FlexWave® CPRI Digital Interface Unit

Installation and Provisioning Guide • FWPP-507-03 • September 2017
## Table of Contents

### Document Overview
- Document Revision History ................................................................. 1
- Document Cautions and Notes ................................................................. 1
- Abbreviations Used in this Guide .............................................................. 2

### CPRI Digital Interface Unit Overview
- CDIU Connectors .................................................................................. 4
- CDIU LEDs ........................................................................................... 5
- Signal-Routing Options between the CDIU and RF Paths ....................... 6
- CDIU/LTE Uplink Gain Overview .......................................................... 8
- Uplink Gain Configuration ..................................................................... 8
- Uplink Power Reports ............................................................................ 8

### Installing a CDIU
- Using the FlexWave EMS with CDIUs ...................................................... 15
  - Identifying CDIUs in the EMS GUI ...................................................... 15
  - Identifying WCDMA in the EMS GUI .................................................. 15
- Safety Precautions.................................................................................. 16
- Guard against Damage from Electro-Static Discharge ............................ 16
- Unpack and Inspect the CDIU ............................................................... 16
- Install the CDIU(s) in the Host Unit Chassis .......................................... 17
- Connect the Reference Clock ............................................................... 18
- Set the Host Unit Clock to External ...................................................... 20
- Configure the CDIU to BBU Interface ................................................... 21
  - CDIU Interfaces Page Read-Only Fields ............................................ 22
  - The Effect of Linked CDIUs on the Configure CDIU Interfaces Page .... 23
  - CDIU Path Bands .............................................................................. 24
  - CDIU Path A and Path B Timeslot Configurations ............................... 25
  - Basic Timeslot Rules ........................................................................ 25
  - Constraints on 1900 PCS SGL or 2100 AWS Dual-Band Configurations 25
- Setting the CDIU Interface Parameters ................................................. 26
- Provision the System Links ................................................................. 29
- Using the Provision System Pages ......................................................... 30
- CDIU and Host DART Summing ............................................................. 34
  - Host DART/CDIU Summing Rules ...................................................... 35
  - Passbands Rules for Host DART/CDIU Summing .............................. 35
- Linking CDIUs to Remote Units ............................................................ 35
  - Using the Linking Table .................................................................. 36
  - Using Passband Selection Panels ...................................................... 38
  - Using the Established Links Table ..................................................... 39
  - Linking CDIU(s) to Remote DART(s) ................................................. 39
- Set the Forward RF ............................................................................... 41
  - Working with Input Power in the Forward RF Page ............................ 42
  - Set the Forward RF for Connection Types 1 and 2 ............................. 44
  - Set the Forward RF for Connection Types 3, 4, and 5 ....................... 47
  - Viewing the CDIU Antenna Carriers Table on the Forward RF Page .... 50
- Set the Reverse RF ............................................................................... 51
  - Configuring the Reverse RF .............................................................. 52
  - Viewing the CDIU Antenna Carriers Table on the Reverse RF Page ..... 53
- Configure Delay .................................................................................. 55
  - Forward Delay and Reverse Delay for a CDIU System ....................... 56
  - Working with CDIU Forward and Reverse Delays .............................. 57
  - Changes to Make at an ALU BBU for LTE Systems ......................... 57
  - Setting the DAS Delay for a CDIU ..................................................... 58
- Working with a Delay Compensation Alarm at the BBU ....................... 61
  - BBU Delay Compensation Alarm when a CDIU Delay Setting Exceeds BBU Maximum Delay .......................................................... 61
  - BBU Delay Compensation Alarm when a CDIU Delay Setting Exceeds FlexWave Maximum ................................................................. 62

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**FWPP-507-03**  
*FlexWave® CPRI Digital Interface Unit Installation and Provisioning Guide*  
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Page iii
Table of Contents

Connect the CDIU to the BBU ............................................................... 63
Check the CDIU for Input Power from the BBU .................................. 65
Checking BBU Input Power for CDIU Connection Types 1 and 2 .......... 65
Checking BBU Input Power for Connection Types 3, 4, and 5 ............... 66
Check the CDIU for Output Power to the BBU ................................... 67
CDIU Temperature as Reported by the BBU ....................................... 67

Managing CDIUs .................................................................................. 68
Powering Up CDIUs .............................................................................. 68
Generate a Test Tone ............................................................................. 68
Using the Unit Information Pages ........................................................ 69
View the CDIU(s) Installed in the Host Unit ........................................ 69
View the CDIU Status .......................................................................... 70
CDIU CPRI Ports Status Table ............................................................ 70
CDIU Path Status Table ...................................................................... 71
View Information about CDIU Antenna Carriers .................................. 72
Elements of a CDIU Antenna Carriers Table ....................................... 72
Viewing the CDIU Antenna Carriers Table on the View CDIU Antenna Carriers Page ........................................................... 73
Viewing the CDIU Antenna Carriers Table in the Get Information CDIU Antenna Carriers Report .................................................. 73
Using the Get Information Reports ....................................................... 74
View Information about the CDIU Hardware ....................................... 74
View a Links Report ............................................................................ 75
View a Link Delays Report .................................................................. 77
View a Forward RF Report .................................................................. 78
View a Reverse RF Report ................................................................... 80
View a CDIU Interfaces Report ........................................................... 82
View a CDIU Antenna Carriers Report ............................................... 83
Unlink a CDIU ...................................................................................... 84
Clear a CDIU Configuration ............................................................... 85
Replacing a CDIU with One or More DARTs ....................................... 86
Replacing One or More DARTs with a CDIU ........................................ 86

Working with CDIU Alarms ................................................................. 88
Using the Manage Alarms Table ......................................................... 88
Enable and Disable CDIU Alarms ......................................................... 90
CDIU Alarms that Can Be Enabled/Disabled ......................................... 91

Commissioning CDIUs in a Host-to-Host Configuration ..................... 92
Configuring the HEU Downlink ........................................................... 93
Configuring an Uplink Cascade ........................................................... 94
Provisioning an Uplink Cascade .......................................................... 94
Option 1—Uplink Cascade via Noise Matching .................................... 95
Option 2—Uplink Cascade via Dynamic Range Optimized .................... 96
Example CDIU H2H Configurations ................................................... 97
Verifying the Uplink Cascade .............................................................. 97
Total System Delay for LTE Systems .................................................. 98
Total System Delay for UMTS Systems ............................................... 98

CDIU Maintenance Guidance ............................................................ 99
Maintenance Activities Known to Break BBU-to-CDIU Links ................. 99
Determining CDIU Isolation by the BBU ............................................. 99
Recovery if the BBU Isolates the CDIU/RRH ....................................... 99

CDIU Alarm Reference ....................................................................... 100
CDIU and FlexWave Interface Alarms .................................................. 101
CDIU and BBU Interface Alarms ........................................................ 108

Specifications and Standards Certification ........................................ 118
Optical Specifications .......................................................................... 118
Standards Certification ....................................................................... 118
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contacting CommScope</td>
<td>119</td>
</tr>
<tr>
<td>DCCS Global Technical Support</td>
<td>119</td>
</tr>
<tr>
<td>Telephone Helplines</td>
<td>119</td>
</tr>
<tr>
<td>Online Support</td>
<td>119</td>
</tr>
<tr>
<td>Waste Electrical and Electronic Equipment Recycling</td>
<td>119</td>
</tr>
<tr>
<td>DCCS Technical Training</td>
<td>120</td>
</tr>
<tr>
<td>Accessing FlexWave User Documentation</td>
<td>120</td>
</tr>
<tr>
<td>Accessing Prism User Documentation</td>
<td>121</td>
</tr>
<tr>
<td>Accessing Spectrum User Documentation</td>
<td>121</td>
</tr>
</tbody>
</table>
DOCUMENT OVERVIEW

This guide provides the information you need to install a FlexWave® CPRI Digital Interface Unit into a FlexWave Host Unit, and how to use the FlexWave Element Management Software to provision the CDIU system.

**NOTE:** Throughout this guide, the use of “REC” (Radio Equipment Controller) is synonymous with the BBU.

This installation guide is compatible with the units listed in Table 1; the products listed in Table 1 can be used in both Prism and Spectrum systems.

### Table 1. Supported FlexWave Units

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FWP-00000HUII</td>
<td>Host Unit Chassis II*</td>
</tr>
<tr>
<td>FWP-NEBS3HUII</td>
<td>Host Unit Chassis II - NEBS Level 3 Compliant*</td>
</tr>
<tr>
<td>FWP-CDIU-01</td>
<td>CPRI Digital Interface Unit</td>
</tr>
</tbody>
</table>

* A CDIU requires a Host System III Module (FWP-000HUSYSIII) in the Host Unit. The Chassis II and the NEBS Level 3 Compliant Host Units both ship with the Host System III Module pre-installed at the factory.

DOCUMENT REVISION HISTORY

This is the third release of the *FlexWave® CPRI Digital Interface Unit Installation and Provisioning Guide*, which:

- adds information for the Nokia AirScale FSM4 BBU, see
  - "Forward Delay and Reverse Delay for a CDIU System” on page 56
  - "Changes to Make at an ALU BBU for LTE Systems” on page 57
  - "Connect the CDIU to the BBU” on page 63.
- adds "Waste Electrical and Electronic Equipment Recycling” on page 119.

DOCUMENT CAUTIONS AND NOTES

Two types of messages, identified below, appear in the text:

**CAUTION!** Cautions indicate operations or steps that could cause personal injury, induce a safety problem in a managed device, destroy or corrupt information, or interrupt or stop services.

**NOTE:** Notes contain information about special circumstances.
### Abbreviations Used in This Guide

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>aDAS</td>
<td>Analog Distributed Antenna System</td>
<td>MIMO</td>
<td>Multiple-Input Multiple-Output</td>
</tr>
<tr>
<td>AxC</td>
<td>Antenna Carriers</td>
<td>MSA</td>
<td>Multi-Source Agreement</td>
</tr>
<tr>
<td>BBU</td>
<td>Baseband Unit</td>
<td>NO</td>
<td>Normally Open</td>
</tr>
<tr>
<td>CDIU</td>
<td>CPRI Digital Interface Unit</td>
<td>PLL</td>
<td>Phase-Locked Loop</td>
</tr>
<tr>
<td>cm</td>
<td>Centimeter</td>
<td>NC</td>
<td>Normally Closed</td>
</tr>
<tr>
<td>CDIU</td>
<td>CPRI Digital Interface Unit</td>
<td>NO</td>
<td>Normally Open</td>
</tr>
<tr>
<td>cm</td>
<td>Centimeter</td>
<td>NOC</td>
<td>Network Operations Center</td>
</tr>
<tr>
<td>CPRI</td>
<td>Common Public Radio Interface</td>
<td>PLL</td>
<td>Phase-Locked Loop</td>
</tr>
<tr>
<td>CW</td>
<td>Continuous Wave</td>
<td>NC</td>
<td>Normally Closed</td>
</tr>
<tr>
<td>DART</td>
<td>Digital-Analog Radio Transceiver</td>
<td>rdn</td>
<td>Relative Distinguished Name</td>
</tr>
<tr>
<td>DAS</td>
<td>Distributed Antenna System</td>
<td>REC</td>
<td>Radio Equipment Controller</td>
</tr>
<tr>
<td>dBFS</td>
<td>Decibels relative to full scale</td>
<td>REV</td>
<td>Reverse</td>
</tr>
<tr>
<td>DCCS</td>
<td>Distributed Coverage and Capacity Solutions</td>
<td>RF</td>
<td>Radio Frequency</td>
</tr>
<tr>
<td>DL</td>
<td>Downlink</td>
<td>ROCM</td>
<td>Reverse OneBTS CPRI Module</td>
</tr>
<tr>
<td>EMEA</td>
<td>Europe, Middle East, Africa</td>
<td>RRH</td>
<td>Remote Radio Head</td>
</tr>
<tr>
<td>EMS</td>
<td>Element Management System</td>
<td>Rx</td>
<td>Receive</td>
</tr>
<tr>
<td>ESD</td>
<td>Electro-Static Discharge</td>
<td>SDI</td>
<td>Slave Link Downstream Indication</td>
</tr>
<tr>
<td>EXT REF</td>
<td>External Reference</td>
<td>SeRF</td>
<td>Serial RF</td>
</tr>
<tr>
<td>FPGA</td>
<td>Field Programmable Gate Array</td>
<td>SFP</td>
<td>Small Form-Factor Pluggable</td>
</tr>
<tr>
<td>FWD</td>
<td>Forward</td>
<td>SIMO</td>
<td>Single Input, Multiple Output</td>
</tr>
<tr>
<td>GUI</td>
<td>Graphical-User Interface</td>
<td>SISO</td>
<td>Single-Input Single-Output</td>
</tr>
<tr>
<td>H2H</td>
<td>Host-to-Host</td>
<td>SMB</td>
<td>SubMiniature version B</td>
</tr>
<tr>
<td>HW</td>
<td>Hardware</td>
<td>Tx</td>
<td>Transmit</td>
</tr>
<tr>
<td>kTB</td>
<td>Thermal Noise</td>
<td>UL</td>
<td>Uplink</td>
</tr>
<tr>
<td>LTE5</td>
<td>Long Term Evolution 5 MHz bandwidth signal</td>
<td>UMTS</td>
<td>Universal Mobile Telecommunications System</td>
</tr>
<tr>
<td>LTE10</td>
<td>Long Term Evolution 10 MHz bandwidth signal</td>
<td>USB</td>
<td>Universal Serial Bus</td>
</tr>
<tr>
<td>LTE20</td>
<td>Long Term Evolution 20 MHz bandwidth signal</td>
<td>WCDMA</td>
<td>Wideband Code Division Multiple Access</td>
</tr>
<tr>
<td>MHz</td>
<td>Megahertz</td>
<td>WSP</td>
<td>Wireless service Provider</td>
</tr>
</tbody>
</table>
CPRI Digital Interface Unit Overview

CommScope FlexWave systems distribute signals from a common RF source (base station) to multiple Remote Units. A Digital-Analog Radio Transceiver (DART) card provides the interface between the base station RF signals (both uplink and downlink) and digital baseband representations of those signals, which are transported between the DAS Host and Remote Unit via a digital Serial RF (SeRF) protocol.

To interface the DAS to a digital baseband unit (BBU) rather than an RF base station, a CPRI Digital Interface Unit (CDIU) will need to be populated in the FlexWave DAS Host Unit chassis in one or more slots originally provisioned for RF DARTs. CDIU supports up to two carriers of LTE and up to 2 carriers for UMTS. (The FlexWave EMS uses the term UMTS instead of WCDMA in its fields and parameters.)

**Figure 1** illustrates a FlexWave Host Unit that has both CDIUs and DARTs. Each CDIU requires two slot spaces, and can only be installed in the following slot combinations:

- 1 and 3
- 2 and 4
- 5 and 7
- 6 and 8.

![Figure 1. CDIUs Installed in a FlexWave Host Unit](image-url)
CDIU CONNECTORS

<table>
<thead>
<tr>
<th>Ref #</th>
<th>Component</th>
<th>Device</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CPRI Port 1 and CPRI Port 2</td>
<td>SFP/SFP+ connectors that while MSA compliant, are a specific line rate offered by Nokia. Maximum transceiver power per CPRI Port is 2W.</td>
<td>Two connectors for single-mode fiber (one per CPRI link) where one is Tx and the other is Rx.</td>
</tr>
<tr>
<td>2</td>
<td>Craft</td>
<td>Mini-USB to serial port connection.</td>
<td>Functionality reserved for use by CommScope or Nokia.</td>
</tr>
<tr>
<td>3</td>
<td>REF OUT</td>
<td>50-Ohm QMA-F connector</td>
<td>10 MHz reference clock output that is derived from either the CPRI Port 1 or the CPRI Port 2 connector. Connects to the FlexWave Host System III Module.</td>
</tr>
</tbody>
</table>
## CDIU LEDs

<table>
<thead>
<tr>
<th>Ref #</th>
<th>LED</th>
<th>LED Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RX</td>
<td>Off</td>
<td>No SFP is present.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red</td>
<td>Receiver has no light.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amber</td>
<td>Receiver detects light, but is not locked or is not framed to incoming signal.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>Receiver is locked and framed to the incoming signal.</td>
</tr>
<tr>
<td></td>
<td>TX</td>
<td>Off</td>
<td>There is no SFP inserted in this TX connector.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red</td>
<td>An SFP is installed in this TX connector, but the internal FPGA PLL has not locked (this is highly unlikely).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>An SFP is installed in this TX connector, and the internal FPGA PLL is locked.</td>
</tr>
<tr>
<td>2, 3</td>
<td>PATH A and PATH B</td>
<td>Off</td>
<td>CDIU Path A/B is not linked. On startup, Path A/B is defaulted by the FPGA to be Off.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amber*</td>
<td>The DAS user has configured CDIU Path A/B, but the BBU has not provisioned the Path A/B Antenna Carriers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>The DAS user has configured CDIU Path A/B, and the BBU has provisioned the Path A/B Antenna Carriers. For CDIU Connection Types 3, 4, and 5, the CDIU PATH A and PATH B LEDs will not turn green until Antenna Carriers are present for both CPRI ports.</td>
</tr>
<tr>
<td>4</td>
<td>CONFIG</td>
<td>Off</td>
<td>FPGA files are not present; error may have occurred during a software upgrade.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red*</td>
<td>FPGA has loaded, but the processor has not booted, which indicates a file corruption or hardware problem.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amber*</td>
<td>CDIU is still booting or not booting correctly; CDIU is therefore not communicating with the BBU.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>FPGA is configured, and the master processor is running per specification.</td>
</tr>
<tr>
<td>5</td>
<td>PWR</td>
<td>Off</td>
<td>CDIU is not receiving power from the backplane, or there has been a power-on failure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red</td>
<td>One or more of the internal power rails is out of tolerance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>All power rails are present and in-tolerance.</td>
</tr>
</tbody>
</table>

* If the CONFIG LED remains red or amber, there may be file corruption or a missing file; check for an active CDIU configuration fault alarm and follow the alarm remedy. If alarm remedy does not turn the CONFIG LED green, contact CommScope for assistance (see “DCCS Global Technical Support” on page 119).
## SIGNAL-ROUTING OPTIONS BETWEEN THE CDIU AND RF PATHS

Table 2 describes the supported signal-routing options between two CPRI ports and two RF paths.

### Table 2. CPRI to RF Path Mapping

<table>
<thead>
<tr>
<th>Configuration Type</th>
<th>Description</th>
<th>Mapping Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type 1</strong></td>
<td>Type 1 is for Dual Independent SISO—both CPRI Port 1 and CPRI Port 2 map to a single RF path. The two RF paths can be in different RF bands. Note that with the Type 1 mapping, you will configure CPRI Port 1 and CPRI Port 2 independently from each other.</td>
<td><img src="image1" alt="Mapping Diagram for Type 1" /></td>
</tr>
<tr>
<td>CPRI Ports: 1 and/or 2</td>
<td>Carrier Configuration: SISO, SISO</td>
<td>RF Paths: 1 or 2</td>
</tr>
</tbody>
</table>

**Type 2**

CPRI Port: 1
Carrier Configuration: MIMO
RF Paths: 2
RF Bands: 1

**Type 2** is for Single MIMO—one CPRI port maps to two RF paths—that must be in the same band—for MIMO deployment.

**NOTE:** Only Port 1 is allowed in Type 2. Port 2 is disabled.

**Type 3**

CPRI Ports: 1 and 2
Carrier Configuration: SISO, SISO
RF Paths: 1
RF Bands: 1

**Type 3** is for Summed SISO—sums carriers from two CPRI links into a single RF path. Applications include placing LTE and WCDMA carriers (from separate BBUs) in a single RF band, and two WSPs summing into the same RF Band.

**NOTE:** The passband selected for Types 3, 4, or 5 must be sufficient to accommodate the antenna carriers from both CPRI ports. For example, when using Type 5, if AWS Block A is on Port 1 and AWS Block B/C is on Port 2, then the passband on Paths A and Path B must both be tuned to AWS A/B/C. This applies for any of the summed connections (Types 3, 4, and 5).
Table 2. *CPRI to RF Path Mapping* (Cont.)

<table>
<thead>
<tr>
<th>Configuration Type</th>
<th>Description</th>
<th>Mapping Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type 4</strong>&lt;br&gt;CPRi Ports: 1 and 2&lt;br&gt;Carrier Configuration: MIMO, SISO&lt;br&gt;RF Paths: 2&lt;br&gt;RF Bands: 1</td>
<td><strong>Type 4</strong> is for MIMO + Summed SISO—this configuration combines Single MIMO with Summed SISO:&lt;br&gt;• CPRI Port 1 maps to both Path A and Path B—that must be in the same band—for MIMO deployment.&lt;br&gt;• CPRI Port 2 maps to Path A only&lt;br&gt;<strong>NOTE:</strong> This application supports placement of SISO WCDMA carriers in the same RF band as CPRI Port 1.&lt;br&gt;<strong>NOTE:</strong> The passband selected for Types 3, 4, or 5 must be sufficient to accommodate the antenna carriers from both CPRI ports. For example, when using Type 5, if AWS Block A is on Port 1 and AWS Block B/C is on Port 2, then the passband on Paths A and Path B must both be tuned to AWS A/B/C. This applies for any of the summed connections (Types 3, 4, and 5).</td>
<td>![Type 4 Mapping Diagram]</td>
</tr>
<tr>
<td><strong>Type 5</strong>&lt;br&gt;CPRi Ports: 1 and 2&lt;br&gt;Carrier Configuration: MIMO, MIMO&lt;br&gt;RF Paths: 2&lt;br&gt;RF Bands: 1</td>
<td><strong>Type 5</strong> is for Dual-Summed MIMO—it combines MIMO channels from both CPRI Port 1 and CPRI Port 2 and maps them to common (dual) RF paths. For example, you can combine LTE5 and LTE10 MIMO channels in the same RF band, as would occur when multiple WSPs are in the same RF band (i.e., Neutral Host).&lt;br&gt;<strong>NOTE:</strong> The passband selected for Types 3, 4, or 5 must be sufficient to accommodate the antenna carriers from both CPRI ports. For example, when using Type 5, if AWS Block A is on Port 1 and AWS Block B/C is on Port 2, then the passband on Paths A and Path B must both be tuned to AWS A/B/C. This applies for any of the summed connections (Types 3, 4, and 5).</td>
<td>![Type 5 Mapping Diagram]</td>
</tr>
</tbody>
</table>
CDIU/LTE UPLINK GAIN OVERVIEW

This section describes how the CDIU calculates the uplink gain for LTE.

Uplink Gain Configuration

In an LTE system, the CDIU automatically adjusts the uplink gain to achieve the BBU requested Noise Floor, which is always set to -64.42 dBFS.

To calculate the system Noise Figure, the CDIU considers the following:

- whether the product platform is Prism, Spectrum, or Common Host
- whether the Host Gain Mode is set to Normal or High (see "Set the Reverse RF" on page 51)
- what the RAU count (1 to 8) is for each Expansion Module Group in a Spectrum system
- whether the system is configured for simulcast; a “simulcast system” is when there are multiple Remote DARTs connected to the same Host DART
- what the bandwidth of the protocol is (LTE5, LTE10, LTE15, or LTE20).

Uplink Power Reports

The FlexWave EMS GUI provides an uplink power report that indicates the uplink power into the Remote Unit on the Reverse RF page (System Configuration > Provision System > Reverse RF), for CDIUs, refer to the Power (dBm) Current Composite column in the Reverse Link Budget (CDIU) table as shown in Figure 2.

![Figure 2. Reverse Link Budget (CDIU) Table in the Reverse RF Page](image)

**NOTE:** You can also view the Reverse Link Budget (CDIU) table in the Reverse RF report (System Configuration > Get Information > Type > Reverse RF). However, the Get Information tables are read only. By using the Reverse Link Budget (CDIU) table in the Reverse RF page, you can change settings if necessary.
For noise only inputs, the expected power level can be determined by the equation shown in Figure 3. Use Table 3 to calculate kTB (thermal noise) without Noise Figure as a function of DART Type (Super or Classic) and Timeslot.

\[-174 + 10*10\log_{10}(\text{bandwidth}) + \text{Noise Figure}\]

**Figure 3.** Equation for Expected Power Level for Noise-Only Inputs

<table>
<thead>
<tr>
<th>Timeslot</th>
<th>Bandwidth (MHz)</th>
<th>kTB (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SuperDARTs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>6.0</td>
<td>-106.2</td>
</tr>
<tr>
<td>2</td>
<td>12.0</td>
<td>-103.2</td>
</tr>
<tr>
<td>3</td>
<td>18.0</td>
<td>-101.4</td>
</tr>
<tr>
<td>4</td>
<td>25.0</td>
<td>-100.0</td>
</tr>
<tr>
<td>6</td>
<td>35.0</td>
<td>-98.6</td>
</tr>
<tr>
<td>8</td>
<td>45.0</td>
<td>-97.5</td>
</tr>
<tr>
<td>12</td>
<td>65.0</td>
<td>-95.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Timeslot</th>
<th>Bandwidth (MHz)</th>
<th>kTB (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic DARTs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>6.0</td>
<td>-106.2</td>
</tr>
<tr>
<td>2</td>
<td>12.0</td>
<td>-103.2</td>
</tr>
<tr>
<td>3</td>
<td>20.0</td>
<td>-101.0</td>
</tr>
<tr>
<td>4</td>
<td>25.0</td>
<td>-100.0</td>
</tr>
</tbody>
</table>

For example, if this is a 4-timeslot passband (25 MHz) with a 5 dB Noise Figure, then the expected noise-only input should be -95 dBm/25 MHz.

You use the **Power (dBm) Current Composite** column in the **Reverse Link Budget (CDIU)** table to determine if there is any interference coming into the DAS, as follows:

- For noise measurements, use the **Min** field.
- The **Max** levels are useful for a steady state input, such as a Continuous Wave (CW) signal.
- The **Peak** levels are not useful when making noise only measurements; they are most useful if you want to measure the peak-to-average of an input signal.

Table 3 lists Bandwidth and kTB as a function of DART Type and Timeslot. This table is useful when calculated expected noise levels using the equation in Figure 3.

The path-power levels found in the **Reverse RF** page (Figure 2 on page 8) indicate the power into all Remote Units in this simulcast, using the equation shown in Figure 3. The expected noise-only input power can be determined from the same equation as the Remote Unit input powers, except the Noise Figure will reflect the added noise due to simulcasting (Calculated Simulcast Noise Figure (dB)). For example, if this is a 4 timeslot (25 MHz bandwidth), two Remote Unit configuration where each Remote Unit has a 5 dB Noise Figure, then the expected Noise Figure will be 8 dB, and the expected noise only input will be -92 dBm/25 MHz.
The uplink power levels found in the **CDIU Antenna Carriers** table in **Reverse RF** page (Figure 4) indicate the power level for the bandwidth of the displayed Carrier Type.

- For UMTS, the noise-only power will always be approximately -104 dBm/3.84 MHz (if no external interference is present).

- For LTE, you can use the **Calculated Simulcast Noise Figure (dB)** in the **Reverse Link Budget (CDIU)** table to determine the expected noise-only input. Use the appropriate bandwidth for the displayed **Carrier Type** (LTE_5, LTE_10, LTE_15 or LTE_20 MHz) found in the **CDIU Antenna Carriers** table.

![CDIU Antenna Carriers Table](image)

**Figure 4.** CDIU Antenna Carriers Table in the Reverse RF Page

**NOTE:** The Calculated Simulcast Noise Figure (dB) numbers are calculated based on the Noise Figure of the Remote Unit hardware. The calculated value will be wrong if there is an elevated noise condition at the Remote Unit. If necessary, use the Additive Gain setting to achieve the desired noise floor. Note that the Additive Gain does not adjust the calculated Noise Floor or Noise Figure as it is used to restore the original Noise Figure of the Remote Unit in the presence of elevated noise.
For LTE, the uplink power reports within the BBU are offset by the gain reduction calculated by the DAS for achieving the Target Noise Floor requested by the BBU. Table 4 shows the gain reduction expected in the BBU uplink power report as a function of the Noise Figure.

Table 4. Gain Reduction Expected in the BBU Uplink Power Report—LTE Only

<table>
<thead>
<tr>
<th>Noise Floor (dB)</th>
<th>Expected Gain Reduction (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>-1</td>
</tr>
<tr>
<td>5</td>
<td>-2</td>
</tr>
<tr>
<td>6</td>
<td>-3</td>
</tr>
<tr>
<td>7</td>
<td>-4</td>
</tr>
<tr>
<td>8</td>
<td>-5</td>
</tr>
<tr>
<td>9</td>
<td>-6</td>
</tr>
<tr>
<td>10</td>
<td>-7</td>
</tr>
<tr>
<td>11</td>
<td>-8</td>
</tr>
<tr>
<td>12</td>
<td>-9</td>
</tr>
<tr>
<td>13</td>
<td>-10</td>
</tr>
<tr>
<td>14</td>
<td>-11</td>
</tr>
<tr>
<td>15</td>
<td>-12</td>
</tr>
<tr>
<td>16</td>
<td>-13</td>
</tr>
<tr>
<td>17</td>
<td>-14</td>
</tr>
<tr>
<td>18</td>
<td>-15</td>
</tr>
<tr>
<td>19</td>
<td>-16</td>
</tr>
<tr>
<td>20</td>
<td>-17</td>
</tr>
<tr>
<td>21</td>
<td>-18</td>
</tr>
<tr>
<td>22</td>
<td>-19</td>
</tr>
<tr>
<td>23</td>
<td>-20</td>
</tr>
<tr>
<td>24</td>
<td>-21</td>
</tr>
<tr>
<td>25</td>
<td>-22</td>
</tr>
</tbody>
</table>

For example, if the Calculated Simulcast Noise Figure is 8 dB, then the difference between the measurement in the Reverse Power (dBm) Current column in the CDIU Antenna Carriers table and the BBU uplink (UL) measurement will be -5 dB. If the system has an LTE10 carrier, then the Noise-only level in the CDIU Antenna Carriers table will be -96 dBm/10 MHz. The report in the BBU will be 5 dB less than that or -101 dBm/10 MHz.

If you inject a signal (such as a CW signal) into the Remote Unit, then the same table (Table 4) is used. From the previous example, with an 8 dB Noise Figure, then the gain reduction is -5 dB, such that a -60 input signal will display as a -65 dBm level in the BBU user display.
**USING CDIUS IN A MULTI-HOST SYSTEM**

A Multi-Host system is a system in which Prism Remote Units are connected to more than one Host Unit. Effective with FlexWave System Software Release 8.1.9.9, CDIUs can now be used in a Multi-Host system. This is used when Base Stations (i.e., RF Bands) are not all co-located or when additional Host Slots are needed.

**NOTE:** Spectrum and Host-to-Host systems do not support a Multi-Host environment. You also cannot cascade Remote Units in a Multi-Host system.

**Working with Hops in a Multi-Host System**

A Multi-Host system should not exceed eight hops. **Figure 5** provides examples of hops in a Multi-Host system.

![Figure 5. Multi-Host System Hop Examples](image-url)
Rules for CDIUs in a Multi-Host System

NOTE: In this section when discussing CDIUs in a Multi-Host system, Hosts 1 - 4 are as shown in Figure 5, where Host 1 contains the CDIUs and the Clock Priority is set to 0.

The rules for using CDIUs in a Multi-Host system are as follows:

- The system must be running FlexWave System Software 8.1.9.9 or later.
- You can only use CDIUs in Prism-only Multi-Host systems. Multi-Host CDIU systems do not support:
  - Spectrum
  - Common Host
  - Host-to-Host (HEU)
- There can be no more than 8 clock hops.
- You can use CDIU Multi-Host in a simulcast system; a “simulcast system” is when there are multiple Remote DARTs connected to the same Host DART.
- There can be no more than four Host Units in the Multi-Host system (see Figure 7 on page 14).
- Install CDIUs only in Host Unit 1 in a Multi-Host system (see Figure 7 on page 14).
  - Host Unit 1, with installed CDIU(s) must then have its Clock Priority set to 0. Since the system is designed to auto-negotiate Clock Priority, by setting the Clock Priority to 0, the system will always make this Host Unit the Highest Clock Priority.
  - The other Host Units in a Multi-Host system that do not have a CDIU installed must not have their Clock Priority set to 0. If more than one Host Unit has their Clock Priority set to 0, a Clock Priority Level Conflict is generated.
  - The CDIUs installed in Host Unit 1 can be LTE, WCDMA, or both.

NOTE: The Clock Priority setting of 0 is a new Clock Priority level that forces the Host Unit to not auto-negotiate its Clock Priority level so that a Host Unit with a Clock Priority setting of 0 is always the highest Clock Priority. For Multi-Host to work correctly with CDIU, the Host Unit in which the CDIU(s) are installed MUST have a Clock Priority setting of 0, and the other Host Units in the system MUST NOT have a Clock Priority setting of 0.

- The CDIU Multi-Host system can be used for co-located or non-co-located Multi-Host deployments.
  - Co-located is when all Host Units in a system are physically installed in same location.
  - Non-co-located is when the RF Host Unit might be in a different physical location than the Host Unit in which the CDIU modules are installed.
- BBU’s do not need to be co-located with the CDIUs; they can be in a separate location, up to 10 or 15km distance (BBU setting). However, this added delay needs to get added into overall round trip delay constraint for CDIU/DAS.
- You cannot use CDIU Multi-Host in a cascaded system; a cascaded system is when a Host Unit is only connected to the first Remote Unit and additional Remote Units connect to or are “cascaded” after this first Remote Unit. Figure 6 on page 14 shows a cascade system, in which there is one Host Unit with a single Remote Unit connected to it, and then a second Remote Unit connected to the first Remote Unit.
Figure 6. Cascaded System

Figure 7 illustrates a CDIU Multi-Host system.

NOTE: Figure 7 shows the standard FlexWave Host Unit II and the FlexWave NEBS Level 3 Host Unit. You can use either of these Host Units or any combination of these Host Units in a CDIU Multi-Host system.

Host Unit 1
- Must have Clock Priority set to 0, which forces this Host Unit to NOT auto-negotiate its Clock Priority. The Host Unit with Clock Priority set to 0 will always have the highest Clock Priority.
- Can have one to four CDIUs configured as LTE, WCDMA or both
- Can mix RF DARTS with the CDIUs
- Can only connect to Prism Remote Units

Host Units 2 - 4
- Must NOT have Clock Priority set to 0. By not setting Clock Priority set 0, these Host Units auto-negotiate their Clock Priority range between 2 and 14.
- Can only have RF DARTs installed
- Can only connect to Prism Remote Units

Figure 7. Supported CDIU Multi-Host System Configuration
INSTALLING A CDIU

The following sections tells you how to install a CDIU into a FlexWave Host Unit, provision the CDIU through the FlexWave Element Management System (EMS), and then connect the CDIU to a Baseband Unit (BBU).

CAUTION! Follow the installation and provisioning steps in the order provided.

NOTE: The following installation instructions assume that the FlexWave Host Unit and the Nokia BBU are already installed.

USING THE FLEXWAVE EMS WITH CDIUS

The information in this section tells you how to use the FlexWave Element Management System (EMS) to provision a CDIU; the information that this guide provides assumes that the FlexWave system is otherwise already installed and provisioned. This document only tells you how to provision CDIUs. If this is a new system installation, or for information on how to provision the Host Unit or other FlexWave system components, refer to the System Setup and Provisioning Guide that corresponds to the EMS software release installed on the Host Unit. (For information on accessing FlexWave user documentation, see "Accessing FlexWave User Documentation" on page 120.)

NOTE: The GUI pages and parameters described in this section require the presence of a CDIU in the FlexWave Host Unit; otherwise, they do not appear in the EMS. The first time you install a CDIU into a FlexWave system, select the Host Unit in the System Tree to make the CDIU menus and parameters available for use. Alternatively, log out and then back in to the EMS to make the CDIU menus and parameters available.

Identifying CDIUs in the EMS GUI

Table 5 lists how the FlexWave Element Management System (EMS) identifies a CDIU by slot number.

Table 5. CDIU Identification in the FlexWave EMS GUI

<table>
<thead>
<tr>
<th>CDIU #</th>
<th>CDIU installed in Host Unit Slot #s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 and 3</td>
</tr>
<tr>
<td>2</td>
<td>2 and 4</td>
</tr>
<tr>
<td>5</td>
<td>5 and 7</td>
</tr>
<tr>
<td>6</td>
<td>6 and 8</td>
</tr>
</tbody>
</table>

Identifying WCDMA in the EMS GUI

The FlexWave EMS uses the term UMTS instead of WCDMA in its fields and parameters.
SAFETY PRECAUTIONS

CAUTION! This is restricted access equipment and only qualified service personnel should service and operate this equipment using appropriate tools.

CAUTION! Always allow sufficient fiber length to permit routing of patch cords and pigtails without severe bends. Fiber optic patch cords or pigtails may be permanently damaged if bent or curved to a radius of less than 2 inches (5.1 cm).

GUARD AGAINST DAMAGE FROM ELECTRO-STATIC DISCHARGE

CAUTION! Electro-Static Discharge (ESD) can damage electronic components. To prevent ESD damage, always wear an ESD wrist strap when working with a FlexWave Host Unit and its components (CDIUs, SeRF II Module, Host System III Module, DC Power Module, RF DARTs, and so forth). Connect the ground wire on the ESD wrist strap to an earth ground source before touching the Host Unit, the CDIU, or any other Host Unit component. Wear the wrist strap the entire time that you work with the Host Unit and its components.

CAUTION! When transporting or storing a CDIU or any other Host Unit component, place it in anti-static packing material.

UNPACK AND INSPECT THE CDIU

1. Inspect the exterior of the shipping container(s) for evidence of rough handling that may have damaged the components in the container.

2. Unpack each container while carefully checking the contents for damage and verify with the packing slip. The CDIU ships from Nokia and the shipping container should consist of (at the minimum) the CDIU and a Clocking/Referencing cable.

3. If damage is found or parts are missing, contact Nokia (ALU) support at 1-866-582-3688. Save the damaged cartons for inspection by the carrier.

4. Save all shipping containers for use if the equipment requires shipment at a future date.
INSTALL THE CDIU(S) IN THE HOST UNIT CHASSIS

1 Update the Host Unit and connected Remote Units to FlexWave EMS software release that supports CDIU—FlexWave Software Release 8.1.7 or later.

2 If the Host Unit has a Host System II Module, replace it with a Host System III Module (FWP-000HUSYSIII). For further information, refer to the FlexWave Host Unit and Host Expansion Unit Module Replacement Guide (FWPP-514).

CAUTION! A CDIU requires a Host System III Module (FWP-000HUSYSIII) in the Host Unit. If a Host System II Module is installed in the Host Unit chassis, the CDIU will not function.

3 Determine which slots the CDIU will occupy. Each CDIU requires two slot spaces, and can be installed in the following slot combinations:
   • 1 and 3
   • 2 and 4
   • 5 and 7
   • 6 and 8.

4 Do one of the following:
   • If one or two of the slots in which the CDIU is to be installed was occupied by an RF DART, follow the steps in "Replacing One or More DARTs with a CDIU" on page 86 to replace the DART(s) with the CDIU.
   • If a blank faceplate is covering one of the Host Unit slots that the CDIU will occupy, remove the two Phillips head screws securing each blank faceplate from the Host Unit slots in which the CDIU will be installed; reserve the faceplates for future use. Repeat as necessary to clear the Host Unit slots required for the CDIU.

5 If necessary, remove the two Phillips head screws securing the slot-divider bar from between the two slots in which the CDIU will be installed. Slot-divider bars are located between slots
   • 1 and 3
   • 2 and 4
   • Slots 5 and 7
   • Slots 6 and 8.
   Reserve the slot divider and screws for future use.

6 Slide the CDIU into the two slots that it will occupy, and then push the CDIU towards the back of the Host Unit chassis until the faceplate of the CDIU is flush against the Host Unit chassis.

7 Use the four thumbscrews attached to the CDIU to secure it to the Host Unit chassis.
CONNECT THE REFERENCE CLOCK

The selection of the CPRI reference clock is not user configurable. The Host Unit System III Module is responsible for selecting a valid 10MHz CPRI reference clock to serve as the DAS reference. The REF Out connector on each installed CDIU must be connected to one of the four EXT REF IN connectors on the Host Unit System III Module, as shown in Figure 8.

![Figure 8. Connecting the EXT REF IN Connectors](image)

50-ohm coaxial communications cable that ships with the CDIU; it has one right-angle QMA connector and one straight-angle SMB connector.

The System III Module detects all REF IN signals present in the EXT REF IN connectors (1-4) and the corresponding EXT REF 1 - 4 LEDs will be green for all detected signals. The EXT REF LED that is flashing green is the 10MHz CPRI reference clock. If a reference input goes away (the CPRI link goes down causing CDIU to mute REF OUT), then the System III Module automatically selects the next available EXT REF IN connector. The HOVR LED on the System III Module will turn green to indicate the hold-over for about 10 seconds (can be up to 60 seconds) during this transition. Service is maintained on the CDIU with valid CPRI links and RF DARTs during the clock transition.
There are two methods that you can use to tell which CDIU is providing clocking:

- Look at the Input LEDs on the System III Module.
- Use the EMS GUI—select the Host Unit in the System Tree, then click **Unit Configuration > Edit Properties.** Figure 9 shows the **System Board Clock Source** is **External 1.**

![Figure 9. System Board Clock Source](image)

Additionally, when LTE CPRI connections are present (there is a valid optical signal from BBU), the Host Unit firmware will only enable the CDIU REF OUT connector for CDIUs that are connected to LTE BBUs. If LTE is not present, the Host Unit software will enable the REF OUT connector for WCDMA BBUs.

Do the following to connect the CDIU reference clock.

1. Find the 50Ω coaxial communications cable that shipped with the CDIU; it has one right-angle QMA connector and one straight-angle SMB connector.

2. Route the coaxial cable between an EXT REF IN connector on the Host System III Module and the CDIU REF OUT connector as shown in Figure 8 on page 18.

**CAUTION!** Do not connect the CDIU to the BBU until instructed to do so.
**SET THE HOST UNIT CLOCK TO EXTERNAL**

When you first install a CDIU in the Host Unit, a **Clock Configuration Invalid** alarm will activate until you set the Host Unit clock to **External**. The following steps set the reference clock setting required for a CDIU system. For further information on the reference clock, refer to "Connect the Reference Clock" on page 18.

1. In the System Tree, click on the Host Unit icon.
2. In the Unit Menu bar, click **Unit Configuration > Edit Properties**.

The **Unit Configuration > Edit Properties** view opens, from which you set properties specific to the selected Host Unit. The **Edit Properties** page title will have the name of the selected Host Unit enclosed in square brackets as part of its title.
3 Change the **10 MHz Reference Clock** setting to **External**, which allows you to frequency lock the clock to an external 10 MHz reference.

![Edit Host Properties](image)

**NOTE:** The Clock Priority Level only needs to be set if installing the CDIU in a Multi-Host system; for further information, see "Using CDIUs in a Multi-Host System" on page 12.

4 Click **Apply**.

- If you look at the Host Unit System III Module, you should see that one of the four EXT REF IN LEDs will be green with the LED flashing, which indicates that the corresponding EXT REF IN connector is currently acting as the external reference clock. If no CPRI links exist, the SYN LED on the Host System III Module will be red. (For further information on the reference clock, refer to "Connect the Reference Clock" on page 18.)

- If you access the **View Current Alarms** page in the EMS (click **Alarms > View Current Alarms** in the System Menu bar), you will note that **Clock Configuration Invalid** alarm is no longer active. However, the **System Board Synthesizer Fault** will now be active as you have not yet provisioned the CDIU. The SYN LED (Synthesizer) on the Host Unit System III Module will be red, but will clear once you connect the CDIU to the BBU later during the setup process (that is, provide a valid CPRI optical signal).

## CONFIGURE THE CDIU TO BBU INTERFACE

This section is divided into five parts:

- "**CDIU Interfaces Page Read-Only Fields**" on page 22—read this subsection to understand the **Configure CDIU Interfaces** read-only fields.
- "**The Effect of Linked CDIUs on the Configure CDIU Interfaces Page**" on page 23—read this subsection to understand how linking a CDIU to a Remote Unit affects the **Configure CDIU Interfaces** fields and parameters.
- "**CDIU Path Bands**" on page 24—read this subsection to understand how to set the CDIU path bands.
- "**CDIU Path A and Path B Timeslot Configurations**" on page 25—read this subsection to understand how timeslots are supported in a CDIU system.
- "**Setting the CDIU Interface Parameters**" on page 26—follow the steps in this subsection to configure the CDIU to interface with the BBU.
Installing a CDIU

CDIU Interfaces Page Read-Only Fields

The following graphic shows the **Configure CDIU Interfaces** page before any of the parameters have been set. Notice that in the **Configure CDIU Interfaces** page, there are two rows per installed CDIU. Each row in the **Configure CDIU Interfaces** table corresponds to the CDIU and CPRI port identified in the **Slot Id** and **CPRI Port** columns.

**NOTE:** Optics information will only display when an SFP is installed.

The **Configure CDIU Interfaces** page has the read-only parameters listed below.

- **Slot Id**—identifies the CDIUs by its Host Unit slot number (1, 2, 5, or 6).
- **CPRI Port**—maps to the CPRI Port 1 and CPRI Port 2 on the CDIU (see "CDIU Connectors" on page 4) and identifies the CDIU port providing the Antenna Carrier (1 or 2).
- **Optics Type**—identifies the optics type that is installed in the Host Unit slot, which for CDIUs will always be **Intermediate Range** (13 dB).
- **Wavelength (nm)**—identifies the wavelength transmitted through this port, which for CDIUs is **1310 nm**.
- **Power (dBm)**
  - **Tx**—identifies the launch power level in dBm of the forward path signal, which for CDIUs will always be in the Intermediate Range (IR) where the minimum optical transmit power is -5 dBm and the maximum is +1 dBm.
  - **Rx**—identifies the receive power level in dBm of reverse path signal, which incorporates the launch power of the Remote Unit SFP plus all optical losses (insertion losses, fiber cable loss, and so forth). CDIUs are always in the Intermediate Range (IR) where the minimum optical transmit power is -18 dBm and the maximum is +1 dBm.
- **Alarm**—identifies whether an alarm is active. If an alarm is active, there will be a **Minor** or **Major** link that you can click to open a dialog that defines the active alarm. (If a major and a minor alarm are active for the same component, the EMS indicates that a major alarm is active.) The background color of the **Alarm** cell also indicates the alarm level:
  - Green—there is no active major or minor alarm.
  - Yellow—a minor alarm is active.
  - Red—a major alarm is active.
The Effect of Linked CDIUs on the Configure CDIU Interfaces Page

Figure 10 shows the Configure CDIU Interfaces page, in which Path A for the CDIU in Host Unit Slot 6 is linked to a Remote Unit DART. Notice that the REC Type, Connection Type, and Path A Band parameters are read-only. This is because the Configure CDIU Interfaces page follows the rules listed below:

- The Connection Type parameter becomes read-only if either Path is linked.
- The REC Type becomes read-only if its corresponding Path is linked.
- The Path A Band and Path B Band fields become read-only if the corresponding path is linked. This is an easy way to see which path is linked without having to go to the Links report on the Get Information page, or viewing the Links table on the Configure Links page.
- If the Connection Type is Type 1, the REC Type field for CPRI Port 1 becomes read-only if Path A is linked, and the REC Type field for CPRI Port 2 becomes read-only if Path B is linked. If using Connection Type 1, you will configure CPRI Port 1 and CPRI Port 2 independently from each other.

In Figure 10 SFPs are not present for Path B in the CDIU installed in Slot 6. Since the REC Type has not been selected, the EMS does not expect to find an SFP, so therefore no alarms (such as Module Missing) are active. If the SFPs were present but there was no optical input, then an alarm would be active, even without a REC Type selected.
CDIU Path Bands

In "Working with CDIU Forward and Reverse Delays" on page 57, you are going to set up connectivity between the CDIU and the BBU, and then define the RF Bands for the CDIU. Before you do this, familiarize yourself with how the CDIU Path A Band and Path B Band settings work as described below, and then familiarize yourself with timeslot configurations ("CDIU Path A and Path B Timeslot Configurations" on page 25).

- Single (SGL), 850 and 2300 WCS band settings support 6 timeslots.

- Double (DL) band settings
  - support up to 12 timeslots
  - use both Paths of CDIU, if in Slots 2, 5, or 6
  - cannot use CDIU CPRI Port 2 if the CDIU is configured as Connection Type 1 and the CDIU is in Slots 2, 5, or 6
  - cannot be used if the CDIU is configured as Connection Type 2, 4, or 5 and the CDIU is in Slots 2, 5, or 6.

- The possible Path A band settings are:
  - 700 LowerABC SGL
  - 700 UpperC SGL
  - 850
  - 1900 PCS DL
  - 1900 PCS SGL
  - 2100 AWS DL
  - 2100 AWS SGL
  - 2300 WCS
  - Undefined

- If the CDIU is installed in slot 2, 5, or 6, only the options listed below will be available for the Path B Band.
  - 700 LowerABC SGL
  - 700 UpperC SGL
  - 850
  - 1900 PCS SGL
  - 2100 AWS SGL
  - 2300 WCS
  - Undefined

- If the CDIU is installed in slot 1, the options for Path B Band will be the same as the options for Path A Band.
CDIU Path A and Path B Timeslot Configurations

This section provides a brief overview of timeslot configurations and how that configuration differs in a single-band versus a double-band setup. The timeslot configurations are applicable to the Path A Band and Path B Band settings that you will set in “Setting the CDIU Interface Parameters” on page 26.

Basic Timeslot Rules

The following rules apply to the CDIU based on the Path A Band and Path B Band settings in the Configure CDIU Interfaces page.

- The following single-band (SGL) CDIU configurations use less than or equal to 6 timeslots:
  - 700 LowerABC SGL
  - 700 UpperC SGL
  - 850
  - 1900 PCS SGL
  - 2100 AWS SGL
  - 2300 WCS.

- The following dual-band (DL) CDIU configurations use 12 and 8 timeslots, as noted:
  - 1900 PCS DL (12 timeslots)
  - 2100 AWS DL (8 timeslots).

- Slot 1 allows up to 12 timeslots on Paths A and B.
- Slots 2, 5, and 6 support less than or equal to 6 timeslots on both Paths, or more than 6 timeslots on Path A only, when DL is selected.

Constraints on 1900 PCS SGL or 2100 AWS Dual-Band Configurations

The following constraints apply to CDIUs configured as 1900 PCS SGL or 2100 AWS in the Path A Band and Path B Band menus in the Configure CDIU Interfaces page.

- If you configure Slot 1 as 1900 PCS SGL or 2100 AWS SGL
  - Both backplane connections can handle more than 6 timeslots
  - Connection Type 1 can support more than 6 timeslots on both CPRI Port 1 and 2 and on Paths A and B.
  - Connection Type 2 can only use CPRI Port 1, which supports more than 6 timeslots for both MIMO paths.
  - Connection Type 3 can use both CPRI Port 1 and 2 to sum on more than 6 timeslots on Path A. Path B is not used.
  - Connection Type 4 can support more than 6 timeslots on both CPRI Port 1 and 2 and on Paths A and B.
  - Connection Type 5 can support more than 6 timeslots on both CPRI Port 1 and 2 and on Paths A and B.

- If you configure Slots 2, 5, or 6 as 1900 PCS DL or 2100 AWS DL
  - The CDIU slot can handle more than 6 timeslots, but requires both backplane connections, which restricts you to use only Path A.
  - The CDIU slot can be configured as Connection Type 1 or Connection Type 3.
Setting the CDIU Interface Parameters

In this process, you set the **Sector Id** and the **Sector Unit**; these settings are used as follows:

- **Sector Id**—the sector to which the RRH is assigned
- **Sector Unit**—the unique id of the RRH within a sector
- `<Sector Id>`<Sector Unit>`—a unique hardware identification of an RRH within one BBU, where
- `<Sector Id>`<Sector Unit>`—equal to the rdn (Relative Distinguished Name) of the associated RRH Managed Object in the BBU.

**NOTE:** Sector Id and Sector Unit are only necessary for UMTS/WCDMA connections. They can be configured for an LTE REC type, but they aren’t used or needed.

Follow the steps below to set up connectivity between the CDIU and the BBU, and to define the RF Bands for the CDIU.

1. In the System Menu bar, click **System Configuration > Configure CDIU Interfaces**.
   
   The **Configure CDIU Interfaces** page opens.

2. Use the **CPRI Port Name** text box to create a unique label for that CPRI port that you can use to identify the port during troubleshooting and configuration. The **CPRI Port Name** must contain between 1 and 64 characters and cannot contain quote marks (single or double, open or close) or angle brackets (< or >). The default is **CPRI**.

3. Use the **CPRI Rate (Mbs)** menu to set the CPRI line rate to the correct megabits per second setting:
   - **Rate 1 (614.4)**—select for WCDMA; note that **Rate 1 (614.4)** is only for customers using this 3G protocol
   - **Rate 3 (2457.6)**—select for LTE.
4 Use the **Sector Id** menu as follows:
   - If connected to an LTE BBU, leave at the default setting of 0.
   - For WCDMA, set from 1 to 3, per instructions from the owner of the BBU. Do not set the **Sector Id** to 0 for WCDMA.

5 Use the **Sector Unit** menu as follows:
   - If connected to an LTE BBU, leave at the default setting of 0.
   - For WCDMA, set from 1 to 2, per instructions from the owner of the BBU. Do not set the **Sector Unit** to 0 for WCDMA.

6 Use the **REC Type** menu to select with what kind of Radio Equipment Controller (REC) the CDIU will interface:
   - None
   - UMTS—remember that if you select UMTS, you are configuring for WCDMA. Once you select UMTS, the **CPRI Rate (Mbps)** parameter will automatically set to Rate 1 (614.4), which is required for UMTS.
   - LTE—once you select LTE, the **CPRI Rate (Mbps)** parameter will automatically set to Rate 3 (2457.6), which is required for LTE.

   There will be a software version number appended to the UMTS and LTE parameter names to allow support with different BBUs and versions of their software. Refer to the corresponding release notes to verify which software version is compatible with the Nokia BBU installed in the system.

   **NOTE:** The CDIU disables the CPRI Port for two minutes on startup. Startup includes a Host Unit reboot, hot swapping a CDIU, or setting the REC Type. Disabling the CPRI Port gives the Host Unit sufficient time to assess delay settings so the CPRI link does not get multiple resets while delay settings are assessed in the system.

7 (Optional) Click **Apply** to save the parameter settings made in Step 2 - Step 6.

8 In the **Connection Type** column, click **Change**.
Installing a CDIU

The **Change Connection Type** page opens in the EMS View Frame. The CDIU slot number will be in the page header, as shown to the right.

9. In the **Change Connection Type** page, select the radio button next to the type of CPRI to RF path mapping required for the installation:

   - **Type 1** - Dual SISO; this is the only CDIU **Connection Type** that can do different frequency bands on each Port/Path.
   - **Type 2** - Single MIMO (Port 1 only)—both bands must be the same
   - **Type 3** - Sum of two SISO paths
   - **Type 4** - MIMO plus summed SISO on Path A
   - **Type 5** - Dual MIMO, summed on both Paths
   - **None** - No Type selected; default setting.

**NOTE:** If you are configuring the CDIU for Connection Type 3, 4, or 5, the CDIU Path A and Path B Status LEDs expects Antenna Carriers (AxC) on both CPRI ports before the LED will turn green. Here are the rules for the CDIU Path LEDs when using Types 3 to 5:

   - **Type 3** - Path A requires AxCs from both Ports 1 and 2.
   - **Type 4** - Path A requires AxCs from both Ports 1 and 2; Path B requires AxC from Port 1.
   - **Type 5** - Path A and Path B require AxCs from both Ports 1 and 2.

   If one of the CPRI ports is not ready to be brought into service using Types 3 to 5, you can disable “Not-in-Service” CDIU alarms such as CPRI Port optical alarms or REC communication faults (see “Enable and Disable CDIU Alarms” on page 90), but the CDIU Path LEDs will still follow the previous rules. If you do not want an amber Path LED to occur, configure using Type 1 or 2, and then change to Type 3 to 5 when the second port is to be brought into service.

**NOTE:** You must unlink all CDIU paths to change the Connection Type on a CDIU; follow the steps in "Unlink a CDIU” on page 84 to remove a CDIU Path Link.
10  Click OK.

The selected Connection Type is now listed above the Change button, as shown in the following graphic.

11  Use the Path A Band and Path B Band menus to select the band type for Path A and Path B, following the rules listed in "CDIU Path Bands" on page 24.

12  Click Apply.

13  Wait for the Information: Successfully saved CDIU settings message to display.

14  Click Alarms > View Current Alarms in the System Menu bar to access the View Current Alarms page. For all CDIU CPRI ports for which the REC Type was provisioned, the CDIU CPRI Port n REC Communication Fault alarm (where n equals 1 or 2) will be active.

15  Look at the Host Unit—the SYN LED on the Host Unit System III Module should be green.

PROVISION THE SYSTEM LINKS

In this section, you will provision the link(s) between the CDIU(s) and the Remote DARTs. (The Remote DARTs are encased in the RF Modules.) First you link the CDIU to a Remote DART, and then for each Host-to-Remote link, you set the Forward RF, the Reverse RF, and then the system Delays, as described in the sections listed below. Read the first two subsections before trying to provision the links for the first time.

- "Using the Provision System Pages" on page 30
- "CDIU and Host DART Summing" on page 34
- "Linking CDIUs to Remote Units" on page 35
- "Set the Forward RF" on page 41
- "Set the Reverse RF" on page 51
- "Configure Delay" on page 55.
Using the Provision System Pages

This section describes the Provision System pages that you use to provision the system links, forward and reverse RF, and delays.

When you click **System Configuration > Provision System** in the System Menu bar, the default view will be of the **Linking** page, as shown in Figure 11. The **Established Links** table at the bottom of the page will be empty if you have not yet established any links.

![Figure 11. Provision System Default View: Linking Page](image-url)
You use the **Linking**, **Forward RF**, **Reverse RF**, and **Delays** tabs to toggle between the respectively named Provision System pages. If you do not set a link between a Host DART (or CDIU) and a Remote DART in the **Linking** page, the **Forward RF**, **Reverse RF**, and **Delays** pages will be blank, as shown in **Figure 12 on page 31**.

**Figure 12. Manual Delays Page with No Host-to-Remote Links**
Installing a CDIU

Each of the Provision System pages provide the parameters required to provision both the Host and Remote side of a link. In the Linking table, each Host DART is in a separate row. Dependent on configuration, CDIUs can take up to two rows, with one row for Path A and the other for Path B. All Remote DARTs that can link with that Host DART or CDIU are in the same row. Once you link the Host DART or CDIU to a Remote DART, the Forward Link Budget, Reverse Link Budget, and Manual Delays tables show the linked Host and Remote DARTs in a single row, as shown in Figure 13; the parameters in each row therefore configure that specific Host-to-Remote link.

The second row in the Linking table shows the DART in Host Unit Slot 2 can be linked to DARTs in the Remote Unit labeled Grand Ball Park 1-3 that have the same frequency as the Host DART. The checkmark for the DART in Slot 3 of the Remote Unit indicates that it is linked to the Host Unit DART. The DART in the Remote Unit Slot 4 is grayed out, which indicates it cannot be linked to the DART in Host Unit Slot 2.

The second row in the Forward Link Budget (RF Slots) table shows the DART in Host Unit Slot 2 linked to the DART in Remote Unit Slot 3, and provides the parameters required to provision the Forward Link Budget for that link.

Figure 13. Using the Table Rows in the Provision System Pages
The Provision System tables also differ from other tables in the GUI in that more than one field of information may be presented in a column. When more than one field name is in a column header, read the field names from left to right, which correspond to the actual data in the row either from left-to-right or from top-to-bottom, as shown in Figure 14.

Figure 14. Column Titles in the Provision System Tables

The System Tree is not shown while the Provision System pages are open. If you want to view the System Tree, do any of the following:

- Right-click the CommScope logo in the upper-left corner, and then select **Open link in new tab** or **Open link in new window**, which allows you to see the provisioning pages in one tab or window and the System Tree in the other.

- Right-click the **Home** link, and then select **Open link in new tab** or **Open link in new window**, which allows you to see the provisioning pages in one tab and the System Tree in the other. However, if you click the **Home** link before you **Apply** your configuration settings, those setting changes will be lost.

- Right-click any of the menu options in the System Menu bar (except for Provision System), and then select **Open link in new tab** or **Open link in new window**, which allows you to see the provisioning pages in one tab or window and the selected WMS page in the other.

- Open another EMS session and view the two sessions side-by-side, with one session showing the System Tree.
Installing a CDIU

CDIU and Host DART Summing

You can link a single Remote Unit DART in any of the following combinations:

- two different Host DARTs
- one Host DART and one CDIU
- two different CDIUs.

CDIU uses Slots 1, 2, 5, and 6 plus Path A or B to designate the Slot with which to sum.

When Host DARTs/CDIUs are paired, the Configuration cell for each Host DART/CDIU indicates the pairing and the Host DART with which it is paired, as shown in Figure 15.

![Figure 15. Summed Host DARTs](image-url)
Host DART/CDIU Summing Rules

- Paired Host DARTs/CDIUs must be linked to the same Remote DART.
- If a Host DART/CDIU is already linked to more than one Remote DART, then linking a second Host DART/CDIU to any one of the same Remote DARTs will cause it to link to all of the same Remote DARTs as the first Host DART.
- When two Host DARTs/CDIUs are paired and linked to more than one Remote DART, unlinking one Remote DART from a specific Host DART/CDIU will cause all other Remote DARTs to be unlinked on that same Host DART/CDIU.
- If there are any existing links on the second Host DART, its links must be cleared before you can add it to a summed DART/CDIU group. The corresponding Linked check boxes for the disallowed pairing will be desensitized with the following mouseover message: Remove existing links before attempting to pair Host slot.

Passbands Rules for Host DART/CDIU Summing

- Passbands for paired Host DARTs/CDIUs must always be the same; you must select the same passband for both Host DARTs/CDIUs before the EMS will allow the DART/CDIU pairing.
- If passbands are different for two unpaired Host DARTs/CDIUs, the GUI will not allow you to select a link that results in pairing them. The Linked check box will be desensitized and the following mouseover message will display: Paired Host DARTs must have the same passband.

Linking CDIUs to Remote Units

“Linking” establishes an association in software between a particular CDIU (or Host Unit DART) and a particular Remote Unit DART, enabling them to act as an operational unit in one RF band. A link is established by setting CDIU passband frequency, selecting a Remote DART to be paired with the CDIU, and then clicking the Linked check box.

The information that you need to understand and perform CDIU linking is divided into the sections listed below. Read the first three subsections before trying to link a CDIU to a Remote DART.

- "Using the Linking Table" on page 36
- "Using Passband Selection Panels" on page 38
- "Using the Established Links Table" on page 39
- "Linking CDIU(s) to Remote DART(s)” on page 39
Installing a CDIU

Using the Linking Table

You will use the Linking table to configure the Host Unit to Remote DART links. This section familiarizes you with how the Linking table works.

- You can set the links for all installed DARTs at one time—you do not have to click Apply until all links have been selected.
- Each row in the Linking table represents a Host DART or CDIU along with all possible Remote DARTs that could potentially be linked to it. CDIUs are in two rows with the same Host Slot Id, but one row is for Path A and the other for Path B. If no compatible Remote DARTs exist for a particular Host DART, the Host DART is shown, but the Remote columns will be blank.
- Any change that affects existing RF results in a shaded background for the particular cell to indicate that a change has been made. The background shading clears if
  - you change the setting back to the original value
  - the corresponding setting is established (after you click Apply).

- The Linking table is dynamic, and will provide visual cues as you work. For example, if a Remote DART is not available for linking, its corresponding Linked check box will be desensitized until necessary conditions are met to allow it to be available.
• A check box in the **Linked** column allows you to create or remove a link between a Host DART/CDIU and any eligible Remote DART. Whenever you enable or disable a link by changing the state of a **Linked** check box, the rest of the table updates accordingly. For example, a Remote DART may be listed as an eligible link for more than one Host DART/CDIU.

![Linking Table Screenshot]

• For desensitized Remote DART link selections, hover your mouse over the desensitized link to display a message explaining why the link cannot be selected:

![Desensitized Link Message]

• You do not have to de-link a DART before you change its passband.

• After the passband is set, the **Linking** table refreshes to disable any potentially invalid links; this supports restrictions between some passband settings and Remote DART types.

• Only the first Remote Unit in a cascade is shown.
Using Passband Selection Panels

For each DART or CDIU listed in the Host portion of the Linking table, there is an Edit Passband link. Clicking on the Edit Passband link opens a Passband Selection panel that provides interactive graphical check box selections for different band segments and/or text boxes in which start and stop frequencies can be entered, as shown in the graphic to the right. Classic DARTs require a contiguous group of check boxes. SuperDARTs support one or two groups of continuous check boxes. Classic DARTs show only one frequency range. SuperDARTs show one or two frequency ranges.

All Passband Selection panels allow you to specify the passband by selecting or typing the desired forward-path frequency; reverse-path frequencies are automatically calculated and populated, and are read-only fields.

The check-box selection is designed for selection of passband blocks from left to right. If any selections are skipped, the GUI automatically fills them in. To select two non-contiguous bands, the desired gaps must be manually de-selected. For example, if you select Block A for a PCS DART, then click on Block C, all the blocks between A and C will be selected automatically. If you only want to use Blocks A and C, you must deselect Blocks D, B, E and F.

The Passband Selection panel has the following buttons (shown in the preceding graphic):

- **Cancel**—cancels the selections made and closes the Passband Selection panel.
- **FullBand**—allows you to toggle between a full passband selection (that is, all Blocks are selected) versus no Blocks being selected. This provides a quick way to fully populate all check box selections or to clear them all.
- **OK**—accepts the selections made and closes the Passband Selection panel.

Whenever a Passband Selection panel is open all other configurable parameters in the Linking page are disabled. The following Linking page parameters are disabled when the Passband Selection panel is open:

- Host Slot Name text boxes
- Other Edit Passband links
- Configuration No Diversity/Diversity links
- Configure TDD links
- Linked check boxes (in any state)
- Remote Slot Name text boxes

You must click the Cancel or OK button in the Passband Selection panel to re-enable the Linking page parameters. You will be able to switch between the three Provision System tabs, but will not be able to change the Linking page parameters until the Passband Selection panel parameters have been executed or canceled.
Using the Established Links Table

The Established Links table in the Linking page has the same data as the Links report; for further information go to "View a Links Report" on page 75.

Linking CDIU(s) to Remote DART(s)

CAUTION! Setting the Passband for a CDIU may cause a temporary loss of RF. However, a message displays warning you of this to give you the option to proceed or to cancel the operation.

Do the following to establish Host CDIU to Remote DART links:

1. In the System Menu bar, click System Configuration > Provision System.

   The Linking page opens as the default view in the EMS Frame. The Established Links table at the bottom of the page will be empty if you have not yet established any links.

2. Use the Host Slot Id column and the Remote Unit Id/Slot Id column to identify CDIUs and the Remote DART(s) that you can link. Note that each Host DART is in a separate row in the Linking table, and all Remote DARTs that can link with that Host DART are in the same row. CDIUs are in two rows with the same Host Slot Id, but one row is for Path A and the other for Path B.
3 In the **Host Slot Name** box, enter a name for the CDIU. CDIU names must contain between 1 and 64 characters and cannot contain quote marks (single or double, open or close) or angle brackets (< or >). The default **Slot Name** for CDIUs is **CDIU** (for DARTs it is **DART**).

4 The **Passband/Frequency (MHz)** column identifies the passband and frequency of that CDIU path. Click the **Edit Passband** link to set the passband for that CDIU.

   A **Passband Selection** panel opens. The passbands dialog corresponds to the CDIU selected in the **Slot** menu. Refer to "Using Passband Selection Panels" on page 38 for information on how to configure the passband, then click OK to apply those passband settings and to close the **Passband Selection** panel.

5 Leave the **No Diversity** link at its default setting (**No Diversity**).

   If necessary, click **Diversity** to toggle to **No Diversity**. A confirmation window with the following message opens: **This action will affect the RF state. Do you wish to proceed?** Click OK to accept the change to the **No Diversity** setting.

6 In the **Remote** portion of the **Linking** table, click the **Linked** check box that corresponds to the Remote DART to which you want to link this CDIU.

7 In the **Remote Slot Name** box, enter a name for the Remote DART, which must start with an alphabetical character or a space, contain between 1 and 64 characters and cannot contain quote marks (single or double, open or close) or angle brackets (< or >).

8 Repeat this procedure for all CDIUs and Remote DARTs that you want to link.

9 Click **Apply**.

10 Wait for the **Information: Changes applied successfully** message to display.

   The **Established Links** table at the bottom of the page updates with the new links.

![Established Links Table](image)

11 Look at the CDIU—the PATH A and PATH B LEDs will be amber, if that path is linked.

12 Click **Alarms > View Current Alarms** in the System Menu bar to access the **View Current Alarms** page. Note that **CDIU Path X Under Drive** alarm will be active for whichever path was linked (where X equals A or B). Also, for all CDIU CPRI ports for which the **REC Type** was provisioned, the **CDIU CPRI Port n REC Communication Fault** and **CDIU CPRI Port n Under Drive** alarm (where n equals 1 or 2) will be active.
Set the Forward RF

The Forward RF page has two CDIU tables that provide system information and allows you to manually set the Forward RF for CDIUs:

- **Forward Link Budget (CDIU)** table—use this table to set the Forward RF for CDIUs.
- **CDIU Antenna Carriers** table—use this read-only table to view information about the connected Antenna Carriers (AxC). For a full description of the CDIU Antenna Carriers table as it appears on the Forward RF page, go to "Viewing the CDIU Antenna Carriers Table on the Forward RF Page" on page 50.

**NOTE:** The Forward RF page will also show Host RF DART information in the Forward Link Budget (RF Slots) table when Host RF DART Modules are present and linked.

**NOTE:** CDIU currently supports up to 2 AxCs for LTE and UMTS.

How you interact with the Forward RF page is dependent on the Input Power radio buttons at the top of the Forward RF page. How you configure the CDIU Host Forward RF is dependent on the Connection Type setting; make sure you choose the settings that are applicable to your system setup as described in one of the following subsections:

- "Using Passband Selection Panels" on page 38
- "Set the Forward RF for Connection Types 1 and 2" on page 44
- "Set the Forward RF for Connection Types 3, 4, and 5" on page 47.
### Working with Input Power in the Forward RF Page

**Figure 16** shows the Input Power radio buttons at the top of the Forward RF page. The Input Power radio buttons configure how the fields and parameters in the Forward RF page display.

The Input Power radio buttons are in two columns. You select one Input Power radio button in each column in any of the combinations listed below:

- **Current** and **Sub-Band 1**
- **Current** and **Sub-Band 2**
- **Current** and **Composite**
- **Max Hold** and **Sub-Band 1**
- **Max Hold** and **Sub-Band 2**
- **Max Hold** and **Composite**.

The following rules apply to the Input Power radio buttons (see **Figure 17 on page 43**):

- **Sub-Band 1** always exists for any link by virtue of setting the passband.
- **Sub-Band 2** exists if you configured non-contiguous passbands on the Linking page. **Sub-Band 2** will not be applicable if the DART passband is configured for a single, contiguous band. In this case, if you select **Sub-Band 2**, the power measurement will display as **NA**.
- Toggling between **Sub-Band 1** and **Sub-Band 2** allows you to view the power in either sub-band.
- **Composite** power represents the combined power of both **Sub-Band 1** and **Sub-Band 2**. If there’s only one sub-band configured, then **Composite** will be the same as **Sub-Band 1**.
- **Current** is always the real-time power value.
- **Max Hold** is the maximum value measured since the last time the Reset Max Hold button was clicked.
The **Input Power** radio button selections determine the name and contents of the first column under the **Input Power (dBm)** columns in the **Forward Link Budget (RF Slots)** table (see Figure 17).

![Diagram showing how Input Power radio buttons affect Forward RF page](image-url)

**Figure 17.** How the **Input Power** Radio Buttons Affect the **Forward RF** Page
Figure 18 shows the **Host Input Power (dBm)** column that corresponds to the selections made with the **Input Power** radio buttons and which lists the following power measurements; these values are measured by the Host DART: peak (**Peak**), maximum Root Mean Square, or RMS (**Max**), and minimum RMS (**Min**) power levels.

![Figure 18. Host DART Power Levels](image)

**Set the Forward RF for Connection Types 1 and 2**

**NOTE:** Digital power measurements are inaccurate when ALC is active on the CDIU.

1. Do one of the following:
   - If you are on the **Linking** page or one of the other Provision System pages, click the **Forward RF** tab at the top of the page.

![Forward RF tab](image)
• If you are not on the Linking page or one of the other Provision System pages, in the System Menu bar, click System Configuration > Provision System, and once the Linking page opens (default view), click the Forward RF tab at the top of the page.

The Forward RF page opens. The Forward Link Budget (CDIU) table, which is mid page, lists all of the linked CDIUs for this system.

2 Use the Input Power radio buttons to determine how the RF input power displays in the RF Slots and CDIU tables. (For information on the Input Power radio buttons, go to "Working with Input Power in the Forward RF Page" on page 42.)

3 In the Forward Link Budget (CDIU) table, use the Host Slot Id / Slot Name / Passband column in the Forward Link Budget (CDIU) table to identify the CDIU whose forward gains you want to set.

4 In the Operating Mode menu, select one of the following:
   • Disable—RF function is muted in the Host Unit and its linked Remote Unit.
   • Normal—RF function is not muted, which allows the system to operate normally.

The EMS disables the Power Allocation % (CPRI Port 1/Port 2) menu for Connection Type 1 and Type 2—this parameter is read only and cannot be changed from its NA setting.

5 CommScope recommends that the Additive Forward Gain be left at the 0.0 default setting. However, you can use the Additive Forward Gain (dB) menu to select the Forward Gain value of -15 to +2 dB, based upon the fully loaded forward path signal level from the Base Station, but CommScope recommends that these adjustments be done at the Remote Unit. The Additive Forward Gain range is between -15 to +2 dB. (0 to +2 is available in 0.2 dB steps and -15 to 0 is available in 1 dB steps.)

       At this point, the power levels shown in the Host Input Power (dBm) column in the Forward Link Budget (RF Slots) table will be at -90 dBFS. These power levels will increase when the BBU is connected to the CDIU and Antenna Carriers are enabled.

NOTE: The CDIU Antenna Carriers table (bottom of the Forward RF page) that corresponds to the Antenna Carrier (AxC) will only display if the BBU is connected and the AxCs have been enabled.

6 If the CDIU is paired with another CDIU or Host DART for summing, use the Paired Power % text box to allocate the amount of power for both of paired units. (A Paired Power % text box only exists if at least one set of Host DARTs/CDIUs is paired—otherwise the cell shows NA.)

   • Enter power percentage, which can be from 0% to 100%, and can be entered in 1% increments.
   • Changing the value for one DART/CDIU automatically changes it appropriately for the paired DART/CDIU.
   • Text in the Paired Power % column indicates with which DART or CDIU the DART/CDIU is paired.
7 Use the Path Mode / LPA Status column on the Remote side of the Forward Link Budget (RF Slots) table to set the functionality of the Remote DART (Path Mode) and the Linear Power Amplifier (LPA) mode (LPA Status) in Remote Unit.

A PRU LPA is a high quality broadband RF amplifier used for achieving Prism product-rated power for the Tx forward path spectrum RF. In a dual-LPA system, both LPAs will have the same LPA Status setting.

Note that the status of the LPA is shown in the Path Mode / LPA Status column under the Path Mode menu, as shown in the graphic to the right.

You can select one of the three mode settings listed below. Spectrum DART Remote Units (DRUs) and Prism Host Expansion Units (HEUs) do not have an LPA; therefore, only two of the Path Mode / LPA Status options will be available for DRUs and HEUs, as noted below.

- **Normal**—both forward and reverse paths are enabled (default setting).
- **FWD Disable**—the forward path is disabled by placing LPAs/PAs in PRUs or FRUs in standby mode; this setting is not applicable to Spectrum. The reverse path is not disabled.
- **FWD+REV Disable**—both forward and reverse paths are disabled, for PRUs and FRUs, the LPA will be also be offline.

**NOTE:** In a dual Linear Power Amplifier (LPA) system in which the RF Module requires two Remote Unit bays, the Path Mode / LPA Status column shows two values for the LPA status, one for each LPA. Changing the LPA Mode or resetting the LPA applies to both LPAs at the same time.

**CAUTION!** For Prism systems, as soon as you set the LPA Operating Mode to Normal, RF transmission will start. Before you set the LPA Operating Mode to Normal, make sure that the antenna has been connected and the system is ready to transmit RF. For information on connecting the antenna, refer to the FlexWave Prism Remote Unit and RF Module Installation Guide (FWPP-504).

8 Use the Max / Fully Loaded Composite column (see graphic to the right) on the Remote side of the Forward Link Budget (RF Slots) table to set the desired maximum (or, fully loaded) output power referenced to the output of the RF Module or Spectrum RAU.

The Max field displays the maximum output power the Remote Unit RF Module or RAU can support. For Spectrum, the value represents maximum output power for a standard power RAU. The GUI shows the Max and Fully Loaded Composite power for a standard RAU. Note that there can be up to 8 RAUs associated with a link, and zero to eight of them can be High Power RAUs. The actual output power therefore depends on the ratio of standard and high power RAUs.
9 Click **Apply**.

- If you set the Host DART Operating Mode to **Disable**, when you click **Apply** the following confirmation message opens: **This action will affect the RF State. Do you wish to proceed?** Do one of the following:
  - Click **OK** to set the Host DART Operating Mode to **Enable**, and then click **Apply**.
  - Click **Cancel**, reset the Host DART Operating Mode to **Enable**, and then click **Apply**.

- If you set the Remote DART Path Mode/LPA Status to **Forward Disable** or **Forward+Reverse Disable**, when you click **Apply** the following confirmation message opens: **This action will affect the RF State. Do you wish to proceed?**
  - Click **OK** to set the Remote DART Path Mode/LPA Status to **Forward Disable** or **Forward+Reverse Disable**.
  - Click **Cancel**, reset the Remote DART Path Mode/LPA Status to **Normal**, and then click **Apply**.

The **Forward Link Budget (CDIU)** table refreshes with the new settings.

### Set the Forward RF for Connection Types 3, 4, and 5

**NOTE:** Digital power measurements are inaccurate when ALC is active.

1 Do one of the following:

- If you are on the **Linking** page or one of the other Provision System pages, click the **Forward RF** tab at the top of the page.

  ![Forward RF tab](image)

- If you are not on the **Linking** page or one of the other Provision System pages, in the System Menu bar, click System Configuration > Provision System, and once the **Linking** page opens (default view), click the **Forward RF** tab at the top of the page.

The **Forward RF** page opens. The **Forward Link Budget (CDIU)** table, which is mid page, lists all of the linked CDIUs for this system.
Installing a CDIU

2 Use the **Input Power** radio buttons to determine how the RF input power displays in the **RF Slots** and CDIU tables. (For information on the **Input Power** radio buttons, go to “Working with Input Power in the Forward RF Page” on page 42.)

3 Use the **Host Slot Id / Slot Name / Passband** column in the **Forward Link Budget (CDIU)** table to identify the CDIU whose forward gains you want to set.

4 In the **Operating Mode** menu, select one of the following:
   - **Disable**—RF function is muted in the Host Unit and its linked Remote Unit.
   - **Normal**—RF function is not muted, which allows the system to operate normally.

5 **Connection Type 3, 4 or 5** sum the two Ports in a CDIU; the allocation between ports changes as two BBUs are sharing the same RF Band. Use the **Power Allocation % (CPRI Port 1/Port 2)** menu to allocate power in 10% steps between the two CPRI ports such that the total is always 100% (for example, 90/10, 80/20). The default setting is 50/50. The following table shows the reduction in power in dB for a given CPRI Port as a function of the **Power Allocation % (CPRI Port 1/Port 2)** setting.

<table>
<thead>
<tr>
<th>Port 1 (%)</th>
<th>Port 2 (%)</th>
<th>Port 1 (dB)</th>
<th>Port 2 (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>off</td>
<td>0.0</td>
</tr>
<tr>
<td>10</td>
<td>90</td>
<td>-10.0</td>
<td>-0.5</td>
</tr>
<tr>
<td>20</td>
<td>80</td>
<td>-7.0</td>
<td>-1.0</td>
</tr>
<tr>
<td>30</td>
<td>70</td>
<td>-5.2</td>
<td>-1.5</td>
</tr>
<tr>
<td>40</td>
<td>60</td>
<td>-4.0</td>
<td>-2.2</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>-3.0</td>
<td>-3.0</td>
</tr>
<tr>
<td>60</td>
<td>40</td>
<td>-2.2</td>
<td>-4.0</td>
</tr>
<tr>
<td>70</td>
<td>30</td>
<td>-1.5</td>
<td>-5.2</td>
</tr>
<tr>
<td>80</td>
<td>20</td>
<td>-1.0</td>
<td>-7.0</td>
</tr>
<tr>
<td>90</td>
<td>10</td>
<td>-0.5</td>
<td>-10.0</td>
</tr>
<tr>
<td>100</td>
<td>0</td>
<td>0.0</td>
<td>off</td>
</tr>
</tbody>
</table>

**NOTE:** The Power Allocation setting will be driven by the RF design for the amplifier that is being shared between the two Ports. For example, if the system has a 20W max output (+43dBm), and you want 10 watts for each port (40 dBm), use the 50/50 setting. If you want 42.5 dBm for Port 1 and 33 dBm for Port 2, use the 90/10 setting.
6 CommScope recommends that the **Additive Forward Gain** be left at the **0.0** default setting. However, you can use the **Additive Forward Gain (dB)** menu to select a Forward Gain value of **-15** to **0 dB**, based upon the fully loaded forward path signal level from the Base Station, but CommScope recommends that these adjustments be done at the Remote Unit. The **Additive Forward Gain** range is between **-15** to **+2 dB**. (0 to +2 is available in 0.2 dB steps and -15 to 0 is available in 1 dB steps.) Look at the power levels shown in the **Peak**, **Max**, and **Min** fields in the **Forward Link Budget (RF Slots)** table. The power levels will be at **-90 dBFS**. These power levels will increase when the BBU is connected to the CDIU and Antenna Carriers are enabled.

**NOTE:** The CDIU Antenna Carriers table (bottom of the Forward RF page) that corresponds to the Antenna Carrier (AxC) will only display if the BBU is connected and the AxCs have been enabled.

7 If the CDIU is paired with another CDIU or Host DART for summing, use the **Paired Power %** text box to allocate the amount of power for both of paired units. (A **Paired Power %** text box only exists if at least one set of Host DARTs/CDIUs is paired—otherwise the cell shows **NA**.)

- Enter power percentage, which can be from **0%** to **100%**, and can be entered in **1%** increments.
- Changing the value for one DART/CDIU automatically changes it appropriately for the paired DART/CDIU.
- Text in the **Paired Power %** column indicates with which DART or CDIU the DART/CDIU is paired.

8 Use the **Path Mode / LPA Status** column on the **Remote** side of the **Forward Link Budget (RF Slots)** table to set the functionality of the Remote DART (**Path Mode**) and the Linear Power Amplifier (LPA) mode (**LPA Status**) in Remote Unit.

A PRU LPA is a high quality broadband RF amplifier used for achieving Prism product-rated power for the Tx forward path spectrum RF. In a dual-LPA system, both LPAs will have the same **LPA Status** setting.

Note that the status of the LPA is shown in the **Path Mode / LPA Status** column under the **Path Mode** menu, as shown in the graphic to the right.

You can select one of the three mode settings listed below. Spectrum DART Remote Units (DRUs) and Prism Host Expansion Units (HEUs) do not have an LPA; therefore, only two of the **Path Mode / LPA Status** options will be available for DRUs and HEUs, as noted below.

- **Normal**—both forward and reverse paths are enabled (default setting).
- **FWD Disable**—the forward path is disabled by placing LPAs/PAs in PRUs or FRUs in standby mode; this setting is not applicable to Spectrum. The reverse path is not disabled.
- **FWD+REV Disable**—both forward and reverse paths are disabled, for PRUs and FRUs, the LPA will be also be offline.

**NOTE:** In a dual Linear Power Amplifier (LPA) system in which the RF Module requires two Remote Unit bays, the **Path Mode / LPA Status** column shows two values for the LPA status, one for each LPA. Changing the LPA Mode or resetting the LPA applies to both LPAs at the same time.

**CAUTION!** For Prism systems, as soon as you set the LPA Operating Mode to Normal, RF transmission will start. Before you set the LPA Operating Mode to Normal, make sure that the antenna has been connected and the system is ready to transmit RF. For information on connecting the antenna, refer to the *FlexWave Prism Remote Unit and RF Module Installation Guide* (FWPP-504).
9 Use the **Max / Fully Loaded Composite** column (see graphic to the right) on the **Remote** side of the **Forward Link Budget (RF Slots)** table to set the desired maximum (or, fully loaded) output power referenced to the output of the RF Module or Spectrum RAU.

The **Max** field displays the maximum output power the Remote Unit RF Module or RAU can support. For Spectrum, the value represents maximum output power for a standard power RAU. The GUI shows the **Max** and **Fully Loaded Composite** power for a standard RAU. Note that there can be up to 8 RAUs associated with a link, and zero to eight of them can be High Power RAUs. The actual output power therefore depends on the ratio of standard and high power RAUs.

10 Click **Apply**.

- If you set the Host DART **Operating Mode** to **Disable**, when you click **Apply** the following confirmation message opens: *This action will affect the RF State. Do you wish to proceed?* Do one of the following:
  - Click **OK** to set the Host DART **Operating Mode** to **Disable**.
  - Click **Cancel**, reset the Host DART **Operating Mode** to **Enable**, and then click **Apply**.

- If you set the Remote DART **Path Mode/LPA Status** to **Forward Disable** or **Forward+Reverse Disable**, when you click **Apply** the following confirmation message opens: *This action will affect the RF State. Do you wish to proceed?*  
  - Click **OK** to set the Remote DART **Path Mode/LPA Status** to **Forward Disable** or **Forward+Reverse Disable**.
  - Click **Cancel**, reset the Remote DART **Path Mode/LPA Status** to **Normal**, and then click **Apply**.

The **Forward Link Budget (CDIU)** table refreshes with the new settings.

**Viewing the CDIU Antenna Carriers Table on the Forward RF Page**

**NOTE:** The CDIU Antenna Carriers table that corresponds to the Antenna Carrier (AxC) will only display on the Forward RF page if the BBU is connected and the AxCs have been enabled.

On the **Forward RF** page, the **CDIU Antenna Carriers** table behaves as described below.

- **LTE MIMO**—when using a LTE MIMO configuration, you will see two Antenna Carriers (AxC) in the **CDIU Antenna Carriers** table on the **Forward RF** page.

- **LTE SISO**—when using LTE SISO, you will see up to two AxCs in the **CDIU Antenna Carriers** table on the **Forward RF** page.

- **UMTS SISO**—when using UMTS, you will see up to two AxCs in the **CDIU Antenna Carriers** table on the **Forward RF** page.

**NOTE:** **CDIU currently supports up to 2 AxCs for LTE and UMTS.**

Do one of the following to view the **CDIU Antenna Carriers** table on the **Forward RF** page:

- If you are on the **Linking** page or one of the other Provision System pages, click the **Forward RF** tab at the top of the page.

- If you are not on the **Linking** page or one of the other Provision System pages, in the System Menu bar, click **System Configuration > Provision System**, and once the **Linking** page opens (default view), click the **Forward RF** tab at the top of the page.
The **Forward RF** page opens. The **CDIU Antenna Carriers** table is at the bottom of the page.

The **CDIU Antenna Carriers** table on the **Forward RF** page has the elements listed below.

- **Carrier Frequency (MHz)**—identifies the Forward Path center frequency of the Antenna Carrier.
- **Slot Id**—identifies the CDIUs by its Host Unit slot number (1, 2, 5, or 6).
- **CPRI Port**—maps to the CPRI Port 1 and CPRI Port 2 on the CDIU (see "CDIU Connectors" on page 4) and identifies the CDIU port providing the Antenna Carrier (1 or 2).
- **Carrier**—the carrier number provided by the BBU.
- **Antenna**—the CPRI Antenna number will be 1 or 2, which indicates the number of Forward AxC Antenna connections that are being sent by the BBU and how many Reverse AxC antenna connections are expected by the BBU. For example, if the BBU is configured in SIMO, then the forward AxC would only have Antenna 1, and the reverse AxC would have Antennas 1 and 2. For MIMO, both the forward and reverse AxCs would have Antennas 1 and 2.
- **Carrier Type**—the type of carrier for which the CDIU is provisioned:
  - LTE_5, LTE_10, LTE_15, or LTE_20 for 5, 10, 15, or 20 MHz LTE carriers
  - UMTS for a 3.84 MHz WCDMA carrier.
- **Forward Power (dBFS) Current**
  - **Peak**—peak instantaneous power experienced on the forward link
  - **Max**—maximum average power experienced on the forward link
  - **Min**—minimum average power experienced on the forward link.

### Set the Reverse RF

The **Reverse RF** page has two **CDIU** tables that provide system information and allows you to manually set the Reverse RF for CDIUs:

- **Reverse Link Budget (CDIU)** table—use this table to set the Reverse RF for CDIUs, as described in "Configuring the Reverse RF" on page 52.
- **CDIU Antenna Carriers** table—use this read-only table to view information about the connected Antenna Carriers (AxC). For a full description of the **CDIU Antenna Carriers** table as it appears on the **Forward RF** page, go to "Viewing the CDIU Antenna Carriers Table on the Reverse RF Page" on page 53.

**NOTE:** The Reverse RF page will also show Host RF DART information in the Reverse Link Budget (RF Slots) table when Host RF DART Modules are present and linked.

**NOTE:** CDIU currently supports up to 2 AxCs for LTE and UMTS.
**Configuring the Reverse RF**

Do the following to set the CDIU Reverse RF:

1. Do one of the following:
   - If you are on the Forward RF page or one of the other Provision System pages, click the **Reverse RF** tab at the top of the page.
   - If you are not on the Forward RF page or one of the other Provision System pages, in the System Menu bar, click **System Configuration > Provision System**, and once the **Linking** page opens (default view), click the **Reverse RF** tab at the top of the page.

   The Reverse RF page opens. The **Reverse Link Budget (CDIU)** table is populated with all of the linked CDIUs for this system.

2. In the **Reverse Link Budget (CDIU)** table, use the Host Slot Id / Slot Name / Passband column to identify the CDIU whose reverse gains you want to set.

3. In the **Gain Mode** menu, select one of the following:
   - **Normal**—no increase to the gain setting.
   - **High**—increases the gain settings, as follows:
     - Classic DARTs—the gain setting increases 2 dB with a 1 dB improvement in the Noise Figure
     - SuperDARTs—the gain setting increases by 6 dB with a 2 dB improvement in the Noise Figure
     - HDM DARTs—the gain setting increase by 5 dB with a 2 dB improvement in the Noise Figure

   When paired, changing the **Gain Mode** for one Host DART/CDIU in the pair results in EMS applying the same change to the paired DART.

4. In the **Additive Gain (dB)** menu, select the Reverse Gain value of 0 to -15 dB, based upon the fully loaded reverse path signal level from the Remote Unit.

   **CAUTION!** For WCDMA, the CDIU reports Receive Total Wideband Power (RTWP) back to the BBU, which is a measurement of the RF reverse path power at the front end of the Remote Unit. If you change the Additive Gain setting to something other than zero, this RTWP report is not adjusted.

5. Click **Apply**.

   The **Reverse Link Budget (CDIU)** table refreshes with the new settings.
Viewing the CDIU Antenna Carriers Table on the Reverse RF Page

NOTE: The CDIU Antenna Carriers table that corresponds to the Antenna Carrier (AxC) will only display on the Reverse RF page if the BBU is connected and the AxCs have been enabled.

On the Reverse RF page, the CDIU Antenna Carriers table behaves as described below.

- **LTE MIMO**—when using a LTE MIMO configuration, you will see two Antenna Carriers (AxC) in the CDIU Antenna Carriers table on the Reverse RF page.

- **LTE SISO**—when using LTE SISO, you will see two Antenna Carriers (AxC) in the CDIU Antenna Carriers table on the Reverse RF page. The second AxC in the Configure Host Reverse Gain page will list NA for power levels, as the BBU does not support SISO, but actually does SIMO (Single Input, Multiple Output), causing the second path to be ignored within the DAS.

- **UMTS SISO**—when using UMTS, you will see two Antenna Carriers (AxC) in the CDIU Antenna Carriers table on the Reverse RF page for each active UMTS carrier. A UMTS BBU expects SIMO, so the DAS copies the first reverse path into the second path to create a pseudo-diversity signal. This is required to provide optimal performance for the BBU Uplink. The power levels of the second path in the CDIU Antenna Carriers table on the Reverse RF page will be 0.5dB lower than the first path.

NOTE: CDIU currently supports up to 2 AxCs for LTE and UMTS.

Do one of the following to view the CDIU Antenna Carriers table on the Reverse RF page:

- If you are on the Linking page or one of the other Provision System pages, click the Reverse RF tab at the top of the page.

- If you are not on the Linking page or one of the other Provision System pages, in the System Menu bar, click System Configuration > Provision System, and once the Linking page opens (default view), click the Reverse RF tab at the top of the page.
Installing a CDIU

The Reverse RF page opens. The CDIU Antenna Carriers table is at the bottom of the page.

The CDIU Antenna Carriers table on the Reverse RF page has the elements listed below.

- **Carrier Frequency (MHz)**—identifies the Reverse Path center frequency of the Antenna Carrier.
- **Slot Id**—identifies the CDIUs by its Host Unit slot number (1, 2, 5, or 6).
- **CPRI Port**—maps to the CPRI Port 1 and CPRI Port 2 on the CDIU (see "CDIU Connectors" on page 4) and identifies the CDIU port providing the Antenna Carrier (1 or 2).
- **Carrier**—the carrier number provided by the BBU.
- **Antenna**—the CPRI Antenna number will be 1 or 2, which indicates the number of Forward AxC Antenna connections that are being sent by the BBU and how many Reverse AxC antenna connections are expected by the BBU. For example, if the BBU is configured in SIMO, then the forward AxC would only have Antenna 1, and the reverse AxC would have Antennas 1 and 2. For MIMO, both the forward and reverse AxCs would have Antennas 1 and 2.
- **Carrier Type**—the type of carrier for which the CDIU is provisioned:
  - LTE_5, LTE_10, LTE_15, or LTE_20 for 5, 10, 15, or 20 MHz LTE carriers
  - UMTS for a 3.84 MHz WCDMA carrier.
- **Reverse Power (dBm) Current**
  - **Peak**—peak instantaneous power experienced on the reverse link
  - **Max**—maximum average power experienced on the reverse link
  - **Min**—minimum average power experienced on the reverse link.
Configure Delay

The information in this section tells you how to set the **Forward Delay** and **Reverse Delay** for a CDIU System. This information is broken into the following topics:

- "Forward Delay and Reverse Delay for a CDIU System" on page 56
- "Working with CDIU Forward and Reverse Delays" on page 57
- "Changes to Make at an ALU BBU for LTE Systems" on page 57
- "Setting the DAS Delay for a CDIU" on page 58
- "Working with a Delay Compensation Alarm at the BBU" on page 61
**Forward Delay and Reverse Delay for a CDIU System**

The **Forward Delay** and **Reverse Delay** values for a CDIU System automatically propagate to the BBU via the CDIU. For a simulcast, all remote delays need to be normalized to the longest delay remote, as shown below. Note the following:

- The BBU to CDIU fiber length that drives L1 needs to be less than 10km or 15km (round trip) depending upon the `MaxTransportFiberDelayLengthCategory` setting.
- L3 needs to be included to ensure delay constraints are met. If you use all of the delay budget (e.g. 200 usec) to the output of the Remote Unit, calls will only be allowed right next to the Remote Unit.

![Diagram of FlexWave Prism Remote Unit and FlexWave Host Unit]

Dependent on the BBU settings, the maximum delay (MAX_DEL) is one of the following:

- **LTE**: 60, 170 or 200 usec
- **UMTS**: 200 usec.

**NOTE:** The preceding values indicate Round Trip delays.

The following equation shows the constraints for delay: \( BD + L1 + L2 + L3 < MAX\_DEL \)
Working with CDIU Forward and Reverse Delays

Before you set the forward and reverse delays for the CDIU, familiarize yourself with the following:

- **WCDMA only.** For CDIUs connected to the same BBU, the Forward delays for these CDIUs must all be set to the same value and the Reverse delays for these CDIUs must be set to the same value. The difference between UMTS sectors must be less than 600 nanoseconds, otherwise the BBU will not allow service. If delays are not set within the limit, then the BBU will report an *Initialization Failure/Delay Limit Exceeded* alarm.

- If delays are not set to the same value within a simulcast, then the CDIU reports the shortest delay back to the BBU. This is because calls can occur with a delay longer than those reported to the BBU, but calls will not go through if the delay is too low (this assumes that the delay for each remote is within the MAX_DEL value). CommScope recommends that the delays for all Remote Units in a simulcast be set to the same value.

- The system comes up with a default delay. Once linking is complete, the system will calculate the actual delay. The initial parameters that are set may therefore be out of range. If necessary, correct the delay within the available range.

- Each time the CDIU forward and/or reverse delay is changed in the DAS, the CPRI link gets reset, as the only way to report delay back to the BBU is at link startup. If too many resets occur (each time forward and/or reverse delay is changed), the BBU can “isolate” the CDIU, which requires the BBU to perform a Radio Head (RH) reset.

- The Forward and Reverse delays do not need to match; best practice requires that you try to minimize the total round trip delay.

Changes to Make at an ALU BBU for LTE Systems

**NOTE:** The changes described in this section do not have to be made on a Nokia AirScale FSM4 as it self-adjusts for delays from the CDIU.

There are three breakpoint limits in maximum round-trip delays. These breakpoint limits occur at 60 usec, 170 usec, and 200 usec. To accommodate for these breakpoint limits, make the following changes at an ALU BBU, as appropriate to the installation.

- To go from 60 to 170 usec, change the BBU *IsFiberDelayAllowed* from 0 to 1.
- To go from 170 to 200 usec of delay, change the BBU *MaxTransportFiberDelayLengthCategory* from *tenKm* to *fifteenKm*.

**NOTE:** The *IsDASEnabled* BBU field accounts for analog fiber DAS delays. Do not use this field with the CDIU for the following reasons:

- You would have to set the delays in the BBU Datafill manually.
- *IsDASEnabled* overrides accounting for delays automatically through the ARD-546 interface.

**NOTE:** The BBU for WCDMA allows 200 usec of round trip delay for the DAS. Unlike LTE, you do not need to make BBU Datafill changes to achieve this amount of delay.
Installing a CDIU

Setting the DAS Delay for a CDIU

You use the **Delays** page to set a specific amount of delay between the Host Unit and the Remote Unit(s) in both the Forward and Reverse paths. You can also use the **Delays** page to view minimum delay based on fiber distance and intrinsic system delay.

Delay is a key parameter when commissioning a Prism or Spectrum system. If delays are not set correctly, then calls may not go through and/or performance may be effected.

The following list provides specific delay guidelines.

- For each Remote DART linked to a given Host DART or CDIU (i.e. Remote DARTs in simulcast):
  - All Forward Path delays should be set to the longest Forward Path delay in the simulcast.
  - All Reverse Path delays should be set to the longest Reverse Path delay in the simulcast.
  - Note that Forward Path delays and Reverse Path delays do not need to be set to the same value.
- A total round-trip delay (Forward + Reverse) must be within the delay limits defined for a given BTS.
- For Hosts DARTs connected to the BTS via RF connections, the DAS delays should be included in the BTS configuration.
- For Hosts CDIUs connected to the BTS via CPRI, the delays are automatically reported to the BTS via the CPRI link.

You may decide to set all delays to the same value at a given location, to simplify the changes within the BTS. This is acceptable, if the specific guidelines shown above are followed.

The following rules apply to the delay settings:

- **Linking**—linking automatically sets the default value for the delay, based on the system delay and fiber length. This default value takes effect approximately one minute after the DARTs and/or CDIUs are linked. The default value for the Forward and Reverse direction is the lowest value in the supported range plus 3 microseconds.
- **Cascaded Remote Units**—when linking a cascaded group of Remote Units, the default delay for all Remote Units will be 3 microseconds more than the lower value in the supported range of the Remote Unit farthest from the Host Unit. If a Remote Unit is later added to extend the cascade, it uses the same rules for determining the default delay as the previously existing Remote Units.
- **Fiber-Optic Cable Length Change**—if the delay cause by the fiber changes by more than what the system can compensate for, then the delay between the Host Unit and the Remote Unit(s) will be set to its minimum or maximum value and **Delay Out of Range** alarm occurs.

Do the following to set the system delay:

1. **Do one of the following**:
   - If you are on the **Reverse RF** page or one of the other Provision System pages, click the **Delays** tab at the top of the page.
   - If you are not on the **Reverse RF** page or one of the other Provision System pages, in the System Menu bar, click **System Configuration > Provision System**, and once the **Linking** page opens (default view), click the **Delays** tab at the top of the page.

The **Delays** page opens. The **Delays** table is populated with all of the linked DARTs for this system.
2 Use the **System Delay Mode** radio buttons to determine how delays will be set at the system level (that is, all links in the system). The System Delay Mode radio buttons allow you to select the delay mode for all configured links within the system; valid values are: **Minimum**, **Common** and **Manual**.

- **Minimum**—Select to have the system automatically determine what the delay value should be for all links in the system. At the system level, the minimum delay is set to the lowest intersection value of all links in the system plus 3μs. At the Host DART level, it is the intersection of delay ranges for all links for that Host DART. The minimum delay is always the same value for both the Forward and Reverse paths.

Once you select the **Minimum** radio button, the **Delays** table becomes read-only and a single value displays for the Remote DART link for both the **Forward Delay (μs)** and **Reverse Delay (μs)** columns. Although the **Delays** page immediately reacts to the selection of the **Minimum** radio button, the **Minimum** mode is not applied until the **Apply** button is clicked.
• **Common**—Select to enable a menu that allows you to set the **Forward Delay (μs)** and **Reverse Delay (μs)** manually for the Remote DART link. You will enter a single delay value that applies to both the Forward and Reverse delay for the Remote DART link that corresponds to the row. Although the **Delays** page immediately reacts to the selection of the **Common** radio button, the **Common** mode is not applied until the **Apply** button is clicked.

![Image of Common Delay Configuration](image1.png)

• **Manual**—Select to enable the **Host Delay Type** menu in the **Delays** table, which allows you to set all of the delay parameters for each simulcast group individually.

![Image of Manual Delay Configuration](image2.png)

Note that when paired, changing the **Delay Type** for one Host DART in the pair results in EMS applying the same change to the paired DART.

3 Click **Apply** to ensure the selection made in the **System Delay Mode** radio buttons is applied and activated.
4 Do one of the following:

- If you selected the **Common** radio button, use the enabled **Forward Delay (μs)** and **Reverse Delay (μs)** text box to enter the desired forward and reverse delays for that simulcast group (i.e., the Host and Remote Units in that row). The delay must be within the valid delay ranges shown in the corresponding parentheses.

- If you selected the **Manual** radio button, use the enabled the **Host Delay Type** menu to select the delay type for that simulcast group.

5 Click **Apply**.

The **Delays** table refreshes with the new settings.

### Working with a Delay Compensation Alarm at the BBU

There are two different scenarios in which the CDIU **Forward Delay** or **Reverse Delay** (set in the FlexWave EMS) can cause a **Compensation Alarm** at the BBU:

- "BBU Delay Compensation Alarm when a CDIU Delay Setting Exceeds BBU Maximum Delay" on page 61
- "BBU Delay Compensation Alarm when a CDIU Delay Setting Exceeds FlexWave Maximum" on page 62.

#### BBU Delay Compensation Alarm when a CDIU Delay Setting Exceeds BBU Maximum Delay

Dependent on the BBU settings, the maximum delay (**MAX_DEL**) for a BBU is one of the following:

- **LTE**: 60, 170 or 200 usec
- **UMTS**: 200 usec.

When comparing CommScope DAS Delay values with the BBU reported/received delay alarms, this is the round-trip delay versus a one-way delay.

If the CDIU **Forward Delay** or **Reverse Delay** (set in the FlexWave EMS) exceeds the BBU maximum delay, the Nokia system software generates a **Compensation Alarm** at the BBU. Should this occur, do the following:

1 Change the DAS delay so that it is within a valid range for the BBU (see delay limitation guidance).

2 To clear the **Compensation Alarm** at the BBU, use the Nokia system software to have the eNodeB locked (LOCK) and then unlocked (UNLOCK).
BBU Delay Compensation Alarm when a CDIU Delay Setting Exceeds FlexWave Maximum

To prevent a CDIU from causing Delay Compensation alarms within the BBU, starting with release 9.0.2, the CDIU limits the delay reports to the BBU as follows:

- **FWD Delay** is capped at 96 μs
- **REV Delay** is capped at 88 μs.

If the CDIU FWD Delay or REV Delay is greater than its limit, you need to increase the Cell Radius within the BBU, as described below.

1. Follow the steps in "View a Link Delays Report" on page 77 to see if, for any given CDIU link, the FWD Delay and/or the REV Delay is greater than its limit stated above.

2. If the answer to Step 1 is “yes,” increase the BBU Cell Radius by the bigger of the delay overages. You calculate the Cell Radius increase (in km) as follows:

   \[
   \text{CELL_RADIUS_INCREASE} = \frac{\text{LARGEST_OVERAGE}}{3}
   \]

   For example:

   - The BBU Cell Radius is set to 5 km.
   - The CDIU FWD Delay and REV Delay are both at 100 μs.
   - The REV Delay is capped at 88 μs; the uplink delay therefore has the greater overage, which is 12 μs (100 μs minus 88 μs equals 12 μs).
   - The calculation to increase the Cell Radius would therefore be: \( \frac{12}{3} = 4 \) km
   - You would therefore change the Cell Radius from 5 km to 9 km
CONNECT THE CDIU TO THE BBU

CAUTION! Make sure that the BBU to which you connect this CDIU is configured the same (SISO or MIMO). If you connect a MIMO BBU to a SISO CDIU (or vice versa), downlink data rate issues can occur. If the BBU is configured as MIMO, configure the CDIU as MIMO. If the BBU is configured as SISO, configure the CDIU as SISO.

1. Obtain the required length of Single-Mode Fiber cable (with loss of less than 13 dB) that has a dual-fiber LC jumper that will run from the BBU CPRI ports on the eCCM module to the CPRI Port 1 or CPRI Port 2 on the CDIU.

2. Connect one end of the cable to the CDIU CPRI Port 1 or CPRI Port 2.

3. Connect the other end of the cable to a CPRI port on the eCCM/eCCM2 (ALU BBU), or ABIA Module (Nokia AirScale FSM4), as described below.

   - **ALU BBU eCCM Module or eCCM2 Module**—CPRI ports are labeled Optic n where n is the port number as described below (see Figure 19, which shows an eCCM Module):
     - eCCM: 1 - 6

![Diagram showing connection of CDIU to ALU BBU eCCM or eCCM2 Module](image)

**Figure 19.** Connect CDIU to an ALU BBU eCCM or eCCM2 Module (eCCM Module Shown)
- **Nokia AirScale FSM4 ABIA Module**—CPRI ports are labeled RF-\(n\) where \(n\) is the port number (1 - 6); see Figure 20.

![Diagram showing CDIU connection to FSM4 ABIA Module](image)

**Figure 20.** Connect CDIU to FSM4 ABIA Module

4 **For LTE systems only.** Note the first time the BBU connects with a CDIU, the BBU reports a LOSS OF GEO LOC PHASE SYNC major alarm. This is normal. After several minutes, the LOSS OF GEO LOC PHASE SYNC alarm clears automatically.

5 Look at the CDIU Port SFP connector(s) to verify that the RX LED(s) change from amber to green (see “CDIU Connectors” on page 4).
Click **Alarms** > **View Current Alarms** in the System Menu bar to access the **View Current Alarms** page to verify that for all CDIU CPRI ports for which the **REC Type** was provisioned, the **CDIU CPRI Port n REC Communication Fault** and **CDIU CPRI Port n Optical Under Drive** alarms (where n equals 1 or 2) are no longer active.

**NOTE:** For WCDMA, the EMS automatically adjusts the Uplink Gain in the CDIU to normalize the noise floor to -104 dBm for a 3.84 MHz WCDMA channel (-104 dBm/3.84 MHz equates to a 4 dB Noise Figure). You should see approximately a -104 dBm value (noise only) in the Antenna Carrier powers of the Configure Host Reverse Gain, assuming that the noise power is only due to the noise figure of the hardware. External noise may make this measurement higher than -104 dBm. Also, the gain is set using the following equation: Uplink Gain = 4 - Estimated Noise Figure. For example, if you have a 4 dB noise figure (for a single PRU), then Uplink Gain will be 0dB; however, if you have a 17 dB NF (8 RAUs in a Spectrum system), then the Uplink Gain will be -13 dB.

**Check the CDIU for Input Power from the BBU**

Once the BBU connects with the CDIU and has enabled Antenna Carriers, you need to check the CDIU for input power from the BBU.

The steps that you follow is dependent on the **Connection Type** setting; make sure you choose the settings that are applicable to your system setup as described in one of the following subsections:

- "Checking BBU Input Power for CDIU Connection Types 1 and 2" on page 65
- "Checking BBU Input Power for Connection Types 3, 4, and 5" on page 66.

**Checking BBU Input Power for CDIU Connection Types 1 and 2**

1. In the System Menu bar, click **System Configuration** > **Provision System** and then click the **Forward RF** tab to access the **Forward RF** page.

2. Use the **Forward Link Budget (CDIUs)** table to check CDIU power levels.
   a. Use the **Host Slot Id** and **Slot Name** fields to identify the CDIU that you want to check.
   b. Do any of the following to check power levels in the **Forward Link Budget (CDIU)** table.
      - **For fully loaded systems**, look at the **Max** field in the **Host RMS Input Power (dBFS) Current Composite** column. The **Max** power should within the following levels:
        - LTE: -15.5 dBFS when fully loaded
        - UMTS: -15.5 dBFS when fully loaded.
      - **For unloaded systems**, look at the **Min** field in the **Host RMS Input Power (dBFS) Current Composite** column. The **Min** power level should be within the following levels:
        - LTE: ~-25.5 dBFS when unloaded
        - UMTS: ~-23.5 dBFS when unloaded.
3 Use the **CDIU Antenna Carriers** table to check the Antenna Carrier (AxC) power levels.

- **For fully loaded systems**, look at the **Max** field in the **Forward Power (dBFS) Current** column. The **Max** power should within the following levels:
  - Single carrier
    - LTE: **-15.5 dBFS** loaded
    - UMTS: **-15.5 dBFS** loaded
  - Two Carriers: **-18.5 dBFS** loaded.

- **For unloaded systems**, look at the **Min** field in the **Forward Power (dBFS) Current** column. The **Min** power level should within the following levels:
  - Single carrier
    - LTE: ~**-25.5 dBFS** unloaded
    - UMTS: ~**-23.5 dBFS** unloaded
  - Two Carriers: **-26.5 dBFS** unloaded.

### Checking BBU Input Power for Connection Types 3, 4, and 5

1. In the System Menu bar, click **System Configuration > Provision System** and then click the **Forward RF** tab to access the **Forward RF** page.

2. Use the **Forward Link Budget (CDIUs)** table to check CDIU power levels.
   a. Use the **Host Slot Id** and **Slot Name** fields to identify the CDIU that you want to check.
   b. Look at the **Max** field in the **Host RMS Input Power (dBFS) Current Composite** column. The **Max** power level should within the levels listed in the following table:

<table>
<thead>
<tr>
<th>Port 1 (%)</th>
<th>Port 2 (%)</th>
<th>LTE Unloaded (dBFS)</th>
<th>LTE Loaded (dBFS)</th>
<th>UMTS Unloaded (dBFS)</th>
<th>UMTS Loaded (dBFS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>-90.0</td>
<td>-25.5</td>
<td>-90.0</td>
<td>-25.5</td>
</tr>
<tr>
<td>10</td>
<td>90</td>
<td>-35.5</td>
<td>-26.0</td>
<td>-25.5</td>
<td>-26.0</td>
</tr>
<tr>
<td>20</td>
<td>80</td>
<td>-29.5</td>
<td>-27.7</td>
<td>-19.5</td>
<td>-27.7</td>
</tr>
<tr>
<td>30</td>
<td>70</td>
<td>-30.7</td>
<td>-27.0</td>
<td>-20.7</td>
<td>-25.0</td>
</tr>
<tr>
<td>40</td>
<td>60</td>
<td>-28.5</td>
<td>-28.5</td>
<td>-18.5</td>
<td>-25.0</td>
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<td>-26.5</td>
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<td>-16.5</td>
<td>-24.5</td>
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<tr>
<td>60</td>
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<tr>
<td>70</td>
<td>30</td>
<td>-27.0</td>
<td>-30.7</td>
<td>-17.0</td>
<td>-25.0</td>
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<tr>
<td>80</td>
<td>20</td>
<td>-26.5</td>
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<td>90</td>
<td>10</td>
<td>-26.0</td>
<td>-35.5</td>
<td>-16.0</td>
<td>-24.0</td>
</tr>
<tr>
<td>100</td>
<td>0</td>
<td>-25.5</td>
<td>-90.0</td>
<td>-15.5</td>
<td>-90.0</td>
</tr>
</tbody>
</table>
3 Use the **CDIU Antenna Carriers** table to check the Antenna Carrier (AxC) power levels.

- **For fully loaded systems**, look at the **Max** field in the **Forward Power (dBFS) Current** column. The **Max** power should within the following levels:
  - Single carrier
    - LTE: **-15.5 dBFS** loaded
    - UMTS: **-15.5 dBFS** loaded
  - Two Carriers: **-18.5 dBFS** loaded.

- **For unloaded systems**, look at the **Min** field in the **Forward Power (dBFS) Current** column. The **Min** power level should within the following levels:
  - Single carrier
    - LTE: ~**-25.5 dBFS** unloaded
    - UMTS: ~**-23.5 dBFS** unloaded
  - Two Carriers: **-26.5 dBFS** unloaded.

### Check the CDIU for Output Power to the BBU

Once the BBU connects with the CDIU and has enabled Antenna Carriers, you need to verify output power is as expected.

- A fully loaded Path power will be -15.5 dBFS, which will map to a maximum output power when the Remote Forward Gain is set to **31 dB**.
- If the input is unloaded, then the output will be reduced by this same amount. For example, if the CDIU Input Path Power is -25.5 dBFS and you expect a +43 dBm maximum output, then the output would be +33 dBm.

Note that the output power reported to the BBU is calculated as follows:

1. The BBU tells the CDIU the maximum output power for the CDIU Antenna Carrier.
2. The CDIU reports the output power to the BBU based on the input power into the CDIU, with full-scale being -15.5 dBFS.

For example, if the BBU tells the CDIU the CDIU Antenna Carrier has a 20W (43 dBm) output and the CDIU has a -25.5 dBFS input signal, then the CDIU reports an output power of +33.0 dBm.

### CDIU Temperature as Reported by the BBU

The Nokia system software on the BBU identifies the CDIU as a ROCM (Reverse OneBTS CPRI Module), not as an RRH (Remote Radio Head). The BBU therefore records the CDIU temperature as **Not Reported**.
MANAGING CDIUs

The following sections tell you how to use the FlexWave EMS to manage and troubleshoot a CDIU.

POWERING UP CDIUs

The CDIU disables the CPRI Port for two minutes on startup. Startup includes a Host Unit reboot, hot swapping a CDIU, or setting the REC Type. Disabling the CPRI Port gives the Host Unit sufficient time to assess delay settings so the CPRI link does not get multiple resets while delay settings are assessed in the system.

GENERATE A TEST TONE

CAUTION! Generating a test tone causes loss of RF for the CDIU under test.

You can generate a Test Tone to drive the forward path without connection to a BBU. This allows you to verify the path by checking the Output Power Setting (Host Unit selected in the System Tree, then click Unit Information > View CDIU Antenna Carriers). The Test Tone can range from -40 to -18 dBFS in 1 dB steps.

Follow the steps below to generate a forward path test tone for the selected CDIU.

1. Notify the NOC or the system operator monitoring alarms that you are going to generate a test tone, which will cause a CDIU Path A Test Tone Enabled or CDIU Path B Test Tone Enabled alarm.
2. In the system Menu bar, click System Configuration > Generate Test Tone.
3. Use the Slot Id, Slot Name, and Passband columns to identify the CDIU for which you want to generate a test tone.
4. In the row that corresponds to the CDIU identified in Step 2, use the Frequency (MHz) text box to enter the frequency of the test tone. The possible range of the test tone will display next to the Frequency (MHz) text box, and will be applicable to the CDIU band type. Typically, you will select a guard band frequency, not something in the center of the band, as this minimizes over-the-air interference in the coverage area on existing macro or other DAS sector levels.
5. Use the Power (dBFS) menu to set the strength of the test tone, measured in decibel to full scale.
6. Select the check box in the Enable Test Tone column.
7 Click **Apply**.

The Test Tone remains active until you disable it.

8 Wait for the **Successfully saved test tone settings** message to display.

9 To stop the test tone, deselect the check box in the **Enable Test Tone** column, and then click **Apply**.

10 Wait for the **Successfully saved test tone settings** message to display.

11 Notify the NOC or the system operator monitoring alarms that the test tone has ended and the **CDIU Path A Test Tone Enabled** or **CDIU Path B Test Tone Enabled** alarm should no longer be active.

**USING THE UNIT INFORMATION PAGES**

The following sections tell you how to find information about the CDIU by using the **Unit Information** menu in the Unit Menu bar.

**View the CDIU(s) Installed in the Host Unit**

1 In the System Tree, click on the Host Unit icon.

2 In the Unit Menu bar, click **Unit Information > View Slots** to open the **View Slots** page, which will have the name of the selected Host Unit enclosed in square brackets as part of its title.

The **View Slots** table provides the information listed below.

- **Slot Id**—identifies the CDIU by the Host Unit slot number in which it is installed (1, 2, 5, or 6).
- **Slot Name**—name assigned to a DART (default is DART) or CDIU (default is CDIU).
- **HW Type**—type of hardware is in the slot: DART or CDIU.
- **Band Type**—the band type of the DART or CDIU.
- **Passband**—user-defined band frequency for the DART or CDIU; default is **Undefined** (until a specific passband is set).
- **Alarm**—whether an alarm is active. If an alarm is active, there will be a **Minor** or **Major** link that you can click to open a dialog that defines the active alarm. (If a major and a minor alarm are active for the same component, the EMS indicates that a major alarm is active.) The background color of the **Alarm** cell also indicates the alarm level:
  - Green—there is no active major or minor alarm.
  - Yellow—a minor alarm is active.
  - Red—a major alarm is active.
Managing CDIUs

View the CDIU Status

1. In the System Tree, click on the Host Unit icon.

2. In the Unit Menu bar, click Unit Information > View Status to open the View Status page, which will have the name of the selected Host Unit enclosed in square brackets as part of its title.

NOTE: Path status displays once the CDIU is linked. If the CDIU is not connected to the BBU, expect to see CDIU Under Drive alarms.

The View Status page for Host Units has the following tables that are specific to CDIUs:

- "CDIU CPRI Ports Status Table" on page 70
- "CDIU Path Status Table" on page 71.

CDIU CPRI Ports Status Table

The CDIU CPRI Ports Status table shows the alarm status of CDIU CPRI ports. For information on how to resolve an alarm, refer to "CDIU Alarm Reference" on page 100 or to the FlexWave Prism and Spectrum Element Management System Alarm Reference (FWPP-506).

![CDIU CPRI Ports Status Table]

- **Slot Id**—shows that CDIUs can be in Slots 1, 2, 5, or 6.
- **CPRI Port**—works with the Slot Id to identify the corresponding CPRI Port 1 or 2 for that slot.
- **Optical RX High BER**—High Bit Error Rate (BER) detected by fiber optic receiver. Fault threshold is 0.00001.
- **Optical RX No Light**—no signal detected by optical receiver.
- **Optical Transmitter Fault**—Remote Unit SFP optical transmitter failed.
• **Optical Over Drive**—SFP optical receive input power above specification. The threshold is 1 dBm for IR and -9 dBm for LR.

• **Optical Under Drive**—SFP optical receive input power for the Remote Unit is below specification. The threshold is -18 dBm for IR.

• **Optical Module Missing Fault**—CDIU CPRI Port X Module Missing Fault, where X can be 1 or 2, indicates that the CDIU CPRI Port 1 or 2 SFP is either not present or not responding, which causes a loss of forward and reverse RF. Note that the actual alarm names are CDIU CPRI Port 1 Module Missing Fault and CDIU CPRI Port 2 Module Missing Fault.

• **Remote Alarm Indication (RAI)**—the RAI bit is set in the received CPRI frame from the REC on the indicated CDIU CPRI Port n (where n can be 1 or 2). The RAI alarm occurs when the BBU is not receiving messages from the CDIU and sets the RAI bit in the CPRI link. If this condition persists, the CDIU will attempt a CPRI link reset after 15 minutes.

• **Slave Link Downstream Indication (SDI)**—the SDI bit is set in the received CPRI frame from the REC on the indicated CDIU CPRI Port n (where n can be 1 or 2). Note that CDIUs in slave configurations is not currently supported, so this alarm will not occur.

• **REC Communication Fault**—control and management channel with the REC on CDIU CPRI Port n (where n can be 1 or 2) has failed.

• **REC Type Configuration Mismatch**—user configured REC type on CDIU CPRI Port n (where n can be 1 or 2) is not supported by the CDIU.

## CDIU Path Status Table

The CDIU Path Status table shows the alarm status of CDIU paths. For information on how to resolve an alarm, refer to "CDIU Alarm Reference" on page 100 or to the FlexWave Prism and Spectrum Element Management System Alarm Reference (FWPP-506).

- **Slot Id**—shows that CDIUs can be in Slots 1, 2, 5, or 6.

- **Over Drive**—a CDIU CPRI Port 1 Optical Over Drive or CDIU CPRI Port 2 Optical Over Drive major alarm is active. A CDIU over drive alarm indicates that the CDIU CPRI Port 1 or 2 SFP optical receive input power is above specification; the threshold is 1 dBm (IR).

- **Under Drive**—a CDIU CPRI Port 1 Optical Under Drive or CDIU CPRI Port 2 Optical Under Drive major alarm is active. A CDIU under drive alarm indicates that the CDIU CPRI Port 1 SFP optical receive input power is below specification; the threshold is -18 dBm (IR).

- **Test Tone Enabled**—a Test Tone is active on that path. As long as the Test Tone is active, there will be a loss of RF for the CDIU under test, which generates the Test Tone Enabled major alarm.

- **ALC Limiting**—a CDIU Path A ALC Limiting or CDIU Path B ALC Limiting minor alarm is active. An ALC Limiting alarm means that the CDIU Path A or CDIU Path B forward path Automatic Level Control is active; the threshold is -1.5 dBFS (peak).

- **Linking Conflict**—the CDIU cannot restore a link with the Remote Unit DART with which it was linked, so the Linking Conflict major alarm is active.
View Information about CDIU Antenna Carriers

The GUI displays a **CDIU Antenna Carriers** table on four different pages. The content of the **CDIU Antenna Carriers** table is dependent on the page in which the **CDIU Antenna Carriers** table is displayed.

This section has the following subtopics:

- "Elements of a CDIU Antenna Carriers Table” on page 72
- "Viewing the CDIU Antenna Carriers Table on the View CDIU Antenna Carriers Page" on page 73
- "Viewing the CDIU Antenna Carriers Table in the Get Information CDIU Antenna Carriers Report” on page 73.

You can also view the **CDIU Antenna Carriers** table in the System Provisioning pages, as noted below:

- "Viewing the CDIU Antenna Carriers Table on the Forward RF Page” on page 50
- "Viewing the CDIU Antenna Carriers Table on the Reverse RF Page” on page 53

Elements of a CDIU Antenna Carriers Table

The **CDIU Antenna Carriers** table provides the following information about the CDIU Antenna Carriers.

- **Slot Id**—identifies the CDIUs by its Host Unit slot number (1, 2, 5, or 6).
- **CPRI Port**—maps to the CPRI Port 1 and CPRI Port 2 on the CDIU (see "CDIU Connectors” on page 4) and identifies the CDIU port providing the Antenna Carrier (1 or 2).
- **Carrier**—the carrier number provided by the BBU.
- **Carrier Type**—the type of carrier for which the CDIU is provisioned:
  - LTE_5, LTE_10, LTE_15, or LTE_20 for 5, 10, 15, or 20 MHz LTE carriers
  - UMTS for a 3.84 MHz WCDMA carrier.
- **Forward Center Frequency (MHz)**—configured by the CARRIERCFG message from BBU. Represents the Forward Path center frequency of the Antenna Carrier.
- **Reverse Center Frequency (MHz)**—configured by the CARRIERCFG message from BBU. Represents the Reverse Path center frequency of the Antenna Carrier.
- **Reverse Noise Setting (dBFS)**—configured by the CARRIERCFG message from LTE BBU. The CDIU uses this number to configure the Reverse Path gain in the system. Typically set to -64.42 dBFS.
- **Output Power Setting (dBm)**—configured by the CARRIERCFG message from BBU. Tells CDIU the BBU-expected output power. CDIU will report Output Power based upon this setting. A full-scale input into the CDIU (-15.5 dBFS) will result in a full-scale output power report. Note that the **Output Power Setting** report is displayed within the BBU system and is independent of the DAS Output power readings.
- **Path A Forward Containers**—defined by the BBU, this is the starting location of the Forward Path Container within CPRI basic frame on RF Path A.
- **Path A Reverse Containers**—defined by the BBU, this is the starting location of the Reverse Path Container within CPRI basic frame on RF Path A.
- **Path B Forward Containers**—defined by the BBU, this is the starting location of the Forward Path Container within CPRI basic frame on RF Path B.
- **Path B Reverse Containers**—defined by the BBU, this is the starting location of the Reverse Path Container within CPRI basic frame on RF Path B.
Viewing the CDIU Antenna Carriers Table on the View CDIU Antenna Carriers Page

Do the following to view the **CDIU Antenna Carriers** table on the **View CDIU Antenna Carriers** page:

1. In the System Tree, click on the Host Unit icon.

2. In the Unit Menu bar, click **Unit Information > View CDIU Antenna Carriers** to open the **View CDIU Antenna Carriers** page, which will have the name of the selected Host Unit enclosed in square brackets as part of its title.

![View CDIU Antenna Carriers Table](image)

Viewing the CDIU Antenna Carriers Table in the Get Information CDIU Antenna Carriers Report

To access the **CDIU Antenna Carriers** report, in the System Menu bar, click **System Information > Get Information**, and then in the **Type** menu, select **CDIU Antenna Carriers**.

![Get Information CDIU Antenna Carriers](image)
Managing CDIUs

**USING THE GET INFORMATION REPORTS**

The following subsections tell you how to use the Get Information menu to find information about the CDIU.

**View Information about the CDIU Hardware**

1. In the System Menu bar, click **System Information > Get Information**.
2. In the Type menu, select **Hardware Inventory**.

![Hardware Inventory Report](image)

The **Hardware Inventory** report lists any installed CDIUs in the Hardware Inventory table that pertains to the Host Unit, as follows:

- **Module Type**—identifies the module by type, such as CDIU, with the name assigned to that module appended after that the module type in the format of: [module type]-[slot name].
- **Id**—identifies the CDIU by its Host Unit slot number (1, 2, 5, or 6).
- **Date Code**—identifies the manufacturing date code of the installed CDIU.
- **Hardware Version**—identifies the release version number of the installed CDIU. The CDIU firmware release is identified in parentheses.
- **Serial Number**—identifies the CommScope Connectivity serial number of the installed CDIU assigned during manufacturing. Nokia will be able to cross reference the **Serial Number** with Nokia records.
- **Part Number**—identifies the CommScope Connectivity Part Number of the installed CDIU assigned during manufacturing. The Part Number tells CommScope what type of CDIU is installed.
View a Links Report

The **Links** report provides information about DARTs or CDIUs that are linked between a Host Unit and a Remote Unit.

**NOTE:** If there are TDD DARTs in the system, there will also be a TDD Settings table, refer to the *System Setup and Provisioning Guide* that corresponds to the EMS software release installed on the Host Unit.

To open the **Links** report, in the System Menu bar, click **System Information > Get Information**, and then in the **Type** menu, select **Links**.

---

**System Information > Get Information**

**Reports**

- **Type:** Links

  Downloading this file can take up to 15 mins depending on system size. The system will be unresponsive during this time.

**Links**

<table>
<thead>
<tr>
<th>Slot Id</th>
<th>Slot Name</th>
<th>SFP Id</th>
<th>SFP Name</th>
<th>Passband (MHz)</th>
<th>Unit Id</th>
<th>Unit Name</th>
<th>Slot Id</th>
<th>Slot Name</th>
<th>SFP Id</th>
<th>SFP Name</th>
<th>Timeslots</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RU_CIR_DART 51</td>
<td>5</td>
<td>GBP WU SPF5</td>
<td>Cell_060-894</td>
<td>6</td>
<td>Sector2_DRU</td>
<td>2</td>
<td>DART2</td>
<td>7</td>
<td>DR52 SPF7</td>
<td>1-4</td>
</tr>
<tr>
<td>2 (Paired with Slot 4)</td>
<td>RU_DART 7000LABC 52</td>
<td>6</td>
<td>GBP WU SPF5</td>
<td>LABC700_728-746</td>
<td>6</td>
<td>Sector2_DRU</td>
<td>3</td>
<td>DART3</td>
<td>7</td>
<td>DR52 SPF7</td>
<td>5-7</td>
</tr>
<tr>
<td>3</td>
<td>RU DART 7000 BC 53</td>
<td>7</td>
<td>GBP WU SPF7</td>
<td>UCB700_740-750</td>
<td>7</td>
<td>Sector3</td>
<td>3</td>
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<td>1</td>
<td>DR53 SPF7</td>
<td>1-2</td>
</tr>
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<td>4 (Paired with Slot 7)</td>
<td>RU DART 7000LABC 54</td>
<td>7</td>
<td>GBP WU SPF7</td>
<td>LABC700_728-746</td>
<td>5</td>
<td>Sector2_DRU</td>
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<td>DART3</td>
<td>7</td>
<td>DR52 SPF7</td>
<td>5-7</td>
</tr>
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<td>6 (Paired with Slot 6)</td>
<td>DART</td>
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<td>GBP WU SPF5</td>
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<td>DART9</td>
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<td>DR52 SPF7</td>
<td>8-11</td>
</tr>
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<td>6 (Path A) (Paired with Slot 6)</td>
<td>CDU 1900 PCS S6 PA</td>
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<td>GBP WU SPF5</td>
<td>PCS_1930-1955</td>
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<td>DART9</td>
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<td>DR52 SPF7</td>
<td>8-11</td>
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<tr>
<td>7</td>
<td>RU DART 2600TD 57</td>
<td>3</td>
<td>GBP WU SPF3</td>
<td>TD02500A.0_2408.5-2631.5</td>
<td>3</td>
<td>Sector1_DRU</td>
<td>1</td>
<td>DART10</td>
<td>1</td>
<td>PR01 SPF1</td>
<td>1-6</td>
</tr>
</tbody>
</table>

**TDD Settings**

<table>
<thead>
<tr>
<th>Slot Id</th>
<th>UL Configuration</th>
<th>Special SubFrame</th>
<th>DL Cyclic Prefix</th>
<th>UL Cyclic Prefix</th>
<th>Downlink Override</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>3</td>
<td>8</td>
<td>Normal</td>
<td>Normal</td>
<td>Disabled</td>
</tr>
</tbody>
</table>
Managing CDIUs

The **Links** table provides the information listed below.

- **Host** columns—identify the Host Unit and its elements.
  - **Slot Id**—identifies Host DARTs and CDIUs by the Host Unit slot number in which it is installed. A Host DART can be installed in any of the eight slots, but CDIUs can only be in Slot 1, 2, 5, or 6. For CDIUs, the path (A or B) is identified. Additionally, if the DART or CDIU is part of a simulcast group, the slot with which the DART or CDIU is paired is listed.
  - **Slot Name**—user-defined name for the Host DART or CDIU; the default for DARTs is **DART**, and the default for CDIUs is **CDIU**.
  - **SFP Id**—system assigned number (1 to 8) of the Optical port. For a Host Unit, the **SFP Id** represents the physical SFP TX/RX port on the SeRF II Module.
  - **SFP Name**—user-defined name for the TX/RX Optical port; default is **SFP**.
  - **Passband (MHz)**—frequency range configured on the DART.

- **Remote** columns—identify the Remote Unit and its elements.
  - **Unit Id**—identification of the unit within the system.
  - **Unit Name**—Unit Name for the Remote Unit.
  - **Slot Id**—identifies Remote DARTs by the Remote Unit slot number in which it is installed.
  - **Slot Name**—user-defined name for the Remote DART; the default is **DART**.
  - **SFP Id**—system assigned number (1 to 8) of the Optical port. For a HEU or DRU, the **SFP Id** represents the physical SFP TX/RX port on the SeRF II Module. For PRUs, the **SFP Id** represents the SeRF SFP Connector inside the Prism Remote Unit Fiber 1 or Fiber 2 connector.
  - **SFP Name**—user-defined name of the Optical port. The default **SFP Name** is **SFP**.
  - **Timeslots**—timeslots allocated to the link. If **Timeslots 2 - 4** are allocated, the link will use three timeslots.
  - **Diversity**—whether Remote DART is configured as **Diversity** or **Non Diversity**.
View a Link Delays Report

To open the Link Delays report, in the System Menu bar, click System Information > Get Information, and then in the Type menu, select Link Delays.

The Link Delays table provides information listed below.

- **Host** columns/fields—provide delay information about the Host Unit side in the link.
  - **Slot Id**—identifies the Host DART by the slot in which it is installed, which can be from 1 through 8.
  - **Slot Name**—user-defined name for the Host DART; the default is DART.
  - **Passband**—type of passband provided by the DART or CDIU.
  - **Frequency (MHz)**—passband frequency of the DART or CDIU.
  - **Delay Type**—type of delay that corresponds to all links tied to that Host DART (or in other words, that simulcast group).

- **Remote** columns—provide delay information about the Remote Unit side in the link.
  - **Unit Id**—identification of the unit within the system.
  - **Unit Name**—user-defined label for the Remote Unit.
  - **Slot Id**—identifies Remote DARTs by the Remote Unit slot number in which it is installed.
  - **Slot Name**—user-defined name for the Remote DART; default is DART.
  - **FWD Delay (μs)**—user configured FWD RF path delay in microseconds; should be within the range listed within the parentheses.
  - **REV Delay (μs)**—user configured REV RF path delay in microseconds; should be within the range listed within the parentheses.
Managing CDIUs

View a Forward RF Report

The Forward RF report provides information regarding the end-to-end forward RF path.

When CDIUs are present in the system, there will be two tables in the Forward RF report: the Forward Link Budget (RF Slots) table, and the Forward Link Budget (CDIUs) table. This document describes the Forward Link Budget (CDIUs) table. For information on the Forward Link Budget (RF Slots) table, refer to the System Setup and Provisioning Guide that corresponds to the EMS software release installed on the Host Unit.

To open the Forward RF report, in the System Menu bar, click System Information > Get Information, and then in the Type menu, select Forward RF. The Forward Link Budget (CDIUs) table will be at the bottom of the page.

The Forward Link Budget (CDIUs) table has the elements listed below.

- **Host columns/fields**
  - **Slot Id**—identifies the Host Unit slot in which the CDIU is installed, which can be 1, 2, 5, or 6.
  - **Slot Name**—user-defined name for the CDIU; the default is CDIU.
  - **Passband (MHz)**—frequency range configured on the CDIU.
  - **Operating Mode**—identifies the CDIU operating mode:
    - **Disable**—RF function is muted in the Host Unit CDIU and its linked Remote Unit DART.
    - **Normal**—RF function is not muted, which allows the system to operate normally.
  - **Input Power (dBm)**
    - **Power Allocation % (CPRI Port 1/Port 2)**—indicates how the power is allocated between CPRI Port 1 and CPRI Port 2. When two BBUs are sharing the same RF Band, power is allocated in 10% steps between CPRI Port 1 and CPRI Port 2. The total allocated power must always equal 100%.
    - **Additive Forward Gain (dB)**—Forward Gain in decibels assigned to the CDIU.
  - **Input Power (dBFS)**
    - **Peak**—peak instantaneous power experienced on the CDIU forward path.
    - **Max**—maximum average power experienced on the CDIU forward path.
    - **Min**—minimum average power experienced on the CDIU forward path.
  - **Paired Power %**—when Host DART/CDIU summing is used, the **Paired Power (%)** column indicates the amount of power allocated to each of the paired HOST DARTs/CDIUs. The **Paired Power (%)** column only displays if at least one set of Host DARTs/CDIUs is paired.
### Remote columns/fields

- **Unit Id**—identification of the unit within the system.
- **Unit Name**—Unit Name for the Remote Unit.
- **Slot Id**—identifies Remote DART's by the Remote Unit slot number in which it is installed.
- **Slot Name**—user-defined name for the Remote DART; the default is **DART**.
- **Mode / LPA Status**—the functionality of the Remote DART (**Mode**) and the Linear Power Amplifier (**LPA**) mode (**LPA Status**) in Remote Unit. Spectrum DART Remote Units (DRUs) and Prism Host Expansion Units (HEUs) do not have an LPA or a PA; therefore, only two of the **Path Mode / LPA Status** options will be available for DRUs and HEUs, as noted below. The **LPA Status** can be any of the following:
  - **Normal**—both forward and reverse paths are enabled (default setting).
  - **FWD Disable**—the forward path is disabled, for PRUs and FRUs, the LPA will be also be offline; this setting is not applicable to Spectrum.
  - **FWD+REV Disable**—both forward and reverse paths are disabled, for PRUs and FRUs, the LPA will be also be offline.

**NOTE:** In a dual Linear Power Amplifier (**LPA**) system, the **Path Mode / LPA Status** column shows two values for the LPA status, one for each LPA. Changing the LPA Mode or resetting the LPA applies to both LPAs at the same time.

- **RMS Output Power (dBm)**
  - **Current Composite**—the forward power at the Remote Unit Antenna port. For Prism PRUs and FRUs, this is a measured output value. For Spectrum, this value is an estimate output level based on the value on a standard power RAUs, the value therefore displays as **(est.)** after the power level.
  - **Max/Fully Loaded Composite**—the desired maximum (or, fully loaded) output power referenced to the remote antenna from the Remote DART.

  The **Max** field displays the maximum output power the Remote DART can support. For Spectrum, the value represents maximum output power for a standard power RAU.

  The **Fully Loaded Composite** field is the desired maximum (or, fully loaded) output power referenced to the remote antenna from the Remote DART. The maximum setting has the same value as what is shown in the **Max** field. For Spectrum, the displayed value corresponds to the estimated **(est.)** output power for a standard power RAU.

- **VSWR**—the Voltage Standing Wave Ratio (**VSWR**) for the LPA. An **LPA VSWR Fault** occurs if the LPA VSWR measurement exceeds the threshold, which is 3:1. The GUI reported **VSWR** measurement is averaged over a 3-minute period to provide a more stable and reliable reading. On PA and link startup, you may notice a **VSWR** reading of 9:1 (maximum value) initially, but after approximately 6 minutes, the **VSWR** reading will settle into its steady state reading. Additionally, a **VSWR** alarm can take up to 6 minutes to set or clear as the **VSWR** reading settles into its steady state value.

  This field is only applicable to the PRU LPAs and FRU PAs—it is not applicable to DRUs or HEUs. For DRUs and HEUs, this field will display **NA**. Note that the LPA VSWR measurement is not shown in the GUI.
View a Reverse RF Report

The Reverse RF report shows the configuration of the reverse RF signal path. When CDIUs are present in the system, there will be two tables in the Reverse RF report: the Reverse Link Budget (RF Slots) table, and the Reverse Link Budget (CDIU) table. This section describes the Reverse Link Budget (CDIU) table. For information on the Reverse Link Budget (RF Slots) table, refer to the FlexWave Provisioning Guide that corresponds to the software release installed on the system.

To open the Reverse RF report, in the System Menu bar, click System Information > Get Information, and then in the Type menu, select Reverse RF.

The Reverse Link Budget (CDIU) table provides the following information.

- **Host columns/fields**—provide gain information for the Host Unit side in the link.
  - **Slot Id**—number of the Host Unit slot in which a DART is installed, which can be from 1 through 8.
  - **Slot Name**—user-defined name for the Host DART; the default is DART.
  - **Passband (MHz)**—frequency range configured on the DART.
  - **Power Current (dBm)**
    - **Peak**—peak instantaneous power experienced on the DART reverse link.
    - **Max**—maximum average power experienced on the DART reverse link.
    - **Min**—minimum average power experienced on the DART reverse link.
  - **Gain Mode**—identifies whether the Host Unit will increase its gain. **Gain Mode** is applicable to Prism systems only.
    - **Normal**—no increase to the gain setting.
    - **High**—increases the gain settings, as follows:
      - Classic DARTs—the gain setting increases 2 dB with a 1 dB improvement in the Noise Figure
      - SuperDARTs—the gain setting increases by 6 dB with a 2 dB improvement in the Noise Figure
      - HDM-850—the gain setting increase by 5 dB with a 2 dB improvement in the Noise Figure.
- **Calculated Simulcast Noise Figure (dB)**—estimate of the Reverse Noise Figure based upon product type (Prism or Spectrum), simulcast number (1-8), **Remote Gain Mode** (**Normal** or **High**), and RAU count (1-8). Examples are as follows:

<table>
<thead>
<tr>
<th>Prism NF Example</th>
<th>Spectrum NF Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single PRU: 5 dB (typical)</td>
<td>Single DRU, 8 RAUs: 17 dB</td>
</tr>
<tr>
<td>Two PRUs: 8 dB</td>
<td>Two DRUs, 8 RAUs per DRU: 20 dB</td>
</tr>
<tr>
<td>Four PRUs: 11 dB</td>
<td>Four DRUs, 8 RAUs per DRU: 23 dB</td>
</tr>
<tr>
<td>Eight PRUs: 14 dB</td>
<td>Eight DRUs, 8 RAUs per DRU: 26 dB</td>
</tr>
</tbody>
</table>

**NOTE:** The Calculated Simulcast Noise Figure (dB) numbers are calculated based on the Noise Figure of the Remote Unit hardware. The calculated value will be wrong if there is an elevated noise condition at the Remote Unit. If necessary, use the Additive Gain setting to achieve the desired noise floor. Note that the Additive Gain does not adjust the calculated Noise Floor or Noise Figure as it is used to restore the original Noise Figure of the Remote Unit in the presence of elevated noise.

- **Remote** columns/fields—provide gain information for the Remote Unit side in the link.
  - **Unit Id**—identification of the unit within the system.
  - **Unit Name**—Unit Name for the Remote Unit.
  - **Slot Id**—identifies Remote DARTs by the Remote Unit slot number in which it is installed.
  - **Slot Name**—user-defined name for the Remote DART; the default is **DART**.
  - **Calculated Reverse System Gain (dB)**—estimate of the Reverse Gain from the Remote Unit input to the Host Unit output.
  - **Additive Gain (dB)**—user-adjustable gain applied to the reverse path signal in the Remote DART. The range is **0 to -15 dB**; note that the gain range is negative, which indicates only attenuation can be applied.
  - **Input Power Current (dBm)** column
    - **Peak**—peak instantaneous power experienced on the DART reverse link.
    - **Max**—maximum average power experienced on the DART reverse link.
    - **Min**—minimum average power experienced on the DART reverse link.
View a CDIU Interfaces Report

1. In the System Menu bar, click **System Information > Get Information**.
2. In the **Type** menu, select **CDIU Interfaces**.

The **CDIU Interfaces** report provides the information listed below for the installed CDIUs:

- **Slot Id**—identifies the CDIUs by its Host Unit slot number (1, 2, 5, or 6).
- **CPRI Port**—maps to the CPRI Port 1 and CPRI Port 2 on the CDIU (see "CDIU Connectors" on page 4) and identifies the CDIU port providing the Antenna Carrier (1 or 2).
- **CPRI Port Name**—unique label assigned to the CPRI port that helps to identify the port during troubleshooting and configuration.
- **CPRI Rate (Mbps)**—the CPRI line rate to the correct megabits per second.
  - **Rate 1 (614.4)**—select for WCDMA
  - **Rate 3 (2457.6)**—select for LTE.
- **REC Type**—with what kind of Radio Equipment Controller the CDIU interfaces, will be the same as BBU and will be either **LTE** or **UMTS**. The version number is included in the **REC Type** to allow support with different BBUs and versions of their software.
- **Connection Type**—the type of CPRI to RF path mapping required for the CDIU.
  - **Type 1** - Dual SISO; this is the only CDIU **Connection Type** that can do different frequency bands on each Port/Path.
  - **Type 2** - Single MIMO (Port 1 only)—both bands must be the same
  - **Type 3** - Sum of two SISO paths
  - **Type 4** - MIMO plus summed SISO on Path A
  - **Type 5** - Dual MIMO, summed on both Paths
  - **None** - No Type selected; default setting.
• **Path A Band / Path B Band**—user-defined band (850, 1900, 2100, SGL or DL) that allows CDIU to be linked to DARTs in Remote Units.

• **Optics Type**—identifies the optics type that is installed in the Host Unit slot, which for CDIUs will always be Intermediate Range (13 dB).

• **Wavelength (nm)**—identifies the wavelength transmitted through this port, which for CDIUs is 1310 nm.

• **Tx Power (dBm)**—identifies the launch power level in dBm of the forward path signal, which for CDIUs will always be in the Intermediate Range (IR) where the minimum optical transmit power is -5 dBm and the maximum is +1 dBm.

• **Rx Power (dBm)**—identifies the receive power level in dBm of reverse path signal, which incorporates the launch power of the Remote Unit SFP plus all optical losses (insertion losses, fiber cable loss, and so forth). CDIUs are always in the Intermediate Range (IR) where the minimum optical transmit power is -18 dBm and the maximum is +1 dBm.

• **Alarm**—identifies whether an alarm is active. If an alarm is active, there will be a Minor or Major link that you can click to open a dialog that defines the active alarm. (If a major and a minor alarm are active for the same component, the EMS indicates that a major alarm is active.) The background color of the Alarm cell also indicates the alarm level:
  - Green—there is no active major or minor alarm.
  - Yellow—a minor alarm is active.
  - Red—a major alarm is active.

**View a CDIU Antenna Carriers Report**

For information on the Get Information CDIU Antenna Carriers report, go to "Viewing the CDIU Antenna Carriers Table in the Get Information CDIU Antenna Carriers Report" on page 73.
UNLINK A CDIU

1. In the System Menu bar, click **System Configuration > Provision System**. The **Linking** page opens as the default view in the EMS Frame.

2. In the **Linking** table **Linked** column, deselect the check box of the CDIU that you want to unlink from the Remote Unit DART.

3. Click **Apply**.

4. Wait for the **Information: Changes applied successfully** message to display. The **Established Links** table at the bottom of the page updates with the new links.

**NOTE:** Linking a CDIU (or DART) places it into service. If a CDIU/DART has not been linked, it is not in service, so if the unlinked CDIU/DART is hot swapped, no alarms will result and its settings will not persist in the EMS. If you hot swap a CDIU/DART that has been linked, you are hot swapping a CDIU/DART that is in service. In this case, a Module Missing alarm will result when the CDIU/DART is removed and the EMS will retain the original settings of the CDIU/DART (including its hardware and software inventory data) and restore these settings when either the original or a different CDIU/DART is installed. For DARTs, the settings that persist are the DART Name and Passband. For CDIUs, the settings that persist are the CPRI Port Name, CPRI Rate (Mbps), Sector ID, Sector Unit, REC Type, Connection Type, Path A and Path B Passbands. If you need to remove the configuration settings of the original CDIU, follow the steps in “Clear a CDIU Configuration” on page 85.
CLEAR A CDIU CONFIGURATION

NOTE:  The Clear Configuration function on a CDIU clears both Path A and Path B.

1. In the System Tree, click on the icon for the Host Unit for which you want to clear CDIU configurations.

2. In the Unit Menu bar, click **Unit Configuration > Configure Slots** to open the **View Configure Slots** page, which will have the name of the selected Host Unit enclosed in square brackets as part of its title.

3. In the **Clear Configuration** column, select the CDIU(s) for which you want to clear configuration. Notice that the **Slot Name** field becomes disabled.

4. Click **Apply**.

   A confirmation window with the following message opens:

   **This action completely clears the configuration of the selected Slot(s).**
   Do you want to continue?

5. In the confirmation dialog, click **OK**.

6. Wait for the **Information: Operation completed** message to display.

   If the CDIU has been removed from the Host Unit, the entire CDIU entry disappears. If the CDIU is still present in the Host Unit chassis, the **Slot Name** and **Passband** reset to default.
Managing CDIUs

REPLACING A CDIU WITH ONE OR MORE DARTS

1. Follow the steps in "Clear a CDIU Configuration" on page 85 to clear the CDIU configuration, which also removes the CDIU link.
2. Physically remove the CDIU from the Host Unit.
3. Install a DART in either one or both slots that the CDIU had previously occupied.
4. Configure the DART(s).

REPLACING ONE OR MORE DARTS WITH A CDIU

Since each CDIU requires two slot spaces, you may have to remove two DARTs from the Host Unit chassis. CDIUs can be installed in the slot combinations listed in Step 1 below and as shown in Figure 1 on page 3.

1. Determine which slots the CDIU will occupy:
   - 1 and 3
   - 2 and 4
   - 5 and 7
   - 6 and 8.
2. Log in to the FlexWave EMS.
3. Record the configuration parameters of the Host Unit RF DART(s). (If there is more than one RF DART being replaced with a CDIU, make sure you record the configuration settings for each DART.) Note that some of the parameters that you are capturing do not map to a CDIU; you are preserving these parameters in case the Host Unit RF DART needs to be reinstalled. Do the following to record the reports that pertain to a Host Unit RF DART:
   a. In the System Menu bar, click System Information > Get Information.
   b. In the Reports panel Type menu, select Links, and then click Download.
   c. Follow the steps of the operating system on your PC to save the file to the PC’s hard drive. The filename will be in the following format: `<ReportName>_<UnitName>_<DATETIME>.<file extension>`
   d. To view the recorded parameters, go to the directory where the file was saved to open the files.

NOTE: While Excel is often used to view a FlexWave EMS report, Excel uses characters such as hyphens and slashes to create formulas. If discrepancies are seen in this report, use a text editor to verify the report’s content.

4. Repeat Step 3 to download the following reports:
   - Forward Gain
   - Reverse Gain
   - Link Delays.
5 Perform a Clear Configuration of the removed RF DART.

a In the Unit Menu bar, click Unit Configuration > Configure Slots to open the Configure Slots page, which will have the name of the selected Host Unit enclosed in square brackets as part of its title.

b In the Clear Configuration column, select the DART(s) for which you want to clear configuration. Notice that the Slot Name field becomes disabled.

c Click Apply.

A confirmation window with the following message opens:

This action completely clears the configuration of the selected Slot(s). Do you want to continue?

d In the confirmation dialog, click OK.

e Wait for the Information: Operation completed message to display.

If the DART has been removed from the Host Unit, the entire DART entry disappears. If the DART is still present in the Host Unit chassis, the Slot Name and Passband reset to default.

6 To remove a DART from the Host Unit chassis, remove the Phillips head screws securing the DART Module to the Host Unit (two screws for single-slot DARTs, four screws for dual-slot DARTs), and then slide the DART Module out of the Host Unit slot. As a CDIU requires two slots, make sure to clear two Host Unit slots for the CDIU.
WORKING WITH CDIU ALARMS

The EMS Manage Alarms page has an interactive table, which provides information about managed alarms and allows you to manually enable and disable CDIU alarms.

- For information on the Manage Alarms table, go to "Using the Manage Alarms Table" on page 88.
- For the steps required to enable or disable an alarm, go to "Enable and Disable CDIU Alarms" on page 90.
- For a list of alarms that you can enable or disable, go to "CDIU Alarms that Can Be Enabled/Disabled" on page 91.
- For definitions of CDIU related alarms and how to remedy them, go to "CDIU Alarm Reference" on page 100.

USING THE MANAGE ALARMS TABLE
The **Manage Alarms** table has the following elements:

- **Unit Id** menu—has the following implementations:
  - **Global**—displays alarms for the Host Unit and all connected Remote Units. Changes made when **Global** is selected affects all units in the system for which the alarm is applicable.
  - **Unit name**—each unit in the system is listed by name, which allows you to select a specific unit for which to enable or disable an alarm.

- **Unit Type** column—type of unit to which the alarm pertains:
  - **Host**—Host Unit
  - **Remote**—Prism Remote Unit (Prism Remote Unit)
  - **DRU/HEU**—Prism HEU or Spectrum DRU.

- **Module Type** column—which module the alarm pertains to, which can be any of the following. Note that the EMS only lists alarms for discovered modules. Therefore, if only one CDIU is installed, only one CDIU will be shown.
  - **DART**—can be up to eight DARTs listed
  - **CDIU**—can be up to four CDIUs listed
  - **LNA**—can be up to eight LNAs listed (applicable only to PRUs)
  - **Power Detector** (applicable only to PRUs)
  - **SFP**—can be up to eight Small Form-Factor Pluggables (SFPs) listed
  - **SeRF**—Serialized RF Module.
  - **RDI**—Remote DART Interface (applicable only to PRUs).

- **Alarm Name** column—identifies the alarm by name.

- **Enabled** check box—select to enable alarm reporting for the corresponding alarm.

- **Threshold Value** column—value that once surpassed generates the specified alarm; see "CDIU Alarms that Can Be Enabled/Disabled."
ENABLE AND DISABLE CDIU ALARMS

The Manage Alarms page allows you to enable and disable alarm reporting. Once an alarm has been disabled, the Host Unit and the Remote Unit View Status page indicate the disabled alarm with a D and a gray background.

NOTE: The enable/disable alarm reporting feature is only applicable to an EMS session run from a Host Unit. Alarms for which reporting has been disabled will appear in the alarm reports when viewed from an EMS session connected directly to a Remote Unit Craft port.

NOTE: Enabling/disabling affects SNMP Traps and GUI alarm reporting.

Do the following to enable or disable an alarm:

1. To access the Manage Alarms page, in the System Menu bar, click Alarms > Manage Alarms.
2. Do one of the following in the Unit menu:
   - Select Global (default) to display all the manageable alarms for the Host Unit and all connected Remote Units. Enabling or disabling an alarm with Global selected affects all units in the system to which the alarm is applicable.
   - Select a specific unit to manage alarms for the selected unit.
3. In the Enabled column, do one of the following:
   - To enable the alarm, make sure the Enabled check box is selected (that is, it has a check mark in it).
   - To disable the alarm, clear the Enabled check box.
4. Click Apply.
5. Wait for the Operation completed message to display.
The alarms that can be enabled/disabled are listed in Table 6. For CPRI Port and Path alarms where there can be up to two separate alarms, the CPRI Port is identified as **CDIU CPRI Port 1** or **CDIU CPRI Port 2**, and the Path is identified as **CDIU Path A** or **CDIU Path B**. For a complete list of alarms that can be managed, refer to the *System Setup and Provisioning Guide* that corresponds to the EMS software release installed on the Host Unit. (For information on accessing FlexWave user documentation, see "Accessing FlexWave User Documentation" on page 120.)

### Table 6. CDIU Alarms You Can Enable/Disable

<table>
<thead>
<tr>
<th>Alarm Name</th>
<th>Threshold Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDIU CPRI Port 1 Optical Under Drive</td>
<td>-18 dBm (IR) / -27 dBm (LR)</td>
</tr>
<tr>
<td>CDIU CPRI Port 1 Optical Over Drive</td>
<td>1 dBm (IR) / 9 dBm (LR)</td>
</tr>
<tr>
<td>CDIU CPRI Port 1 Optical Rx High BER</td>
<td>0.00001</td>
</tr>
<tr>
<td>CDIU CPRI Port 1 Module Missing Fault</td>
<td>--</td>
</tr>
<tr>
<td>CDIU CPRI Port 2 Optical Under Drive</td>
<td>-18 dBm (IR) / -27 dBm (LR)</td>
</tr>
<tr>
<td>CDIU CPRI Port 2 Optical Over Drive</td>
<td>1 dBm (IR) / 9 dBm (LR)</td>
</tr>
<tr>
<td>CDIU CPRI Port 2 Optical Rx High BER</td>
<td>0.00001</td>
</tr>
<tr>
<td>CDIU CPRI Port 2 Module Missing Fault</td>
<td>--</td>
</tr>
<tr>
<td>CDIU CPRI Port 1 Remote Alarm Indication (RAI)</td>
<td>--</td>
</tr>
<tr>
<td>CDIU CPRI Port 1 Slave Link Downstream Indication (SDI)</td>
<td>--</td>
</tr>
<tr>
<td>CDIU CPRI Port 1 REC Communication Fault</td>
<td>--</td>
</tr>
<tr>
<td>CDIU CPRI Port 1 REC Type Configuration Mismatch</td>
<td>--</td>
</tr>
<tr>
<td>CDIU CPRI Port 1 Carrier Configuration Mismatch</td>
<td>--</td>
</tr>
<tr>
<td>CDIU CPRI Port 2 Remote Alarm Indication (RAI)</td>
<td>--</td>
</tr>
<tr>
<td>CDIU CPRI Port 2 Slave Link Downstream Indication (SDI)</td>
<td>--</td>
</tr>
<tr>
<td>CDIU CPRI Port 2 REC Communication Fault</td>
<td>--</td>
</tr>
<tr>
<td>CDIU CPRI Port 2 REC Type Configuration Mismatch</td>
<td>--</td>
</tr>
<tr>
<td>CDIU CPRI Port 2 Carrier Configuration Mismatch</td>
<td>--</td>
</tr>
<tr>
<td>CDIU Path A Over Drive</td>
<td>-0.5 dBFS Peak</td>
</tr>
<tr>
<td>CDIU Path A Under Drive</td>
<td>-45 dBFS Peak</td>
</tr>
<tr>
<td>CDIU Path A Test Tone Enabled</td>
<td>--</td>
</tr>
<tr>
<td>CDIU Path A ALC Limiting</td>
<td>-1.5 dBFS Peak</td>
</tr>
<tr>
<td>CDIU Path B Over Drive</td>
<td>-0.5 dBFS Peak</td>
</tr>
<tr>
<td>CDIU Path B Under Drive</td>
<td>-45 dBFS Peak</td>
</tr>
<tr>
<td>CDIU Path B Test Tone Enabled</td>
<td>--</td>
</tr>
<tr>
<td>CDIU Path B ALC Limiting</td>
<td>-1.5 dBFS Peak</td>
</tr>
</tbody>
</table>
COMMISSIONING CDIUs IN A HOST-TO-HOST CONFIGURATION

You can cascade CDIUs in a Host-to-Host (H2H) configuration with an Analog Distributed Antenna System (aDAS). The following sections tell you how to configure the H2H downlink output power, uplink noise cascade, and the total system delay when using CDIUs in an H2H configuration.

Figure 21 shows a block diagram of an H2H system with CDIUs, in which the HEU RF interface to the aDAS is as follows:

- non-duplexed
- Downlink output is either Low Power (~ -10 dBm) or High Power (~ +20 dBm)
- Uplink Noise figure is between 12 to 17 dB, dependent on the band.

Figure 21. Simplified Block Diagram for an H2H System with a CDIU
CONFIGURING THE HEU DOWNLINK

You configure the downlink cascading of CDIUs with another DAS within a H2H system the same as you would for an RF interface. Output Power from the HEU Remote DART is approximately -10 dBm with PAR headroom of 14 dB. For further information on Output Power, see the FlexWave Performance Specification that corresponds with the FlexWave software installed on this system.

If additional power is required to drive the aDAS downlink, then you need to add an optional Amplifier Shelf, as shown in Figure 22. The Amplifier Module in the Amplifier Shelf has 30 dB of gain, so the Output Power from HEU and connected Amplifier would be approximately +19 (assumes 1 dB of cable loss from HEU DART to the Amplifier Shelf). For information on available HEUs, Amplifier Shelves and Modules, refer to the *FlexWave Host Expansion Unit and Amplifier Shelf Installation Guide* (FWPP-508).

**NOTE:** This assumes a 1dB cable loss from the HEU to the AMP.

---

**Figure 22.** Simplified Block Diagram for an H2H System with CDIU(s) and Amplifier Shelf
CONFIGURING AN UPLINK CASCADE

To configure an uplink cascade, you need to be aware of the following.

1. The H2H with CDIU has been optimized for standalone operation.
2. To add an aDAS, you need to keep the Noise Floor into the BBU at an optimized level to ensure good uplink performance.

Provisioning an Uplink Cascade

Do the following to provision an uplink cascade in a CDIU H2H system:

1. Determine the aDAS Noise Figure.
2. Set the aDAS uplink gain to ensure correct uplink cascade with the H2H.
3. Adjust the H2H front-end gain to account for the increase in the Noise Floor.

There are two methods that you can follow to achieve the preceding.

- Option 1—use Noise Matching, which will result in a 3 dB impact to the Noise Figure; see "Option 1—Uplink Cascade via Noise Matching" on page 95.
- Option 2—optimize the Dynamic Range, which will result in a 1 dB impact to the Noise Figure; see "Option 2—Uplink Cascade via Dynamic Range Optimized" on page 96.
Option 1—Uplink Cascade via Noise Matching

Table 7 shows the UL Gain required by the aDAS as a function of:

- aDAS Noise Figure
- DART type
  - Classic DARTs: 850 Cell
  - Super DARTs: 700 Lower ABC; 700 UpperC; 1900 PCS; 2100 AWS; 2300 WCS.
- aDAS uplink output noise level is configured to match the input Noise Floor of the Host-to-Host band
- Increases uplink Noise Floor by 3dB
- Set the Remote Additive Gain to -3 dB to maintain an optimized Noise Floor to the BBU; see "Configuring the Reverse RF" on page 52 for information on how to set the Remote Additive Gain.

<table>
<thead>
<tr>
<th>Noise Figure</th>
<th>Classic DARTs (dB)</th>
<th>SuperDARTs (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>14.0</td>
<td>10.0</td>
</tr>
<tr>
<td>4</td>
<td>13.0</td>
<td>9.0</td>
</tr>
<tr>
<td>5</td>
<td>12.0</td>
<td>8.0</td>
</tr>
<tr>
<td>6</td>
<td>11.0</td>
<td>7.0</td>
</tr>
<tr>
<td>7</td>
<td>10.0</td>
<td>6.0</td>
</tr>
<tr>
<td>8</td>
<td>9.0</td>
<td>5.0</td>
</tr>
<tr>
<td>9</td>
<td>8.0</td>
<td>4.0</td>
</tr>
<tr>
<td>10</td>
<td>7.0</td>
<td>3.0</td>
</tr>
<tr>
<td>11</td>
<td>6.0</td>
<td>2.0</td>
</tr>
<tr>
<td>12</td>
<td>5.0</td>
<td>1.0</td>
</tr>
<tr>
<td>13</td>
<td>4.0</td>
<td>0.0</td>
</tr>
<tr>
<td>14</td>
<td>3.0</td>
<td>-1.0</td>
</tr>
<tr>
<td>15</td>
<td>2.0</td>
<td>-2.0</td>
</tr>
<tr>
<td>16</td>
<td>1.0</td>
<td>-3.0</td>
</tr>
<tr>
<td>17</td>
<td>0.0</td>
<td>-4.0</td>
</tr>
<tr>
<td>18</td>
<td>-1.0</td>
<td>-5.0</td>
</tr>
<tr>
<td>19</td>
<td>-2.0</td>
<td>-6.0</td>
</tr>
<tr>
<td>20</td>
<td>-3.0</td>
<td>-7.0</td>
</tr>
</tbody>
</table>

* aDAS Gain plus attenuation should equal this value.
Option 2—Uplink Cascade via Dynamic Range Optimized

Table 8 shows the uplink gain required by the aDAS as a function of:

- aDAS Noise Figure
- DART type
  - Classic DARTs: 850 Cell
  - Super DARTs: 700 Lower ABC; 700 UpperC; 1900 PCS; 2100 AWS; 2300 WCS.
- aDAS UL output noise level is configured 5 dB above the input noise of the Host-to-Host uplink
- Increases uplink Noise Floor by 6dB
- Sets the Remote Additive Gain to -6 dB to maintain optimized Noise Floor to the BBU; see “Configuring the Reverse RF” on page 52 for information on how to set the Remote Additive Gain.

Table 8. Uplink Gain Required by the aDAS

<table>
<thead>
<tr>
<th>Noise Figure</th>
<th>Classic DARTs (dB)</th>
<th>SuperDARTs (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>19.0</td>
<td>15.0</td>
</tr>
<tr>
<td>4</td>
<td>18.0</td>
<td>14.0</td>
</tr>
<tr>
<td>5</td>
<td>17.0</td>
<td>13.0</td>
</tr>
<tr>
<td>6</td>
<td>16.0</td>
<td>12.0</td>
</tr>
<tr>
<td>7</td>
<td>15.0</td>
<td>11.0</td>
</tr>
<tr>
<td>8</td>
<td>14.0</td>
<td>10.0</td>
</tr>
<tr>
<td>9</td>
<td>13.0</td>
<td>9.0</td>
</tr>
<tr>
<td>10</td>
<td>12.0</td>
<td>8.0</td>
</tr>
<tr>
<td>11</td>
<td>11.0</td>
<td>7.0</td>
</tr>
<tr>
<td>12</td>
<td>10.0</td>
<td>6.0</td>
</tr>
<tr>
<td>13</td>
<td>9.0</td>
<td>5.0</td>
</tr>
<tr>
<td>14</td>
<td>8.0</td>
<td>4.0</td>
</tr>
<tr>
<td>15</td>
<td>7.0</td>
<td>3.0</td>
</tr>
<tr>
<td>16</td>
<td>6.0</td>
<td>2.0</td>
</tr>
<tr>
<td>17</td>
<td>5.0</td>
<td>1.0</td>
</tr>
<tr>
<td>18</td>
<td>4.0</td>
<td>0.0</td>
</tr>
<tr>
<td>19</td>
<td>3.0</td>
<td>-1.0</td>
</tr>
<tr>
<td>20</td>
<td>2.0</td>
<td>-2.0</td>
</tr>
</tbody>
</table>
Example CDIU H2H Configurations

Table 9 lists example CDIU H2H configuration settings.

Table 9. Example CDIU H2H Configurations

<table>
<thead>
<tr>
<th>Example #</th>
<th>Uplink Cascade Configuration Option</th>
<th>Noise Matching</th>
<th>aDAS Uplink Gain (dB)</th>
<th>Remote Additive Gain (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Option 1—Noise Matching</td>
<td>1900 PCS SuperDART</td>
<td>5</td>
<td>8 dB</td>
</tr>
<tr>
<td>2</td>
<td>Option 1—Noise Matching</td>
<td>850 Cell Classic DART</td>
<td>10</td>
<td>7 dB</td>
</tr>
<tr>
<td>3</td>
<td>Option 2—Dynamic range Optimized</td>
<td>2100 AWS SuperDART</td>
<td>5</td>
<td>13 dB</td>
</tr>
<tr>
<td>4</td>
<td>Option 2—Dynamic range Optimized</td>
<td>850 Cell Classic DART</td>
<td>10</td>
<td>12 dB</td>
</tr>
</tbody>
</table>

Verifying the Uplink Cascade

1. Check the uplink noise as measured by BBU; the uplink noise must be within the following parameters:
   - LTE5: -104 dBm
   - LTE10: -101 dBm
   - LTE15: -99 dBm
   - LTE20: -98 dBm
   - UMTS: -104 dBm

2. Adjust the aDAS uplink gain if the BBU uplink Noise Figure is more than 2 dB off from the targets listed in Step 1.
**TOTAL SYSTEM DELAY FOR LTE SYSTEMS**

Figure 23 shows a simple block diagram of the total system delay in a CDIU H2H LTE system, in which:

- **D1** delay is automatically calculated by BBU.
- **D2** delay is reported automatically to the BBU by the CDIU.
- **D3** delay must be determined (cabling plus aDAS delays). The BBU parameter `IsDASEnabled` must be enabled and the D3 delays (FWD and REV) must be added into the BBU datafile.
- The sum of D1+D2+D3 must be less than 103 usec for the DL and must be less than 98 usec for the UL to ensure the BBU does not report a **Delay Compensation** fault:

![Figure 23. Simple Block Diagram of Total System Delay](image)

**TOTAL SYSTEM DELAY FOR UMTS SYSTEMS**

The total system delay in a CDIU H2H UMTS system, in which:

- aDAS DL delay must be reported in the BBU parameter `extDelayDLAntenna1`; the number is in nanoseconds
- aDAS UL delay must be reported in the BBU parameters `extDelayULAntenna1` and `extDelayULAntenna2`. The numbers are in nanoseconds which should be the same for both parameters and both should map to the single aDAS UL delay value.
- The total round-trip delay of H2H plus the aDAS must be less than 200 usec.
- Within a given BBU, the delays reported by the H2H CDIU must all be the same (< 600 nsec).
CDIU MAINTENANCE GUIDANCE

Certain activities cause the BBU-to-CDIU link to be reset. A single reset of the CPRI link should recover without issue. However, if there are multiple resets of the CPRI link within a given period (i.e., six times in an hour) the BBU isolates the CDIU, which results in no service. This isolation requires BBU action, such as **RRH Lock/Unlock** or **RRH Reset** to recover the link.

CommScope therefore recommends that **before** you perform any maintenance activity on the BBU or DAS, you should isolate the CDIU from the BBU by either performing **RRH Lock** or disconnect the fiber between the BBU and CDIU. However, isolating the CDIU from the BBU while performing maintenance activities provides a more consistent recovery of the BBU-CDIU link.

**NOTE:** If performing an **RRH Lock** is not possible and disconnecting of fiber is utilized, please follow proper fiber handling and cleaning techniques and procedures.

MAINTENANCE ACTIVITIES KNOWN TO BREAK BBU-TO-CDIU LINKS

The following activities are known to cause the BBU-to-CDIU link to break:

- CDIU upgrades
- DAS software upgrades
- Changing of delays
- Unlinking of bands
- Reset of Remote Units
- Remote fiber disconnects
- BBU maintenance
  - Upgrades
  - Data fill changes

DETERMINING CDIU ISOLATION BY THE BBU

The CDIU may be in isolation if there are active CDIU Under Drive alarms with no other CDIU alarms.

RECOVERY IF THE BBU ISOLATES THE CDIU/RRH

If the CDIU becomes isolated from the BBU/eNodeB, perform the following:

- **Lock/Unlock** the RRH
- **RRH Reset** in the BBU/eNodeB
# CDIU Alarm Reference

This section lists and defines the FlexWave EMS alarms that are specific to the CDIU, and provides remedies for each alarm in the following format:

- **Alarm:** Lists the user-readable alarm name, such as Fan Fault.
- **Alarm Code:** Lists the unique alpha-numeric code assigned to the alarm by CommScope, such as AC1 or RUJ014.
- **Trap:** Lists the unique SNMP trap name assigned to the alarm. Note that the EMS GUI does not show trap names. This alarm reference provides traps for those who use an SNMP MIB browser to troubleshoot a FlexWave system. Traps are in the format of: `fwuHstDARTDCSupplyFault`
- **Affected Module:** Identifies which unit and module has an alarm state, such as: Host Unit SeRF.
- **Definition:** Provides the meaning of the alarm and includes alarm thresholds, when applicable.
- **Cause/Impact:** Provides information as to what can cause the alarm, and the impact or affect that the alarm condition can have on the alarmed unit or system.
- **Remedy:** Provides information on how to troubleshoot and clear the alarm.
- **Severity:** Identifies whether the alarm has a major, minor, or user-configurable alarm severity.

This section is divided into two parts:

- "CDIU and FlexWave Interface Alarms" on page 101 are alarms that can be resolved within the FlexWave system.
- "CDIU and BBU Interface Alarms" on page 108 are alarms that require coordination between the DAS and BBU vendors to resolve.

The alarms are listed in alphabetical order in each subsection.
CDIU AND FLEXWAVE INTERFACE ALARMS

The following alarms can be resolved within the FlexWave system. The "CDIU and BBU Interface Alarms" on page 108 are alarms that require coordination between the DAS and BBU vendors to resolve.

**Alarm:** CDIU CPRI Port 1 Module Missing Fault

**Alarm Code:** AC212
**Trap:** fwuHstCDIUPort1OptMissingFault
**Affected Module:** Host Unit CDIU
**Definition:** CDIU CPRI port 1 SFP is either not present or not responding.
**Cause/Impact:** Loss of forward and reverse RF.
**Remedy:** Insert or replace the SFP.
**Severity:** Major

**Alarm:** CDIU Internal Fault

**Alarm Code:** AC201
**Trap:** fwuHstCDIUInternalFault
**Affected Module:** Host Unit CDIU
**Definition:** Internal CDIU problem due to a failure with one or more of the following components: internal communications, calibration EEPROM, watchdog, FPGA configuration.
**Cause/Impact:** Internal problem with CDIU hardware, software or configuration; RF is lost.
**Remedy:** First, power cycle the CDIU either by physically removing, then re-inserting it, or by resetting the Host Unit; if alarm persists, replace the CDIU.
**Severity:** Major

**Alarm:** Clock Configuration Invalid

**Alarm Code:** AC38
**Trap:** fwuHstSysCardClockCfgFault
**Affected Module:** Host Unit System
**Definition:** Host Units with a CDIU require that the System Board III be configured for an external reference clock.
**Cause/Impact:** System is currently configured to use the internal 10 MHz clock reference, but the CDIU requires an external reference, resulting in no RF for the CDIU bands.
**Remedy:** Change the 10 MHz Reference Clock selection to External ([Host Unit Configuration >Edit Properties](#)). Ensure that each CDIU has its REF OUT connected to the System Board EXT REF IN and that the Host Unit has a System Board III or higher.
**Severity:** Major
**CDIU Alarm Reference**

**Alarm:** DART Communications Fault

**Alarm Code:** AC92

**Trap:** fwuRmtDARTCommsFault

**Affected Module:** Remote Unit DART

**Definition:** The Remote Unit DART communication path is missing or incorrect. The DART Communications Fault for Remote Units can also occur on HEUs.

**Cause/Impact:** The following causes are possible: the fiber-optic communication path is missing or incorrect; the Host Unit DART or CDIU may be missing; the Host DART or CDIU is not compatible with the Remote Unit DART or they are configured differently; the Remote Unit DART is linked to the wrong Host Unit DART/CDIU or the wrong slot on the Host Unit; this causes loss of RF.

**Remedy:** Check if the Host Unit DART or CDIU is missing. If present, verify that it is compatible with the Remote Unit DART and/or configured correctly. Check the optical performance of the SFPs used to connect RF to the Remote Unit DART, including Tx/Rx levels and alarms. If the optical path is good, then check whether the SFPs or fiber-optic cable have been moved. If either has been moved, restore to its original position. If original position is not available or is unknown, then perform a Clear Configuration on the Remote Unit DART (select the Remote Unit in System Tree, and then click Unit Configuration > Configure Slots) and re-link (System Configuration > Provision System > Linking).

**Severity:** Major

---

**Alarm:** DART Communications Fault Slot 1

**Alarm Code:** AC161

**Trap:** fwuRmtDARTCommsSlot1Fault

**Affected Module:** DART

**Definition:** The Remote Unit DART communication path to Host Unit Slot 1 is missing or incorrect. The DART Communications Fault for Remote Units can also occur on HEUs.

**Cause/Impact:** The following causes are possible: the fiber-optic communication path is missing or incorrect; the Host Unit DART or CDIU in Slot 1 may be missing; the Host DART or CDIU is not compatible with the Remote Unit DART or they are configured differently; the Remote Unit DART is linked to the wrong Host Unit DART/CDIU or the wrong slot on the Host Unit; this causes loss of RF.

**Remedy:** Check if the Host Unit DART or CDIU in Slot 1 is missing. If present, verify that it is compatible with the Remote Unit DART and/or configured correctly. Check the optical performance of the SFPs used to connect RF to the Remote Unit DART, including Tx/Rx levels and alarms. If the optical path is good, then check whether the SFPs or fiber-optic cable have been moved. If either has been moved, restore to its original position. If original position is not available or is unknown, then perform a Clear Configuration on the Remote Unit DART (select the Remote Unit in System Tree, and then click Unit Configuration > Configure Slots) and re-link (System Configuration > Provision System > Linking).

**Severity:** Major
**Alarm:** DART Communications Fault Slot 2

**Alarm Code:** AC162

**Trap:** fwuRmtDARTCommsSlot2Fault

**Affected Module:** DART

**Definition:** The Remote Unit DART communication path to Host Unit Slot 2 is missing or incorrect. The DART Communications Fault for Remote Units can also occur on HEUs.

**Cause/Impact:** The following causes are possible: the fiber-optic communication path is missing or incorrect; the Host Unit DART or CDIU in Slot 2 may be missing; the Host DART or CDIU is not compatible with the Remote Unit DART or they are configured differently; the Remote Unit DART is linked to the wrong Host Unit DART/CDIU or the wrong slot on the Host Unit; this causes loss of RF.

**Remedy:** Check if the Host Unit DART or CDIU in Slot 2 is missing. If present, verify that it is compatible with the Remote Unit DART and/or configured correctly. Check the optical performance of the SFPs used to connect RF to the Remote Unit DART, including Tx/Rx levels and alarms. Resolve any optical problem and see if the alarm clears. If the optical path is good, then check whether the SFPs or fiber-optic cable have been moved. If either has been moved, restore to its original position. If original position is not available or is unknown, then perform a Clear Configuration on the Remote Unit DART (select the Remote Unit in System Tree, and then click Unit Configuration > Configure Slots) and re-link (System Configuration > Provision System > Linking).

**Severity:** Major

**Alarm:** DART Communications Fault Slot 3

**Alarm Code:** AC163

**Trap:** fwuRmtDARTCommsSlot3Fault

**Affected Module:** DART

**Definition:** The Remote Unit DART communication path to Host Unit Slot 3 is missing or incorrect. The DART Communications Fault for Remote Units can also occur on HEUs.

**Cause/Impact:** The following causes are possible: the fiber-optic communication path is missing or incorrect; the Host Unit DART or CDIU in Slot 3 may be missing; the Host DART or CDIU is not compatible with the Remote Unit DART or they are configured differently; the Remote Unit DART is linked to the wrong Host Unit DART/CDIU or the wrong slot on the Host Unit; this causes loss of RF.

**Remedy:** Check if the Host Unit DART or CDIU in Slot 3 is missing. If present, verify that it is compatible with the Remote Unit DART and/or configured correctly. Check the optical performance of the SFPs used to connect RF to the Remote Unit DART, including Tx/Rx levels and alarms. Resolve any optical problem and see if the alarm clears. If the optical path is good, then check whether the SFPs or fiber-optic cable have been moved. If either has been moved, restore to its original position. If original position is not available or is unknown, then perform a Clear Configuration on the Remote Unit DART (select the Remote Unit in System Tree, and then click Unit Configuration > Configure Slots) and re-link (System Configuration > Provision System > Linking).

**Severity:** Major
**Alarm:** DART Communications Fault Slot 4  
**Alarm Code:** AC164  
**Trap:** fwuRmtDARTCommsSlot4Fault  
**Affected Module:** DART  
**Definition:** The Remote Unit DART communication path to Host Unit Slot 4 is missing or incorrect. The DART Communications Fault for Remote Units can also occur on HEUs.  
**Cause/Impact:** The following causes are possible: the fiber-optic communication path is missing or incorrect; the Host Unit DART or CDIU in Slot 4 may be missing; the Host DART or CDIU is not compatible with the Remote Unit DART or they are configured differently; the Remote Unit DART is linked to the wrong Host Unit DART/CDIU or the wrong slot on the Host Unit; this causes loss of RF.  
**Remedy:** Check if the Host Unit DART or CDIU in Slot 4 is missing. If present, verify that it is compatible with the Remote Unit DART and/or configured correctly. Check the optical performance of the SFPs used to connect RF to the Remote Unit DART, including Tx/Rx levels and alarms. Resolve any optical problem and see if the alarm clears. If the optical path is good, then check whether the SFPs or fiber-optic cable have been moved. If either has been moved, restore to its original position. If original position is not available or is unknown, then perform a Clear Configuration on the Remote Unit DART (select the Remote Unit in System Tree, and then click Unit Configuration > Configure Slots) and re-link (System Configuration > Provision System > Linking).  
**Severity:** Major

**Alarm:** DART Communications Fault Slot 5  
**Alarm Code:** AC165  
**Trap:** fwuRmtDARTCommsSlot5Fault  
**Affected Module:** DART  
**Definition:** The Remote Unit DART communication path to Host Unit Slot 5 is missing or incorrect. The DART Communications Fault for Remote Units can also occur on HEUs.  
**Cause/Impact:** The following causes are possible: the fiber-optic communication path is missing or incorrect; the Host Unit DART or CDIU in Slot 5 may be missing; the Host DART or CDIU is not compatible with the Remote Unit DART or they are configured differently; the Remote Unit DART is linked to the wrong Host Unit DART/CDIU or the wrong slot on the Host Unit; this causes loss of RF.  
**Remedy:** Check if the Host Unit DART or CDIU in Slot 5 is missing. If present, verify that it is compatible with the Remote Unit DART and/or configured correctly. Check the optical performance of the SFPs used to connect RF to the Remote Unit DART, including Tx/Rx levels and alarms. Resolve any optical problem and see if the alarm clears. If the optical path is good, then check whether the SFPs or fiber-optic cable have been moved. If either has been moved, restore to its original position. If original position is not available or is unknown, then perform a Clear Configuration on the Remote Unit DART (select the Remote Unit in System Tree, and then click Unit Configuration > Configure Slots) and re-link (System Configuration > Provision System > Linking).  
**Severity:** Major
**Alarm:** DART Communications Fault Slot 6

**Alarm Code:** AC166

**Trap:** fwuRmtDARTCommsSlot6Fault

**Affected Module:** DART

**Definition:** The Remote Unit DART communication path to Host Unit Slot 6 is missing or incorrect. The DART Communications Fault for Remote Units can also occur on HEUs.

**Cause/Impact:** The following causes are possible: the fiber-optic communication path is missing or incorrect; the Host Unit DART or CDIU in Slot 6 may be missing; the Host DART or CDIU is not compatible with the Remote Unit DART or they are configured differently; the Remote Unit DART is linked to the wrong Host Unit DART/CDIU or the wrong slot on the Host Unit; this causes loss of RF.

**Remedy:** Check if the Host Unit DART or CDIU in Slot 6 is missing. If present, verify that it is compatible with the Remote Unit DART and/or configured correctly. Check the optical performance of the SFPs used to connect RF to the Remote Unit DART, including Tx/Rx levels and alarms. Resolve any optical problem and see if the alarm clears. If the optical path is good, then check whether the SFPs or fiber-optic cable have been moved. If either has been moved, restore to its original position. If original position is not available or is unknown, then perform a **Clear Configuration** on the Remote Unit DART (select the Remote Unit in System Tree, and then click **Unit Configuration > Configure Slots** and re-link (**System Configuration > Provision System > Linking**)).

**Severity:** Major

---

**Alarm:** DART Communications Fault Slot 7

**Alarm Code:** AC167

**Trap:** fwuRmtDARTCommsSlot7Fault

**Affected Module:** DART

**Definition:** The Remote Unit DART communication path to Host Unit Slot 7 is missing or incorrect. The DART Communications Fault for Remote Units can also occur on HEUs.

**Cause/Impact:** The following causes are possible: the fiber-optic communication path is missing or incorrect; the Host Unit DART or CDIU in Slot 7 may be missing; the Host DART or CDIU is not compatible with the Remote Unit DART or they are configured differently; the Remote Unit DART is linked to the wrong Host Unit DART/CDIU or the wrong slot on the Host Unit; this causes loss of RF.

**Remedy:** Check if the Host Unit DART or CDIU in Slot 7 is missing. If present, verify that it is compatible with the Remote Unit DART and/or configured correctly. Check the optical performance of the SFPs used to connect RF to the Remote Unit DART, including Tx/Rx levels and alarms. Resolve any optical problem and see if the alarm clears. If the optical path is good, then check whether the SFPs or fiber-optic cable have been moved. If either has been moved, restore to its original position. If original position is not available or is unknown, then perform a **Clear Configuration** on the Remote Unit DART (select the Remote Unit in System Tree, and then click **Unit Configuration > Configure Slots** and re-link (**System Configuration > Provision System > Linking**)).

**Severity:** Major
**Alarm:** DART Communications Fault Slot 8  
**Alarm Code:** AC168  
**Trap:** fwuRmtDARTCommsSlot8Fault  
**Affected Module:** DART  
**Definition:** The Remote Unit DART communication path to Host Unit Slot 8 is missing or incorrect. The DART Communications Fault for Remote Units can also occur on HEUs.  
**Cause/Impact:** The following causes are possible: the fiber-optic communication path is missing or incorrect; the Host Unit DART or CDIU in Slot 8 may be missing; the Host DART or CDIU is not compatible with the Remote Unit DART or they are configured differently; the Remote Unit DART is linked to the wrong Host Unit DART/CDIU or the wrong slot on the Host Unit; this causes loss of RF.  
**Remedy:** Check if the Host Unit DART or CDIU in Slot 8 is missing. If present, verify that it is compatible with the Remote Unit DART and/or configured correctly. Check the optical performance of the SFPs used to connect RF to the Remote Unit DART, including Tx/Rx levels and alarms. Resolve any optical problem and see if the alarm clears. If the optical path is good, then check whether the SFPs or fiber-optic cable have been moved. If either has been moved, restore to its original position. If original position is not available or is unknown, then perform a Clear Configuration on the Remote Unit DART (select the Remote Unit in System Tree, and then click Unit Configuration > Configure Slots) and re-link (System Configuration > Provision System > Linking).  
**Severity:** Major

**Alarm:** DART Fault  
**Alarm Code:** AC29  
**Trap:** fwuHstDARTFault  
**Affected Module:** Host Unit DART  
**Definition:** Summary of the DART FPGA status and the following alarms: DART Downconverter 1 Synthesizer Unlocked, Downconverter 2 Synthesizer Unlocked, Upconverter Synthesizer Unlocked, and DC Supply Fault. For CDIU, this alarm indicates a problem with the connection into the backplane (LVDS signals).  
**Cause/Impact:** Startup transient or faulty Host Unit DARTs; this can cause loss of RF if the condition is persistent.  
**Remedy:** Inspect alarms (Alarms > View Current Alarms) for upconverter, downconverter, or DC supply alarms on the same Host Unit DART, and then follow the corresponding alarm remedies. If none of these alarms are found, unplug and replug the DART Module in the Host Unit. If the alarm persists, replace the Host Unit DART. For CDIU, unplug and plug the CDIU Module in the Host Unit. If the alarm persists then replace the Host Unit CDIU.  
**Severity:** Major
## Alarm: Host Module Missing Fault

**Alarm Code:** AC2

**Trap:** fwuHstModuleMissingFault

**Affected Module:** Host Unit DART/CDIU/SFP/System Board

**Definition:** Host Unit is missing a DART Module, CDIU or SFP.

**Cause/Impact:** Host Unit DART, CDIU or SFP has been removed or is no longer communicating. RF will be affected for the bands served by this DART or SFP on the Host Unit and one or more Remotes Units.

**Remedy:** The remedy is dependent on the missing module type.

- **DARTs/CDIUs**—replace the missing Host Unit DART or CDIU, or clear configuration (select the Host Unit in the System Tree, and then click Unit Configuration > Configure Slots).

- **SFPs**—SFPs are only flagged as missing if they contain an active link. The **Host Module Missing Fault** will clear if the link is unlinked. This can be done by either clearing the configuration of the Remote Unit that was once connected to the SFP (select the Remote Unit in the System Tree, and then click Unit Configuration > Edit Properties) or, if it was a multifiber Remote Unit and only one of the fiber-optic cables (and SFP) was removed, the Remote Unit will still talk to the system over the other fiber-optic cable and an unlink operation can be performed. When all links are unlinked, the SFP is no longer in use and the **Host Module Missing Fault** will clear.

**Severity:** Major

## Alarm: System Board Synthesizer Fault

**Alarm Code:** AC40

**Trap:** fwuHstSysCardSynthFault

**Affected Module:** Host Unit System

**Definition:** System Board synthesizer failure or problem with external reference clock.

**Cause/Impact:** Either the System Board failed to initialize, the internal clock is being used even though the system is configured to use an external clock reference, or the synthesizer has failed for some other reason.

**Remedy:** Check if System III Board is provisioned to use an external clock source but none is present. If the reference inputs are connected to CDIU, ensure that the CPRI link is not reporting **CDIU CPRI Port 1/2 Optical Rx High BER** alarm. Otherwise, if the “external selected reference” reported by System III Board is 1, 2, 3, or 4, then the selected input is unstable, has a frequency accuracy outside the tolerance window of +/- 4ppm (both conditions indicate either a base station reference or CDIU problem), or there is a System III Board HW failure.

**Severity:** Major
CDIU and BBU Interface Alarms

The following alarms require coordination between the DAS and BBU vendors to resolve. The "CDIU and FlexWave Interface Alarms" on page 101 are alarms that can be resolved within the FlexWave system.

**Alarm: CDIU CPRI Port 1 Carrier Configuration Mismatch**

**Alarm Code:** AC227  
**Trap:** fwuHstCDIUPort1CarrierCfgFault  
**Affected Module:** Host Unit CDIU  
**Definition:** A carrier configured by the REC on CDIU CPRI Port 1 does not fall completely within the frequency range of the mapped Path's passband.  
**Cause/Impact:** The CDIU Path was configured with a passband that does not match the REC carrier frequency range. RF is muted.  
**Remedy:** Unlink the CDIU Path. Change the passband so that it includes the entire carrier frequency range and link the CDIU Path.  
**Severity:** Major

**Alarm: CDIU CPRI Port 1 Optical Over Drive**

**Alarm Code:** AC208  
**Trap:** fwuHstCDIUPort1OptOverDriveFault  
**Affected Module:** Host Unit CDIU  
**Definition:** CDIU CPRI Port 1 SFP optical receive input power above specification; the threshold is 1 dBm (IR) / -9dBm (LR).  
**Cause/Impact:** Missing or faulty optical attenuator, which can cause degradation or loss of RF.  
**Remedy:** Reduce the optical receive level by adding optical attenuation. Replace optical attenuator if faulty.  
**Severity:** Major
Alarm: **CDIU CPRI Port 1 Optical Rx High BER**

**Alarm Code:** AC209  
**Trap:** fwuHstCDIUPort1OptRxBERFault  
**Affected Module:** Host Unit CDIU  
**Definition:** High bit error rate (BER) detected by fiber-optic receiver on CDIU CPRI Port 1; the threshold is 0.00001.

**Cause/Impact:** Optical over-drive, dirty fiber-optic connection(s), or bend radius on the fiber-optic cable is exceeded. It is also possible that the SFP may be faulty. RF is affected.

**Remedy:** First check that the CDIU Rate ([System Information > Configure CDIU Interfaces](#)) is compatible with the connected BBU. If the CPRI Rate is correct then check for optical overdrive conditions ([Unit Information > View Optical Ports](#)). If RX Power is above specification, add external optical attenuation. If RX Power is below specification, remove attenuation. If problem remains, first ensure that the fiber-optic connection(s) between the CDIU and upstream unit are clean and fully seated, and then check for kinks or sharp bends in the fiber-optic cable. If unable to clear the alarm or correct any problems found, replace the fiber-optic cable. Check SFP and replace, if necessary.

**Severity:** Minor

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Alarm: **CDIU CPRI Port 1 Optical Rx No Light**

**Alarm Code:** AC210  
**Trap:** fwuHstCDIUPort1OptRxNoLightFault  
**Affected Module:** Host Unit CDIU  
**Definition:** No signal detected by optical receiver on CDIU CPRI Port 1.

**Cause/Impact:** Unclean or missing fiber-optic cable, which can cause degradation or loss of RF.

**Remedy:** Check for broken fiber-optic cable, and replace if found. Check for disconnected fiber-optic cable, and reconnect cable if necessary. Check that the BBU has power.

**Severity:** Major

---

Alarm: **CDIU CPRI Port 1 Optical Transmitter Fault**

**Alarm Code:** AC211  
**Trap:** fwuHstCDIUPort1OptLaserFault  
**Affected Module:** Host Unit CDIU  
**Definition:** CDIU CPRI Port 1 SFP optical transmitter has failed, which affects RF service.

**Cause/Impact:** Faulty SFP, which can cause degradation or loss of RF.

**Remedy:** Replace the SFP.

**Severity:** Major
**Alarm:** CDIU CPRI Port 1 Optical Under Drive

**Alarm Code:** AC207

**Trap:** fwuHstCDIUPort1OptUnderDriveFault

**Affected Module:** Host Unit CDIU

**Definition:** CDIU CPRI Port 1 SFP optical receive input power is below specification; the threshold is -18 dBm (IR) / -27 dBm (LR).

**Cause/Impact:** Missing or faulty optical attenuator. Dirty fiber-optic connection or incorrect SFP type. Degradation or loss of RF.

**Remedy:** Check fiber-optic cable for too much attenuation and/or dirty connections. Check SFP type (wavelength or LR) being used. Replace the SFP if it is the wrong type.

**Severity:** Minor

---

**Alarm:** CDIU CPRI Port 1 REC Communication Fault

**Alarm Code:** AC225

**Trap:** fwuHstCDIUPort1CommsFault

**Affected Module:** Host Unit CDIU

**Definition:** Control and management channel with the REC on CDIU CPRI Port 1 has failed.

**Cause/Impact:** REC has stopped managing the CDIU. RF is muted.

**Remedy:** Check REC status and its fiber-optic cable connection to CDIU. Verify REC Type configuration.

**Severity:** Major

---

**Alarm:** CDIU CPRI Port 1 REC Type Configuration Mismatch

**Alarm Code:** AC226

**Trap:** fwuHstCDIUPort1RECTypeCfgFault

**Affected Module:** Host Unit CDIU

**Definition:** User configured REC type on CDIU CPRI Port 1 is not supported by the CDIU.

**Cause/Impact:** CDIU has been replaced. New CDIU does not support the configured REC Type. RF is muted.

**Remedy:** Replace CDIU. Update firmware on CDIU. Configure a different REC type.

**Severity:** Major
**Alarm:** CDIU CPRI Port 1 Remote Alarm Indication (RAI)

**Alarm Code:** AC223

**Trap:** fwuHstCDIUPort1RAIFault

**Affected Module:** Host Unit CDIU

**Definition:** The Remote Alarm Indication (RAI) bit is set in the received CPRI frame from the REC on CDIU CPRI Port 1.

**Cause/Impact:** The upstream unit has detected a problem with the upstream fiber-optic cable. RF is muted.

**Remedy:** Check for problems with the uplink fiber-optic cable.

**Severity:** Major

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**Alarm:** CDIU CPRI Port 1 Slave Link Downstream Indication (SDI)

**Alarm Code:** AC224

**Trap:** fwuHstCDIUPort1SDIFault

**Affected Module:** Host Unit CDIU

**Definition:** The Slave Link Downstream Indication (SDI) bit is set in the received CPRI frame from the REC on CDIU CPRI Port 1.

**Cause/Impact:** There is a problem with fiber-optic communication in the cascade upstream of the CDIU. RF is muted.

**Remedy:** Check the fiber-optic cable on units upstream of the CDIU.

**Severity:** Major

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**Alarm:** CDIU CPRI Port 2 Carrier Configuration Mismatch

**Alarm Code:** AC234

**Trap:** fwuHstCDIUPort2CarrierCfgFault

**Affected Module:** Host Unit CDIU

**Definition:** A carrier configured by the REC on CDIU CPRI Port 2 does not fall completely within the frequency range of the mapped Path’s passband.

**Cause/Impact:** The CDIU Path was configured with a passband that does not match the REC carrier frequency range. RF is muted.

**Remedy:** Unlink the CDIU Path. Change the passband so that it includes the entire carrier frequency range and link the CDIU Path.

**Severity:** Major
Alarm: **CDIU CPRI Port 2 Module Missing Fault**

Alarm Code: AC220

Trap: fwuHstCDIUPort2OptMissingFault

Affected Module: Host Unit CDIU

Definition: CDIU CPRI port 2 SFP is either not present or not responding.

Cause/Impact: Loss of forward and reverse RF.

Remedy: Insert or replace the SFP.

Severity: Major

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Alarm: **CDIU CPRI Port 2 Optical Over Drive**

Alarm Code: AC216

Trap: fwuHstCDIUPort2OptOverDriveFault

Affected Module: Host Unit CDIU

Definition: CDIU CPRI Port 2 SFP optical receive input power above specification; the threshold is 1 dBm (IR) / -9dBm (LR).

Cause/Impact: Missing or faulty optical attenuator, which can cause degradation or loss of RF.

Remedy: Reduce the optical receive level by adding optical attenuation. Replace optical attenuator if faulty.

Severity: Major

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Alarm: **CDIU CPRI Port 2 Optical Rx High BER**

Alarm Code: AC217

Trap: fwuHstCDIUPort2OptRxBERFault

Affected Module: Host Unit CDIU

Definition: High bit error rate (BER) detected by fiber-optic receiver on CDIU CPRI Port 2; the threshold is 0.00001.

Cause/Impact: Optical over-drive, dirty fiber-optic connection(s), or bend radius on the fiber-optic cable is exceeded. It is also possible that the SFP may be faulty. RF is affected.

Remedy: Check for optical overdrive conditions ([Unit Information > View Optical Ports](#)). If Rx Power is above specification, add external optical attenuation. If Rx Power is below specification, remove attenuation. If problem remains, first ensure that the fiber-optic connection(s) between the CDIU and upstream unit are clean and fully seated, and then check for kinks or sharp bends in the fiber-optic cable. If unable to clear the alarm or correct any problems found, replace the fiber-optic cable. Check SFP and replace, if necessary.

Severity: Minor
**Alarm:** CDIU CPRI Port 2 Optical Rx No Light  
**Alarm Code:** AC218  
**Trap:** fwuHstCDIUPort2OptRxNoLightFault  
**Affected Module:** Host Unit CDIU  
**Definition:** No signal detected by optical receiver on CDIU CPRI Port 2.  
**Cause/Impact:** Unclean or missing fiber-optic cable, which can cause degradation or loss of RF.  
**Remedy:** Check for broken fiber-optic cable, and replace if found. Check for disconnected fiber-optic cable, and reconnect cable if necessary. Check that the BBU has power.  
**Severity:** Major

**Alarm:** CDIU CPRI Port 2 Optical Transmitter Fault  
**Alarm Code:** AC219  
**Trap:** fwuHstCDIUPort2OptLaserFault  
**Affected Module:** Host Unit CDIU  
**Definition:** CDIU CPRI Port 2 SFP optical transmitter has failed, which affects RF service.  
**Cause/Impact:** Faulty SFP, which can cause degradation or loss of RF.  
**Remedy:** Replace the SFP.  
**Severity:** Major

**Alarm:** CDIU CPRI Port 2 Optical Under Drive  
**Alarm Code:** AC215  
**Trap:** fwuHstCDIUPort2OptUnderDriveFault  
**Affected Module:** Host Unit CDIU  
**Definition:** CDIU CPRI Port 2 SFP optical receive input power is below specification; the threshold is -18 dBm (IR) / -27 dBm (LR).  
**Cause/Impact:** Missing or faulty optical attenuator. Dirty fiber-optic connection or incorrect SFP type. Degradation or loss of RF.  
**Remedy:** Check fiber-optic cable for too much attenuation and/or dirty connections. Check SFP type (wavelength or LR) being used. Replace the SFP if it is the wrong type.  
**Severity:** Minor
Alarm: CDIU CPRI Port 2 REC Communication Fault
Alarm Code: AC232
Trap: fwuHstCDIUPort2CommsFault
Affected Module: Host Unit CDIU
Definition: Control and management channel with the REC on CDIU CPRI Port 2 has failed.
Cause/Impact: REC has stopped managing the CDIU. RF is muted.
Remedy: Check REC status and its fiber-optic cable connection to CDIU. Verify REC Type configuration.
Severity: Major

Alarm: CDIU CPRI Port 2 REC Type Configuration Mismatch
Alarm Code: AC233
Trap: fwuHstCDIUPort2RECTypeCfgFault
Affected Module: Host Unit CDIU
Definition: User configured REC type on CDIU CPRI Port 2 is not supported by the CDIU.
Cause/Impact: CDIU has been replaced. New CDIU does not support the configured REC Type. RF is muted.
Remedy: Replace CDIU. Update firmware on CDIU. Configure a different REC type.
Severity: Major

Alarm: CDIU CPRI Port 2 Remote Alarm Indication (RAI)
Alarm Code: AC230
Trap: fwuHstCDIUPort2RAIFault
Affected Module: Host Unit CDIU
Definition: The Remote Alarm Indication (RAI) bit is set in the received CPRI frame from the REC on CDIU CPRI Port 2.
Cause/Impact: The upstream unit has detected a problem with the upstream fiber-optic cable. RF is muted.
Remedy: Check for problems with the uplink fiber-optic cable.
Severity: Major
**Alarm:** CDIU CPRI Port 2 Slave Link Downstream Indication (SDI)

**Alarm Code:** AC231

**Trap:** fwuHstCDIUPort2SDIFault

**Affected Module:** Host Unit CDIU

**Definition:** The Slave Link Downstream Indication (SDI) bit is set in the received CPRI frame from the REC on CDIU CPRI Port 2.

**Cause/Impact:** There is a problem with fiber-optic communication in the cascade upstream of the CDIU. RF is muted.

**Remedy:** Check the fiber-optic cable on units upstream of the CDIU.

**Severity:** Major

---

**Alarm:** CDIU Path A ALC Limiting

**Alarm Code:** AC240

**Trap:** fwuHstCDIUPathAALCLimitingFault

**Affected Module:** Host Unit CDIU

**Definition:** CDIU Path A forward path Automatic Level Control active; the threshold is -1.5 dBFS.

**Cause/Impact:** The forward path digital input signal is too high for the Host Unit CDIU path A gain setting. This may result in gain limiting or over-driving of the LPA. May not affect service immediately. May cause loss of RF if the condition persists.

**Remedy:** Decrease the Additive Forward Gain (dB) for CDIU Path A (System Configuration > Provision System > Forward RF > Forward Link Budget (CDIU)), or reduce the forward signal level from the BBU.

**Severity:** Minor

---

**Alarm:** CDIU Path A Over Drive

**Alarm Code:** AC237

**Trap:** fwuHstCDIUPathAOverDriveFault

**Affected Module:** Host Unit CDIU

**Definition:** CDIU Path A forward RF input too high; the threshold is -0.5 dBFS.

**Cause/Impact:** The forward path RF signal exceeds -0.5 dBFS peak, which may affect the forward RF.

**Remedy:** Reduce the forward gain of the affected Host Unit CDIU (System Configuration > Provision System > Forward RF > Forward Link Budget (CDIU)).

**Severity:** Major
CDIU Alarm Reference

**Alarm:** CDIU Path A Test Tone Enabled

**Alarm Code:** AC239

**Trap:** fwuHstCDIUPathATestToneEnableFault

**Affected Module:** Host Unit CDIU

**Definition:** Commissioning test tone is enabled for CDIU Path A, resulting in muted RF traffic.

**Cause/Impact:** Commissioning tone has been enabled either through the GUI or via SNMP. RF is muted as long as the commissioning tone is active.

**Remedy:** Disable the commissioning test tone *(System Configuration > Generate Test Tone).*

**Severity:** Major

---

**Alarm:** CDIU Path A Under Drive

**Alarm Code:** AC238

**Trap:** fwuHstCDIUPathAUnderDriveFault

**Affected Module:** Host Unit CDIU

**Definition:** CDIU Path A forward RF input signal is below the normal operating limit; threshold is [-45 dBFS] based upon the Peak power measurement *(System Configuration > Provision System > Forward RF > Forward Link Budget (CDIU) > RMS Input Power (dBFS) Current Composite > Peak).*

**Cause/Impact:** CDIU forward path signal is not present or the CPRI input level and forward gain are not configured correctly. This can cause degradation to or loss of forward RF.

**Remedy:** Check the RF power levels of the Antenna Carriers of the affected Host Unit CDIU. Check the Power Allocation %. Increase the CDIU Additive Forward Gain (dB) *(System Configuration > Provision System > Forward RF > Forward Link Budget (CDIU)).*

**Severity:** Major

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**Alarm:** CDIU Path B ALC Limiting

**Alarm Code:** AC247

**Trap:** fwuHstCDIUPathBALCLimitingFault

**Affected Module:** Host Unit CDIU

**Definition:** CDIU Path B forward path Automatic Level Control active; the threshold is -1.5 dBFS.

**Cause/Impact:** The forward path digital input signal is too high for the Host Unit CDIU path B gain setting. This may result in gain limiting or over-driving of the LPA. May not affect service immediately. May cause loss of RF if the condition persists.

**Remedy:** Decrease the Additive Forward Gain (dB) for CDIU Path B *(System Configuration > Provision System > Forward RF > Forward Link Budget (CDIU)),* or reduce the forward signal level from the BBU.

**Severity:** Minor
**Alarm:** CDIU Path B Over Drive  
**Alarm Code:** AC244  
**Trap:** fwuHstCDIUPathBOverDriveFault  
**Affected Module:** Host Unit CDIU  
**Definition:** CDIU Path B forward RF input too high; the threshold is -0.5 dBFS.  
**Cause/Impact:** The forward path RF signal exceeds -0.5 dBFS peak, which may affect the forward RF.  
**Remedy:** Reduce the forward gain of the affected Host Unit CDIU (System Configuration > Provision System > Forward RF > Forward Link Budget (CDIU)).  
**Severity:** Major

---

**Alarm:** CDIU Path B Test Tone Enabled  
**Alarm Code:** AC246  
**Trap:** fwuHstCDIUPathBTestToneEnableFault  
**Affected Module:** Host Unit CDIU  
**Definition:** Commissioning test tone is enabled for CDIU Path B, resulting in muted RF traffic.  
**Cause/Impact:** Commissioning tone has been enabled either through the GUI or via SNMP. RF is muted as long as the commissioning tone is active.  
**Remedy:** Disable the commissioning test tone (System Configuration > Generate Test Tone).  
**Severity:** Major

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**Alarm:** CDIU Path B Under Drive  
**Alarm Code:** AC245  
**Trap:** fwuHstCDIUPathBUnderDriveFault  
**Affected Module:** Host Unit CDIU  
**Definition:** CDIU Path B forward RF input signal is below the normal operating limit; threshold is [-45 dBFS] based upon the Peak power measurement (System Configuration > Provision System > Forward RF > Forward Link Budget (CDIU) > RMS Input Power (dBFS) Current Composite > Peak).  
**Cause/Impact:** CDIU forward path signal is not present or the CPRI input level and forward gain are not configured correctly. This can cause degradation to or loss of forward RF.  
**Remedy:** Check the RF power levels of the Antenna Carriers of the affected Host Unit CDIU. Check the Power Allocation %. Increase the CDIU Additive Forward Gain (dB) (System Configuration > Provision System > Forward RF > Forward Link Budget (CDIU)).  
**Severity:** Major
SPECIFICATIONS AND STANDARDS CERTIFICATION

OPTICAL SPECIFICATIONS

Nokia provides the optics (Intermediate Range SFPs); refer to the Nokia documentation for details.

STANDARDS CERTIFICATION

FCC
This equipment complies with the applicable sections of Title 47 CFR Part 15.

WARNING. This is NOT a CONSUMER device. It is designated for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express Consent of an FCC Licensee to operate this device. Unauthorized use may result in Significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation.

IC
This equipment complies with the applicable sections of RSS-131. The term "IC:" before the radio certification number only signifies that Industry Canada Technical Specifications were met.
The Manufacturer's rated output power of this equipment is for single carrier operation. 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.

CAUTION! Modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

UL/CUL
This Host Unit equipment complies with UL and CUL 60950-1 Standard for Safety for Information Technology Equipment, including Electrical Business Equipment.

FDA/CDRH
This equipment uses a Class 1 LASER according to FDA/CDRH Rules. This product conforms to all applicable standards of 21 CFR Part 1040.

EU Harmonized Standards: Meets essential requirements of R&TTE 1999/5/EC.
• Article 3.1a-The protection of the health and the safety of the user and any other person, including the objectives with respect to safety requirements contained in Directive 2006/95/EC, but with no voltage limit applying.
• Article 3.1b-The protection requirements with respect to electromagnetic compatibility contained in Directive 2004/108/EC.
• Article 3.2-In addition, radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communication and orbital resources so as to avoid harmful interference.

EMC Standards
EN 55022 and EN55024 (CE marked)

Safety Standards
This equipment complies with IEC 60950-1, 2ND Edition + Amendment 1 (CE marked) and with UL 60950-1, 2ND Edition + Amendment 1 (File number E362215) (USA and Canada)
CONTACTING COMMScope

The following sections tell you how to contact CommScope for additional information or for assistance.

DCCS GLOBAL TECHNICAL SUPPORT

The following subsections tell you how to contact the CommScope Distributed Coverage and Capacity Solutions (DCCS) Technical Support team. Support is available 7 days a week, 24 hours a day.

Telephone Helplines

Use the following Helpline telephone numbers to get live support, 24 hours a day:

- **24x7** +1 888-297-6433 (Toll free for U.S. and Canada)
- **EMEA 8:00-17:00 (UTC +1)** + 800 73732837 (Toll free for parts of EMEA and Australia)
  + 49 909969333 (Toll charge incurred)

Calls to an EMEA Helpline outside of the 8:00 to 17:00 time frame will be forwarded to the 24x7 Helpline.

Online Support

To go to the CommScope DCCS Support Request web site from which you can initiate a Technical Support ticket, do one of the following:

- Scan the QR Code to the right.
- If viewing this document online as a PDF, click on the following URL link:
- Enter the preceding URL into your web browser, and then press ENTER on your keyboard.

WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT RECYCLING

Country specific information about collection and recycling arrangements per the Waste Electrical and Electronic Equipment (WEEE) Directive and implementing regulations is available on CommScope’s website.

To access information on the CommScope recycling program, do any of the following:

- Scan the QR Code to the right.
- If viewing this document online as a PDF, click on the following URL link:
- Enter the preceding URL into your web browser, and then press ENTER on your keyboard.
Contacting CommScope

DCCS TECHNICAL TRAINING

1 To access training on the online CommScope DAS and Small Cell Institute, do one of the following:
   • Scan the QR Code to the right.
   • If viewing this document online as a PDF, click on the following URL link.
     http://www.commscopetraining.com/courses/dassc/
   • Enter the preceding URL into your web browser, and then press ENTER on your keyboard.

2 Review the courses listed in separate course panels; for further information on a course, click its Full details button. Instructor-led courses are conducted in North America and Europe. Before choosing a course, please verify the region.

3 To view the course schedule and register, click Course Registration at the top of the course page; this opens the Partner Learning Center Login page.
   • If you have an account, enter your Username and Password, and then click Login. (Click on the Reset Password link if you do not have your login information.)
   • If you don't have an account, click on the Create New User Account link under the Login button, and follow the prompts.

   Once you have logged in, you will see a list of available class dates.

4 Click the date you prefer and select the Enroll or Register Now button to enroll. Follow the prompts through the payment process.

5 Click either the Available Training or Calendar tab to view other training courses.

For training related questions, please contact the CommScope DAS and Small Cell Institute at one of the following emails, as appropriate for your location:

Americas:  DASTrainingUS@CommScope.com

EMEA:  DASTrainingEMEA@CommScope.com

ACCESSING FLEXWAVE USER DOCUMENTATION

Refer to one of the following sections for information on how to obtain FlexWave Prism or FlexWave Spectrum user documentation:

• "Accessing Prism User Documentation” on page 121
• "Accessing Spectrum User Documentation” on page 121.
Accessing Prism User Documentation

1 To open the CommScope DCCS Customer Portal, from which you access the FlexWave Prism user documentation, do one of the following:
   • Scan the QR Code to the right.
   • If viewing this document online as a PDF, click on the following URL link:
     https://www.mycommscope.com
   • Enter the preceding URL into your web browser, and then press ENTER on your keyboard.

2 Access to the DCCS Customer Portal requires a user account. On the Sign In page, do one of the following:
   • If you have an account, enter your Email address and Password, and then click Sign In.
   • If you don’t have an account, click New user registration, and follow the prompts.

3 Click DCCS.

4 Select your site, and then click FlexWave Prism.
   The Prism user documentation is listed under the Manuals and Installation Guides headings.

5 Click on the title of any document to open it.

Accessing Spectrum User Documentation

1 To access the FlexWave Spectrum user documentation, do one of the following:
   • Scan the QR Code to the right.
   • If viewing this document online as a PDF, click on the following URL link.
     http://www.commscope.com/collateral/FlexWave_Spectrum
   • Enter the preceding URL into your web browser, and then press ENTER on your keyboard.

2 Click on the title of any document to open it.