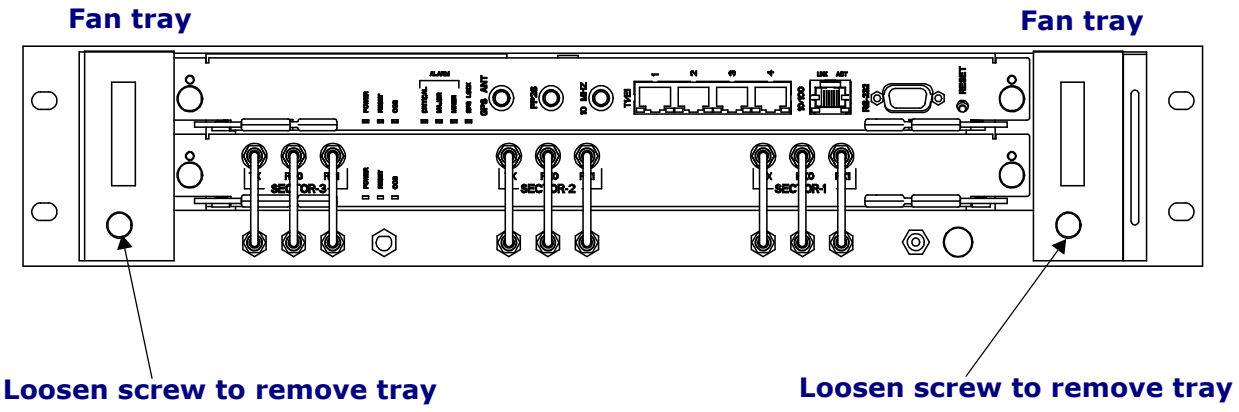


Figure 5-3. Fan tray locations

Air filter

The chassis contains a replaceable air filter (Figure 5-4) on the right side of the shelf. The air filter, in conjunction with the fan tray modules, continuously clears the air circulating through the RN shelf of dust and other contaminants that could interfere with the proper operation of the RN shelf modules.

The air filter should be inspected and, if necessary, replaced at least every six months. See Replacing the air filter on page B-5 for replacement instructions.

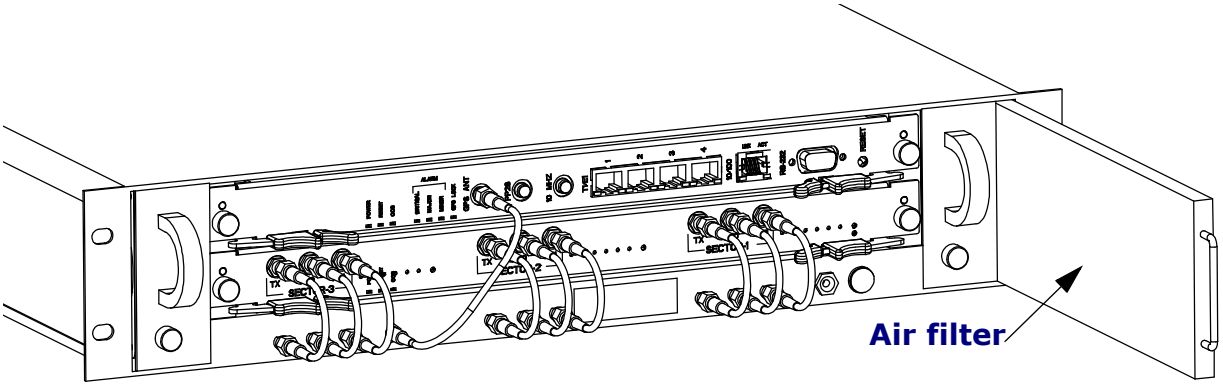


Figure 5-4. Air filter location

Appendix A

RN Specifications

This appendix provides specifications for the ipBTS. It contains the following sections:

Physical and environmental specifications

Table A-1describes the ipBTS physical and environmental requirements.

Table A-1. Physical and environmental specifications

Specification	Description	
Weight	Maximum weight	35 lbs. (15.8 kg)
Dimensions of chassis	Height	3.5 in. (8.8 cm)
	Width	17.5 in. (44.5 cm)
	Depth	18.5 in.s (47 cm)
Operating temperature range	Normal	5°C to 40°C
	Short term	-5°C to 50°C
Relative humidity	Normal	5% to 85%
	Short term	5% to 90%

Table A-1. Physical and environmental specifications (continued)

Specification	Description	
Ratings	UL	UL 1950 (UL60950), UL94.V-1, UL94.VW-1
Altitude	Maximum	6,000 feet (1,800 meters). At altitudes between 6,000 feet (1,829 m) and 12,000 feet (3,658 m), the specified upper limit for operational temperature (+40 degrees C) is reduced by 2 degrees C every 1,000 feet.

Power specifications

Table A-2 describes the ipBTS power requirements.

Table A-2. Power specifications

Specification	Description
Nominal DC Input Voltage	-48 VDC
DC Input Operating Range	-40 VDC to -57 VDC
Typical Input Current at -48 VDC	3A
Maximum Input Current at -48 VDC	5A

Input power interfaces

Table A-3 shows the supported input power connections.

Table A-3. Input power interfaces

Terminal	Function
-48VDC-A	Input Power, -48VDC. Input Power Feed A
-48RTN-A	Input Power, -48VDC Return. Input Power Feed A
-48VDC-B	Input Power, -48VDC. Input Power Feed B
-48RTN-B	Input Power, -48VDC Return. Input Power Feed B

Module physical specifications

Table A-4 describes individual ipBTS module dimensions and weights.

Table A-4. Module specifications

Module	Specifications	
ADCC module	Weight	5.6 lbs (2.5 kg)
	Height	17.5 inches (444.5 mm)
	Length	15.0 inches (381 mm)
	Depth	1.2 inches (30.48 mm)
RM (Radio Module)	Weight	5.6 lbs (2.5 kg)
	Height	17.5 inches (444.5 mm)
	Length	15.0 inches (381 mm)
	Depth	3.8 inches (96.52 mm)

ADCC connector specifications

Table A-6, Table A-6, and Table A-7 provide the provide the specifications and pin out assignments for the GPS antenna, RJ-48C and RJ-45 100BaseT connectors located on the front of the ADCC module.

Table A-5. GPS antenna specifications

Function	Specification
Frequency	1.57542 GHz (L1)
Impedance	50 ohms
Input level	-135 dBm and -115 dBm as measured with 50 ohms
DC power supplied to GPS antenna using the center conduit	+5VDC, +/- 0.1VDC, 25 mA maximum

NOTE

The T1/E1 ports are not supported in this release of the ipBTS.

Table A-6. T1/E1 connector pin assignments

Pin	Function	I/O
1	RX- (Ring)	I
2	RX+ (Tip)	I
3	N/C	
4	TX- (Ring)	0
5	TX+ (Tip)	O
6	N/C	
7	N/C	
8	N/C	

Table A-7. 100BaseT connector pin assignments

Pin	Function	I/O
1	TX+	O
2	TX-	O
3	RX+	I
4	N/C	
5	N/C	
6	RX-	I
7	N/C	
8	N/C	

ADCC craft port interface

Each ADCC module contains an RS-232 craft port operating at a 38400 kbps baud rate and configured for 8-bit data, 1-bit stop, no parity and no flow control. A DB-9 receptacle connector at the bottom of the front panel has the pin assignments shown in Table A-8.

Table A-8 Craft port interface pin assignments

Pin	Function	I/O
1	N/C	
2	TX	O
3	RX	I
4	N/C	
5	GND	
6	N/C	
7	N/C	
8	N/C	
9	N/C	

Radio module specifications

The radio module supports one transmit (Tx) and four receive (Rx) antenna interfaces to support two-way diversity for each radio sector. All antenna connectors are located on the ADCC module and use N-type connectors.

NOTE

The ipBTS does not include integral lightning or surge arrestors. Lightning/surge arrestors are assumed to be part of the external network.

Appendix B

Hot-swapping ipBTS hardware

This appendix describes how to replace a failed component in the field. The ipBTS contains the following hot-swappable and Field Replaceable Units (FRUs):

- RN shelf components:
  - Radio module
  - Fan Trays
  - Air filter

The ADCC module is also FRU but replacing the module causes a service disruption:

Specifically this appendix includes the following information:

Replacing a Radio module

Use this procedure to replace a radio module in an ipBTS C30 shelf.

Tools required

To replace a radio module you will need the following tools:

- #2 phillips-head screwdriver
- Torque wrench with appropriate N-connector attachment for RF cables
- Torque wrench with appropriate SMA connector attachment for SMA cables

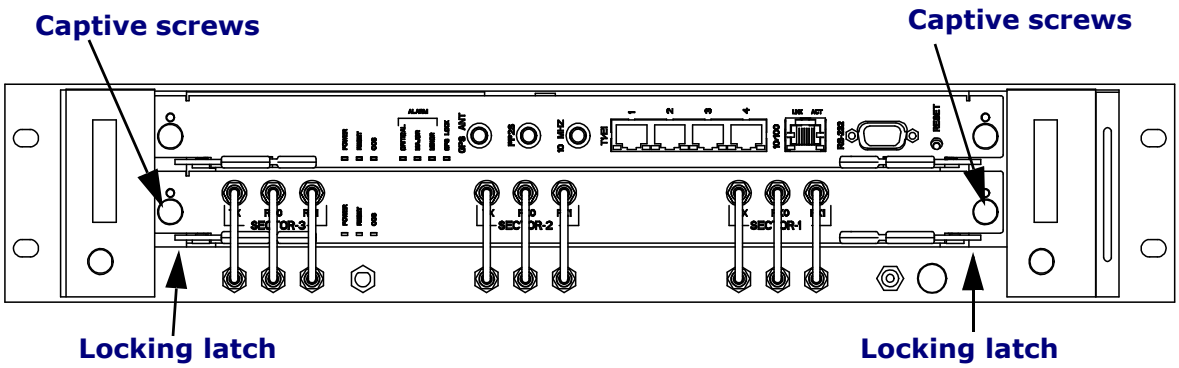


Figure B-1. Radio module replacement

Replacement procedure

1. Disconnect all RF sector cables.
2. Use the #1 phillips-head screwdriver to fully loosen the captive screws on both sides of the radio module (see Figure B-1).
3. Pinch the locking latches (Figure B-2) at the left and right sides of the module with your thumbs and forefingers. Pull both latches out to pop the module away from the RN shelf backplane.
4. Carefully slide the module out and put it aside.
5. Remove the new radio module from its protective electrostatic bag and verify that the pins located on the rear of the module are straight and have not been damaged in shipping.
6. Insert the radio module in the RN shelf slot and push in until the locking latches meet the frame.
7. Pinch the locking latches with your thumbs and forefingers so that you can engage the latches with the frame. Push both latches in until the connector engages the backplane and the locking latches close securely.
8. Use a phillips head screwdriver to engage and tighten the captive screws on both sides to hold the radio module in place.
9. Re-attach the RF sector cables.
10. Use the torque wrench to tighten each connector to 1 N-m (9 in-lbs)
11. Follow the procedure RMA process on page B-7 to return the failed module to the Airvana factory for repair or replacement.

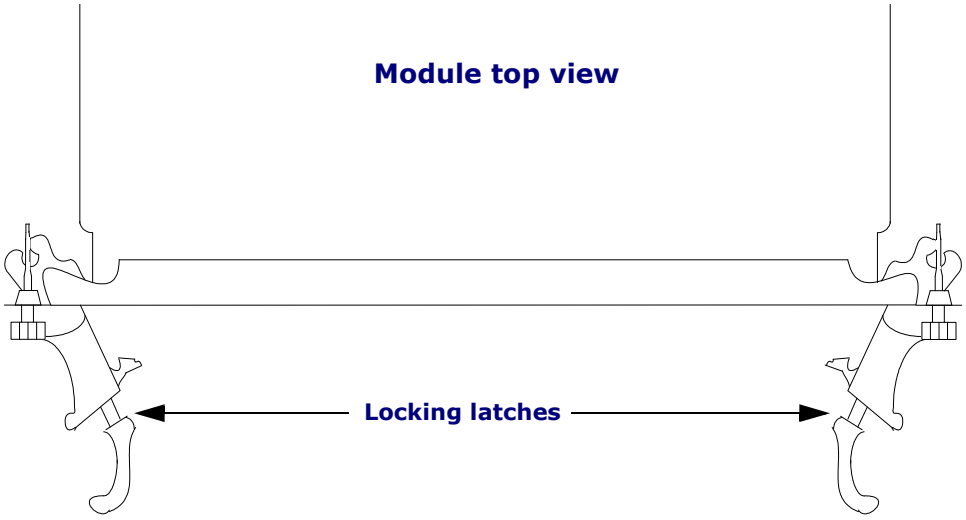


Figure B-2. Module locking latch detail

Replacing an ADCC module

Use this procedure to replace an ADCC module in an ipBTS C30 shelf.

CAUTION

Replacing an ADCC module causes service disruption. Perform this procedure during a maintenance window.

Tools required

To replace a radio module you will need the following tools:

- #1 phillips-head screwdriver
- SMA torque wrench

Procedure

To replace an ADCC card, do the following:

1. Use the #1 phillips-head screwdriver to fully loosen the captive screws on both sides of the ADCC module (see Figure B-1).
2. Pinch the locking latches (Figure B-2) at the left and right sides of the module with your thumbs and forefingers. Pull both latches out to pop the module away from the RN shelf backplane.
3. Carefully slide the module out and put it aside.

4. Remove the new radio module from its protective electrostatic bag and verify that the pins located on the rear of the module are straight and have not been damaged in shipping.
5. Insert the radio module in the ipBTS chassis slot and push in until the locking latches meet the frame.
6. Pinch the locking latches with your thumbs and forefingers so that you can engage the latches with the frame. Push both latches in until the connector engages the backplane and the locking latches close securely.
7. Use a phillips head screwdriver to engage and tighten the captive screws at top and bottom to hold the radio module in place.
8. Follow the procedure RMA process on page B-7 to return the failed module to the Airvana factory for repair or replacement.

Replacing a fan in the RN shelf

If a fan fails in the RN shelf the remaining two fans will go to full power to maintain positive air flow through the RN shelf.

Tools required

- #1 phillips-head screwdriver

Procedure

To replace a fan module, follow this procedure:

Replacement procedure

1. Use a phillips-head screwdriver to loosen the captive screw (see Figure B-3) on the fan tray cover.
2. Grasp the fan tray handle and pull the unit straight out of the tray.
3. Slide the new unit into the open slot in the fan tray and push it back until it engages the power supply in the back of the tray and the latch swings up to close.
4. Tighten the captive screw.
5. Follow the procedure RMA process on page B-7 to return the failed fan to the Airvana factory for repair or replacement.

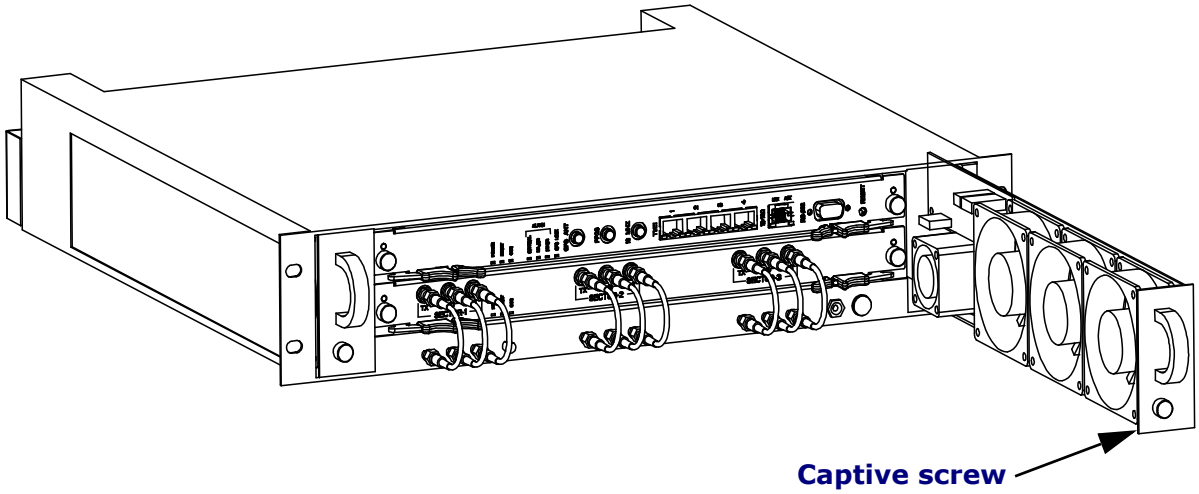


Figure B-3. Replacing a fan tray

Replacing the air filter

The air filter in the main filter rack is located at the bottom of the RN shelf. The filter should be inspected frequently and either cleaned or replaced to maintain a positive cool air flow through the RN shelf.

Tools required

To replace the air filter you will need the following tools:

- #1 phillips-head screwdriver

To inspect and clean or replace the air filter refer to Figure B-4 as you follow this procedure:

Procedure

1. Grasp the air filter handle with your fingers and pull the filter straight out to remove it from the metal channel holding it in place.
2. Inspect it for dirt and debris. Replace or clean the filter, as appropriate.

   To replace the filter:

3. Insert a new filter so that the back seats securely in the channel in the back of the RN shelf.

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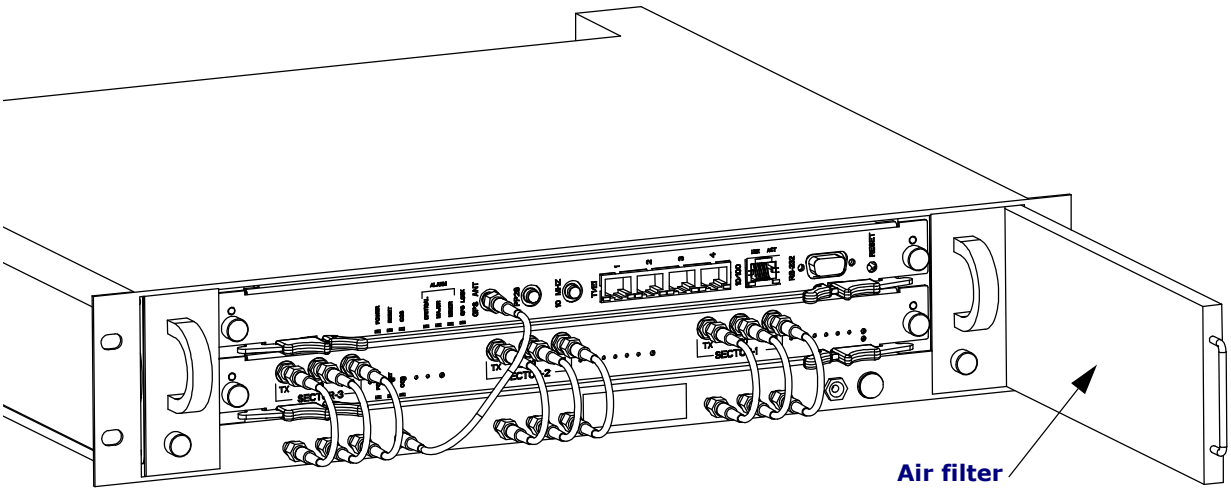

Figure B-4. Replacing an air filter

RMA process

The Return Materials Authorization (RMA) process provides the approved way to return FRU modules that have failed or have been damaged in shipping. To return a defective or damaged ipBTS FRU module follow these steps:

1. Contact your Airvana customer support representative to request an RMA.
2. Customer support troubleshoots the issue to determine whether it is a hardware or software issue.

   If it is a hardware issue the customer support representative processes the RMA order.

   The RMA order includes:

   - Customer/Operator
   - Service Requisition number
   - RMA order number
   - Serial number of the hardware
   - Return type (advanced replacement, like-for-like replacement, or same-for-same replacement)
   - Warranty information
   - Root cause analysis, if available
3. Customer returns the hardware which is repaired or replaced and returned based on the terms of their service contract.

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