# HRR 4104 Return Path Receiver Product Manual

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# 1 Overview

## 1.1 About This Manual

This instruction manual is a guide to installing and operating the HRR 4104 Return Path Receiver. Please read the entire manual before beginning installation.

- Chapter 1 gives general information about the HRR 4104.
- Chapter 2 describes the installation procedures.
- Chapter 3 describes the user interfaces that monitor and control receiver operation.
- Chapter 4 describes how to set up the receiver.
- Chapter 5 describes maintenance and what to do in the event of problems.
- Appendix A provides complete technical specifications.
- Appendix B provides a list of Harmonic's offices around the world.

## 1.2 Description

The HRR 4104 is a high-performance optical return path receiver that is optimized to operate in the 5 to 100 MHz return band. This compact (half-slot) plug-in module is designed for use in the Harmonic HLP 4200 equipment platform. An HMC 4008 module carrier is needed and mounts two HRR 4104 modules in the platform.

The HRR 4104 is a quad receiver card. The four receivers are designed to operate independently, or can be configured as four redundant pairs with another HRR 4104 module.

The HRR 4104 has the following key features:

- Very high packing density
- High RF output level
- Many configuration options
- Automatic or manual gain control to compensate for variations in optical input
- Local control of operating parameters—provided by the HLP 4200 Platform
- Remote control and monitoring—provided by the NET 5200 NETWatch<sup>™</sup> Site Controller

Figure 1-1 shows a block diagram of the HRR 4104, including the HMC 4008 module carrier and the interface to the HLP 4200. Figure 1-2 shows front and rear panel features of the HRR 4104.









The HRR 4104 receiver is a compact plug-in module that mounts easily in Harmonic's HLP 4200 Platform. See Figure 1-3 for a functional diagram of the HLP 4200 Platform and the rear panel connectors. The receiver module draws power from the platform's 24 VDC power bus, and communicates with the platform controller via the platform communication bus.

For additional information on the HLP 4200 Platform and its associated communication and power buses, see the *HLP 4200 Platform Product Manual*. For further information on the platform controller and power supply options, see the *CPS 4200/4248 Controller/Power Supply Product Manual*.



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## 1.3 Applications

Typical applications of the HRR 4104 include:

- Internet access
- Telephony
- Video-on-demand
- Network management
- Pay-per-view
- Data services
- Local origination
- I-net



# Installing the HRR 4104 Receiver

This chapter provides information on installing the HRR 4104 Return Path Receiver. Please read all the instructions before beginning installation.

This chapter describes:

- How to receive and inspect the HRR 4104
- Tools and accessories
- How to install the HRR 4104 module into an HLP 4200 Platform
- How to configure two HRR 4104 modules as a redundant pair
- How to connect the RF output cables
- How to install and use the HFM 4000 Fiber Management Tray (optional)
- How to connect the input fiber cables
- How to test RF signal output

#### 2.1 Receiving and Inspecting

As you unpack your unit, inspect the shipping container and equipment for damage. Save the shipping material for future use. If the container or the equipment is damaged, notify both the freight carrier and Harmonic. See Appendix B, *Harmonic Inc. – Offices*, for contact information.

**CAUTION:** To protect yourself from potential injury and to protect the equipment from further damage, do not perform any operational tests if the equipment appears to be damaged.

### 2.2 Tools and Accessories

The following accessories are provided with each HRR 4104:

• Antistatic bag

The following accessories are provided with each HMC 4008:

6-pin muting cable assembly (part no. 229-0020316)—for primary/backup connection

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The following optional accessories are not included:

- Four 4 dB couplers—to combine the RF outputs from two HRR 4104 modules in a redundant configuration
- HFM 4000 Fiber Management Tray (see Section 2.6)
- Four #10 screws with 10-24 UNC thread, and Phillips screwdriver—to mount the HFM 4000 in the rack

## 2.3 Installing the HRR 4104

The HRR 4104 receiver module plugs into an HMC 4008 module carrier, shown in Figure 2-1. Each HMC 4008 carrier can accommodate two half-slot HRR 4104 modules. The receiver module is held in the carrier by blind mate RF connectors on the carrier. You can place the HMC 4008 carrier into any available position in the HLP 4200 Platform.



Figure 2-1. HMC 4008 module carrier, front and rear panel features

To provide leverage for the blind mate connections, install the HMC 4008 carrier into the HLP 4200 Platform before you install the HRR 4104 module into the carrier. The HLP 4200 Platform can be powered and operating during the installation process.

To install the HMC 4008 carrier into the HLP 4200 Platform:

- 1. Lower the control/display panel on the HLP 4200 Platform.
- 2. Slide the HMC 4008 module carrier into any available slot until it is properly seated.
- 3. Lock the carrier into position with the carrier locking screw, shown in Figure 2-1 on page 2-2.

To install the HRR 4104 receiver module into the HMC 4008 carrier:

• Insert the receiver module into the carrier until it locks in position. This requires some force as there are four blind mate connectors in the rear of the unit.

The HRR 4104 receives power from the HMC 4008 module carrier. The carrier is powered by the +24 VDC bus of the HLP 4200.

For additional information on the HLP 4200 Platform and its associated communication and power buses, see the *HLP 4200 Platform Product Manual*. For further information on the platform controller and power supply options, see the *CPS 4200/4248 Controller/Power Supply Product Manual*.

To remove the HRR 4104 receiver module from the HMC 4008 carrier:

- 1. Press Eject on the HRR 4104 module, as shown in Figure 2-2. The lever raises approximately 10 degrees, as shown.
- 2. Insert your finger under the tab at the bottom of the lever, then lift up on the lever. This disengages the blind mate RF connectors from the HMC 4008 carrier.



3. Remove the module from the carrier.

Figure 2-2. HRR 4104 side view with lever open

# 2.4 Configuring Two HRR 4104 Modules as a Redundant Pair

Each HRR 4104 module can be configured in one of the following ways:

- As an independent, standalone module (not connected to another module)
- As the primary module in a redundant pair (connected to a backup module)
- As the backup module in a redundant pair (connected to a primary module)

This section provides instructions for configuring the HRR 4104 modules as redundant pairs. If you are configuring the HRR 4104 to operate as an independent module, you can skip this section.

Regardless of configuration, all four receivers in a module function in the same role; all four receivers are standalone, primary, or backup. However, at any given time, some receivers in a module can be muted (inactive) while others are not.

In a redundant pair configuration, you use one module for primary fiber paths and a second module for backup fiber paths. Normally, the primary receiver mutes the RF output of the backup receiver. If the primary receiver is in alarm (the optical input level on the primary receiver falls below a set threshold: the optical alarm limit), the primary receiver activates (unmutes) the backup receiver and mutes itself (unless the backup receiver's optical input level is also low, in which case the backup receiver remains muted). When the primary receiver's optical input level rises above the optical alarm limit, it removes the *unmute* command from the backup receiver and the backup receiver returns to its default muted state.

When configuring a redundant pair, Harmonic recommends locating the two HRR 4104 modules in two different HLP 4200 Platforms, if possible. That way, transmission continues even if there is problem with a platform or power supply.

Use the muting cable (included with the HMC 4008 carrier) to connect the two modules of the redundant pair. One end of the muting cable is labeled Primary, the other end is labeled Backup. Use four 4 dB couplers to combine the RF output from the two modules.

To configure two HRR 4104 modules as a redundant pair:

- 1. Verify that both primary and backup HRR 4104 modules are properly mounted into one or two HLP 4200 Platforms, as described in Section 2.3.
- 2. Connect the Primary end of the muting cable to the Primary/Backup connector of the HMC 4008 that is attached to the primary HRR 4104 module. The Primary/Backup connector is located on the rear panel of the HMC 4008 module carrier, as shown in Figure 2-1 on page 2-2.
- 3. Connect the Backup end of the muting cable to the Primary/Backup connector of the HMC 4008 that is attached to the backup HRR 4104 module.

- 4. Connect a 4 dB coupler between the two Receiver A outputs of the HMC 4008 module carriers that are attached to the two HRR 4104 modules. The RF output connectors are located on the rear panel of the HMC 4008 module carrier, as shown in Figure 2-1 on page 2-2.
- 5. Connect three more 4 dB couplers between the two Receiver B outputs, the two Receiver C outputs, and the two Receiver D outputs.

## 2.5 Connecting the RF Output Cables

The HRR 4104 has four RF output connectors, which are located on the rear panel of the HMC 4008 carrier, as shown in Figure 2-1 on page 2-2. They are labelled A, B, C, and D. They are female F connectors that accept 75 Ohm impedance coaxial cables terminated with male F connectors.

**NOTE:** To ensure performance integrity, use RG-59 coaxial cable.

To connect the RF output cables:

- 1. Verify that the HRR 4104 is properly mounted into the HLP 4200 Platform, as described in Section 2.3.
- 2. Connect the male F connectors of the coaxial cables to the RF output connectors on the rear panel of the HMC 4008 carrier. Or, if couplers are attached (as described in Section 2.4), connect the cables to the couplers.
- 3. Tighten the cables securely (using an F-connector tool, if necessary).

## 2.6 Installing and Using the HFM 4000 Fiber Management Tray

The HFM 4000 Fiber Management Tray (shown in Figure 2-3 on page 2-6) is an optional accessory for the HRR 4104. It is a 1 rack-unit tray designed to sit directly below the HLP 4200 Platform and route the fibers from the modules to the rear of the rack, as shown in Figure 2-4 on page 2-6.

To mount the HFM 4000 in the rack, you need:

- Four #10 screws with 10-24 UNC thread
- Phillips screwdriver

To install and use the HFM 4000 Fiber Management Tray in a standard equipment rack:

- 1. Mark the exact position in the rack where you want to install the tray. The rack works best when it is located directly below the HLP 4200 Platform that houses the HRR 4104 modules.
- 2. Position the tray in the rack, align the holes in the mounting brackets of the HFM 4000 with the threaded holes in the rack upright, then secure the four mounting screws through the mounting brackets.
- 3. Identify and mark each fiber before routing fibers into the HFM 4000.
- 4. Route each fiber through the appropriate fiber channel of the HFM 4000. The HFM 4000 has fiber channels for each slot of the HLP 4200 Platform. Fibers can be routed from the front or rear.

- 5. Connect the fiber to the correct optical connector on the front of the HRR 4104 according to the instructions in section 2.7 *Connecting the Input Fiber Cables* on page 2-7.
- 6. The fiber naturally forms a service loop that fits behind the protective front plate on the fiber tray, as shown in Figure 2-5 on page 2-7. The fiber should run straight through the channel and hang out the back of the tray.

At the rear of the HRR 4104 modules, additional fiber management or routing may be required.



Figure 2-3. HFM 4000 Fiber Management Tray



Figure 2-4. HFM 4000 below HLP 4200 fully loaded with HRR 4104 modules



Figure 2-5. Side view of HLP 4200 and HFM 4000 with service loop

## 2.7 Connecting the Input Fiber Cables

The HRR 4104 receiver has four optical input connectors, which are located on the front panel, as shown in Figure 1-2 on page 1-2. The HRR 4104 ships with a protective cap on each optical connector.

**DANGER:** Invisible Laser Radiation. This product does not contain a laser, but is used in systems that contain lasers. **AVOID EXPOSURE TO BEAM.** Never operate unit with a broken fiber or with a fiber connector disconnected.

To connect the optical input cables:

- 1. Remove the protective caps from the optical adapters of the HRR 4104.
- 2. Determine the connector type on the HRR 4104 receiver. The standard optical connector recommended by Harmonic is SC/APC. Other connector types can be special ordered.
- 3. Verify that the type of connector on the fiber cable is the same as that of the HRR 4104, for example, SC/APC.
- 4. Verify that the fiber cable connectors have been cleaned properly. If you suspect that a connector may have been exposed to contamination (for example, by a dirty fiber cable connector), follow the cleaning procedure outlined in Section 5.1.1 *Cleaning Patch Cord or Pigtail Fiber Optical Connectors* on page 5-2.
- 5. Verify that the HRR 4104 optical connectors have not been exposed to any contamination. If you suspect that the connectors may have been exposed to contamination (for example, by a dirty fiber cable connector), follow the cleaning procedure outlined in Section *5.1.2 Cleaning HRR 4104 Optical Connectors* on page 5-2.
- **NOTE:** Any contamination of either the fiber cable or HRR 4104 connector can significantly degrade optical link performance. This degradation will most likely manifest itself as poor carrier-to-noise ratio (CNR) or bit error rate (BER) performance.
- 6. Note the key characteristics of the mating connectors and align them accordingly. Gently insert the fiber cable connector into the connector on the HRR 4104. (If you are using a connector type that includes a rotating sleeve, *do not overtighten*.)

## 2.8 Testing RF Signal Output

Once you have connected the fiber and coaxial cables, you can use the RF monitor port to check the RF output level. The RF monitor port is a test connector (female F-type) located on the front panel of the HRR 4104 module, as shown in Figure 1-2 on page 1-2.

The RF monitor level is 20 dB (±1.0 dB) below the output level of the receiver.

Use the four-position selector switch on the front panel to select one of the four receivers within the HRR 4104 module. After testing one of the receivers, toggle the selector switch and test the next receiver. Repeat for all four receivers.



## 3 User Interface Options

This chapter describes two options for communicating with and controlling the HRR 4104:

- HLP 4200WD Display
   The HLP 4200WD interface provides the most comprehensive means of monitoring and controlling HRR 4104 receiver performance.
- NET 5200 NETWatch Site Controller Once installed and configured, the NET 5200 NETWatch Site Controller provides a straightforward way to monitor and control a network of multiple HRR 4104 receivers, either locally or remotely.

This chapter also describes:

- HRR 4104 front panel LED indicators
- HRR 4104 alarms

## 3.1 HLP 4200WD Display

The HRR 4104 receiver module can be configured and monitored conveniently via the buttons and display of the HLP 4200WD Platform.

#### 3.1.1 Main Menu

Figure 3-1 on page 3-2 provides a flowchart of the commands and messages in the Main menu, which is at the top of the HLP 4200WD Platform interface hierarchy.

Use the Main menu to scan through platform positions and select a specific plug-in module to monitor and control. The Main menu also allows you to set the platform address for communication with the NET 5200 NETWatch Site Controller.

- Use the HLP 4200WD's ▲ and ▼ buttons to scroll through the menus.
- Use the Enter button to make a selection.
- Use the Esc button to escape any menu.

For further information on using the HLP 4200WD display interface, see the *HLP* 4200 *Platform Product Manual*.



Figure 3-1. HLP 4200WD Platform Main menu display

### 3.1.2 Receiver Menu

After you navigate the HLP 4200WD's Main menu and select a specific HRR 4104 module, the Receiver menu appears. (If an alarm is active in the module, the alarm message appears instead of the Receiver menu.)

The Receiver menu is organized into five sub-menus, allowing you to select one of the four receivers or the module, as shown in Figure 3-2. The Receiver A, B, C, and D menus are described in Section 3.1.3. The Module menu is described in Section 3.1.4.

The status and control parameters in the Receiver menu and its sub-menus apply only to the specific HRR 4104 module that is selected.



Figure 3-2. Receiver menu (HLP 4200WD display)

#### 3.1.3 Receiver A, B, C, D Menus

The Receiver A, B, C, and D menus allow you to obtain diagnostic information and make adjustments to a specific receiver (A, B, C, or D) of the HRR 4104. The Receiver A menu is shown in Figure 3-3.



Figure 3-3. Receiver A menu (HLP 4200WD display)

#### 3.1.3.1 Receiver Diagnostics Menu

The Receiver A Diagnostics menu is shown in Figure 3-3 on page 3-4. The Diagnostics menu under each receiver lets you obtain basic operating parameters, as shown in Table 3-1.

#### Table 3-1:Receiver Diagnostics

Parameter	Description
Optical Power (Wavelength)	Current optical input power to the receiver and wavelength (1310 or 1550 nm).
Primary/Backup/ Standalone Module Muted/Not Muted	Whether the module is configured as primary, backup, or standalone; and whether the receiver is muted.
AGC Mode Enabled/Disabled	Whether automatic gain control (AGC) mode is currently enabled or disabled. When AGC mode is disabled, the receiver is in manual gain control (MGC) mode.
AGC RF Pad Setpoint	Actual pad value in dB when in AGC mode. [SET xxdB] was the pad setting when AGC mode was enabled.
AGC Optical Setpoint	Reference input power (in dBm).
AGC Pad Maximum	Maximum pad value allowed in AGC mode.
AGC Pad Minimum	Minimum pad value allowed in AGC mode.
Manual RF Pad Value	Current RF pad value (AGC is disabled).

#### 3.1.3.2 Receiver Adjust Menu

The Receiver A Adjust menu is shown in Figure 3-3 on page 3-4. The Adjust menu under each receiver allows you to:

- Specify the optical alarm limit
- Choose 1550 or 1310 nm wavelength, to ensure proper optical power readings
- Force the receiver into mute status (thereby activating the backup receiver in a redundant pair), or do not force it (allowing the receiver to default to the original configuration)
- Enable or disable AGC
- Adjust the AGC pad and optical setpoints
- Specify the AGC pad maximum and minimum
- Adjust the manual RF pad value

The Receiver Adjust menu settings are described in Section 4.1 Adjustment Options on page 4-1. Step-by-step setup instructions are provided in Section 4.3 Setup via HLP 4200WD Display on page 4-4.

#### 3.1.4 Module Menu

The Module menu lets you obtain status and alarm information, or copy settings, for the HRR 4104 module. The Module menu is shown in Figure 3-4.



Figure 3-4. Module menu (HLP 4200WD display)

#### 3.1.4.1 Module Alarms Menu

The Module Alarms menu displays the active alarms in any of the individual receivers or the module as a whole. The Module Alarms menu is shown in Figure 3-4. Further information about the alarms is provided in Section *3.4 HRR 4104 Alarms* on page 3-8.

#### 3.1.4.2 Module Status Menu

The Module Status menu lets you obtain the serial number and firmware version of the HRR 4104, or the optical power and wavelength at which each of the four receivers is operating. The Module Status menu is shown in Figure 3-4.

#### 3.1.4.3 Module Adjust Menu

The Module Adjust menu allows you to copy the settings from Receiver A to Receivers B, C, and D. The Module Adjust menu is shown in Figure 3-4.

## 3.2 NETWatch Site Controller

Harmonic's NET 5200 NETWatch Site Controller provides a complete element management system, including a Windows<sup>TM</sup>-based GUI and communications package for monitoring and controlling a network of multiple HRR 4104 receiver modules either remotely or locally. For information on installing and using this system, consult the NET 5200 NETWatch Site Controller Product Manual.

## 3.3 HRR 4104 Front Panel LED Indicators

The HRR 4104 front panel includes two LEDs, as shown in Figure 1-2 on page 1-2.

The Status LED illuminates red if an alarm condition exists within the receiver. It also lights for a short period during power up. The Status LED illuminates green if no alarm condition exists and the receiver is operating normally.

The Select LED illuminates yellow when the HRR 4104 receiver module is selected via the front panel controls of the HLP 4200.

## 3.4 HRR 4104 Alarms

The HRR 4104 provides alarms relating to the module as a whole, as well as alarms within the specific receivers (A through D). Table 3-2 describes the alarms for the HRR 4104 Return Path Receiver.

When there is an alarm, the Status LED on the front panel of the HRR 4104 module illuminates red. In addition, every alarm is reported via SNMP and via the HLP 4200WD front panel display. For information on accessing the alarms via the HLP 4200WD front panel display, see Section 3.1.

Table 3-2:HRR 4104 Alarms

Alarm	Description	
Module Alarms		
Module Low 5 V PS	Power supply voltage is below 4.5 V	
Module High 5 V PS	Power supply voltage is above 5.5 V	
Module Heat Sink Temp High	Heat sink temperature is above $80^{\circ}$ C (176° F)	
Receiver Alarms		
Receiver Low Optical Input	Optical input is below the optical alarm limit	
Receiver Muted Manually	Receiver has been set to Mute: Forced	
Receiver AGC Beyond Limits	Gain control is too low or too high (AGC is enabled)	



# Setting Up the HRR 4104 Receiver

This chapter describes how to set up the HRR 4104 Return Path Receiver for optimum performance. Either of the user interface options described in Chapter 3, *User Interface Options*, can be used for receiver setup.

This chapter describes:

- Adjustment options
- The AGC function
- How to set up via the HLP 4200WD display
- How to set up via the NET 5200 NETWatch Site Controller

### 4.1 Adjustment Options

This section describes the features you can control within each specific receiver (A, B, C, D) in the HRR 4104 module. Each setting applies only to a single receiver. The factory default settings are provided in Section 4.1.9.

#### 4.1.1 Optical Alarm Limit

The optical alarm limit is the threshold at which the optical alarm triggers.

When optical power input to the receiver drops below the optical alarm limit, a low optical input alarm occurs. In addition, if the receiver is a primary receiver, the receiver mutes its output and the backup receiver becomes operational.

#### 4.1.2 Input Wavelength 1550/1310 nm

The input wavelength adjustment allows you to choose between 1550 and 1310 nm.

The responsivity of the receiver changes depending on input wavelength. Select the input wavelength to ensure the correct optical power reading. If you are using C/DWDM in the return path, select 1550 nm.

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#### 4.1.3 Mute

When the HRR 4104 is in a primary/backup configuration, by default, the primary HRR 4104 module is active and the backup module is muted (inactive). This is the unforced mute setting.

Forcing the primary receiver into mute status deactivates the primary receiver and (in a redundant pair configuration) activates the backup receiver. This can be useful when there is a problem with the primary receiver or for troubleshooting.

#### 4.1.4 AGC Mode

Each receiver of the HRR 4104 has two gain control modes:

- AGC mode enabled—automatic gain control (AGC) mode
- AGC mode disabled—manual gain control (MGC) mode

Gain control affects the output power from the receiver.

When AGC is enabled:

- The RF pad adjusts automatically, controlling the output of the module based on the optical input.
- You can set the RF pad setpoint, and maximum and minimum pad limits.

When AGC is disabled:

• You must manually set the RF pad to control the output of the module.

#### 4.1.5 AGC Pad Setpoint

When AGC is enabled, you can set the receiver's RF pad. The default value is the manual RF pad value at the time AGC is enabled. For further information, see section 4.2 *Understanding the AGC Function* on page 4-3.

#### 4.1.6 AGC Optical Setpoint

When AGC is enabled, you can set the reference input power for the receiver. The default value is the optical power level at the time AGC is enabled. For further information, see section 4.2 Understanding the AGC Function on page 4-3.

#### 4.1.7 AGC Pad Maximum/Minimum

When AGC is enabled, you can enter an upper and a lower limit on the amount of gain. AGC pad maximum is the maximum pad value allowable. AGC pad minimum is the minimum pad value allowable.

If you enter a value for the AGC RF pad setpoint that exceeds the AGC pad maximum or minimum, the AGC pad maximum/minimum adjusts automatically.

For further information, see section 4.2 *Understanding the AGC Function* on page 4-3.

#### 4.1.8 Manual RF Pad Value

If AGC is disabled, you can set the actual pad value (in dB) to control the output power.

#### 4.1.9 Default Adjustment Values

At initial power up, default values are set as shown in Table 4-1. Once these values have been changed, the new settings are retained, even after the power has been shut off.

#### Table 4-1: Factory Default Settings

Adjustment	Value
Optical Alarm Limit	–18 dB
Input Wavelength	1310 nm
Mute	Unforced
AGC Mode	Disabled
Manual RF Pad Value	10 dB

## 4.2 Understanding the AGC Function

This section describes some details of the AGC function of the HRR 4104. The following example will help you when you set up the receiver by following the setup instructions in Section 4.3 or 4.4:

- 1. At initial power up, AGC is disabled.
- 2. Once the fibers are connected and a reference optical input power is established, in the Receiver Adjust menu, set the manual RF pad to the value that generates the RF output you are looking for.
  - Example: Given the optical input power of the link (for example, -8 dBm), the RF pad value that generates the appropriate RF output for your link is 13 dB.
- 3. Enable AGC via the Receiver Adjust menu.
  - With the example above, the module sets the following parameters as default values:

AGC Optical Setpoint = -8 dBm

AGC Pad Setpoint = 13 dB

- You will be able to go back and look at these AGC settings via the Receiver Diagnostics menu, and you can adjust them via the Receiver Adjustments menu (see Section 3.1.3).
- The module adjusts the RF pad value automatically to compensate for changes in optical input power.

- 4. You can now set the AGC Pad Maximum and Minimum to control the amount of gain allowable.
  - Example: With an RF pad value of 13 dB, you want to allow the pad to adjust to a maximum of 23 dB, and you want to limit the pad to a minimum of 11 dB. This gives you an AGC Pad Maximum = 23 dB and AGC Pad Minimum = 11dB, as shown in Figure 4-1.
  - You will be able to go back and look at these AGC settings via the Receiver Diagnostics menu, and you can adjust them via the Receiver Adjustments menu (see Section 3.1.3).



Figure 4-1. AGC settings example

## Rules for adjusting AGC setpoint, and maximum and minimum pad limits

- AGC Pad Setpoint  $\geq$  AGC Pad Minimum  $\geq$  0 dB
- AGC Pad Setpoint < AGC Pad Maximum < 30 dB
- If you change the AGC pad setpoint manually, the AGC pad limits (maximum and minimum) automatically adjust to appropriate settings that conform to the rules above.

## 4.3 Setup via HLP 4200WD Display

This section provides instructions for setting up the HRR 4104 receiver module via the buttons and display of the HLP 4200WD equipment platform. Using the HLP 4200WD front panel is the quickest and easiest way to initially set up and review the monitoring and control parameters for the HRR 4104. See Section 3.1 for a detailed description of this interface.

Before operating the HRR 4104, make several adjustments to optimize performance.

To set up the HRR 4104 via the HLP 4200WD buttons and display:

- 1. Verify that the HRR 4104 module is properly installed in the HLP 4200 Platform, and the input and output cables are properly connected, as described in Chapter 2, *Installing the HRR 4104 Receiver*.
- 2. Verify that the HLP 4200WD is powered, and that no alarm conditions exist within the HRR 4104 module. Make sure the Status LED on the front panel of the HRR 4104 module is green.
- 3. On the HLP 4200WD, press the Esc button until the display reads module selection.

- 4. Press the ▲ or ▼ button until the display indicates the HRR 4104 module you wish to set up, then press Enter.
- 5. To set up Receiver A within the selected HRR 4104 module, press ▲ or ▼ until the display reads RECEIVER A, then press Enter. If you want to set up another receiver (B, C, or D) instead, press ▲ or ▼ until the display shows the receiver you wish to set up, then press Enter.
- 6. Press ▼ until the display reads RECEIVER A ADJUST, then press Enter.
- 7. To set the optical alarm limit, press ▼ until the display reads REC A OPT ALR LIMIT ... Hold down the Set button and press ▲ or ▼ until the value you want is displayed, then press Enter. The range of possible values is -18 to 0 dB, in 1 dB increments. For details on the optical alarm limit feature, see Section 4.1.1 Optical Alarm Limit on page 4-1.

**NOTE:** If you do not want to change a setting, press Esc before pressing Enter. When you change a value, until you press Enter, an asterisk (\*) appears next to the value to indicate that the value has been changed but not saved.

- To set the wavelength, press ▼ until the display reads REC A INPUT WAV (1550/1310NM) ... Hold down the Set button and press ▲ or ▼ until the value you want—1550 or 1310—is displayed, then press Enter. For details on the wavelength feature, see Section 4.1.2 Input Wavelength 1550/1310 nm on page 4-1.
- 9. To set the mute to forced or unforced, press ▼ until the display reads RECEIVER A MUTE ... Hold down the Set button and press ▲ or ▼ until the value you want—FORCED or UNFORCED—is displayed, then press Enter. For details on the mute feature, see Section 4.1.3 Mute on page 4-2.
- 10. To enable or disable AGC mode, press ▼ until the display reads RECEIVER A AGC MODE ... Hold down the Set button and press ▲ or ▼ until the value you want—ENABLED or DISABLED—is displayed, then press Enter. For details on the AGC mode feature, see Section 4.1.4 AGC Mode on page 4-2.
  - If AGC is enabled, skip to Step 12.
  - If AGC is disabled, follow Step 11, then skip to Step 16.
- 12. If AGC is enabled, to set the AGC pad setpoint, press ▼ until the display reads REC A AGC PAD SETPOINT ... Hold down the Set button and press ▲ or ▼ until the value you want is displayed, then press Enter. The range of possible values is 0 to 30 dB, in 1 dB increments. For details on the AGC pad setpoint feature, see Section 4.1.5 AGC Pad Setpoint on page 4-2.
- 13. To set the AGC optical setpoint, press ▼ until the display reads REC A AGC OPTICAL SET ... Hold down the Set button and press ▲ or ▼ until the value you want is displayed, then press Enter. For details on the AGC optical setpoint feature, see Section 4.1.6 AGC Optical Setpoint on page 4-2.

- 14. To set the AGC pad maximum, press ▼ until the display reads REC A AGC PAD MAXIMUM ... Hold down the Set button and press ▲ or ▼ until the value you want is displayed, then press Enter. The range of possible values is 0 to 30 dB, in 1 dB increments. For details on the AGC pad maximum and minimum, see Section 4.1.7 AGC Pad Maximum/Minimum on page 4-2.
- 15. To set the AGC pad minimum, press ▼ until the display reads REC A AGC PAD MINIMUM ... Hold down the Set button and press ▲ or ▼ until the value you want is displayed, then press Enter.
- 16. Press Enter to exit the Adjust menu for Receiver A.
- 17. Press Enter to exit the Receiver A menu and return to the Receiver menu. This completes the setup of Receiver A.
- 18. To set up Receivers B, C, and D, repeat steps 5 through 17 for each receiver. Or, if you want to duplicate the same settings from Receiver A to Receivers B, C, and D, you can use the copy settings feature by following steps 19 through 22.
- 19. To copy the Receiver A settings to Receivers B, C, and D, press ▼ until the display reads <ENTER> FOR MODULE, then press Enter.
- 20. Press ▼ until the display reads <ENTER> MODULE ADJUST, then press Enter. The display reads COPY RX A SETTINGS TO B, C, D YES/NO.
- 21. Hold down the Set button and press ▲ or ▼ until YES is displayed, then press Enter. The display asks ARE YOU SURE (COPY TO B, C, D) YES/NO.
- 22. To confirm the settings changes, hold down the Set button and press ▲ or ▼ until YES is displayed, then press Enter.

## 4.4 Setup via NETWatch Site Controller

If you are using a platform that does not have a display (such as the HLP 4200ND), you can use the NET 5200 NETWatch Site Controller for receiver setup. For details on communication with the HRR 4104 receiver through the NETWatch Site Controller element management system, consult the *NET 5200 NETWatch Site Controller Product Manual*.

To set up the HRR 4104 via the NETWatch Site Controller:

- 1. Verify that the HRR 4104 module is properly installed in the platform, as described in Chapter 2, *Installing the HRR 4104 Receiver*.
- 2. Verify that the platform is powered, and that no alarm conditions exist within the HRR 4104 module. Make sure the Status LED on the front panel of the HRR 4104 module is green. Also, make sure the module icon in the NETWatch display is green.
- 3. Using the Site Controller, set AGC to enabled or disabled.
- 4. If AGC is enabled, set the AGC pad maximum and ACG pad minimum. If AGC is disabled, set the manual RF pad value.
- 5. Set the optical alarm limit (if desired value is different from the default value).
- 6. To set up Receivers B, C, and D, repeat steps 3 through 5 for each receiver. Or, if you want to duplicate the same settings from Receiver A to Receivers B, C, and D, you can use the copy settings feature.



# **Maintenance and Troubleshooting**

This chapter describes:

- How to clean fiber optic connectors
- How to troubleshoot the HRR 4104
- How to return the unit for service
- Manufacturer disclaimer
- Warranty summary
- Limitations of the warranty
- Exclusive legal remedies

**NOTE:** The HRR 4104 does not include any customer-serviceable components.

## 5.1 Cleaning Fiber Optic Connectors

**DANGER:** The fiber cable carries invisible laser radiation. This product does not contain a laser, but is used in systems that contain lasers. **AVOID EXPOSURE TO THE BEAM.** Never operate a unit that has a broken fiber or a disconnected fiber connector.

Dirty optical connectors are the leading source of poor performance in a broadband optical fiber network. Dirty optical connectors lead to optical signal loss and reflections, which in turn can seriously degrade carrier-to-noise (CNR) performance and, in some cases, distortion performance.

Harmonic recommends that you clean all mating fiber connectors, before connecting them to an optical receiver.

In addition, if you suspect that the optical connector of an HRR 4104 may have been exposed to contamination (by a dirty fiber cable connector, for example), you should properly clean the HRR 4104 optical connector before connecting the optical fiber.

**CAUTION:** Improper cleaning of an optical connector can do more harm than good. Never spray a clean-air product onto the surface of an optical connector. Spraying air onto an optical connector can cause condensation on the connector surface, leaving water spots and trapping dust.

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#### 5.1.1 Cleaning Patch Cord or Pigtail Fiber Optical Connectors

To clean optical connectors, Harmonic recommends using a fiber optic connector cleaning cartridge (such as NTT Cletop). If a cleaning cartridge is not available, follow these steps.

To clean the optical connector of a patch cord or pigtail:

- 1. Fold a piece of unused dry lens cleaning paper twice, for a four-ply thickness.
- 2. Use a drop of high-grade isopropyl alcohol to wet part of the paper.
- 3. Lay the connector on the lens cleaning paper with the tip touching the paper.
- 4. In one continuous motion, pull the connector from the wet part of the paper to the dry part.

### 5.1.2 Cleaning HRR 4104 Optical Connectors

To clean the optical connectors of the HRR 4104 receiver:

- 1. Disconnect the fibers from the optical connectors in the face plate.
- 2. Use a fiber optic cleaning swab (part number F1-25184 from Fiber Instrument Sales, or similar) and wet with high-grade isopropyl alcohol.
- 3. Insert the cleaning swab directly into the adapter until it fully touches the connector end face inside.
- 4. Apply light pressure while rotating the swab clockwise one full turn.
- 5. Insert a second clean (dry) cleaning swab into the adapter until it fully touches the connector end face inside.
- 6. Again, apply light pressure while rotating the swab clockwise one full turn.
- 7. Reconnect the fibers to the optical connectors.

## 5.2 Troubleshooting

Should a problem occur, see if the symptoms are listed in Table 5-1.

#### Table 5-1:Troubleshooting Solutions

Symptom	Solution
Platform does not recognize the HRR 4104 module	Verify that the controller cable is connected between the CPS module and HLP 4200 platform (see the <i>CPS 42xx Product Manual</i> ).
	Verify that the HRR 4104 module is fully engaged with the HMC 4008 carrier. Verify that the HMC 4008 carrier is fully engaged in the platform.
	If that does not correct the problem, contact Customer Service (see Section 5.3).

Symptom	Solution
Receiver x low optical input	Check fiber connection on front of module.
alarm	Follow the connector cleaning procedure (see Section 5.1).
	If that does not correct the problem, contact Customer Service (see Section 5.3).
Module low 5V power supply alarm	Contact Customer Service (see Section 5.3).
Module high 5V power supply alarm	Contact Customer Service (see Section 5.3).
Module heat sink temp high alarm	Verify that the unit is operating within the proper temperature range (0° to 50° C).
	Verify that nothing is obstructing airflow through the front of the module.
	If that does not correct the problem, contact Customer Service (see Section 5.3).
Receiver x muted manually	Manually unmute the receiver (see Section 4.3, step 9).
Receiver x AGC beyond limits	Verify optical input level.
	Change AGC pad maximum and minimum settings (see Section 4.3, steps 14 and 15).
	If that does not correct the problem, contact Customer Service (see Section 5.3).
No RF output	Module is muted. Manually unmute the receiver (see Section 4.3, step 9).
	Verify that the HRR 4104 module is fully engaged with the HMC 4008 carrier.
	If that does not correct the problem, contact Customer Service (see Section 5.3).
In redundancy mode, primary unit Diagnostic menu says standalone/backup	Verify that the redundancy cable is connected properly.
In redundancy mode, backup unit Diagnostic menu says standalone/primary	Verify that the redundancy cable is connected properly.

 Table 5-1:
 Troubleshooting Solutions continued

## 5.3 In Case of Problems

If you continue to have a problem, contact the Harmonic Customer Service department (see Appendix B, *Harmonic Inc. – Offices*). A service technician will assist you in determining whether a fault exists with the unit.

If the service technician determines that you need to return the unit, she or he will issue you a Return Material Authorization (RMA) Number. You must include this RMA number on the shipping container when returning the unit, and with all correspondence regarding the unit.

To return the unit, send it to one of the Harmonic Headquarters addresses listed in Appendix B, *Harmonic Inc. – Offices*. Please add the note:

Attn: Customer Service RMA no. \_\_\_\_\_

## 5.4 Disclaimer

Harmonic Inc. reserves the right to change any products described herein at any time, and without prior notice. Harmonic assumes no responsibility or liability arising from the use of the products described herein, except as expressly agreed to in writing by Harmonic. The use and purchase of this product does not convey a license under any patent rights, copyrights, trademark rights, or any intellectual property rights of Harmonic. Nothing hereunder constitutes a representation or warranty that using any products in the manner described herein will not infringe any patents of third parties.

## 5.5 Warranty Summary<sup>1</sup>

This Harmonic Inc. product is warranted against defects in material and workmanship for twelve (12) months from the date of shipment. Harmonic Inc. will, at its option, either repair or replace products that prove to be defective.

We shall have no liability or responsibility to the customer or any other person with respect to any loss or damage caused or alleged to be caused directly or indirectly by equipment or software sold or furnished by us. Read instructions carefully. No liability will be assumed for any damage caused by improper installation.

The information in this document is subject to change without notification. The content of this document is protected by copyright. No part of this document may be reproduced or copied by any means without the permission of Harmonic Inc.

<sup>1.</sup> See Order Acknowledgment for complete warranty details.

For warranty or repair, return this product to a service facility designated by Harmonic Inc. The Buyer shall prepay shipping charges to Harmonic Inc., and Harmonic Inc. shall pay shipping to return the product to the buyer. However, buyer shall pay all shipping charges, duties and taxes for products returned to Harmonic Inc. from outside the U.S.

Harmonic Inc. warrants that its software, as well as firmware designated by Harmonic Inc. for use with the product, will execute its programming instructions when installed properly for ninety (90) days. Harmonic Inc. does not warrant that the operation of the product or software or firmware will be uninterrupted or error free.

## 5.6 Limitations of Warranty

The foregoing warranty shall not apply to defects resulting from abuse, neglect by the Buyer, improper installation or application by the Buyer, the Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product or improper site penetration or maintenance.

No other warranty is expressed or implied. Harmonic Inc. specifically disclaims the implied warranties or merchantability and fitness for a particular purpose.

## 5.7 Exclusive Remedies

The remedies provided herein are the Buyer's sole and exclusive remedies.

Harmonic Inc. shall not be liable for any direct, indirect, special, incidental or consequential damages, whether based upon contract, tort or any other legal theory.



# Appendix A Technical Specifications

## A.1 Optical Input

Number of inputs: 4 Input level range: –18 to +2 dBm Wavelength: 1280 to 1600 nm Connector type: SC/APC (standard), SC/UPC, FC/UPC, FC/APC, E-2000

## A.2 RF Output

Number of outputs: 4  $C/IM2^1$ :  $\ge 60 \text{ dB}$   $C/IM3^1$ :  $\ge 60 \text{ dB}$ RF output level<sup>2</sup>: >45 dBmV per channel Operational bandwidth: 5 to 100 MHz Flatness: 5 to 70 MHz:  $\pm 0.5 \text{ dB}$ 70 to 100 MHz:  $\pm 1.0 \text{ dB}$ RF attenuator adjustment range: >30 dB in 1.0 dB steps Impedance: 75  $\Omega$ Return Loss: >16 dBConnector type: Female F Isolation between receivers: 5 to 70 MHz: >65 dB70 to 100 MHz: >40 dB

<sup>1.</sup> Second (or third) order intermodal distortion; two carriers at 45 dBmV/ch output level with -10 dBm optical input and 16% OMI.

<sup>2.</sup> At maximum gain with -10 dBm optical input and 16% OMI.

## A.3 User Interface

#### Front panel

Bi-state status LED: Normal = green, Alarm = red Module selection indicator: Yellow LED Six-pin primary/backup connector Receiver selector switch for RF monitor point

RF monitor point:

Level:  $-20 \text{ dB} \pm 1.0 \text{ dB}$  below output

Return loss:

5 to 65 MHz: -16 dB

65 to 100 MHz: -12 dB

Impedance: 75  $\Omega$ 

Connector type: Female F

#### **Network Management**

RS-485, RS-233C connectors (in HLP 4200)

## A.4 Electrical

Power requirements: +24 VDC; supplied by HLP 4200 bus Power consumption: 15 W maximum

## A.5 Environmental

Operating temperature range:  $0^{\circ}$  to  $50^{\circ}$  C /  $32^{\circ}$  to  $122^{\circ}$  F Storage temperature range:  $-40^{\circ}$  to  $85^{\circ}$  C /  $-40^{\circ}$  to  $185^{\circ}$  F Relative humidity: 90% maximum, non-condensing

## A.6 Physical

Dimensions: 1.20" W x 4.45" H x 11.53" D / 3.0 cm W x 11.3 cm H x 24.3 cm D Weight: 3.3 lbs / 1.5 kg Mounting: HLP 4200 Platform; via HMC 4008 module carrier

## A.7 Laser Radiation Warning

This product does not contain a laser, but is used in systems that contain lasers.

**DANGER:** AVOID EXPOSURE TO THE BEAM. Never operate a unit that has a broken fiber or a disconnected fiber connector.

## A.8 Agency Certifications

UL60950, CSA60950 (cTUVus)

FCC Part 15 Class A

EN60950, (TUV GS-mark)

EN 55022, EN 55024 (TUV EMC-mark, CE)

## A.9 Compliance with WEEE

Harmonic will ensure that all products that cannot be re-used will be recycled in compliance with the WEEE Directive. To that end, users are advised that (1) Harmonic equipment is not to be discarded in household or office garbage, (2) customers may consult the Harmonic web site (www.harmonicinc.com) for additional and updated information on this process.





# Appendix B Harmonic Inc. – Offices

#### Assistance

For technical support and customer service, call toll free: 800.730.4099.

Harmonic's web address is www.harmonicinc.com.

## Worldwide Technical Support and Return Materials Authorization

Tel: 1.800.730.4099 (inside U.S.) Tel: +1.408.542.2771 (outside U.S.) Fax: +1.408.490.6770 E-mail: rma@harmonicinc.com

#### U.S.A. Corporate Headquarters

Harmonic Inc. 549 Baltic Way Sunnyvale, CA 94089, U.S.A. Tel: 1.800.788.1330 (inside U.S.) Tel: +1.408.542.2500 (outside U.S.) Fax: +1.408.490.6708

#### **Asia Pacific Headquarters**

Harmonic Limited Suite 703-704, CMG Asia Tower The Gateway, 15 Canton Road Tsimshatsui, Kowloon, Hong Kong Tel: +852.2116.1119 Fax: +852.2116.0083

#### **Europe and Africa Headquarters**

Harmonic Inc. Continental Square, 4 Place de Londres Saturne Building, 2nd Floor ROISSY CDG Cedex, 95727, France Tel: +33.1.48.62.92.12 Fax: +33.1.48.62.92.36

#### U.K., Middle East, and South Africa Headquarters

Harmonic Inc. 21 Progress Business Centre Whittle Parkway Slough, Berkshire SL1 6DQ, United Kingdom Tel: +44.1.753.714.367 Fax: +44.1.753.540.990