Hitachi MCPA Series

1900 MHz 90-Watt Amplifier Product Manual

80088-CST-000-00d
January 29, 2009

HITACHI
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FCC Compliance

Hitachi wireless devices comply with Parts 15, 22, and 24 of the FCC Rules. Operation is subject to the following two conditions:

- this device may not cause harmful interference, and
- this device must accept any interference received, including interference that may cause undesired operation.

These devices comply with the limits for a Class A digital device in accordance with Part 15 of the FCC Rules. The limits stated in Part 15, Class A, of the FCC Rules are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, which may cause harmful interference to radio communications if not installed and operated as described in its associated documentation. Operating these devices in a residential area is likely to cause harmful interference, in which case the user is required to correct the interference at his own expense.

Note: Install the Multi-Carrier Power Amplifier (MCPA) in restricted access areas (dedicated equipment rooms, equipment closets, or the like) in accordance with articles 110-16, 110-17, and 110-18 of the National Electric Code; ANSI/NFPA 70.

Any changes or modifications to the equipment or its enclosure must be expressly approved by Hitachi Telecom (USA), Inc. Otherwise, the user's authority to operate this equipment may be voided by the FCC.

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 This edition (80088-CST-000-00d for Release 1.0, January 29, 2009) replaces previously dated versions of this document.

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Trademarks

MCPA 1900 MHz 90 Watt MCPA
Product Manual

80088-CST-000-00d
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Revision History

The following table identifies the history of revisions to this document, the MCPA 1900 MHz 90 Watt MCPA Product Manual (80088-CST-000-00d).

Revision Date	Revision Level	For Product Release	Summary of Changes
February 2008	a	1.0	Initial draft for 19-inch rack
February 2008	b	1.0	Updated content from HIKE
January 6, 2009	a	1.0	Initial draft
January 7, 2009	b	1.0	Removed configuration-specific information
January 13, 2009	c	1.0	Added new graphic, removed 850 MHz, moved COM port info to pragmatic location

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PREFACE

Please read this Preface to learn important information about using this document and the product(s) that it describes. The Preface contains general information about this document as well as important safety notices.

Contents

Topics covered in the Preface include: Page

About this Document

This section provides some general information that you need to know when using this document.

Purpose

This document describes the Multi-Carrier Power Amplifier (MCPA) module.

Intended audience

This document is intended for individuals involved in the operations of the Multi-Carrier Power Amplifier (MCPA).

How this document is organized

The following table summarizes the organization of this document:

Chapter	Description
Preface	Information about this document: its purpose, intended audiences, and organization
1	An introduction to the MCPA Amplifier module
2	Materals, tools, and equipment needed for the MCPA Amplifier module
3	Procedures for installing the MCPA Monitor software
4	Procedures for replacing MCPA Amplifier parts
5	Procedures for troubleshooting the MCPA Amplifier
7	Systems alarms on the MCPA Amplifier module
Appendix A	Technical specifications
Appendix B	Repair and Return Procedures
Glossary	Definitions of terms used in this document
Index	An index of the information in this document

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- Document name
- Document date
- Page number
- Brief description of the content, noting whether you noticed step-by-step instructions that are inaccurate, information that requires clarification or more details, etc.
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Please send e-mail messages to documentation_mgr@hitel.com. This e-mail address is only for documentation feedback. If you have a technical question, please contact Technical Support as described in “Technical support” on page xv.

A Word about Safety Notices

This section describes how different types of safety notices are presented in this document.

IMPORTANT!

Comply with all danger, warning, and caution statements in this document.

Hazardous conditions

This document includes safety notices that emphasize the potential for these hazardous conditions:

- Danger
- Warning
- Caution

The hazards typically involve situations where installers handle:

- Electrical power
- Circuit packs

Danger message

Danger messages indicate you are in the presence of a hazard that *will* cause death or severe personal injury if the hazard is not avoided. This document uses the following format to indicate **Danger** messages:

DANGER!

Text describing the hazardous condition.

Warning message

Warning messages indicate that you are in the presence of a hazard that may cause death or severe personal injury if the hazard is not avoided. This document uses the following format to indicate **Warning** messages:

WARNING!

Text describing the hazardous condition.

Caution message

Caution messages indicate the presence of a hazard that may cause personal injury or property damage if the hazard is not avoided. Property damage includes:

- Equipment damage or malfunction
- Loss of software or data
- Service interruption

This document uses the following format to indicate **Caution** messages:

⚠ CAUTION!

Text describing the hazardous condition.

Important message

Important messages indicate information that is important to the successful and/or efficient operation of the product, including:

- Settings for the hardware or software to avoid conflict with other devices
- Configuration information to ensure maximum efficiency
- Reminders to verify that vital prerequisite processes have been completed

This document uses the following format to indicate **Important** messages:

⚠ IMPORTANT!

Text describing necessary information.

IMPORTANT SAFETY NOTICES

This section contains important information about safely operating the MCPA.

⚠ IMPORTANT!

Before installing, operating, or maintaining the MCPA, please read this entire document carefully. Safe and efficient use of your MCPA depends upon careful reading of this document. Be sure to carefully follow all instructions that accompany this product. Pay particular attention to safety statements, and keep this document for future reference.

General safety instructions

When handling equipment described in this document, adhere to the following safety instructions, and follow all warnings and instructions marked on the product.

⚠ CAUTION!

Prevent equipment damage or malfunction by adhering to the following instructions:

- Do not attempt to perform any repairs on this equipment. Only technicians who have been professionally trained on this equipment are qualified to perform such operations.
- Disassembling or modifying this product except as described in procedures provided by Hitachi voids the product warranty.
- Do not place this product on an unstable or inclined surface.
- Do not place or use a magnet or any type of magnetic device on or near this equipment. Magnetic and static devices can affect the operation of this equipment.
- Do not expose this equipment to liquid, moisture, or oily vapor of any kind, under any circumstance.
- Check that all fuses and circuit breakers used with this equipment meet the voltage, current, and power specifications provided in this document.
- The MCPA may not work properly if you use insufficient torque on it. Excess torque may damage the product. For torque requirements, see Table 2-4, “Torque settings for connectors and screws,” on page 2-8.

continued...

General safety instructions, continued

⚠ WARNING!

Improper handling or placement of this product may cause a fire or electrical hazard or other personal injury risks. Avoid risk of personal injury by adhering to the following instructions:

- Do not place this product in an enclosure, except as provided in the installation instructions. This product requires adequate ventilation to avoid overheating and risk of fire.
- Do not block or cover the slots or openings in the product.
- Do not place anything on top of the product.
- Do not place this product in direct sunlight or in a high temperature area unless it is in the provided enclosure.
- Depending on the lifting and weight restrictions at your workplace, installing or replacing the MCPA in the rack may require the use of lifting equipment and/or the efforts of more than one person. Refer to your company's guidelines.
- To avoid possible damage to the MCPA due to condensation, do not apply power to the MCPA until after it has been in its operating environment without power for a minimum of 30 minutes prior to applying power.
- Check that all fuses and circuit breakers used with this equipment meet the voltage, current, and power specifications provided in this document.

⚠ DANGER!

Opening or removing covers and/or circuit packs may expose you to dangerous voltages. Avoid the risk of electric shock or damage to electrical components by adhering to the following instructions:

- Use extreme caution whenever applying or removing DC power. When removing DC power, the cable has a residual DC charge that could arc, which could cause electrocution and/or death. Follow your company's safety practices for handling DC voltage.
- While installing this product, make sure that the product is disconnected from its power source. Before applying power, check that the ground is properly connected to the unit.
- If using a 7/16 DIN-type to N-type adapter, only disconnect the adapter when the RF power is off to avoid electrical arcing, physical injury, and/or damage to the equipment.
- If your hands are wet, do *not* touch the power terminal board or any power wires.
- Do not power this equipment from any power source other than the type that is indicated on the product labels.
- Do not insert any object through any slots or holes in the equipment or enclosure.
- Remove power at the main breaker before performing any work on this product.
- Remain aware of the hazards involved when working with electrical and RF circuitry and be sure to follow standard practices for preventing accidents.

Industry Canada application notice

The Manufacturer's rated output power of this equipment is for single carrier operation.

⚠ CAUTION!

For situations when multiple carrier signals are present, the rating would have to be reduced by 3.5 dB, especially where the output signal is re-radiated and can cause interference to adjacent band users. This power reduction is to be by means of input power or gain reduction and not by an attenuator at the output of the device.

When the MCPA requires service

Only service personnel trained to install and remove this equipment are authorized to move this product to a different location. All service must be performed by trained personnel only.

- Covers for this product can only be removed by trained service personnel.

Disassembling or modifying this product except as described in procedures provided by Hitachi voids the product warranty.

If service is required, contact your Field Engineer or Hitachi Technical Assistance Center (TAC) at 770-446-8836 for instructions. Service is required when any of the following circumstances occurs:

- There is damage to the equipment.
- There is smoke or odor coming from the product.
- Liquid enters the equipment.
- A heavy object falls on the equipment.
- Operation is not normal as described in these instructions.
- The equipment gets dropped or falls.

⚠ IMPORTANT

Do not return equipment for warranty or repair service until you have received proper shipping instructions from Hitachi.

Technical support

After following the procedures in this document, if the product is still not functioning properly, contact the Hitachi Technical Assistance Center (TAC) at 770-446-8836.

Cleaning instructions

Follow these guidelines when attempting to clean the equipment.

⚠ WARNING!

Improper cleaning can cause damage to the equipment. To prevent inadvertently damaging the equipment during cleaning, follow these guidelines when cleaning the equipment or in its vicinity:

- Do not use a liquid cleaner, solvent, or an aerosol cleaner.
- Use only blown air or equipment that has been specially designed for cleaning computer equipment to clean this equipment.
- Surfaces may be cleaned with a soft, dry cloth.

1 PRODUCT OVERVIEW

This chapter provides an overview of the Hitachi Multi-Carrier Power Amplifier (MCPA) and its components.

Contents

Topics covered in this chapter include: Page

Note: The first topic begins on the following page.

MCPA Overview

The Hitachi Multi-Carrier Power Amplifier (MCPA) increases the number of carriers per cell site without requiring additional feeder lines or antennas, and expands the coverage and capacity of the cell site.

MCPA module

The MCPA module boosts the combined radio signal to a high power using linearization and high-efficiency methods to maintain signal quality. The following figure shows the front of the MCPA module.

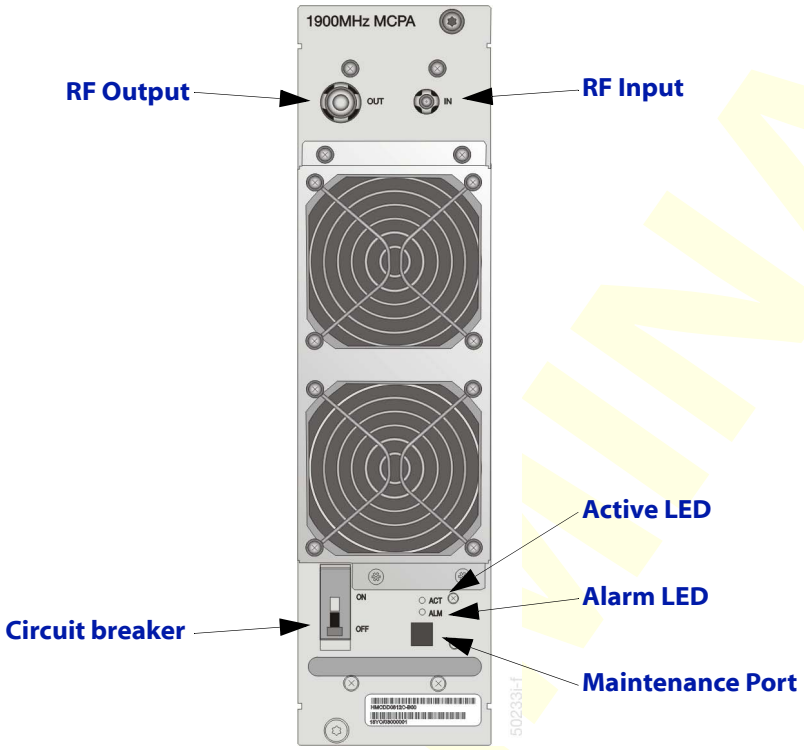


Figure 1-1: MCPA module (front)

The labels on the front of the MCPA module are described in the following table:

Table 1-1: Labels on the MCPA module faceplate

Label	Description
OUT	RF output connector (N-type Female)
IN	RF input connector (SMA-type Female)
ON OFF	Circuit Breaker • ON: Power ON • OFF: Power OFF
ACT	Active LED: Green indicates the MCPA module is active
ALM	Alarm LED: Red indicates an MCPA module alarm

continued...▶

MCPA module, continued

The following figure shows the back of the MCPA module:

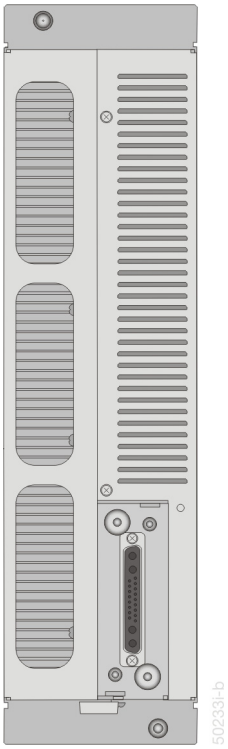


Figure 1-2: MCPA module (back)

2 EQUIPMENT REQUIREMENTS

This chapter lists the tools and equipment needed to successfully install the Hitachi Multi-Carrier Power Amplifier (MCPA).

Contents

Topics covered in this chapter include: Page

Note: The first topic begins on the following page.

Electrical Requirements

Each Amplifier module installed in the subrack requires a separate circuit. The maximum current draw of each Amplifier module is 25A @ +27 VDC (675 W).

Note: The Amplifier module circuit breaker is rated for 30A.

For DC cable requirements, refer to "AWG guidelines" on page 2-6.

Tools and Equipment

This section describes the materials, tools, equipment, and preparation work required to install an MCPA system.

⚠ IMPORTANT!

The following tables are intended to identify typical items provided by the installer or the customer. Review the scope of work, the individual site survey, and the installation plan to determine the quantity and size of each item as well as whether other items may be necessary.

Input power and grounding materials

The following table lists input and grounding materials typically required:

Table 2-1: Input power materials

Item	Description/Purpose
Input breakers from the main +27 VDC power source	30-amp breakers per installed MCPA module [a]

a. For detailed requirements, refer to "AWG guidelines" on page 2-6.

RF cable requirements

The following table shows the RF cable requirements:

Table 2-2: RF cables

Item	Description/Purpose
N-type Male hex head connector	For 1/2" Low loss RF cable. Used for connecting external equipment.
SMA connector	

Tools required

In addition to the items listed in the preceding tables, you should have a telecommunications installer's kit which includes the following items:

- Calibrated torque screwdrivers for TORX 25 screws, if required for other equipment
- Calibrated torque wrenches for RF cables (SMA-type, N-type, 7/16 DIN-type)
- Calibrated RF power meter with appropriate sensors
- High-power (500W) 30 dB attenuators
- Calibrated compression crimpers with an assortment of crimp sizes, if needed
- Calibrated voltmeter
- Safety equipment per customer requirements, such as hard hat and gloves

⚠ IMPORTANT

You should have torque wrenches that can be calibrated to the recommended torque for each type of connector.

Figure 2-1 shows the torque screwdriver and wrenches you may need for the installation.

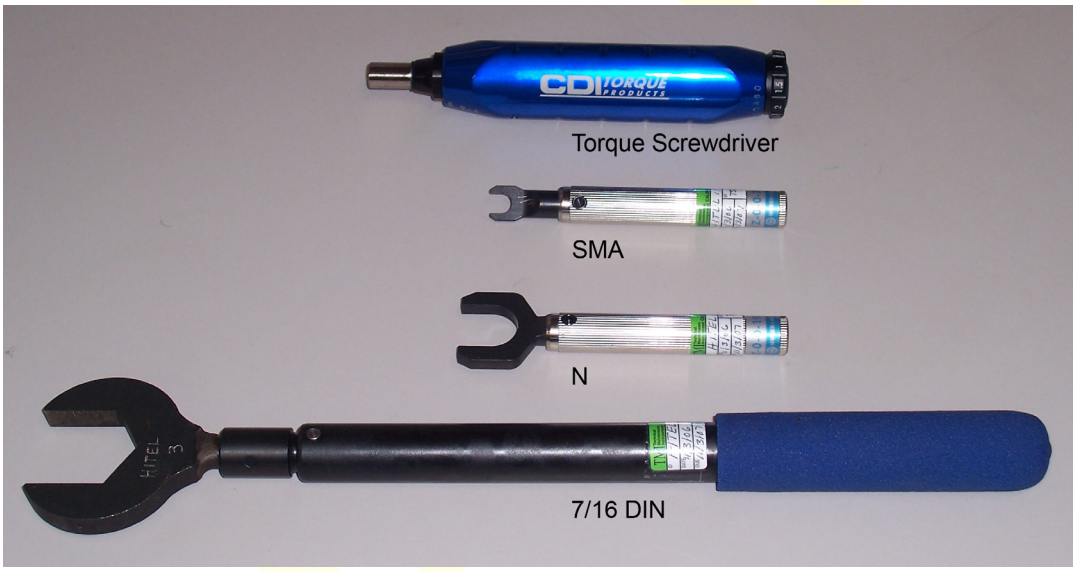


Figure 2-1: Torque screwdriver and wrenches

Torque setting guidelines for connectors and screws

The following table provides the recommended torque settings for connectors and screws when installing the MCPA equipment:

Table 2-3: Torque settings for connectors and screws

Item		Torque range
Connector type	SMA	0.5 to 0.7 N-m (4.5 to 6.0 lbf in)
	N	1.3 to 1.7 N-m (11.5 to 15 lbf in)
	7/16 DIN	25 to 30 N-m (221 to 265 lbf in), typical
Screw	T25	2.4 to 3.4 N-m (21.2 to 30.1 lbf in), typical

⚠ CAUTION!

Excess tightening can damage connectors. You can tighten the N-type RF connectors by hand. Under-tightening the connectors does not damage the product, but it may not work properly if the connectors are under tightened.

AWG guidelines

The following table provides guidelines for using the appropriate AWG cable. These guidelines are based on the distance to be covered and the voltage drop.

Note: Recommended size for frame grounding cable is 6 AWG.

Table 2-4: AWG Guidelines

AWG	1900 MHz Single MCPA module/ Sector Max. Run (Ft.)
10	5.1
8	8.1
6	13.0
4	20.5
2	32.8
1/0	52.2
Breaker Rating	30
Max Current	25

3 INSTALLING THE MCPA MONITOR

This chapter lists required system hardware and software, and provides instructions for installing the MCPA Monitor software from the CD-ROM to a Windows XP® PC.

Contents

Topics covered in this chapter include: Page

Note: The first topic begins on the following page.

System Configuration Requirements

A PC is required for connecting to a Hitachi Multi-Carrier Power Amplifier to run the MCPA Monitor software. You can only connect to one MCPA at a time. The MCPA Monitor software cannot monitor more than one MCPA concurrently.

The following software is required:

- Microsoft Windows XP® (SP-2)
  or
- Windows 2000

The following configurations are recommended:

- **Windows XP**:
  - PC: Processor clock ≥300 MHz
  - RAM: ≥128 MB
  - HDD: ≥2.1 GB
- **Windows 2000**:
  - PC: Processor clock ≥133 MHz
  - RAM: ≥64 MB
  - HDD: ≥2.1 GB

⚠ IMPORTANT!

The computer you use with the MCPA Monitor must have a DB-9 serial (RS-232) port with a logical COM port to connect to the MCPA. If your computer does not have a serial port, you can use a high-speed USB-to-serial adapter with software that creates a virtual COM port connection for the adapter, also known as a smart USB-to-RS232 adapter. Follow the manufacturer's installation instructions that accompany the device before installing the MCPA Monitor software, and be sure the adapter is connected to the same COM port each time you use it to connect to the MCPA Monitor.

Installing the MCPA Monitor

Follow these procedures to install the MCPA Monitor software.

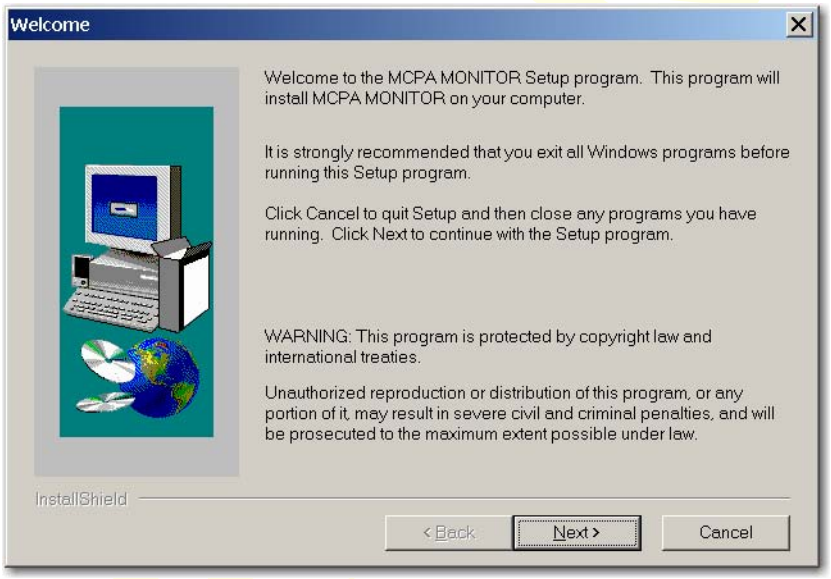
⚠ IMPORTANT!

Before you install the current release of the MCPA Monitor, you must uninstall any previous versions of the MCPA Monitor.

Using the InstallShield Wizard to install the MCPA Monitor

Perform the following steps to install the MCPA Monitor.

1. Uninstall any previous verisons of the MCPA Monitor that are on your computer.
2. If you are using a CD or other removable media to install the MCPA Monitor, insert it now.
3. Navigate to the path containing the executable (.exe) file for the MCPA Monitor (i.e., setup.exe).
4. Double-click the executable (.exe) file. InstallShield prepares the wizard to guide you through the installation. The *Welcome* window opens.



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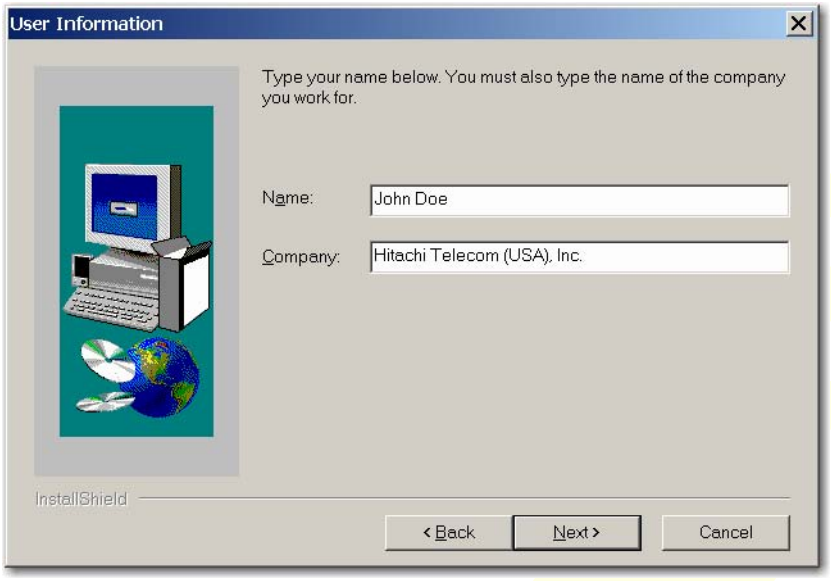
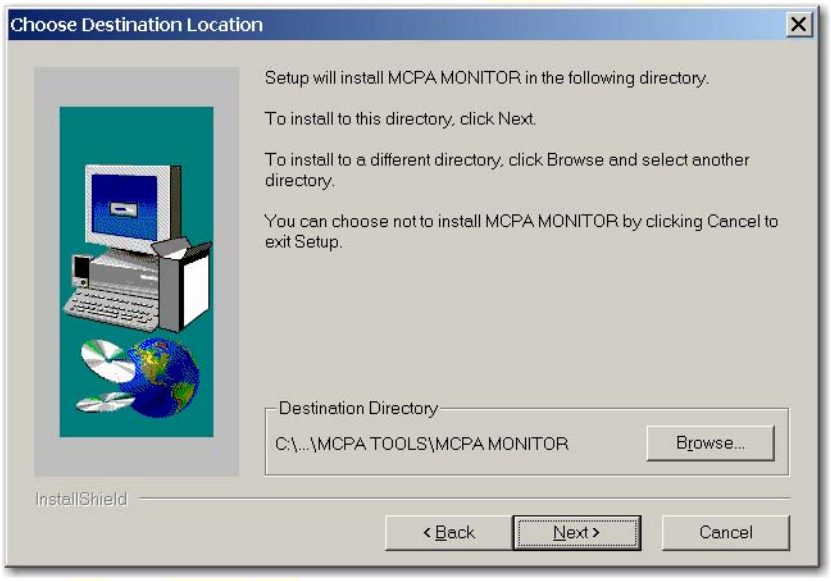
Using the InstallShield Wizard to install the MCPA Monitor, continued

5. Click **Next.** The *User Information* window opens.



6. Type your name and the name of your company, and then click **Next.** The *Choose Destination Location* window opens.



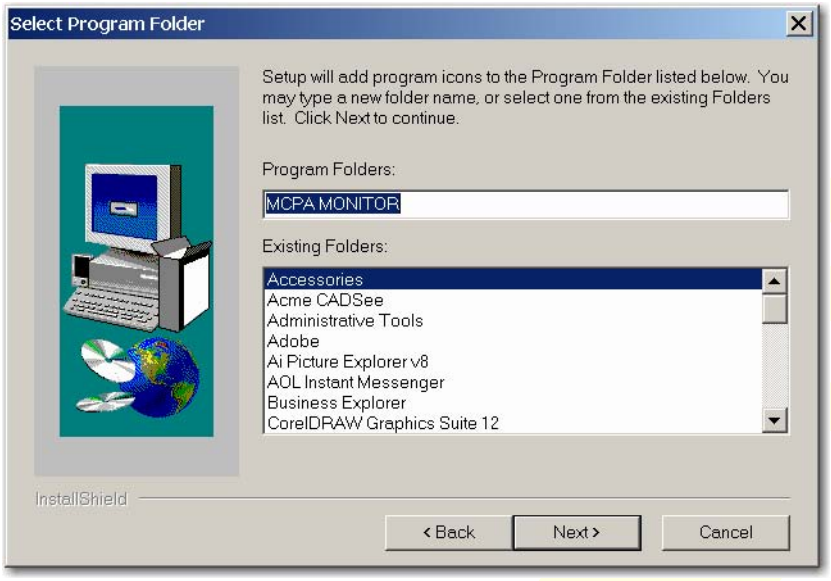
Use this window to specify the location where you want to install the MCPA Monitor:

- To install to the default directory, click **Next.**
- To install to another directory, click **Browse**, select another directory, and then click **Next.**

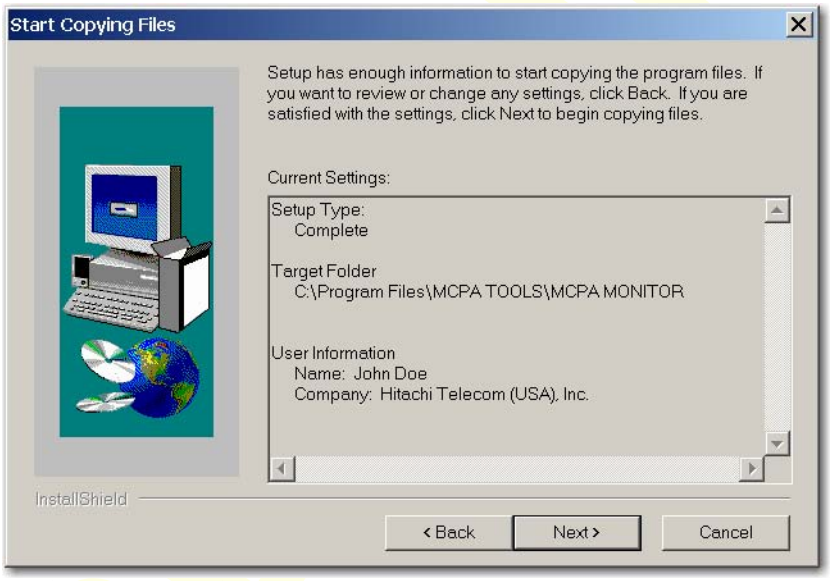
continued...

Using the InstallShield Wizard to install the MCPA Monitor, continued

The *Select Program Folder* window opens.



7. Select the folder you want the program icons installed to, and then click **Next.** The *Start Copying Files* window opens.



- If you are satisfied with the settings displayed, click **Next.**
- Otherwise, click **Back,** make changes to settings on previous windows as desired, click **Next** until you return to the *Start Copying Files* window, and then click **Next.**

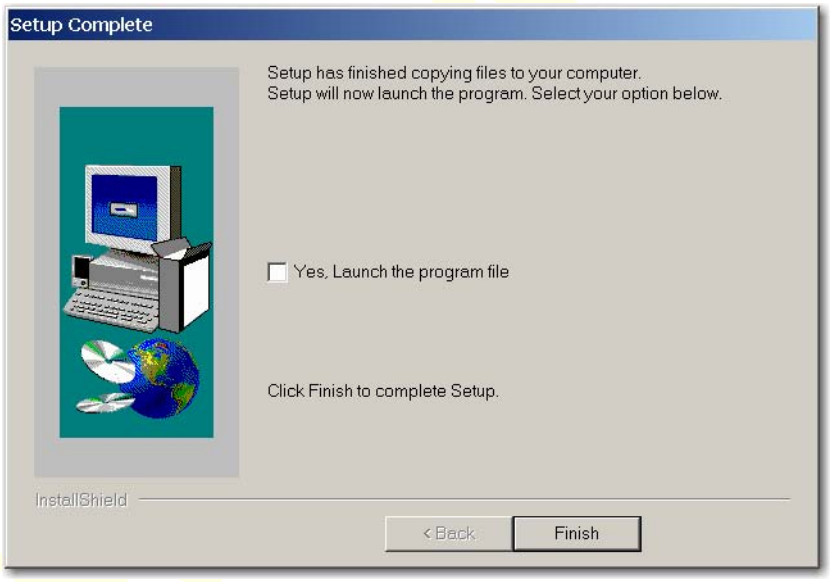
continued... ▶

Using the InstallShield Wizard to install the MCPA Monitor, continued

8. The program files are copied to the destination folder. When the copy process is complete, the *Setup Complete* window opens.

Note: The *Setup Complete* window may vary slightly depending upon your computer configuration and previous installation(s) of the MCPA Monitor.

9. If you choose not to restart your computer at this time, the *Setup Complete* window displays as follows:



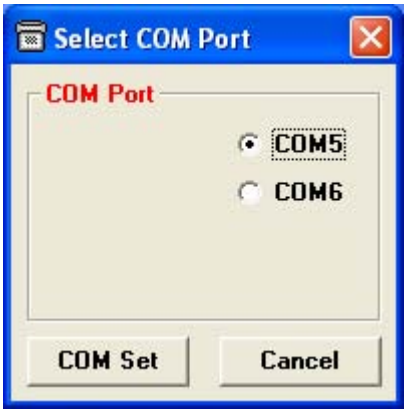
10. Click **Finish**. You have successfully installed the MCPA Monitor.

Changing the selected COM port

If you want to use a different COM port for the MCPA Monitor, or if at any point the MCPA MONITOR loses communication with the MCPA, perform this procedure.

Note: This does not change a configuration in the MCPA Monitor software. It is a runtime-only change. Therefore, if you change the COM port, you will have to change it each time you run the MCPA Monitor. If you use a USB-to-serial adapter, consider labeling your USB-to-serial adapter or the computer on which your run the MCPA Monitor with the COM port number used by the USB-to-serial adapter.

1. With the *MCPA MONITOR* window open, press <Alt>+C. The *Select COM Port* window opens indicating the currently active COM port and other enabled COM ports as options.



2. Select a different COM port, and then click **COM Set**.
3. Click **Cancel** to close this window and return to the *MCPA MONITOR* window.

4 REPLACING MCPA MODULES

Use this chapter to replace the MCPA modules, if necessary.

Contents

Topics covered in this chapter include:

Note: The first topic begins on the following page.

WARNING!

- Be careful not to drop the modules during replacement work.
- Use work gloves to prevent injury when replacing equipment.
- Make sure that all bolts and screws are properly tightened.
- In the event that any RF connector must be removed during maintenance, turn off all power to the affected equipment.

⚠ CAUTION!

- Minimize the time during which the fan is stopped. The temperature of the Amplifier module will continue to rise and result in a temperature shutdown if the fan is not returned to operation in a timely manner.
- Check that the Tx input signal does not exceed the specified value. Damage to the product may occur.

Replacing the Fan Module

This section provides instructions for replacing the Fan module.

⚠ CAUTION!

- This product is equipped with a cooling fan. To avoid personal injury, replace the FAN module with the power turned OFF.

Note: The FAN module *can* be replaced with the power ON if the replacement can be completed within one (1) minute. If replacement of a running fan is not completed within one minute, the MCPA module may shut down due to an excessive temperature alarm.

- Contact with the Fan connector can result in electric shock.
- Do not insert any item through the fin guard or inside the connector when handling the Fan module.

Replacing the fan module

Complete these steps to replace the fan module:

1. Power OFF the Amplifier module, if desired. You can hot-swap the fan.
2. Remove the two mounting screws at the top of the module, and the two mounting screws at the bottom of the module to detach the Fan module.
3. Insert the replacement Fan module so that the connector is on the left side of the unit, and replace the mounting scsrews at the top and bottom of the module .
4. Power ON the Amplifier module and confirm that the ACT LED is lit green.

⚠ CAUTION!

- Be careful handling the Fan module when it is exposed. Use work gloves to prevent injury.

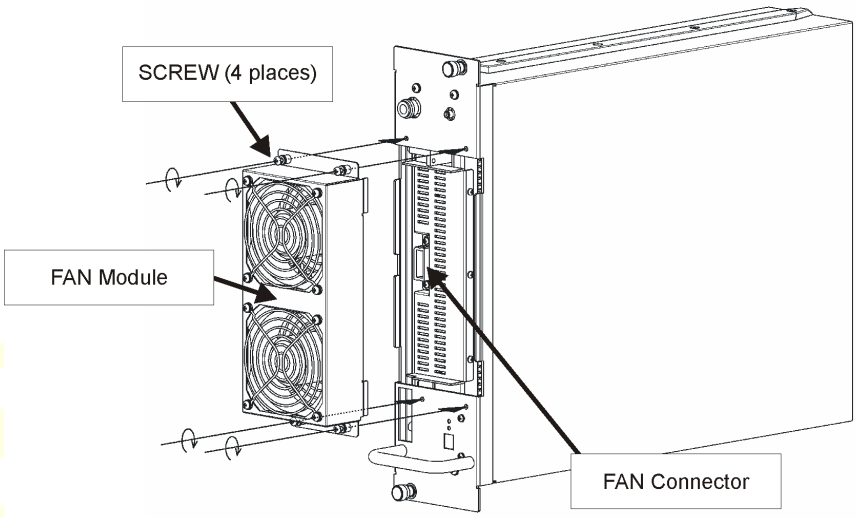


Figure 4-1: Replacing the Fan module

Replacing the Amplifier Module

To replace the Amplifier module, follow the steps below in the exact order shown.

⚠ CAUTION!

- After powering off, the temperature of the Amplifier module will still be very hot, so handle with care. Do not begin replacement until the unit has cooled.
- The Amplifier module weighs approximately 13.5 kg (29.8 lbs). Use caution when handling and use work gloves to prevent injury.

Replacing the Amplifier module

Complete these steps to replace the Amplifier module:

1. Power OFF the Amplifier module.
2. When Amplifier module has cooled, remove the RF input cable, the RF output cable, and the captive screws (TORX type T25) at the top and bottom of the Amplifier module.
3. Remove the Amplifier module.
4. Install the replacement Amplifier module and secure it using the captive screws.
5. Connect the RF input and RF output cables, tightening the connectors.
6. Power ON and confirm the Amplifier module ACT LED is lit green.

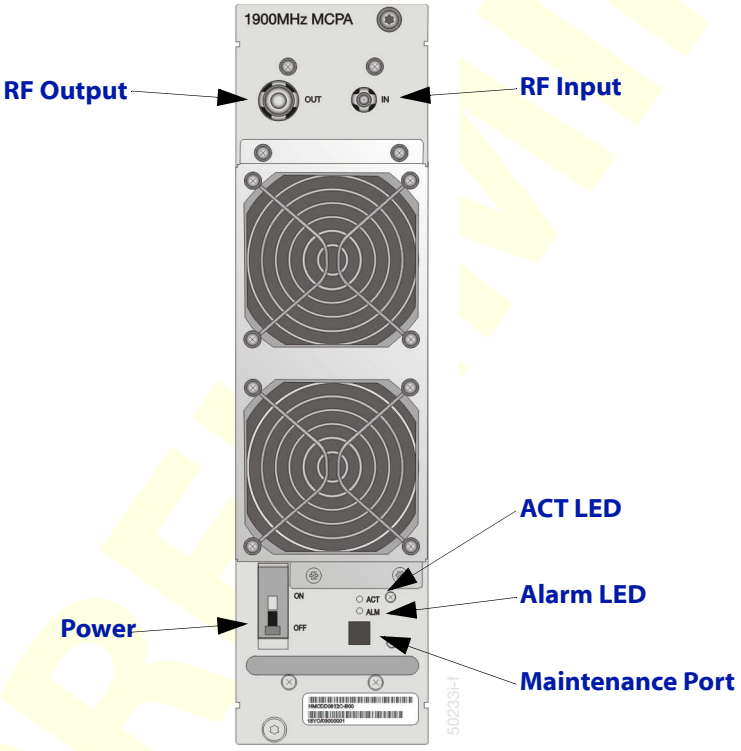


Figure 4-2: MCPA module (front)

5 TROUBLESHOOTING

This chapter describes how to use the information on the MCPA Monitor windows, together with the LEDs on the components, to find and resolve problems with the MCPA.

Contents

Topics covered in this chapter include: Page

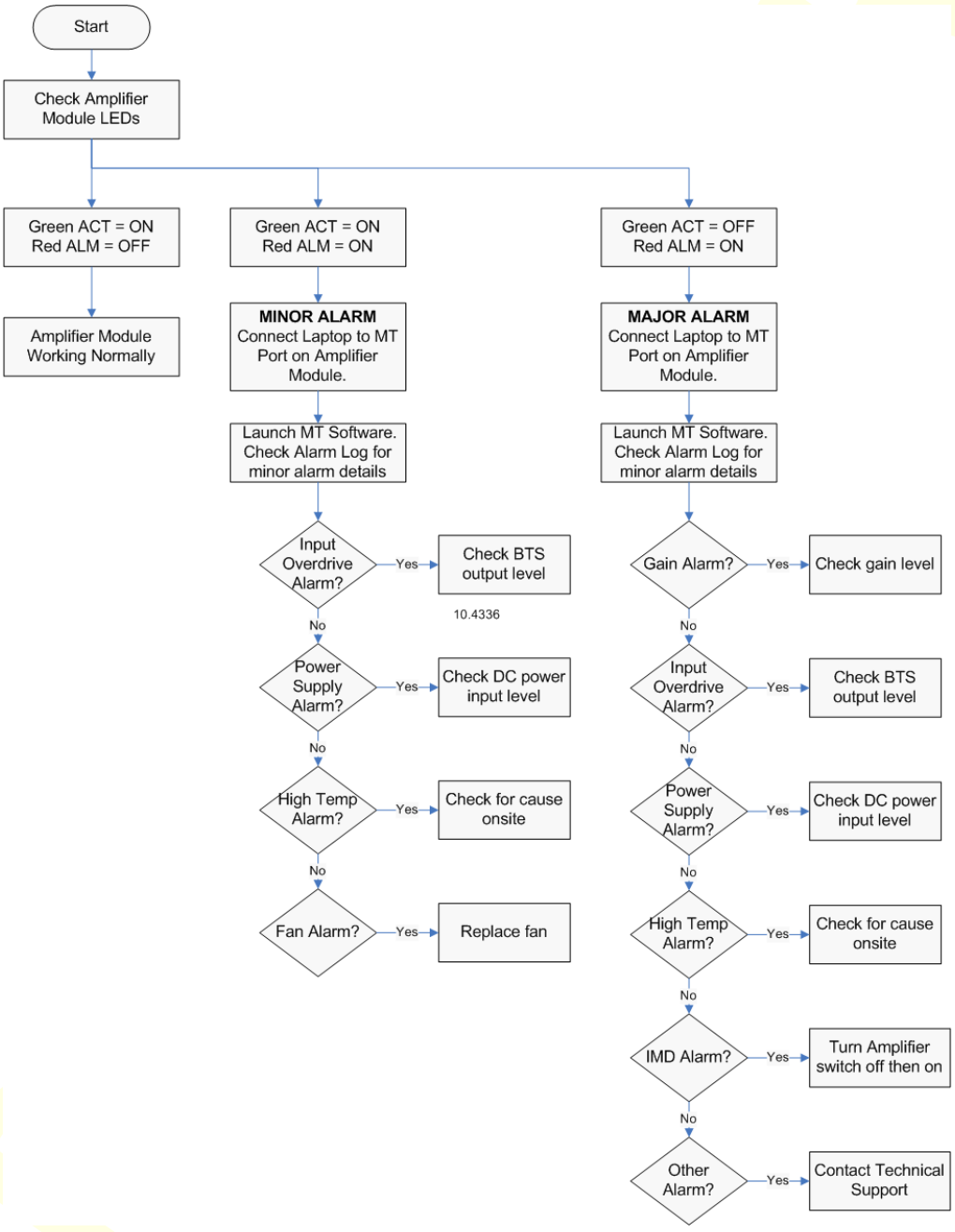
Note: The first topic begins on the following page.

Troubleshooting Overview

The MCPA provides two sources of information for determining and resolving problems in the individual components; the MCPA Monitor software and the LEDs on the units. Most alarms can be resolved without contacting technical support by using these tools and referring to the "Problem Solving Matrix" on page 5-10.

Troubleshooting flowchart

The following table describes the process for locating problems on the MCPA:



MCPA Monitor Windows

This section describes how to log on to the MCPA Monitor and use the information on the windows to troubleshoot your Multi-Carrier Power Amplifier.

Logging on to the MCPA Monitor

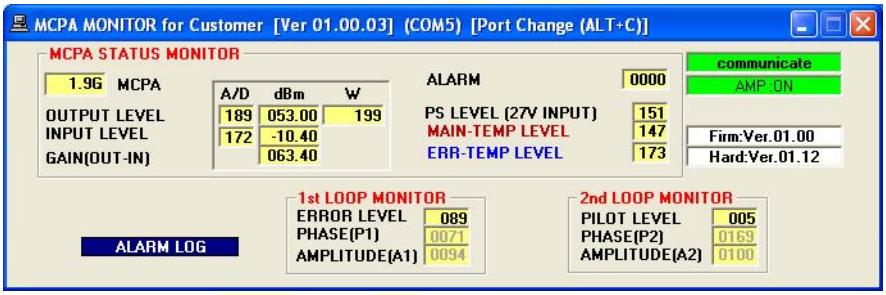
To log on to the MCPA Monitor, follow these steps:

1. Log on to your PC by typing your username and password.
2. Connect your PC to the USB port on the Amplifier using the maintenance cable.
3. Launch the MCPA Monitor. If more than one COM port is enabled, the lowest number COM port is automatically selected, and an *Initial COM Port Set* message opens.

The COM port must be COM5 or lower. If the Initial COM Port Set message does not open, there is only one COM port enabled.

Note: This example indicates that more than one COM port is enabled, with the lowest enabled port number being COM5. If you are using a USB-to-serial adapter and a COM port number of 6 or higher is assigned, you must use your computer's Device Manager to reassign the COM port.

4. Click **OK** to close the *Initial COM Port Set* message. The *MCPA Monitor* window opens.



IMPORTANT!

Do not disconnect the USB-to-serial adapter while the *MCPA MONITOR* window is open. Doing so can cause the *MCPA MONITOR* to stop abruptly.

continued...

Logging on to the MCPA Monitor, continued

5. If you do not want to change the COM port, go to Step 6. If you want to manually assign a different COM port, perform "Changing the selected COM port" on page 3-7.
6. When you are satisfied with the COM port setting, continue working in this window.

The *MCPA MONITOR* window fields are described in the following table:

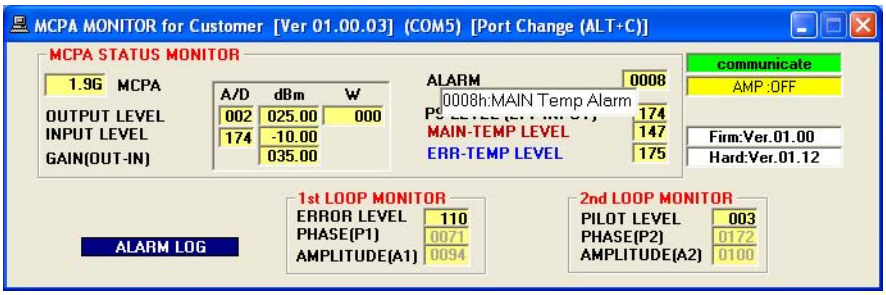
Monitor	Field	Description	Value
MCPA Status	MCPA	Amplifier module type	1.9G : 1900 MHz PA
	OUTPUT LEVEL	RF OUTPUT LEVEL (A/D conversion value)	0–255
		RF OUTPUT LEVEL (dBm conversion value)	dBm
		RF OUTPUT LEVEL (W conversion value)	≤350W
	INPUT LEVEL	RF INPUT LEVEL (A/D conversion value)	0–255
		RF INPUT LEVEL (dBm conversion value)	dBm
	GAIN (OUT-IN)	dBm—Amps output/input (typically 63.5)	dBm

Monitor	Field	Description	Value
MCPA Status, Continued	ALARM	The code of alarms that have occurred (Click alarm code field to display the alarm type.)	0000 : No Alarm 0001 : Gain Alarm 0002 : Input Overdrive (MAJOR) 0004 : IMD Alarm 0008 : MAIN Temp Alarm 0010 : Pilot Unlock Alarm 0040 : ERR Temp Alarm 0080 : Power Supply 0100 : Relay Alarm 0200 : FAN Alarm (MINOR) 0400 : Input Overdrive (MINOR) 0800 : MAIN Temp (MINOR) 1000 : ERR Temp (MINOR) 2000 : Power Supply (MINOR)
	PS LEVEL (27V INPUT)	PS Voltage level (A/D)	0–255
	MAIN-TEMP LEVEL	Main-amp's temperature level (A/D)	
	ERR-TEMP LEVEL	Error-amp's temperature level (A/D)	
	• Recv timeout (red) • Communicate (green)	Communication state between PA and Maintenance tool	• Red background: The Communication is FALSE. • Green background: The Communication is TRUE
	• AMP:ON (green) • AMP:OFF (yellow)	Amplification state:	• Green indicates that the Amplifier is ENABLEd. • Yellow indicates that the Amplifier is DISABLEd.
	Firm:	The version of firmware currently running	Ver.*xx.xx*
	Hard:	The version of the hardware being used	Ver.*xx.xx*
1st Loop	ERROR LEVEL	ERROR-AMP input level (A/D)	0–255
	PHASE (P1)	phase value (D/A)	
	AMPLITUDE (A1)	amplitude value (D/A)	

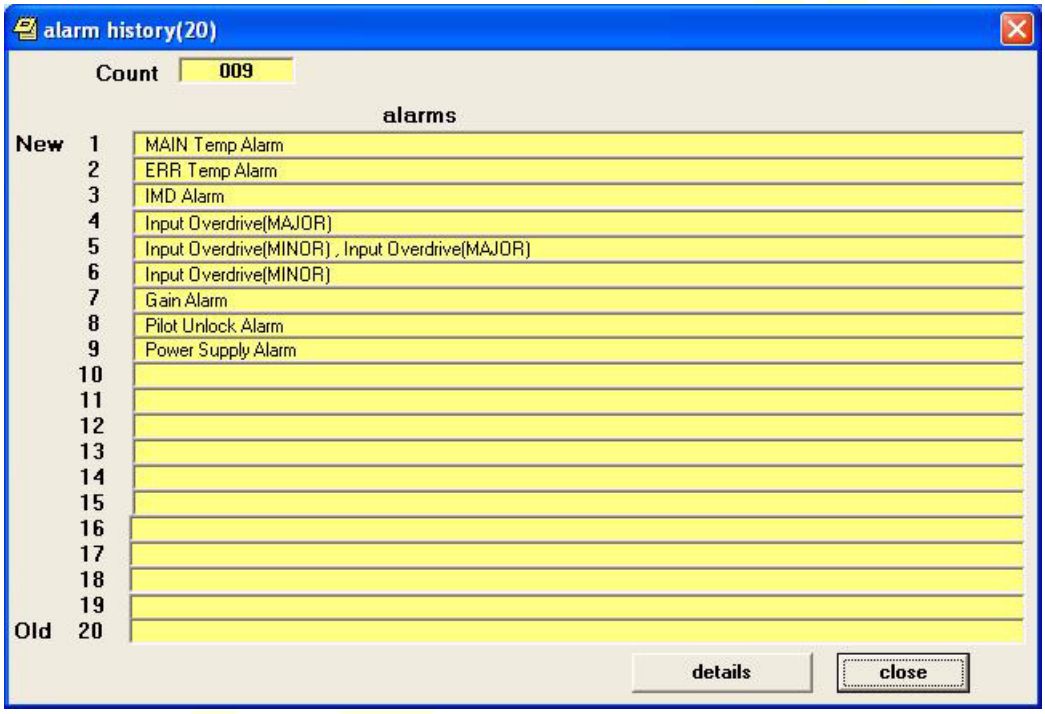
Monitor	Field	Description	Value
2nd Loop	PILOT LEVEL	Pilot signal level (A/D)	0–255
	PHASE (P2)	phase value (D/A)	
	AMPLITUDE (A2)	amplitude value D/A	
ALARM LOG button		Click to display the *alarm history* window	

Using the alarm history window

The following figure is an example of various types of alarms the *MCPA MONITOR* window can display:



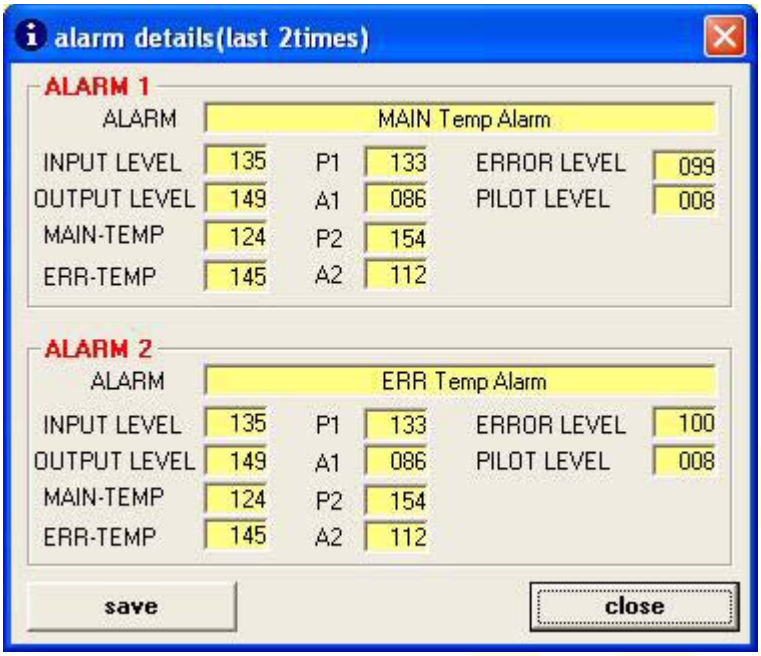
Open the *alarm history* window by clicking **ALARM LOG** in the *MCPA MONITOR* window. The following figure shows a sample *alarm history* window:



Item		Description
Field	Count	The total number of alarms that have occurred.
	alarms	A brief description of the alarms that have occurred. NEW (1) is the most recent alarm.
Button	details	Displays detailed information about the two most recent alarms (see the following figure).
	close	Closes the window. The *MCPA Monitor* window remains open.

Using the alarm details window

You can view detailed information about an alarm by highlighting it in the list of the *alarm history* window and then clicking **details**. The *alarm details* window opens, as shown in the following figure:



The following table describes the items on the *alarm details* window:

Item		Description
Button	**save**	Prompts you to enter a filename for a text file containing the information on the window.
	close	Closes the window. The *alarm history* window remains open.
Field	ALARM	Shows the type of alarm (for example, IMD Alarm, Gain)
	INPUT LEVEL	RF INPUT LEVEL (A/D)
	OUTPUT LEVEL	RF OUTPUT LEVEL (A/D)
	MAIN TEMP	Main-amp's temperature level (A/D)
	ERR-TEMP	Error-amp's temperature level (A/D)
	P1	phase value (D/A) for 1st LOOP
	A1	amplitude value (D/A) for 1st LOOP
	P2	phase value (D/A) for 2nd LOOP
	A2	amplitude value (D/A) for 2nd LOOP
	ERROR LEVEL	ERROR-AMP input level (A/D) for 1st LOOP
	PILOT LEVEL	Pilot signal level (A/D) for 2nd LOOP

Checking the LEDs

This section describes how the LEDs on the Duplexer/Combiner tray and the Amplifier help you to identify possible problems.

⚠ CAUTION!

Disconnect power at the main breaker before performing any work on this unit. Shelf Electrical rating: 27VDC, 25 amps per feed.

Verification

Check the LEDs of each Duplexer/Combiner tray and Amplifier module and compare them with the descriptions in the table below.

Table 5-1: Verification check points

Check point	Detail
ACT	Confirm the LED (green) is ON.
ALM	Confirm the LED (red) is OFF.
RF input cable (SMA)	Confirm the connector is tight.
RF output cable (N)	

Problem Solving Matrix

The following table provides a matrix of the indicators for problems with the Amplifier, the possible causes, and suggested solutions.

Table 5-2: Problems & solutions

LEDs		Problem	Possible Cause	Solution
ACT	ALM			
Green	Off	None	Normal operation	
Off	Red	Module not in operation	No power	Check +27 Vdc power at back of shelf
			Outside temp. >56° C (>133°F)	Connect the PC to the Amplifier. Check the Alarm Log using the MCPA Monitor. The *alarm details* window provides more detailed information on the two most recent alarms.
			Abnormal gain - >6 dB error	
			IMD (Insufficient Intermodulation correction)	
			Overdrive - Input level >10 dB	
			External PS - DC input voltage from power supply <23V or >28V	
			Internal PS - Abnormal input voltage (internal)	
			Relay ALM - Redundancy switch failure	

6 MCPA ALARMS

This chapter describes the alarms in the MCPA system.

Contents

Topics covered in this chapter include: Page

Note: The first topic begins on the following page.

MCPA Module Alarms

All module alarms that occur in a Hitachi MCPA subrack are routed to the Alarm Interface Block Module and are identified as either a major or a minor alarm; and then the appropriate alarm signal is sent to the Alarm Interface Block connector. The Alarm Interface Block connector is a DB-9 female and has both normally open (NO) and normally closed (NC) wiring points that notify the NOC of the presence of major or minor alarms in the MCPA subrack.

When the alarm circuit for the MCPA system is connected to the Alarm Interface Block, the NOC receives an alarm severity notification through the relay interface. Determining which specific module contains a fault condition can only be done when a technician is on site. Once on site, the technician can identify which module is in an alarm condition by checking the LEDs on the individual subrack modules. The technician can also obtain additional alarm information for the MCPA Amplifier Module by using the Hitachi MCPA Monitor software.

To avoid damage to the MCPA module, major alarm conditions cause the MCPA module to be automatically shut down.

When the MCPA module detects a minor alarm, it continues operating. The dry-contact relay is open when an alarm condition is detected through the Alarm Interface Block connector. Depending on the alarm, the MCPA module either automatically recovers or may require a reset.

Note: You can view alarm details using the MCPA Monitor software. Refer to the "MCPA Monitor Windows" on page 5-3.

Note: The notification method to the BTS for all the alarms is dry contact.

The following table describes the MCPA module alarms.

Table 6-1: MCPA module alarms (Sheet 1 of 2)

Alarm	Description	Type	Parameters	Spare Unit in Use?	LEDs	
					ALM (Red)	ACT (Green)
Over Temp	Over temperature	Major	>56°C (133°F) (ambient)	Y	ON	OFF
		Minor	>53°C (127°F) (ambient)	Y	ON	ON
Gain	Abnormal gain	Major	>6 dB error	Y	ON	OFF
IMD	Insufficient Intermodulation correction	Major		Y	ON	OFF
Overdrive	Input overdrive[a]	Major	>10 dB	N	ON	OFF
		Minor	>1.0 dB	N	ON	ON
External PS	Abnormal external DC voltage [b]	Major	<22.5V, >28V	Y	ON	OFF
		Minor	>22.5V, <25.5V	Y	ON	ON
Internal PS	Abnormal internal DC voltage	Major		Y	ON	OFF

Table 6-1: MCPA module alarms (Sheet 2 of 2)

Alarm	Description	Type	Parameters	Spare Unit in Use?	LEDs	
					ALM (Red)	ACT (Green)
Fan ALM	Fan failure	Minor		Y	ON	ON
Relay ALM[c]	Redundancy switch failure	Major		N	OFF	ON
MCPA power Off	Circuit breaker is Off on the MCPA module	No alarm		Y	OFF	OFF

a. For Minor input overdrive conditions, the gain is reduced such that the output power does not exceed +1 dB overdrive. Normal gain is restored after the overdrive condition is removed. For a Major alarm, the unit shuts down.
b. In an abnormal external DC voltage alarm condition, the gain is reduced by 1 dB in the 23.5 VDC to 25.5 VDC range and 2 dB in the 22.5 VDC to 23.5 VDC range.
c. Only available in certain configurations

MCPA module status monitoring

By connecting the maintenance cable to the Maintenance port located at the front of the MCPA module with Hitachi's monitoring software, information on the MCPA module can be displayed on the monitor screen of a PC.

⚠ CAUTION!

Only the maintenance cable supplied by Hitachi should be used to connect to the Maintenance port. Attempting to use any other cable could cause damage to the PC and/or the MCPA module.
This is *not* a USB device. Any attempt to connect to this port using a standard USB cable could result in damage to the MCPA module and/or any USB device connected through the USB cable.

Some of the items that can be displayed are the alarm log and alarm status. See the *MCPA Maintenance and Troubleshooting Guide* for more information.

APPENDIX A TECHNICAL SPECIFICATIONS FOR THE 90 W MCPA

This appendix lists the technical specifications for Hitachi's 90 W Multi-Carrier Power Amplifier (MCPA) module, part number HMC190951C, including the following information:

- Physical and environmental specifications
- Common electrical specifications
- Configuration-specific electrical specifications

Contents

Topics covered in this appendix include: Page

Note: The first topic begins on the following page.

Physical and Environmental Specifications

This section discusses the physical and environmental specifications forHitachi's 90 W MCPA module.

Physical and environmental specifications

The physical and environmental specifications for the 90 W MCPA are listed in the following table.

Table A-1: Physical & environmental specifications

Item		Specification	Remarks
Shipping weight	MCPA module	37.5 lbs / 17.0 kg	
Actual weight	MCPA module	30.9 lbs / 14.0 kg	
Dimensions	MCPA module	• W3.9 × H13.4 × D17.5 in. • W100 × H340 × D445 mm	
Environmental	Ambient temperature	-5°C to +50°C (23°F to +122°F)	Operational specifications
	Relative humidity	20% to 85%	
	Vibration	5 to 100Hz / 0.1G / 3 principal axes / 90 minutes per axis	
	Atmospheric pressure (altitude)	13,000 feet (3,900m) or less	
	Ambient temperature	-40°C to +70°C (-40°F to +158°F)	Transportation and storage specifications
	Relative humidity	5% to 95%	
	Vibration	5 to 100Hz / 0.5G, 100 to 500Hz / 1.5G /3 principal axes	
	Atmospheric pressure (altitude)	40,000 feet (12,000m) or less	
	Shock (packaged)	Drop shocks from 23.6 inches / 6 faces and 4 corners	
	Heat dissipation	585 W	

Electrical Specifications

This section provides electrical specifications for transmission and reception for Hitachi's 90 W MCPA module.

Common electrical specifications

The transmit electrical specifications common to all configurations are listed in the following table:

Table A-2: Common transmit electrical specifications

Item	Transmit System Level
Modulation	GMSK (8PSK) or CDMA-2000 (1xEV-Do)
Operating Temp Range	-5°C to 50°C
Operating Frequency Band	1930–1990 MHz
Instantaneous Bandwidth	20MHz
Operating Voltage	26 to 28 VDC
Passband Flatness	±1.0dB
Out of Band Spurious	Meets FCC requirements[a]
Input Return Loss (VSWR)	>15dB (1.4:1)
Output Return Loss (VSWR)	>15dB (1.4:1)
Output Power	90 W
Gain[b]	63.5 dB
Gain Variation over Temp[b]	±0.75dB
Power Consumption	675 W @ +90 W typical output and 27 VDC input

a. With a duplexer
b. Applicable over the entire operating conditions using the Standard Test Signal of 8 GSM and 3 CDMA-2000 for measurement

APPENDIX B REPAIR AND RETURN PROCEDURES

This appendix provides the policies, requirements, and procedures for the Return Material Authorization (RMA) process. Use this process to return Hitachi equipment for repair or replacement.

Contents

Topics covered in this appendix include: Page

Note: The first topic begins on the following page.

Policies and Requirements

The Return Material Authorization (RMA) process facilitates the repair and return of MCPA equipment. There are two acceptable initiators of the RMA process:

- Request from an Authorized Purchasing Agent of the Buyer to determine warranty status
- Request from an Authorized Technical Support Representative for failures that occur in the field during the acceptance period

Hitachi Telecom (USA), Inc. reserves the right to modify or amend the Repair and Return policies with written notification to the Buyer at least 90 days in advance.

Requirements

Make all repair and return requests to the Hitachi Technical Assistance Center (TAC) by contacting 770-446-8836. The Sales Administrator provides a copy of the *RMA Packaging and Handling Guidelines* and RMA number(s).

⚠ IMPORTANT!

Equipment must be returned in accordance with the *RMA Packaging and Handling Guidelines* in order to be accepted. Any equipment with missing or defaced serial numbers is treated as out-of-warranty.

Exceptions

Any equipment that is modified by someone other than an authorized Hitachi technician or damaged by causes other than defects in parts or workmanship, including but not limited to power surges, lightning strikes, water damage, accidents, abuse, neglect, vandalism, acts of God, or any other use contrary to the specifications or instructions provided by Hitachi Telecom, can be rejected. If rejected, Hitachi notifies and invoices the Buyer for any advance replacement equipment. Any equipment that is not returned in accordance with the Hitachi *RMA Packaging and Handling Guidelines,* including proper ESD packaging, is subject to rejection.

Shipping costs

The shipping cost policies are as follows:

- The Buyer pays all shipping costs if the RMA is rejected.
- Hitachi pays shipping costs outbound to the customer for all in-warranty requests.
- The Buyer pays all shipping for any out-of-warranty requests.

Advance replacement policy

Hitachi Telecom's standard policy for replacing equipment is based on the Buyer's Technical Support Agreement. The Agreement can require the receipt of the defective equipment prior to shipment of replacement equipment. However, if Hitachi determines the need is urgent, an advance replacement can be immediately shipped to the Buyer. The Buyer must return the defective equipment within 30 days or else a full invoice for the advance replacement equipment is issued.

RMA Process and Procedures

This topic includes the RMA process and procedures. The RMA process is illustrated in the following diagram:

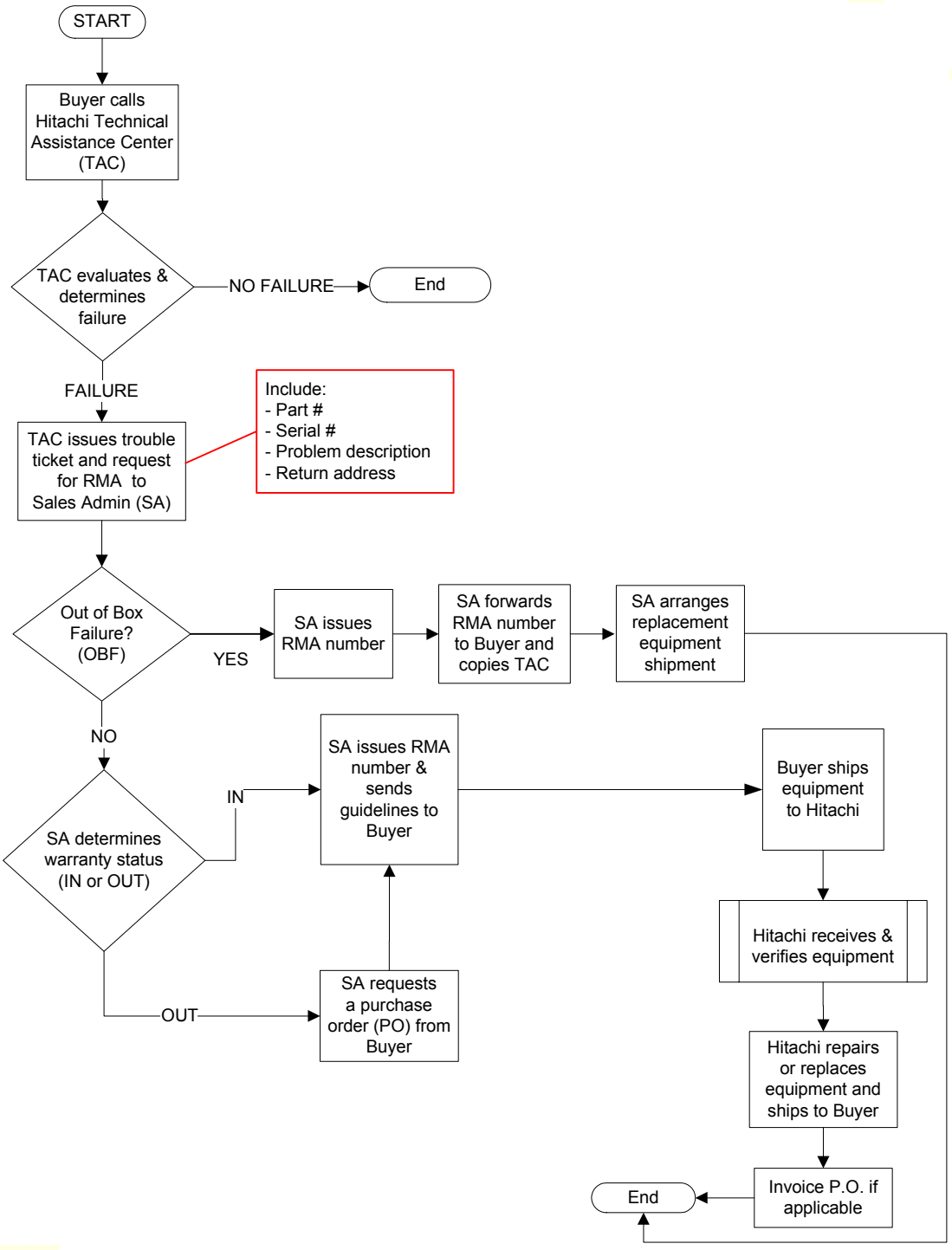


Figure B-1: Return Material Authorization (RMA) process

Buyer warranty repair and return requests

To submit an RMA request based on warranty status, do the following:

1. The Buyer submits a request for an RMA number to the Sales Administrator. This number is used to track the request and identify the equipment. The Buyer includes the part number and serial number of the equipment, and a description of the problem, along with the return address.
2. The Sales Administrator determines the warranty status of the equipment based on the serial number provided. If the equipment is out of warranty, the Buyer must submit a purchase order.
3. The Sales Administrator issues an RMA number and forwards the *RMA Packaging and Handling Guidelines* to the Buyer.
4. The Buyer returns the equipment to the Hitachi Norcross facility with the issued RMA number marked on the outside of the package. The Buyer should include the part number, serial number, and a description of the problem.

   Note: Returned equipment must adhere to the *RMA Packaging and Handling Guidelines*. Any equipment with missing or defaced serial numbers will be treated as out-of-warranty.

5. Hitachi receives the defective equipment and processes the request within the time period specified in the Buyer's Support Agreement, beginning on the day the equipment is received by Hitachi.

Technician advance replacement requests

If the equipment fails to comply with customer specifications within the first 15 calendar days from shipment, or if it fails to operate during initial installation, the qualified technical support representative submits an advance replacement request.

To submit a request due to an Out of Box Failure (OBF), do the following:

1. Contact TAC at 770-446-8836.
2. TAC performs the following activities:
   a. Determines if the trouble is equipment related
   b. Issues a trouble ticket number for tracking purposes and forwards to Sales Administration.
3. Sales Administrator performs the following activities:
   a. Issues an RMA number
   b. Forwards the number to the Buyer and copies TAC.
   c. Arranges replacement equipment shipment after TAC confirms OBF.

continued...▶

Technician advance replacement requests, continued

4. Buyer returns defective equipment to Hitachi's Norcross facility with the proper RMA number marked on the outside of the box.

⚠ IMPORTANT!

If the equipment is received beyond the thirty (30) day time period, the Buyer is billed the full amount of the advance replacement equipment. The defective equipment is either returned to the Buyer at the Buyer's expense or discarded by Hitachi.

GLOSSARY

Wireless Industry and Hitachi Terms

µs
microsecond

Access Point
A network device or communication hub that allows wireless devices to connect to a wired local area network (LAN).

AMPS
Advanced Mobile Phone Service, the standard for analog cellular in the United States.

Analog
An early wireless network technology using the modulation of radio signals to transmit information as sound waves, and allowing only one call per channel. Digital wireless transmission is now most commonly used.

ANT
Antenna

BA
BCCH Allocation

Band
In wireless communications, a frequency or contiguous range of frequencies.

Bandwidth
The width or capacity of a communications channel in wireless communications. Analog bandwidth is measured in hertz (Hz). Digital bandwidth is measured in bits per second (bps), and is the volume of data that a channel can carry.

Base Station
Also referred to as a cell tower or a cell site. A base station is a transmitter/receiver location that establishes radio links between the wireless system and the wireless device. The base station includes an antenna tower, transmission radios and radio controllers. A base station is required for each cell in a cellular network.

BCCH
Broadcast Control Channel, a downlink logical channel that contains signaling and control parameters needed by a cellular phone so that the phone can identify the network and gain access to it. Typical information includes the LAC, RAC, MNC, and BA list.

Broadband
Generic term for high-speed digital Internet connections, such as wireline, DSL or cable modems and wireless third-generation technologies, such as WCDMA (UMTS), CDMA2000 1xEV-DO and HSDPA.

BTS
Base Transceiver Station. The stationary component of a cell phone system that includes transmit-receive units and connects to one or more antennae. Also known as a cell-site or a base station.

Carrier
A wireless network operator or service provider that provides mobile telecommunications services. In wireless communications, an electromagnetic pulse or radio wave is transmitted at a steady base frequency.

CDMA
Code Division Multiple Access. A digital wireless technology that works by converting analog information, such as speech, into digital information, which is then transmitted as a radio signal over a wireless network. Third-generation (3G) wireless technologies use CDMA to increase voice capacity and provide higher data rates than 2G and 2.5G networks.

Cell
The geographic area covered by the signal range from one base station. Wireless networks are made up of many overlapping cells to efficiently use radio spectrum for wireless transmissions.

Cell Site
A fixed transmitter/receiver location, also called a base station or a cell tower, which establishes communications between a wireless system and a wireless device using radio links. The cell site includes an antenna tower, transmission radios and radio controllers.

Cell Tower
A fixed transmitter/receiver location, also called a base station or a cell site, which establishes communications between a wireless system and a wireless device using radio links. The cell tower includes an antenna tower, transmission radios and radio controllers.

Channel
The amount of wireless spectrum occupied by a specific technology implementation. For cellular, there is a transmit side and a receive side. For example, a 5-MHz channel uses 5 MHz to transmit and 5 MHz to receive for a total of 10 MHz of wireless spectrum.

Coverage Area
Geographic area served by a cellular system in which service is available to wireless users. The capacity of a communications channel, expressed in bits per second.

BER
Bit Error Rate

CPU
Central Processing Unit

Crosstalk
See Intermodulation.

dB
Decibel

dBm
An abbreviation for the power ratio in decibel (dB) of the measured power referenced to one milliwatt (mW).

Demultiplexing
The process of recovering individual signals that have been combined for transmission.

Digital
A form of transmission that transforms analog signals, such as voice, into a series of electrical or optical pulses that represent the binary digits 0 and 1. This numerical data is then converted into various forms depending on the type of network, such as radio waves for wireless transmission, electronic pulses for a wired network or optical light waves for fiber optics.

DIP
Dual in-line package. A type of chip housed in a rectangular casing with two rows of connecting pins on either side.

Dual band
The capability of some cellular phones to operate on two different frequency bands of one technology. In CDMA technology dual-band handsets support both the 800 MHz and 1900 MHz band. In GSM technology dual-band phones support two of the four major GSM bands—800, 850, 1800 or 1900 MHz.

EDGE
Enhanced Data Rates for Global Evolution. Hardware and software for existing GSM networks that provide higher data rates to improve the delivery of multimedia and other broadband applications for wireless devices.

ESD
ElectroStatic Discharge

ET
End Terminal

GB
Gigabyte. A measure of computer data storage capacity. Measured as approximately a billion bytes or 1,073,741,824 in decimal notation.

GHz
Gigahertz

Global roaming
A feature of some GSM cellular phones that support a mixture of US and European frequency bands, allowing customers to use their phones while traveling overseas. (*See also* Roaming.)

GSM
Global System for Mobile Communications. A second-generation wireless telecommunications standard for digital cellular services first deployed in Europe. GSM is based on TDMA technology and provides circuit-switched data connections.

handoff
The act of switching coverage responsibility from one base station to another. It usually refers to what happens when a wireless phone user moves from one cell to another.

Decibels referenced to 1 milliwatt

Hz (Hertz)
The international unit for measuring frequency, equivalent to cycles per second. One megahertz (MHz) is one million hertz. One gigahertz (GHz) is one billion hertz.

IEEE
Institute of Electrical and Electronic Engineers.

Intermodulation
Crosstalk. A process whereby signals mix together in a circuit, and nonlinearities in the circuit create undesired output frequencies that are not present at the input.

ITU
International Telecommunications Union

ITU-T
ITU-Telecommunications Standardization Sector

kb
kilobit

Kbps
Kilobits per second, or thousands of bits per second. A measure of bandwidth.

kHz
kilohertz

LAC
Local Area Code

LNA
Low Noise Amplifier. A special type of electronic amplifier used in communication systems to amplify very weak signals captured by an antenna. It is usually located at the antenna.

Mbps
Megabits per second, or millions of bits per second. A measure of bandwidth.

MNC
Mobile Network Code. A part of the International Mobile Subscriber Identity (IMSI).

Mobile phone
Another term for cellular phone or wireless phone.

Mb
Megabit

MHz (Megahertz)
One million hertz or cycles per second. A measurement often used to describe the speed of digital and analog signals.

ms
millisecond

nm
nanometer

ns
nanosecond

OS
Operation System

PCS
Personal Communications Services. Refers to the 1900 MHz cellular frequency band. More commonly used as a marketing term to describe digital wireless services in the Americas, regardless of the particular frequency band being used.

PDU (power distribution unit)
Also known as a power distribution panel, circuit breaker (CB) panel, breaker panel, or power panel. Part of a power distribution system that receives voltages from the main power supply and distributes them to the cabinet shelves.

RAC
Routing Area Code

RF
Radio Frequency. Measured in Hertz, MHz and GHz. Wireless and cordless telephones, radio and television broadcast stations, satellite communications systems and two-way radio services all operate using radio frequencies.

Roaming
The ability for a cellular customer to automatically make & receive voice calls, send & receive data, or access other services when travelling outside the geographical coverage area of the home network.

RS-232C
Recommended Standard-232C. A standard interface for connecting serial devices, approved by the Electronic Industries Alliance (EIA).

Service Provider
A “carrier” or “network operator” that provides mobile telecommunication services.

signal loss
The amount of signal strength that can be lost in antenna cable, connectors, and free space. Signal loss is measured in decibels.

signal strength
The strength of the radio waves in a wireless network.

SMS
Short Messaging Service. Available on many 2G and all 3G wireless networks. With SMS, subscribers can send short text messages (usually about 160 characters) to and from wireless handsets.

Subscriber
In wireless, a user of a mobile telecommunication service.

TDMA
Time Division Multiple Access, a way to deliver digital wireless service. TDMA works by dividing a frequency into time slots and allocating them to multiple calls. TDMA is the standard on which GSM is based, but GSM phones will not work on TDMA networks and vice versa.

Telcordia Technologies
Formerly Bell Communications Research, Inc. or Bellcore, an American telecommunications research and development company created in 1984 as part of the 1982 Modified Final Judgment that divested the Bell System.

transmit power
The amount of power used by a radio transceiver to send the signal out. Transmit power is generally measured in milliwatts, which you can convert to dBm.

UMTS
Also known as WCDMA. Universal Mobile Telecommunications System. A third-generation (3G), CDMA-based wireless communication standard that offers enhanced voice and data capacity and higher data rates than previous, second generation wireless technologies.

UNC (Unified Coarse Thread):
An inch thread form (60°) standard defined by ANSI/ASME. Usually used in reference to machine screws. It is covered by ASMEB1.1 and British Standard BS 1580.

VSWR
Voltage Standing Wave Ratio. In telecommunication, standing wave ratio (SWR) is the ratio of the amplitude of a partial standing wave at an antinode (maximum) to the amplitude at an adjacent node (minimum).

WAP
Wireless Application Protocol, a set of standards to enable wireless devices to access Internet services, such as the World Wide Web and email.

WCDMA
Also know as UMTS. Wideband CDMA. A third-generation (3G), CDMA-based wireless communication technology that offers enhanced voice and data capacity and higher data rates than previous, second-generation wireless technologies.

Wi-Fi
Stands for “Wireless Fidelity”— a logo provided by the Wireless Ethernet Compatibility Association (WECA) for the 802.11b wireless Ethernet standard. Compatible PC cards and base stations can use the Wi-Fi logo.