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6800 PLUS

DA-6804+D Series

Single- and Dual-Channel 3 Gb/s-SDI/HD-SDI/ SD-SDI Power Saving Distribution Amplifiers

Installation and Operation Manual

Edition A
175-100192-00

DA-DHR6804+D

Dual 1×4 3-Gb/s HD-SDI Distribution Amplifiers with Reclocking

DA-DH6804+D

Dual 1×4 3-Gb/s HD-SDI Distribution Amplifiers

DA-DSR6804+D

Dual 1×4 SD-SDI Distribution Amplifiers with Reclocking

DA-DS6804+D

Dual 1×4 SD-SDI Distribution Amplifiers

DA-HRO6804+D

3 Gb/s-SDI/HD-SDI/SD-SDI Dual Channel Optical and Electrical Distribution Amplifiers

DA-DHROE6804+D

3 Gb/s-SDI/HD-SDI/SD-SDI Dual Channel Optical to Electrical Distribution Amplifiers

DA-DHREO6804+D

3 Gb/s-SDI/HD-SDI/SD-SDI Dual Channel Electrical to Optical Distribution Amplifiers

DA-DHROO6804+D

3 Gb/s-SDI/HD-SDI/SD-SDI Dual Channel Optical Distribution Amplifiers with Dual Electrical Output

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Installation and Operation Manual

Edition A
February 2010

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About This Manual

This manual details the features, installation procedures, operational procedures, and specifications of the following DA-6804+ series distribution amplifiers:

- **DA-DHR6804**+D: Dual 1×4 3-Gb/s HD-SDI distribution amplifiers with reclocking
- **DA-DH6804**+D: Dual 1×4 3-Gb/s HD-SDI distribution amplifiers
- **DA-DSR6804**+D: Dual 1×4 SD-SDI distribution amplifiers with reclocking
- **DA-DS6804**+D: Dual 1×4 SD-SDI distribution amplifiers
- **DA-HRO6804**+D: 3 Gb/s HD-SDI optical and electrical distribution amplifier
- **DA-DHROE6804**+D: 3 Gb/s HD-SDI dual channel optical to electrical distribution amplifier
- **DA-DHREO6804**+D: 3 Gb/s HD-SDI dual channel electrical to optical distribution amplifier
- **DA-DHROO6804**+D: 3 Gb/s HD-SDI dual channel optical distribution amplifier with dual electrical output

About This Manual provides an overview of this installation and operation manual, describes manual conventions, and tells you where to look for specific information. This section also gives you important information on unpacking and shipping your product.

Intended Audience

This manual is written for engineers, technicians, and operators responsible for the installation, setup, and/or operation of the DA-6804+ series of distribution amplifiers.

Finding Specific Information in This Guide

Table P-1 shows the location of specific information in this guide.

Table P-1 Finding Specific Information in this Guide

If you are looking for	Go to
Alarms	**Chapter 3**, ***Operation***
Back panel connections	**Chapter 1**, ***Introduction***
Back connector setup	**Chapter 2**, ***Installation***
Cleaning fiber optic connections	**Appendix B**, ***Inspecting and Cleaning Fiber Optic Connections***
Frame setup	**Chapter 2**, ***Installation***
Front panel interface	**Chapter 1**, ***Introduction***
Inspecting fiber optic connections	**Appendix B**, ***Inspecting and Cleaning Fiber Optic Connections***
Installing and removing modules	**Chapter 2**, ***Installation***
Key features	**Chapter 1**, ***Introduction***
Laser safety guidelines	**Appendix A**, ***Laser Safety Guidelines***
Power ratings	**Chapter 2**, ***Installation***
Rack mounting instructions	**Chapter 2**, ***Installation***
Setting jumpers	**Chapter 2**, ***Installation***
Setting parameters	**Chapter 3**, ***Operation***
Signal flow	**Chapter 1**, ***Introduction***
Specifications	**Chapter 4**, ***Specifications***

Manual Information

This section provides information about the revision history of the manual, writing conventions used for ease of understanding as well as for navigation throughout the document, and information about obtaining

Revision History

Table P-2 Manual Revision History

Edition	Date	Revision History
A	February 2010	Initial release

Writing Conventions

To enhance your understanding, the authors of this manual have adhered to the following text conventions:

Table P-3 Manual Style and Writing Conventions

Term or Convention	Description
Bold	Indicates dialog boxes, property sheets, fields, buttons, check boxes, list boxes, combo boxes, menus, submenus, windows, lists, and selection names
Italics	Indicates email addresses, the names of books or publications, and the first instances of new terms and specialized words that need emphasis
CAPS	Indicates a specific key on the keyboard, such as ENTER, TAB, CTRL, ALT, or DELETE
`Code`	Indicates variables or command-line entries, such as a DOS entry or something you type into a field
>	Indicates the direction of navigation through a hierarchy of menus and windows
hyperlink	Indicates a jump to another location within the electronic document or elsewhere
Internet address	Indicates a jump to a website or URL
 ***NOTE*:**	Indicates important information that helps to avoid and troubleshoot problems

Obtaining Documents

Technical documents can be viewed or downloaded from our website. Alternatively, contact your Customer Service representative to request a document.

Unpacking/ Shipping Information

This product was carefully inspected, tested, and calibrated before shipment to ensure years of stable and trouble free service.

Unpacking a Product

1. Check equipment for any visible damage that may have occurred during transit.
2. Confirm that you have received all items listed on the packing list.
3. Contact your dealer if any item on the packing list is missing.
4. Contact the carrier if any item is damaged.
5. Remove all packaging material from the product and its associated components before you install the unit.

Product Servicing

DA-6804+ series modules are not designed for field servicing. All hardware and firmware upgrades, modifications, or repairs require you to return the modules to the Customer Service center.

Returning a Product

In the unlikely event that your product fails to operate properly, please contact Customer Service to obtain a Return Authorization (RA) number, and then send the unit back for servicing.

Keep at least one set of original packaging, in the event that you need to return a product for servicing. If the original packaging is not available, you can purchase replacement packaging at a modest cost or supply your own packaging as long as it meets the following criteria:

- Withstands the weight of the product
- Holds the product rigid within the packaging
- Leaves at least two inches of space between the product and the container
- Protects the corners of the product

Ship products back to us for servicing prepaid and, if possible, in the original packaging material. If the product is still within the warranty period, we will return the product prepaid after servicing.

Safety Standards and Compliances

See the ***6800+ Safety Instructions and Standards Manual*** to find the safety standards and compliances for this 6800+ series product. A safety manual is shipped with every ***FR6802+ Frame Installation and Operation Manual*** and can be downloaded from our website. Alternatively, contact your Customer Service representative for a copy of this safety manual.

Safety Terms and Symbols

This product manual uses the following safety terms and symbols to identify certain conditions or practices. See the ***6800+ Safety Instructions and Standards Manual*** for more information.

Table P-4 Safety Terms and Symbols

Symbol	Description
	**WARNING: Identifies conditions or practices that can result in personal injury or loss of life — high voltage is present. Uninsulated dangerous voltage within the product's enclosure may be sufficient to constitute a risk of electric shock to persons.**
	**CAUTION: Identifies conditions or practices that can result in damage to the equipment or other property. Important operating and maintenance (servicing) instructions are included in the literature accompanying the product.**

Restriction on Hazardous Substances (RoHS) Directive

Directive 2002/95/EC — commonly known as the *European Union (EU) Restriction on Hazardous Substances (RoHS)* — sets limits on the use of certain substances found in electrical and electronic equipment. The intent of this legislation is to reduce the amount of hazardous chemicals that may leach out of landfill sites or otherwise contaminate the environment during end-of-life recycling. The Directive, which took effect on July 1, 2006, refers to the following hazardous substances:

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent Chromium (Cr-V1)
- Polybrominated Biphenyls (PBB)
- Polybrominated Diphenyl Ethers (PBDE)

In accordance with this EU Directive, products sold in the European Union will be fully RoHS-compliant and "lead-free." Spare parts supplied for the repair and upgrade of equipment sold before July 1, 2006 are exempt from the legislation. Equipment that complies with the EU directive will be marked with a RoHS-compliant symbol, as shown in **Figure P-1**.

Figure P-1 RoHS Compliance Symbol

Waste from Electrical and Electronic Equipment (WEEE) Directive

The *European Union (EU) Directive 2002/96/EC on Waste from Electrical and Electronic Equipment (WEEE)* deals with the collection, treatment, recovery, and recycling of electrical and electronic waste products. The objective of the WEEE Directive is to assign the responsibility for the disposal of associated hazardous waste to either the producers or users of these products. As of August 13, 2005, producers or users are required to recycle electrical and electronic equipment at end of its useful life, and must not dispose of the equipment in landfills or by using other unapproved methods. (Some EU member states may have different deadlines.)

In accordance with this EU Directive, companies selling electric or electronic devices in the EU will affix labels indicating that such products must be properly recycled. Contact your local Sales representative for information on returning these products for recycling. Equipment that complies with the EU directive will be marked with a WEEE-compliant symbol, as shown in **Figure P-2**.

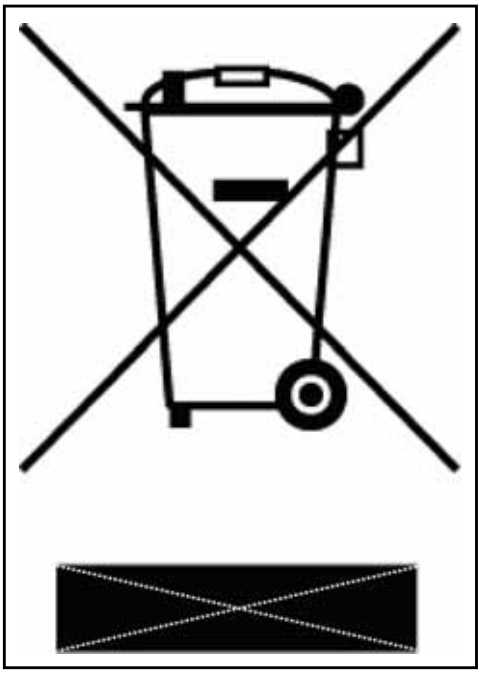

Figure P-2 WEEE Compliance Symbol

1 Introduction

The DA-6804✚D series of distribution amplifiers is designed to distribute serial digital signals according to SMPTE259C, 292M, 424M and DVB-ASI standards.

The individual modules are available as follows:

- DA-DHR6804✚D is a dual channel 3 Gb/s HD/SD-SDI distribution amplifier with reclocking. See page 3 for a list of its main features.
- DA-DH6804✚D is a dual channel 3 Gb/s HD/SD-SDI distribution amplifier. See page 4 for a list of its main features.
- DA-DSR6804✚D is a dual channel SD-SDI distribution amplifier with reclocking. See page 5 for a list of its main features.
- DA-DS6804✚D is a dual channel SD-SDI distribution amplifier. See page 7 for a list of its main features.
- DA-HRO6804✚D is a 3 Gb/s HD/SD-SDI single channel optical to electrical and electrical to optical converting distribution amplifier. See page 8 for a list of its main features.
- DA-DHROE6804✚D is a 3 Gb/s HD/SD-SDI dual channel optical to electrical converting distribution amplifier. See page 9 for a list of its main features.
- DA-DHREO6804✚D is a 3 Gb/s HD/SD-SDI dual channel electrical to optical converting distribution amplifier. See page 10 for a list of its main features.
- DA-DHROO6804✚D is a 3 Gb/s HD/SD-SDI dual channel optical distribution amplifier with dual electrical outputs. See page 12 for a list of its main features.

Each distribution amplifier consists of a front module and a back module, and operates in FR6802✚ series frames.

Each distribution amplifier, with its corresponding back module, occupies two slots in the frame. Ten distribution amplifiers can be loaded in a frame.

Each distribution amplifier contains two inputs and eight outputs, and can be configured as a single channel (1×8_ACO or 1×8) or two independent channels (2_1×4). Each FR6802✚ frame can provide up to 20 channels for serial digital signal distribution.

The DA-6804✚D series is featured as “green” (power saving). The power can be shut down automatically if no input signal is detected. Power consumption should be reduced if any output BNC is not terminated.

The setup, control, and monitoring can be controlled locally via jumpers on the front edge of the front module with LED display; or remotely via RS-232 ports or Ethernet connection using an ICE6800**+** and 6800**+**ETH Ethernet connection and Harris CCS control software. CCS remote control provides additional control functions that are not included in local control mode.

Main Features

This section provides the main features for each of the DA-6804+D series of distribution amplifiers.

DA-DHR6804+D

The main features for the DA-DHR6804+D are listed below. **Figure 1-1** shows a basic signal flow diagram for this distribution amplifier module.

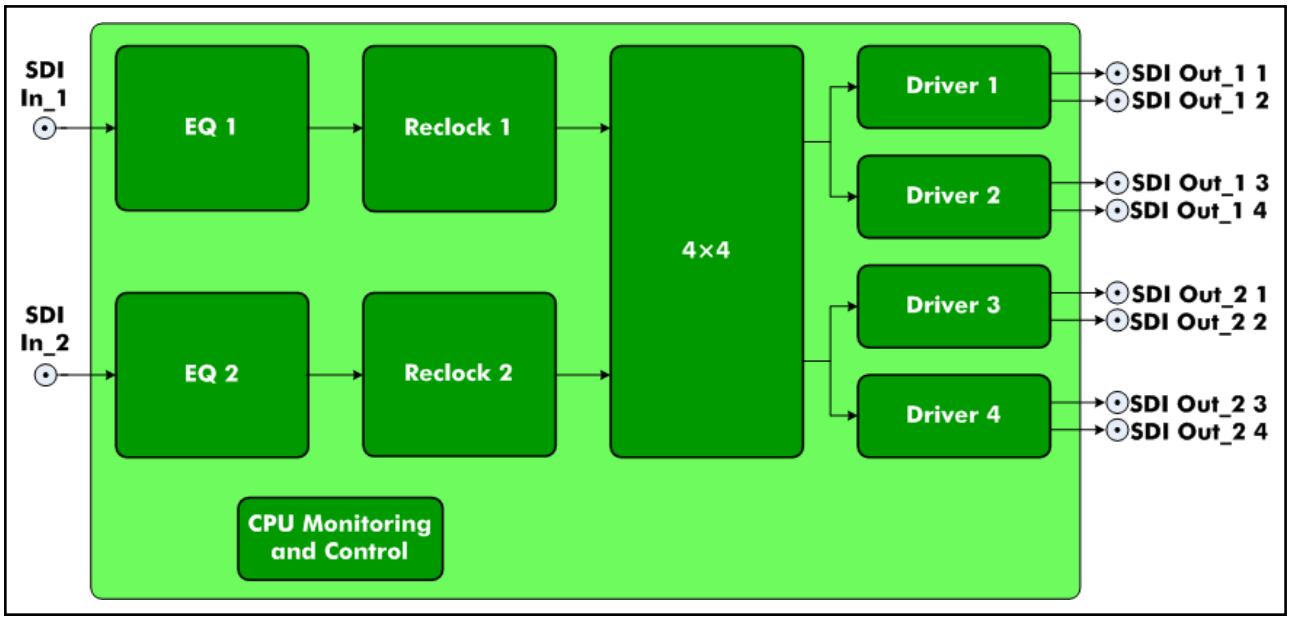

Figure 1-1 DA-DHR6804+D Signal Flow Diagram

- Operates with standard dual slot distribution amplifier back module (see page 14)
- Passes signals at data rates from 5 Mb/s to 3 Gb/s
- Four selectable channel configurations:
  - **1×8_ACO**: 1 input to 8 outputs with auto changeover

    The signal on SDI In_1 is distributed to 8 outputs. If the signal at SDI In_1 disappears, the outputs are switched to SDI In_2 (if a signal at SDI In_2 is detected).

    When the signal reappears at SDI In_1, the outputs are switched back to SDI In_1 from SDI In_2 automatically.
  - **1×8_ In_1**: SDI In_1 to 8 outputs
  - **1×8_ In_2**: SDI In_2 to 8 outputs
  - **2_1×4**: 2 independent 1×4
    - SDI In_1 to SDI Out_1, 1-4
    - SDI In_2 to SDI Out_2, 1-4
- Input signal presence detect and report
- Automatic input cable equalization
- Selectable + 6dB gain to use external passive 75Ω 2×1 splitter (via CCS only)

- Selectable input EQ bypass
- Reclockable for 270 Mb/s, 1.485 Gb/s, or 2.97 Gb/s SMPTE and DVB-ASI signals
- Three selectable reclocking modes (automatic, manual, enforce bypass)
- Automatic bypassing reclock stage if not relockable
- Reclock status and data rate report
- Automatic slew rate control for output signal
- Automatic power saving if no input signal or no termination on the output BNC
- Local and remote control
- Module hot swappable

DA-DH6804+D

The main features for the DA-DH6804+D are listed below. **Figure 1-2** shows a basic signal flow diagram for this distribution amplifier module.

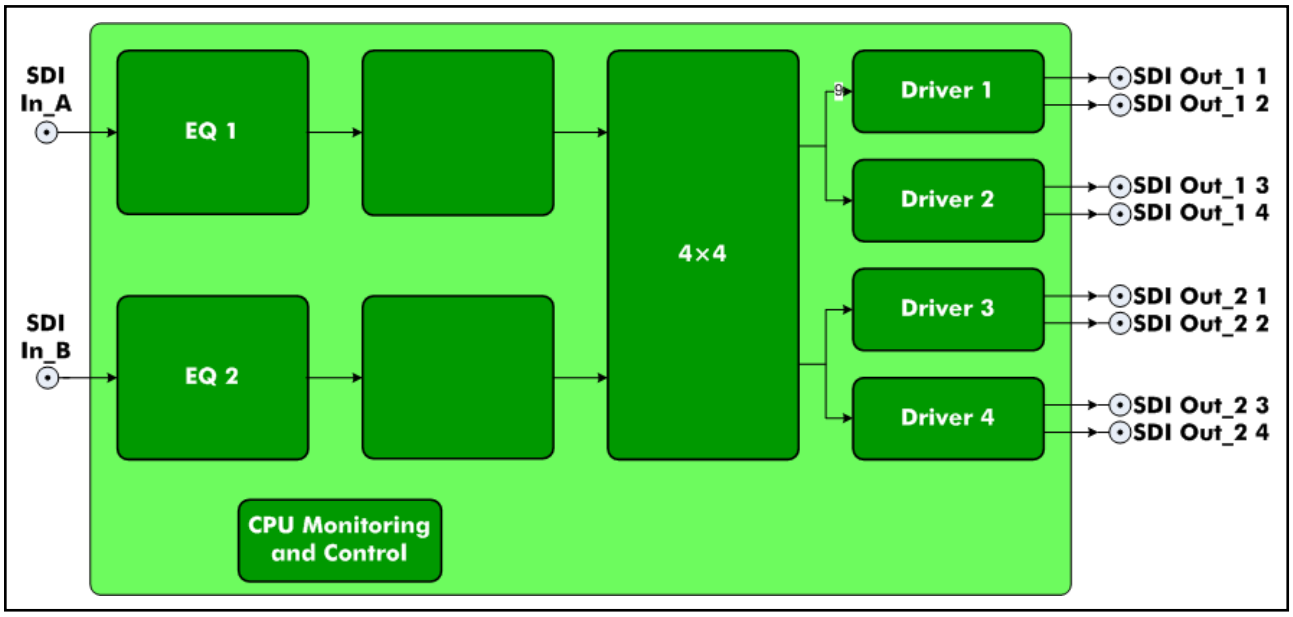

Figure 1-2 DA-DH6804+D Signal Flow Diagram

- Operates with standard dual slot distribution amplifier back module (see page 14)
- Passes signals at data rates from 5 Mb/s to 3 Gb/s
- Four selectable channel configurations:
  - **1×8_ACO**: 1 input to 8 outputs with auto changeover

    The signal on SDI In_1 is distributed to 8 outputs. If the signal at SDI In_1 disappears, the distribution amplifier outputs are switched to SDI In_2 (if a signal at SDI In_2 is detected).

    When the signal reappears SDI In_1, the outputs are switched back to SDI In_1 from SDI In_2 automatically.
  - **1×8_ In_1**: SDI In_1 to 8 outputs
  - **1×8_ In_2**: SDI In_2 to 8 outputs

- **2_1×4**: 2 independent 1×4
  - SDI In_1 to SDI Out_1, 1-4
  - SDI In_2 to SDI Out_2, 1-4
- Input signal presence detect and report
- Automatic input cable equalization
- Selectable +6 dB gain to use external passive 75Ω 2×1 splitter (via CCS only)
- Selectable input EQ bypass
- Automatic power saving if not input signal or no termination on the output BNC
- Local and remote control
- Module hot swappable

DA-DSR6804✚D

The main features for the DA-DSR6804✚D are listed below. **Figure 1-3** shows a basic signal flow diagram for this distribution amplifier module.

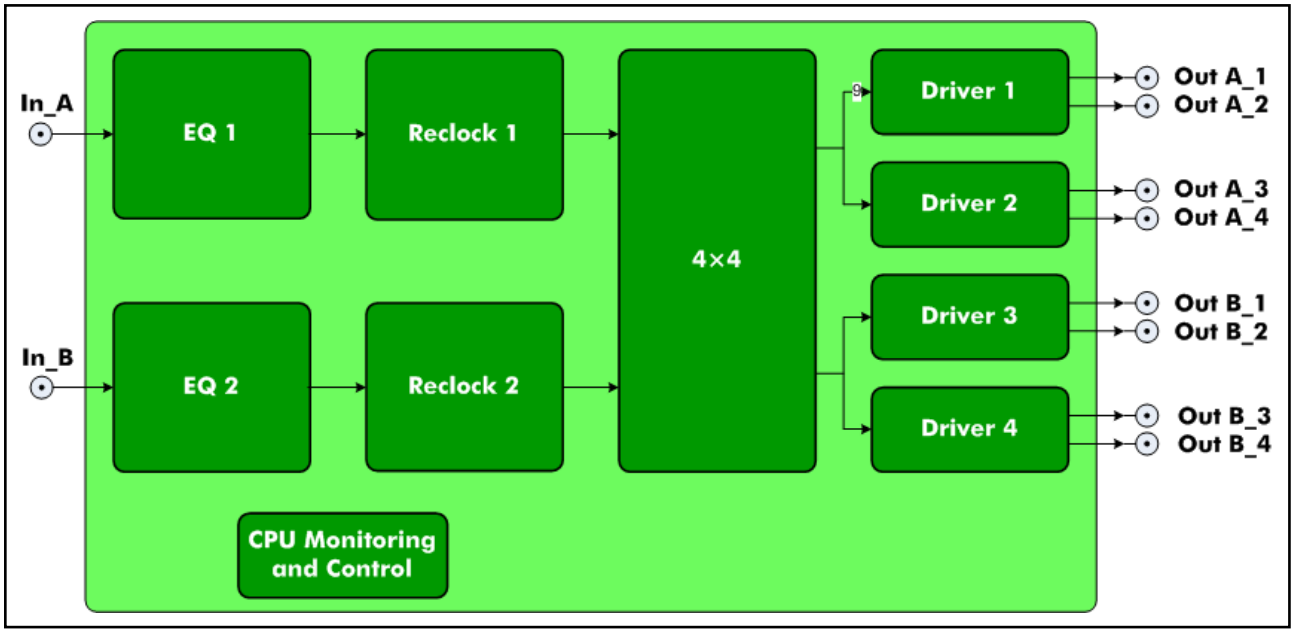

Figure 1-3 DA-DSR6804✚D Signal Flow Diagram

- Operates with standard dual slot distribution amplifier back module (see page 14)
- Passes signals at data rates from 5 Mb/s to 540 Mb/s
- Four selectable channel configurations:
  - **1×8_ACO**: 1 input to 8 outputs with auto changeover

    The signal on SDI In_1 is distributed to 8 outputs. If the signal at SDI In_1 disappears, the outputs are switched to SDI In_2 (if a signal at SDI In_2 is detected).

    When the signal reappears SDI In_1, the outputs are automatically switched back to SDI In_1 from SDI In_2.
  - **1×8_ In_1**: SDI In_1 to 8 outputs

  - **1×8_ In_2**: SDI In_2 to 8 outputs
  - **2_1×4**: 2 independent 1×4
    - SDI In_1 to SDI Out_1, 1-4
    - SDI In_2 to SDI Out_2, 1-4
- Input signal presence detect and report
- Automatic input cable equalization
- Selectable +6 dB gain to use external passive 75Ω 2×1 splitter (via CCS only)
- Selectable input EQ bypass
- Reclockable for 270 Mb/s SMPTE and DVB-ASI signals
- Three selectable reclocking modes (automatic, manual, enforce bypass)
- Automatic bypassing reclock stage if not relockable
- Reclock status and data rate report
- Automatic slew rate control for output signal
- Automatic power saving if not input signal or no termination on the output BNC
- Local and remote control
- Module hot swappable

DA-DS6804+D

The main features for the DA-DS6804✚D are listed below. **Figure 1-4** shows a basic signal flow diagram for this distribution amplifier module.

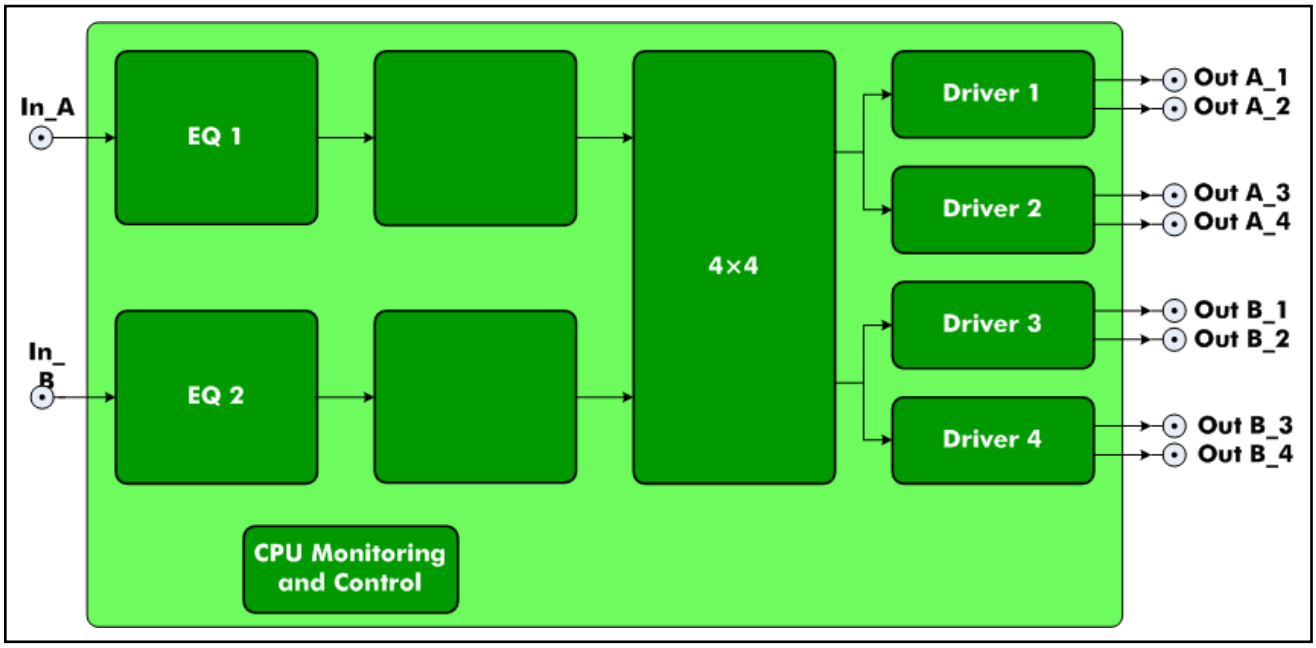

Figure 1-4 DA-DS6804✚D Signal Flow Diagram

- Operates with standard dual slot distribution amplifier back module (see page 14)
- Passes signals at data rates from 5 Mb/s to 540 Mb/s
- Four selectable channel configurations:
  - **1×8_ACO**: 1 input to 8 outputs with auto changeover

    The signal on SDI In_1 is distributed to 8 outputs. If the signal at SDI In_1 disappears, the outputs are switched to SDI In_2 (if a signal at SDI In_2 is detected).

    When the signal reappears on SDI In_1, the outputs are automatically switched back to SDI In_1 from SDI In_2.
  - **1×8_ In_1**: SDI_ In_1 to 8 outputs
  - **1×8_ In_2**: SDI_ In_2 to 8 outputs
  - **2_1×4**: 2 independent 1x4
    - SDI In_1 to SDI Out_1, 1-4
    - SDI In_2 to SDI Out_2, 1-4
- Input signal presence detect and report
- Automatic input cable equalization
- Selectable +6 dB gain to use external passive 75Ω 2×1 splitter (via CCS only)
- Selectable input EQ bypass
- Automatic power saving if not input signal or no termination on the output BNC
- Local and remote control
- Module hot swappable

DA-HRO6804+D

The main features for the DA-HRO6804+D are listed below. **Figure 1-5** shows a basic signal flow diagram for this distribution amplifier module.

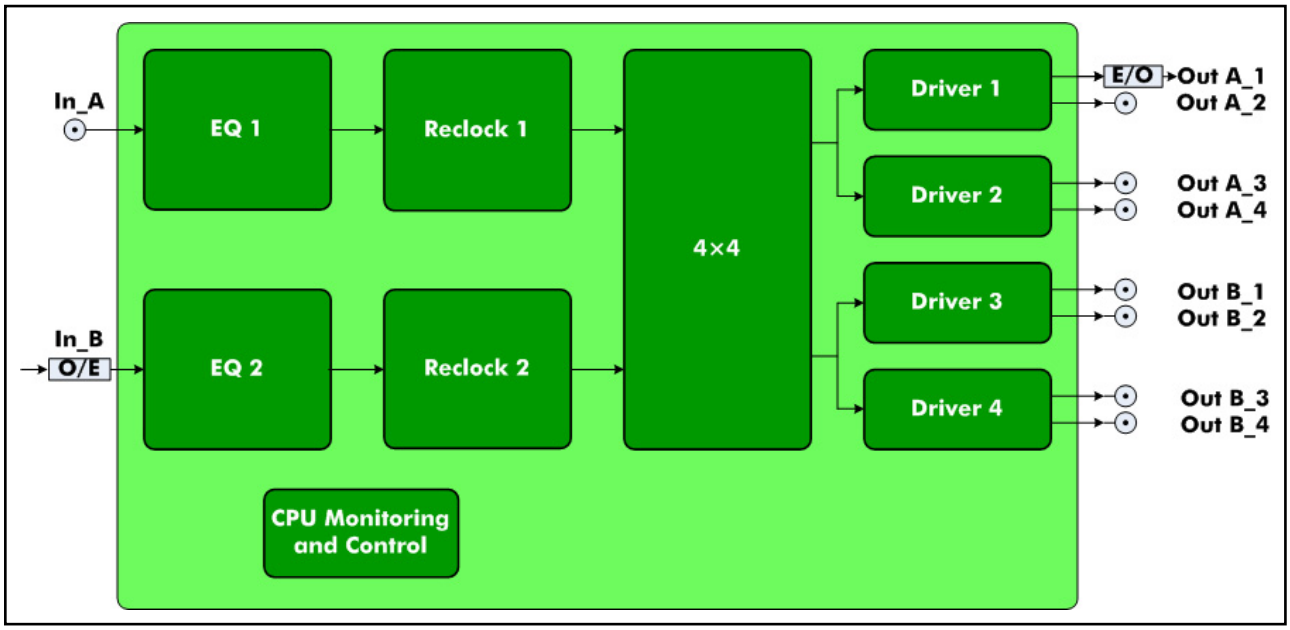

Figure 1-5 DA-HRO6804+D Signal Flow Diagram

- Operates with dual slot, RT optical distribution amplifier back module (see page 14)
- Passes signals at data rates from 5 Mb/s to 3 Gb/s
- Three selectable channel configurations:
  - **1×8_ACO**: 1 electrical input to 1 optical output and 7 electrical outputs with auto changeover

    The Electrical signal on SDI In_1 is distributed to 1 optical output and 7 electrical outputs. If the electrical signal at SDI In_1 disappears, the outputs are switched to Optical input at SDI In_2 (if an Optical signal at SDI In_2 is detected). When the Electrical signal reappears on SDI In_1, the outputs are automatically switched back to SDI In_1 from SDI In_2.
  - **1×8_ In_1**: 1 electrical input (In_A) to 1 optical output and 7 electrical outputs
  - **1×8_ In_2**: 1 optical input (In_B) to 1 optical output and 7 electrical outputs
- Input signal presence detect and report
- Optical input status for optical input (by CCS)
- Automatic input cable equalization for electrical input
- Selectable +6 dB gain to use external passive 75Ω 2×1 splitter (via CCS only) for electrical input
- Selectable input EQ bypass for electrical input
- Reclockable for 270 Mb/s, 1.485 Gb/s, or 2.97 Gb/s SMPTE and DVB-ASI signals
- Three selectable reclocking modes (automatic, manual, enforce bypass)

- Automatic bypassing reclock stage if not relockable
- Reclock status and data rate report
- Automatic slew rate control for electrical output signal
- Optical output protection enable
- Output output loss alarm
- Optical status for optical output (by CCS)
- Automatic power saving if not input signal or no termination on the output BNC
- Local and remote control
- Module hot swappable

DA-DHROE6804✚D

The main features for the DA-DHROE6804✚D are listed below. **Figure 1-6** shows a basic signal flow diagram for this distribution amplifier module.

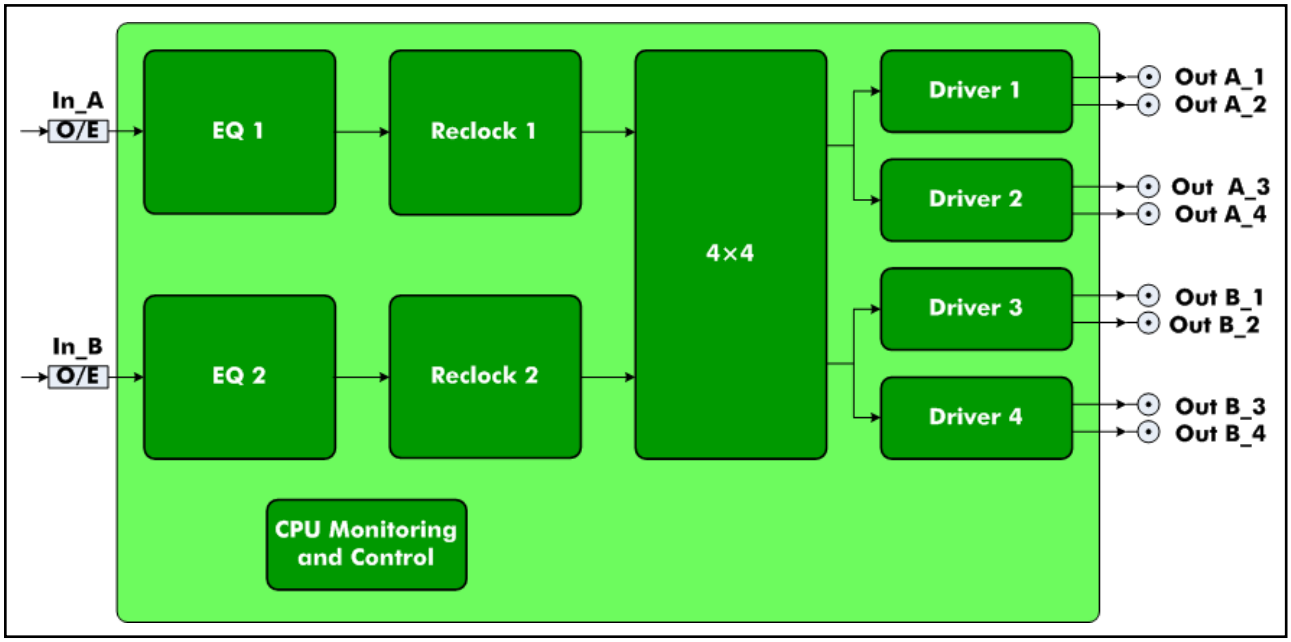

Figure 1-6 DA-DHROE6804✚D Signal Flow Diagram

- Operates with dual slot, RR optical distribution amplifier back module (see page 14)
- Passes signals at data rates from 5 Mb/s to 3 Gb/s
- Four selectable channel configurations:
  - **1×8_ACO**: 1 optical input (In_A) to 8 electrical outputs with auto changeover

    The optical signal on In_A is converted and distributed to 8 electrical outputs. If the signal at In_A disappears, the outputs are switched to In_B (if a signal at In_B is detected).

    When the signal reappears on In_A, the outputs are automatically switched back to In_A from In_B.
  - **1×8_ In_1**: optical In_A to 8 electrical outputs

- **1×8_ In_2**: optical In_B to 8 electrical outputs
- **2_1×4**: 2 independent 1×4
  - Optical In_A to electrical Out_A, 1-4
  - Optical In_B to electrical Out_B, 1-4

- Input signal presence detect and report
- Optical input status for optical input (by CCS)
- Reclockable for 270 Mb/s, 1.485 Gb/s, or 2.97 Gb/s SMPTE and DVB-ASI signals
- Three selectable reclocking modes (automatic, manual, enforce bypass)
- Automatic bypassing reclock stage if not relockable
- Reclock status and data rate report
- Automatic slew rate control for electrical output signal
- Automatic power saving if not input signal or no termination on the output BNC
- Local and remote control
- Module hot swappable

DA-DHREO6804+D

The main features for the DA-DHREO6804**+**D are listed below. **Figure 1-7** shows a basic signal flow diagram for this distribution amplifier module.

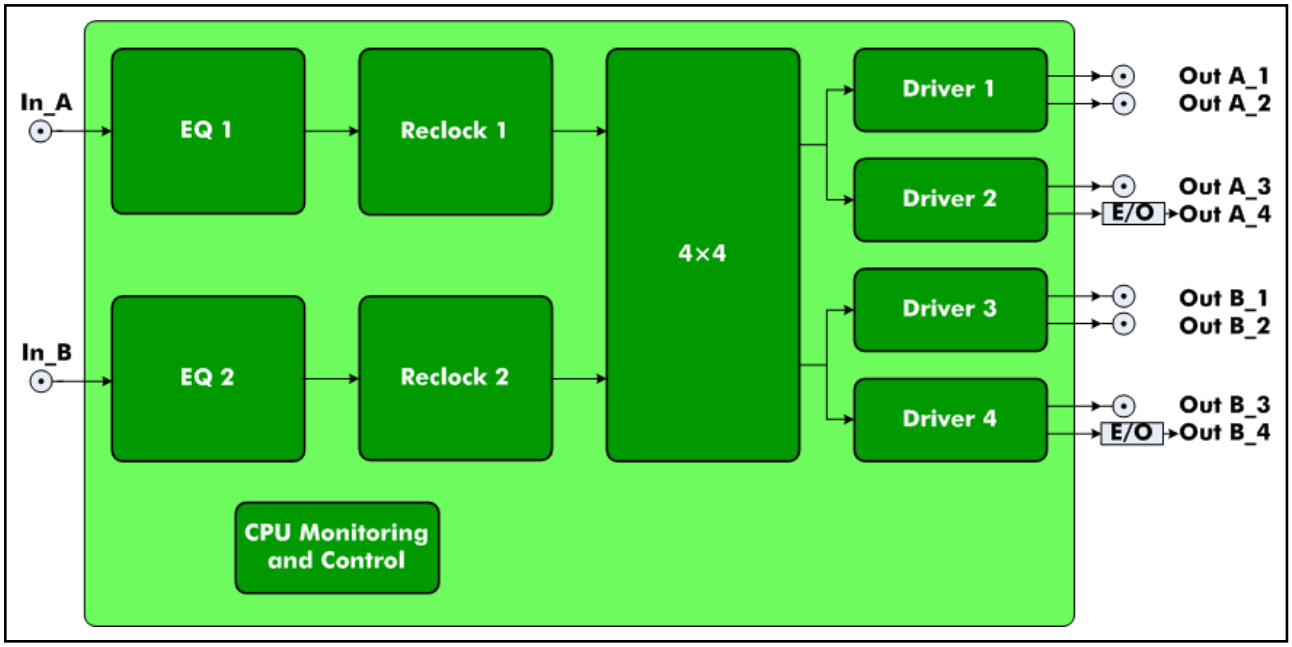

Figure 1-7 DA-DHREO6804**+**D Signal Flow Diagram

- Operates with dual slot, TT optical distribution amplifier back module (see page 14)
- Passes signals at data rates from 5 Mb/s to 3 Gb/s
- Four selectable channel configurations:

- **1×8_ACO**: 1 electrical input (In_A) to 6 electrical outputs and 2 optical outputs with auto changeover

  The signal on In_A is distributed to 6 electrical outputs and 2 optical outputs. If the signal at In_A disappears, the outputs are switched to In_B (if a signal at In_B is detected).

  When the signal reappears on In_A, the outputs are automatically switched back to In_A from In_B.
- **1×8_ In_1**: Electrical In_A to 6 electrical outputs and 2 optical outputs
- **1×8_ In_2**: Electrical In_B to 6 electrical outputs and 2 optical outputs
- **2_1×4**: 2 independent 1×4
  - Electrical In_A to Out_A, 1 optical output and 3 electrical outputs
  - Electrical In_B to Out_B, 1 optical output and 3 electrical outputs

- Input signal presence detect and report
- Automatic input cable equalization for electrical input
- Selectable +6 dB gain to use external passive 75Ω 2×1 splitter (via CCS only) for electrical input
- Selectable input EQ bypass for electrical input
- Reclockable for 270 Mb/s, 1.485 Gb/s, or 2.97 Gb/s SMPTE and DVB-ASI signals
- Three selectable reclocking modes (automatic, manual, enforce bypass)
- Automatic bypassing reclock stage if not relockable
- Reclock status and data rate report automatic slew rate control for electrical outputs
- Optical output protection enable
- Optical output loss alarm
- Optical status for optical output (by CCS)
- Automatic power saving if not input signal or no termination on the output BNC
- Local and remote control
- Module hot swappable

DA-DHROO6804+D

The main features for the DA-DHROO6804+D are listed below. **Figure 1-8** shows a basic signal flow diagram for this distribution amplifier module.

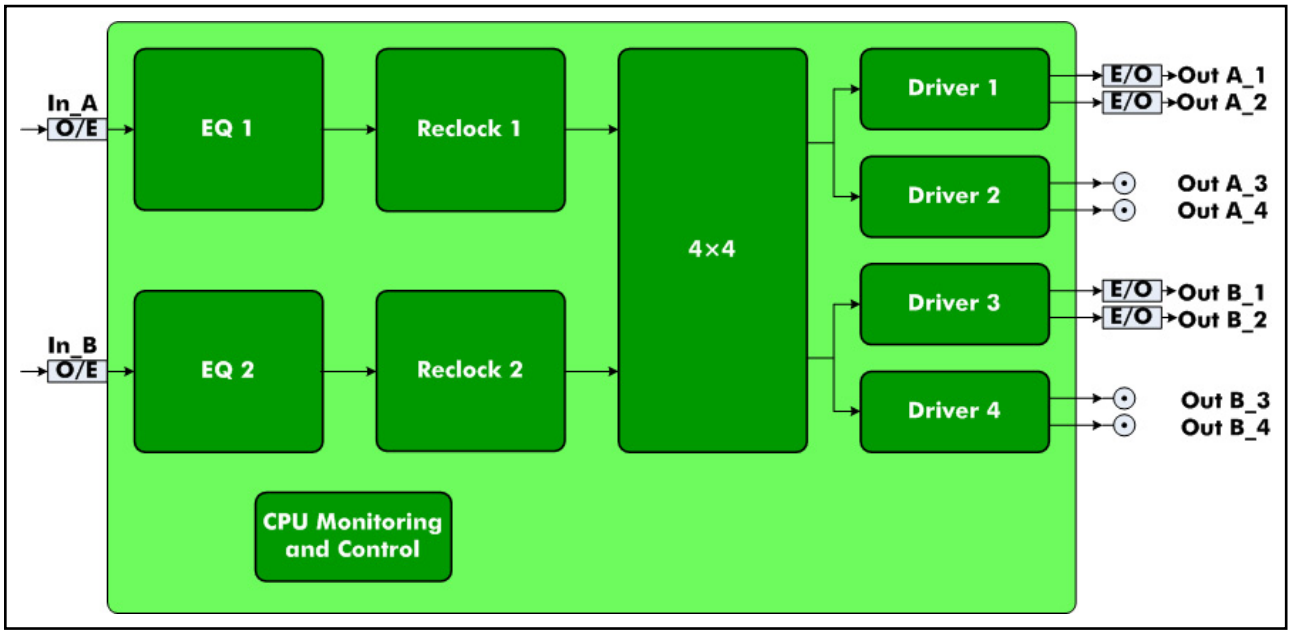

Figure 1-8 DA-DHROO6804+D Signal Flow Diagram

- Operates with dual slot, 3SFP optical distribution amplifier back module (see page 14)
- Passes signals at data rates from 5 Mb/s to 3 Gb/s
- Four selectable channel configurations:
  - **1×8_ACO**: 1 optical input (In_A) to 4 electrical outputs and 4 optical outputs with auto changeover

    The optical signal on In_A is distributed to 4 electrical outputs and 4 optical outputs. If the signal at In_A disappears, the outputs are switched to In_B (if an optical signal at In_B is detected).

    When the signal is reappears In_A, the outputs are automatically switched back to In_A from In_B.
  - **1×8_ In_1**: optical In_A to four electrical outputs and four optical outputs
  - **1×8_ In_2**: optical In_B to four electrical outputs and four optical outputs
  - **2_1×4**: 2 independent 1×4
    - Optical In_A to OUT_A1/A2 (optical outputs) and A3/A4 (electrical outputs)
    - Optical In_B to OUT_B1/B2 (optical outputs) and B3/B4 (electrical outputs)
- Input signal presence detect and report
- Optical input status for optical input (by CCS)
- Reclockable for 270 Mb/s, 1.485 Gb/s, or 2.97 Gb/s SMPTE and DVB-ASI signals
- Three selectable reclocking modes (automatic, manual, enforce bypass)
- Automatic bypassing reclock stage if not relockable

- Reclock status and data rate report
- Automatic slew rate control for electrical output signal
- Optical output protection enable
- Optical output loss alarm
- Optical status for optical output (by CCS)
- Automatic power saving if not input signal or no termination on the output BNC
- Local and remote control
- Module hot swappable

Product Views

This section includes information about the front and back modules, as well as a view of the rear of a frame with various DA-6804+D series back connector modules installed.

Front Module

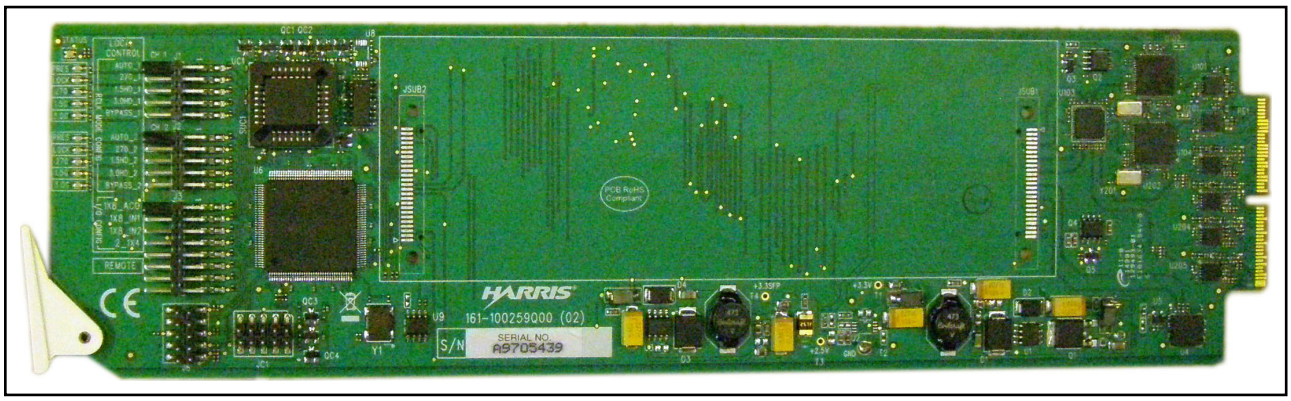

Figure 1-9 DA-6804+D Series Front Module

Back Modules

DA-6804+D series modules can be installed with double-width back modules in their respective host frames. (These modules cannot be installed in 6800/7000 series frames.)

Table 1-1 show the back connector modules used with corresponding front modules when installed in the host frame.

Table 1-1 Back Modules

DA-DS6804+D DA-DSR6804+D DA-DH6804+D DA-DHR6804+D	DA-HRO6804+D	DA-DHROE6804+D	DA-DHREO6804+D	DA-DHROO6804+D
				

Rear View

Figure 1-10 shows a rear view of the DA-6804✚D Series fully-filled frame. The frame holds 10 modules (each front module and its corresponding back module occupies 2 slots in a frame).

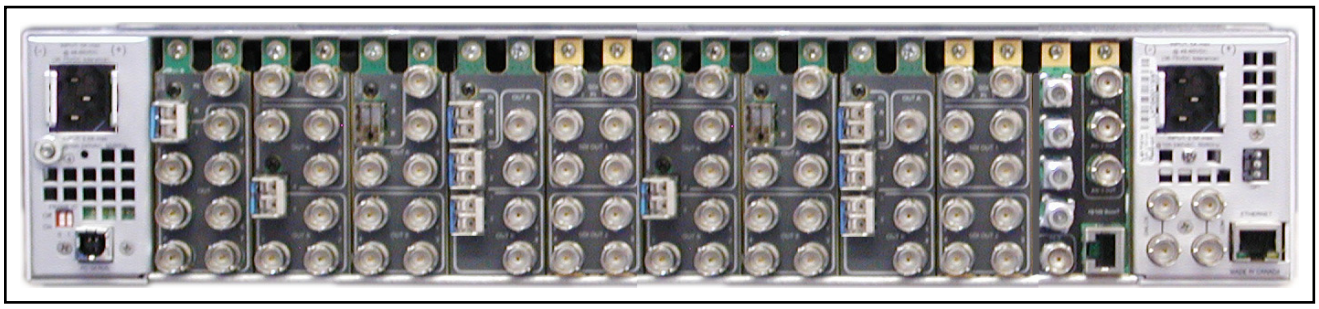

Figure 1-10 Frame Rear View

Maximum 6800✚ Frame Power Ratings

Power consumption information is listed in Chapter 4, Specifications on page 52.

Table 1-2 describes the maximum allowable power ratings for 6800✚ frames. Note the given maximums before installing any 6800✚ modules in your frame.

DA-6804✚D series modules cannot be installed in 6800/7000 series frames.

Table 1-2 Maximum Power Ratings for 6800✚ Frames

6800✚ Frame Type	Max. Frame Power Dissipation	Number of Usable Slots	Max. Power Dissipation Per Slot
FR6802✚XF (frame with AC power supply)	120 W	20	6 W
FR6802✚XF48 (frame with DC power supply)	105 W	20	5.25 W
FR6802✚QXF (frame with AC or DC power supply)	120 W	20	6 W
FR6822✚ (frame with AC or DC power supply)	120 W	20	6 W

2 Installation

CAUTION: Before installing this product, read the *6800+ Series Safety Instructions and Standards* manual shipped with every frame installation and operation manual, or downloadable from our website. This safety manual contains important information about the safe installation and operation of 6800+ series products.

Before you install DA-6804+D series modules, perform the following:

- Remove the anti-static shipping pouch, if present, and all other packaging material.

  Retain the original packaging materials for possible re-use.
- Confirm receipt of all items on the packing list. See ***Checking the Packing List*** on page 18.
- Check the equipment for any visible damage that may have occurred during transit.
- Contact your Customer Service representative if parts are missing or damaged.

  See ***Unpacking/Shipping Information*** on page ix for information about returning a product for servicing.

Checking the Packing List

Table 2-1 shows the items that are part of your DA-6804✚D series module package. If any of these items are missing from your shipment, contact your Customer Service representative.

Table 2-1 DA-6804✚D Series Packing List

Ordered Product	Content Description
DA-DHR6804+D: 3G/HD/SD/ASI Dual Channel Distribution Amplifier with Reclocking	
DA-DHR6804✚	One DA-DHR6804✚ front module One *DA-6804✚* Series *Installation and Operation Manual*
DA-DHR6804✚D	One DA-DHR6804✚ front module One standard double-slot BNC back connector module One *DA-6804✚* Series *Installation and Operation Manual*
DA-DH6804+D 3G/HD/SD/ASI Dual Channel Distribution Amplifier	
DA-DH6804✚	One DA-DH6804✚ front module One *DA-6804✚* Series *Installation and Operation Manual*
DA-DH6804✚D	One DA-DH6804✚ front module One standard double-slot BNC back connector module One *DA-6804✚* Series *Installation and Operation Manual*
DA-DSR6804+D SD/ASI Dual Channel Distribution Amplifier with Reclocking	
DA-DSR6804✚	One DA-DSR6804✚ front module One *DA-6804✚* Series *Installation and Operation Manual*
DA-DSR6804✚D	One DA-DSR6804✚ front module One standard double-slot BNC back connector module One *DA-6804✚* Series *Installation and Operation Manual*
DA-DS6804+D SD/ASI Dual Channel Distribution Amplifier with Reclocking	
DA-DS6804✚	One DA-DS6804✚ front module One *DA-6804✚* Series *Installation and Operation Manual*
DA-DS6804✚D	One DA-DS6804✚ front module One standard double-slot BNC back connector module One *DA-6804✚* Series *Installation and Operation Manual*

Table 2-1 DA-6804✚D Series Packing List *(Continued)*

Ordered Product	Content Description
DA-HRO6804+D 3G/HD/SD Optical and Electrical Distribution Amplifier	
DA-HRO6804✚D	One DA-DHR6804✚ front module One RT optical distribution amplifier back connector module One *DA-6804✚* Series *Installation and Operation Manual*
DA-DHROE6804+D 3G/HD/SD/ASI Dual Channel Optical to Electrical Distribution Amplifier	
DA-DHROE6804✚D	One DA-DHR6804✚ front module One RR optical distribution amplifier back connector module One *DA-6804✚* Series *Installation and Operation Manual*
DA-DHREO6804+D 3G/HD/SD/ASI Dual Channel Electrical to Optical Distribution Amplifier	
DA-DHREO6804✚D	One DA-DHR6804✚ front module One TT optical distribution amplifier back connector module One *DA-6804✚* Series *Installation and Operation Manual*
DA-DHROO6804+D 3G/HD/SD/ASI Dual Channel Electrical to Optical Distribution Amplifier	
DA-DHROO6804✚D	■ One DA-DHR6804✚ front module ■ One 3SFP optical distribution amplifier back connector module ■ One *DA-6804✚* Series *Installation and Operation Manual*

Setup Procedures

DA-6804+D series frames, back connectors, and front modules require different setup procedures before the modules can be installed in the frame.

Setting Up a Frame

Frame setup consists of installing a frame into its rack, and then connecting to a power and/or Ethernet source. See the appropriate frame installation and operation manual for details on installing and operating the frame and its components.

If the frame does not have CCS control, plug a power cord (A) to the back of the frame as shown in **Figure 2-1**. Plug the other end of the power cord into an electrical outlet.

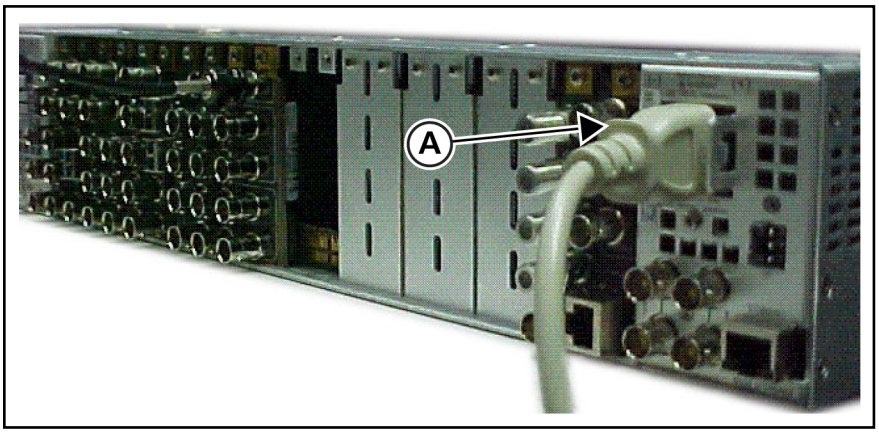

Figure 2-1 Connection for Non-CCS Control

If the frame uses CCS control, plug the power cord (A) and the Ethernet connector cable (B) to the back of the frame, as shown in **Figure 2-2**. Plug the other end of the power cord into an electrical outlet. Plug the other end of the Ethernet connector to a PC that has Harris CCS software installed.

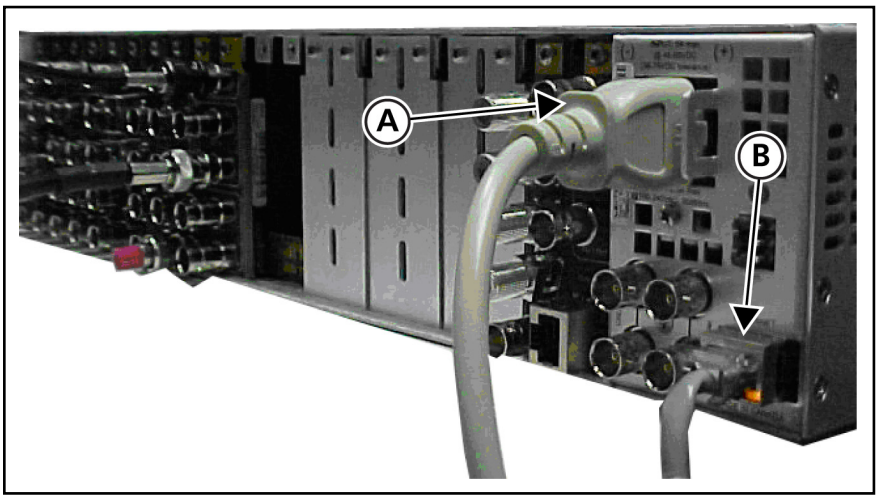

Figure 2-2 Connection for CCS Control

Setting Up Back Connector Modules

Back module setup consists of plugging in coaxial cables (A) and fiber optical cables (B), as shown in **Figure 2-3**. Apply a 75Ω coaxial cable to the BNC jacks and LC single mode fiber optical cables, as appropriate, to installed back modules. The other ends of the cables should be connected to a system's other devices.

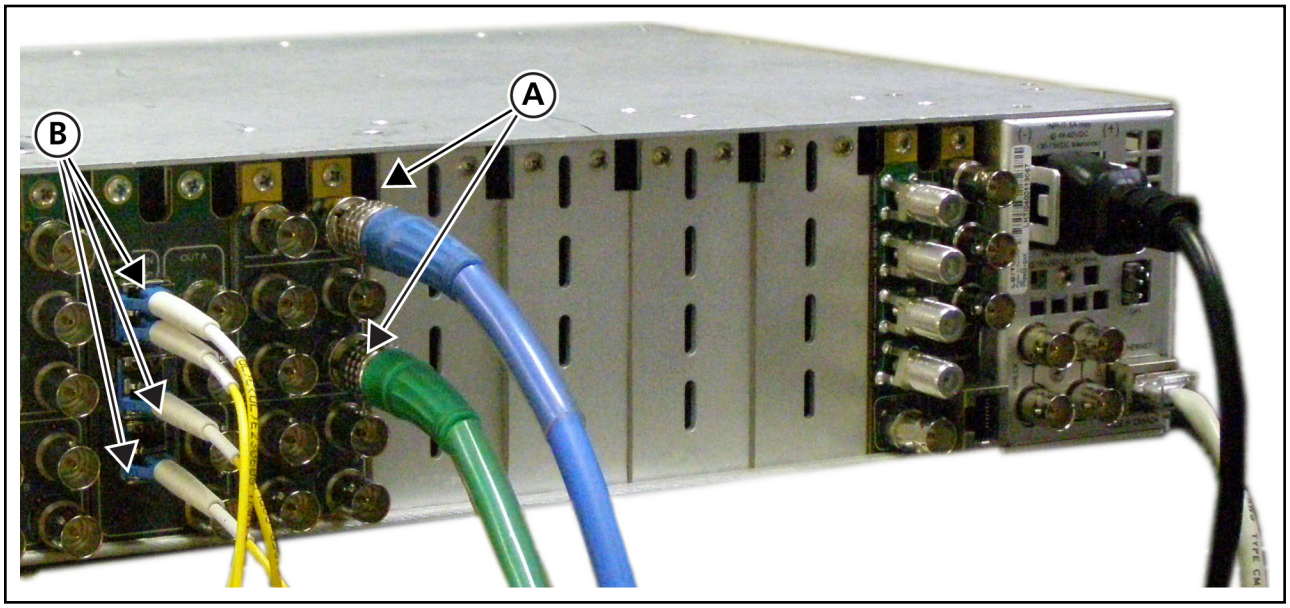

Figure 2-3 Plugging in Coaxial and Fiber Optical Cables

CAUTION: Take special care when attaching fiber optical cables. See page 21 for more information.

Setting Up Front Modules

Front module setup consists of setting the jumpers for the DA-6804+D series modules. Three jumpers that need to be set: J1 and J2 are used for reclockers, and J3 is designed for channel configuration and enabling remote control.

Figure 2-4 shows the location of the J1, J2, and J3 jumpers.

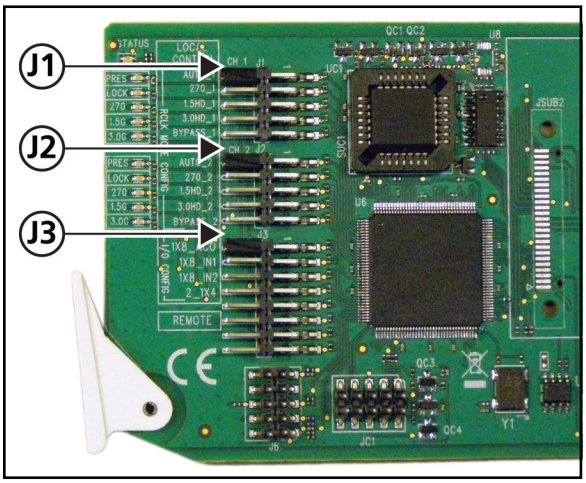

Figure 2-4 Jumper Locations

Setting Up J1 and J2 Jumpers

J1 and J2 are used to locally set the reclocker working mode. J1 is used for channel 1 and J2 for is used for channel 2. The reclocker remains in **AUTO** mode if no shunt is on any position of the jumper.

Table 2-2 J1 and J2 Jumper Settings

Jumper Selection	Pin Setting	Label	Description
J1/J2	1/2	AUTO_1/2	Input signal locked at one of these data rates: ■ 2.97 Gb/s ■ 1.485 Gb/s ■ 270 Mb/s If not relockable, signal automatically bypasses reclocker
J1/J2	3/4	3.0G_1/2	Input signal locked at 2.97 Gb/s*; if not relockable, signal automatically bypasses reclocker
J1/J2	5/6	HD_1/2	Input signal locked at 1.485 Gb/s*; if not relockable, signal automatically bypasses reclocker
J1/J2	7/8	SD_1/2	Input locked at 270 Mb/s; if not relockable, signal automatically bypasses reclocker
J1/J2	9/10	BYPASS_1/2	Enforces signal bypass reclocker

* Not used with DA-DSR6804+

Setting Up J3 Jumpers

The J3 jumper controls the control modes available for DA-6804✚D series modules.

- Local control for channel configuration
- Remote control enable

Table 2-3 J3 Jumper Settings

Jumper Selection	Pin Setting	Label	Description
J3	1/2	1×8_ACO	Locally configures distribution amplifier as single channel (1×8) with ACO
J3	3/4	1×8_IN1	Locally configures distribution amplifier as single channel (1×8); input is from IN1
J3	5/6	1×8_IN2	Locally configures distribution amplifier as single channel (1×8); input is from IN2
J3	7/8	2_1×4	Locally configures distribution amplifier as dual channel (2-1×4)
J3	11/12	REMOTE	Enables remote control via CCS; J3 pins 1-8 are not functional

Installing and Removing Modules

The DA-6804+D series front modules have corresponding back modules that are installed in the host frame. See page 24 for details on installing back modules.

These modules cannot be installed in 6800/7000 series frames.

Back Module Installation

The DA-6804+D series back modules have specialized installation procedures. If installing both front and back modules, ensure that the back module is installed first before plugging in the front module.

- When removing both the front and back modules, ensure that the front module is unplugged from the frame first, before removing the back module.
- See the appropriate frame installation and operation manual for details on installing and operating the frame and its components.
- See the ***6800+ Safety Instructions and Standards Manual*** for important information about safely installing your module.

Once you have installed the modules, you can connect them to the appropriate input and outputs.

SFPs on DA-6804+D series back modules have plastic caps that protect the fragile laser connections from dust (see **Figure 2-5** on page 25). You must remove these protective covers before you attach the fiber cables.

Figure 2-5 on page 25 shows a typical fiber optical back module. Your module's appearance may differ slightly from the one shown; however, the protective covers are positioned identically and must be removed according to the instructions provided. The installation instructions that follow will prompt you as to when you should remove the protective covers.

In addition, all of the LC connections of the fiber optical cables must be inspected and cleaned before they are assembled. Carefully follow the inspection and cleaning steps described in the next pages. Additional safety information begins on Laser Safety Guidelines on page 53.

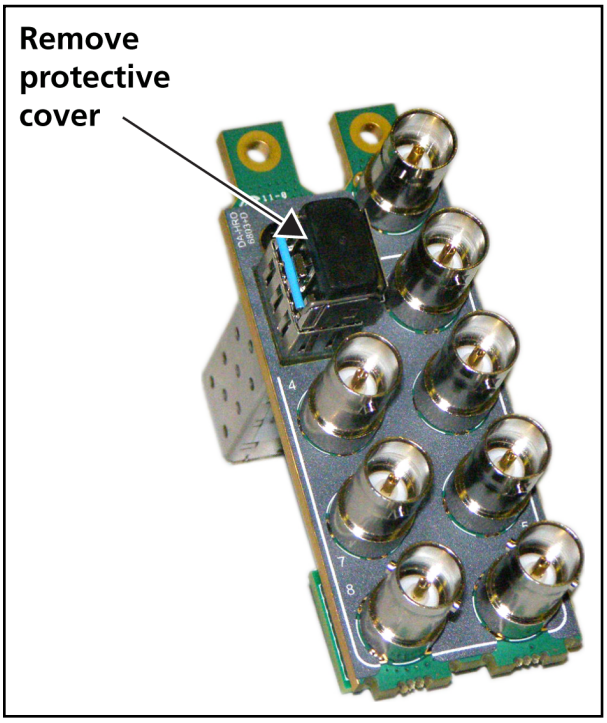

Figure 2-5 Protective Covers for Laser Connectors

1 Remove a blank back plate from the frame. Do not discard the blank back plates. They may be needed for future configurations.

***CAUTION*: Microscopic dust or other contaminants can seriously impair or disable a fiber optic network. Observe strict cleaning procedures. Do not touch the end of the fiber.**

2 If it is already installed, remove the front module from the slot.

3 Install the new back module by inserting the bottom lip into the required frame slot, and then screwing it into place.

4 Follow the fiber cable inspection and cleaning procedure that begins on page 59.

5 Insert the front module into the slot holding the corresponding back module.

6 Attach the fiber cable and/or electrical cables to the back module (see ***Setting Up Back Connector Modules*** on page 21).

Front Module Installation

Front modules require no specialized installation procedures other than those described in ***Setting Up Front Modules*** on page 22. If installing both front and back modules, ensure that the back module is installed first before plugging in the front module.

Removing Modules

These modules require no specialized removal procedures. If installing both front and back modules, ensure that the front module is removed first.

3 Operation

When a frame, back modules, and the front module are set up, plug the front module into the frame; connect the input and output cables to BNCs on back module and/or LC fiber optional cables to SFPs; and turn on the power supply of the frame. After approximately three seconds, the distribution amplifier should operate properly. Usually there is no need for other operational changes.

Without a CCS remote control system, DA-6804✚D series distribution amplifiers are fully functional in FR6802✚ frames. With an installed CCS system (including 6800✚ETH module in the FR6802✚ frame), distribution amplifier operation can be monitored and configured on the remote computer display. The J3 jumper must be set to **REMOTE** (see **Table 2-3** on page 23). If the J3 jumper is not set to this setting, the distribution amplifier can be remotely monitored only, and remote configuration is not possible.

LED Displays

LEDs on the front edge of the front module report the operating status when power is ON and signal is applied. The location of the system status (A) and signal condition (B) LEDs are shown in **Figure 3-1**. The meaning of the system status LED color sequence is described in **Table 3-1**. The meanings for the signal condition LEDs are described in **Table 3-2**.

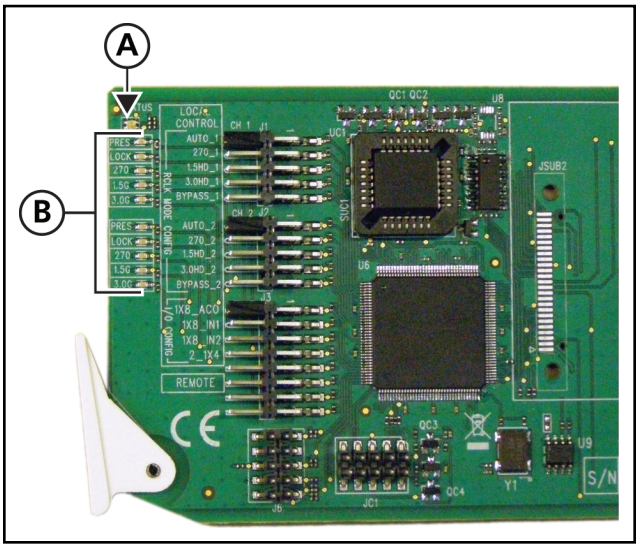

Figure 3-1 LED Locations

System Status Indicators

Table 3-1 System Status Indicator LED Descriptions

LED Color Sequence	Meaning
Off	There is no power to the module; the module is not operational
Red	There is an alarm condition
Green	There is power to the module; the module is operating properly

Signal Condition Indicators

Each 6800+ module has a number of LEDs assigned to indicate varying states/ functions. These functions are listed in **Table 3-2**.

Table 3-2 Signal Condition LED Descriptions

Name	Color	Function
PRES	Green	Input signal is present
	Off	Input signal is absent
LOCK	Green	Input signal is locked
	Off	Input signal is unlocked and appears on the outputs

Table 3-2 Signal Condition LED Descriptions *(Continued)*

Name	Color	Function
270	Green	Input signal is reclocked at 270 Mb/s
	Off	Input signal is not reclocked
1.5G	Green	Input signal is reclocked at 1.485 Gb/s
	Off	Input signal is not reclocked
3.0G	Green	Input signal is reclocked at 2.97 Gb/s
	Off	Input signal is not reclocked

Alarms

If an alarm is triggered within a module, the module status LED turns red and the alarm light on the front of the frame lights red.

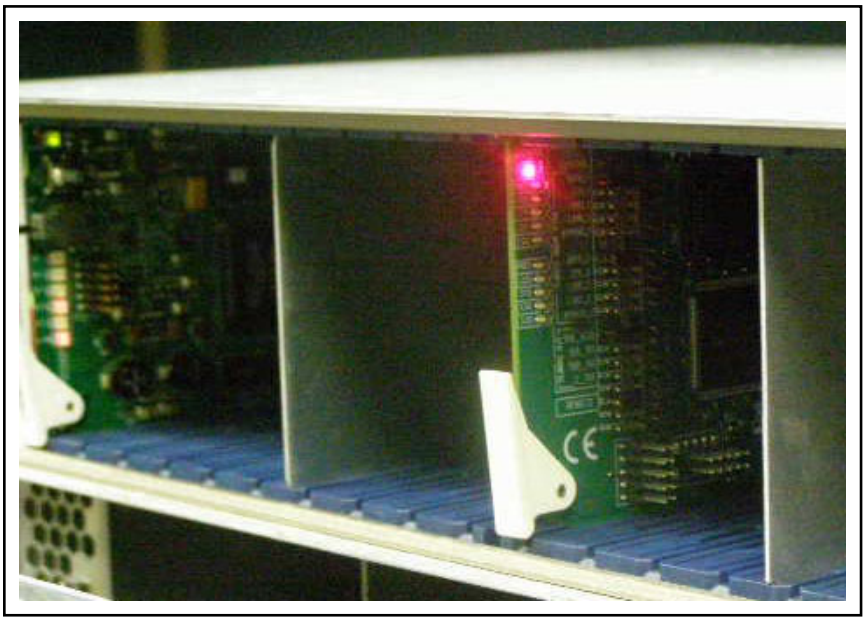

Figure 3-2 Alarm Indicator, System Status LED

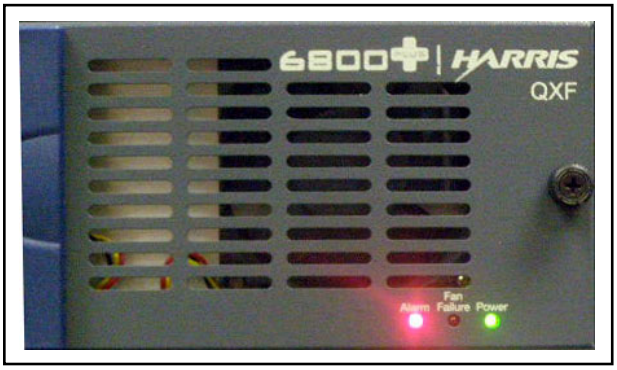

Figure 3-3 Alarm Indicator, Frame Front

Alarms are usually logged and monitored within the available software control applications. See the appropriate software control user manual or online help for more information.

Table 3-3 Alarm Definitions

Alarm Name	Alarm Description	Alarm Level
Ch. 1 loss of input	Indicates input signal for channel 1 is lost or absent	Major
Ch. 2 loss of input	Indicates input signal for channel 2 is lost or absent	Major
Ch. 1 loss of lock	Indicates signal for channel 1 is not locked	Major
Ch. 2 loss of lock	Indicates signal for channel 2 is not locked	Major
Ch.1a Tx Fault	Indicates SFP transmitter fault on channel 1a	Major
Ch.1b Tx Fault	Indicates SFP transmitter fault on channel 1b	Major
Ch.2a Tx Fault	Indicates SFP transmitter fault on channel 2a	Major
Ch.2b Tx Fault	Indicates SFP transmitter fault on channel 2b	Major

Web-Enabled Display and Control

***NOTE**: To enable web-based display and control, make sure that you have set up the frame for CCS control, as described in **Setting Up a Frame** on page 20. You must also have an 6800+ETH Ethernet connection module installed.*

To access the web-enabled display, open a web browser and enter the IP address of the frame in the Address field, and then click **Enter** at the **6800+ Control Interface** display. A view of the frame modules components is displayed on screen.

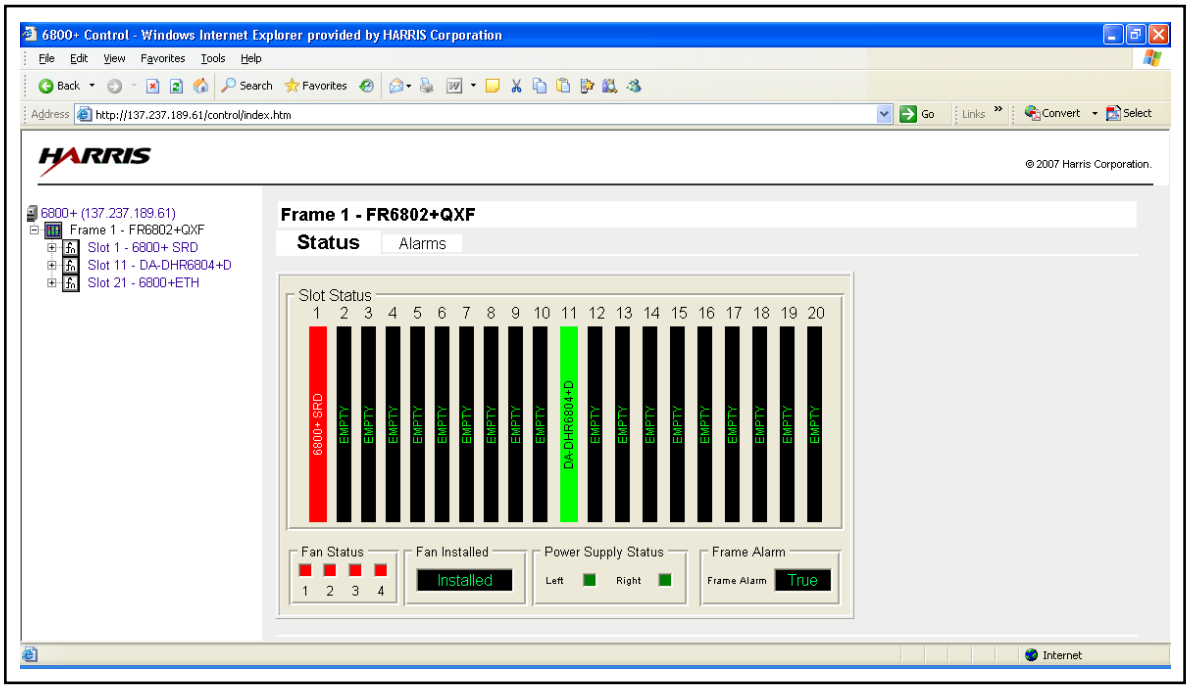

Figure 3-4 Web-Enabled Control Display

A tree view of the frame and its contents is displayed at the left of the screen. Click the + button (or click on the component name) to expand the tree view. Information corresponding to the selection is displayed in the control pane to the right of the tree view.

Click the - button to collapse the tree view.

When you select the frame and slot for a distribution amplifier module location, the software displays the item list in the tree view and the item values on the control pane, as shown in **Figure 3-5**. Some parameters are adjustable if the J3 jumper is set to **REMOTE**.

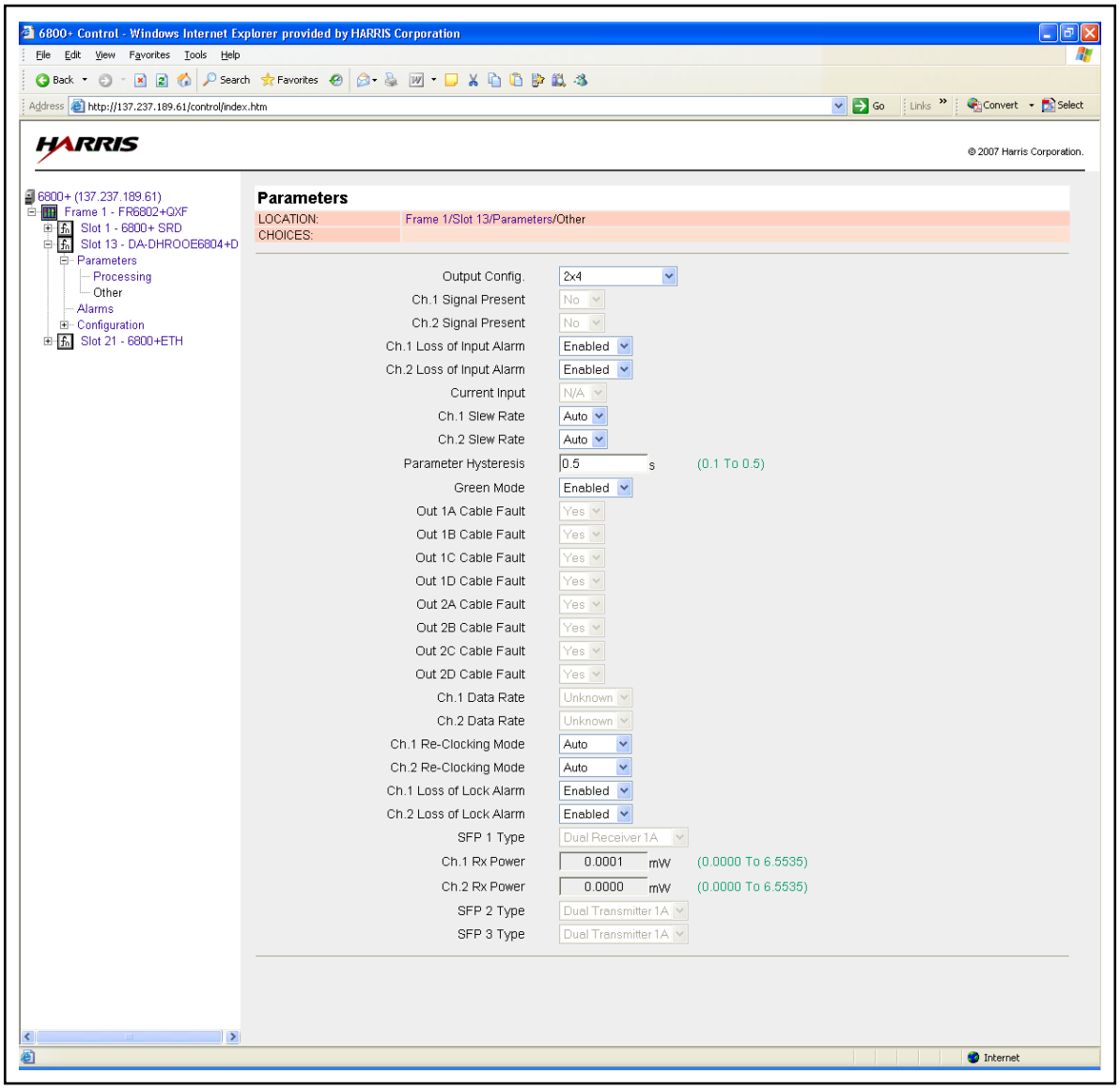

Figure 3-5 Parameter View for Web-Enabled Display

In the value display boxes on the pane, the value of read-only parameter is displayed as grey ground with black characters and you cannot change it. The adjustable parameter value is displayed as white ground with black characters. The adjustable parameter boxes should be turned to grey if the J3 jumper is not set on the **REMOTE** pins.

CCS Navigator Display and Control

***NOTE**: This section presupposes that you have a working knowledge of CCS Navigator and have used the software's other capabilities. If not, please refer to the pertinent software application user manual to familiarize yourself with its functions before you continue.*

When viewing the DA-6804✚D series in Navigator control mode, a control pane is displayed on screen of the computer monitor. When you select the frame and slot for a distribution amplifier module location, the software displays the item values on the control pane, as shown in **Figure 3-6**. Some parameters are adjustable if the J3 jumper is set to **REMOTE**.

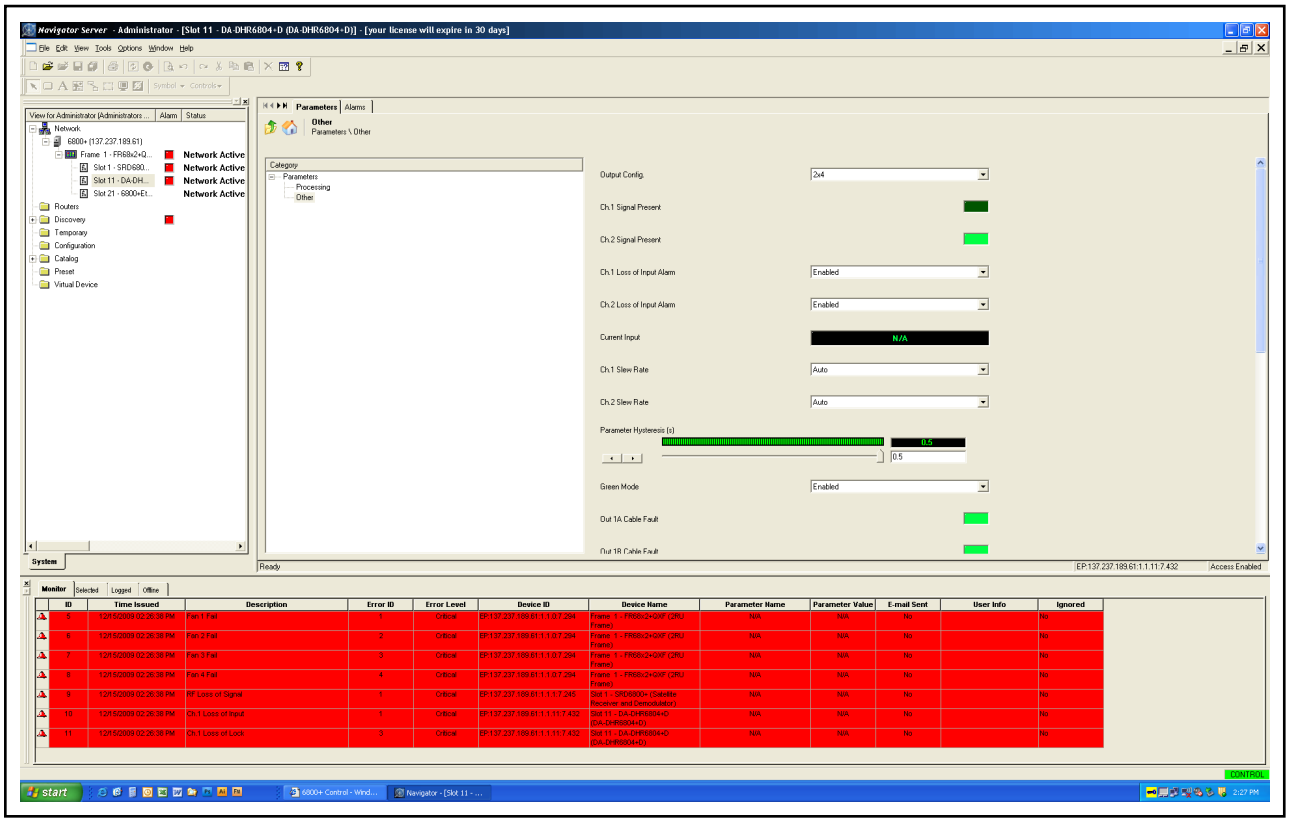

Figure 3-6 CCS Navigator Control Display

In the value display boxes on the pane, the value of read-only parameter is displayed as black ground with green characters. The adjustable parameter value is displayed as white ground with black characters. The adjustable parameter boxes should be turned to grey if the J3 jumper is not set to **REMOTE**.

Operating Notes

When you set the control parameters on DA-6804+D series distribution amplifiers, observe the following:

- If you make changes to certain parameters, other related parameters may also be affected.
- When you change a parameter, the effect is immediate. However, the module requires up to 30 seconds to save the latest change. After 30 seconds, the new settings are saved and will be restored if the module loses power and must be restarted.

Setting Locally Controlled Parameters

In the local control operation mode, all of the settings' data status information appears on the CCS control software application control screen; however, you cannot change any setting in this mode via the CCS control software application. (To control the operation mode via the CCS control software application, set the J3 jumper to the **REMOTE**.)

Reclocking mode and control mode parameters are available for local control.

The J1 and J2 jumpers are used to determine reclocking mode. **Table 2-2** on page 22 describes parameters that are accessible locally.

The J3 jumper is used to determine control mode. **Table 2-3** on page 23 describes parameters that are accessible locally.

Setting Remotely Controlled Parameters

In the remote control operation mode, all of the settings' data status information appears on the CCS control software application control screen, and you can change settings in this mode via the CCS control software application. (To control the operation mode via the CCS control software application, set the J3 jumper to the **REMOTE**.) **Figure 3-4** on page 31 shows a web-enabled control pane and **Figure 3-6** on page 33 shows a Navigator control pane displaying the parameters for a DA-DHROO6804+D module. **Table 3-8** describes parameters that are accessible remotely.

See your CCS control software application manual or online help for more information on setting and monitoring these parameters remotely.

Table 3-4 DA-DHR6804✚D/DA-DH6804✚D/DA-DSR6804✚D/DA-DS6804✚D Remotely Controlled Parameters
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
Processing	Serial Number [RO]	String	Serial number for the module
	License Key	String	License key number for the module
Other	Output Config.	■ **Ch.1 1×8 with ACO** ■ Ch.1 1×8 ■ Ch.2 1×8 ■ 2×4	Selects module output configuration as dual 1×4 or 1×8, 1 input routed to all outputs; or 1×8 with input 2 routed to all outputs
	Ch.1 Signal Present [RO]	■ No ■ Yes	Indicates if the input signal for channel 1 is present or not
	Ch.2 Signal Present [RO]	■ No ■ Yes	Indicates if the input signal for channel 2 is present or not
	Ch.1 Loss of Input Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Input alarm for channel 1
	Ch.2 Loss of Input Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Input alarm for channel 2
	Current Input [RO] ***NOTE**: Only valid in 1×8 with ACO mode output configuration*	■ N/A ■ Ch. 1 ■ Ch. 2	Indicates if the input signal is channel 1 or channel 2
	Ch. 1 Slew Rate	■ SD ■ HD ■ **Auto**	Controls output/rise fall time for channel 1 ■ SD – Output Rise Fall time complies with SMPTE 259M ■ HD – Output Rise Fall time complies with SMPTE 424M /292M ■ Auto – Automatically selects proper rise fall time based on incoming signal
	Ch. 2 Slew Rate	■ SD ■ HD ■ **Auto**	Controls output/rise fall time for channel 2 ■ SD – Output Rise Fall time complies with SMPTE 259M ■ HD – Output Rise Fall time complies with SMPTE 424M /292M ■ Auto – Automatically selects proper rise fall time based on incoming signal
	Parameter Hysteresis	0.1 to **0.5** seconds	Value used to determine how long a condition (that is, signal presence) must be asserted before it is reported to the control system

Table 3-4 DA-DHR6804✚D/DA-DH6804✚D/DA-DSR6804✚D/DA-DS6804✚D Remotely Controlled Parameters *(Continued)*
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
	Green Mode	■ **Enabled** ■ Disabled	Enables or disables the use of the power-saving ("green") mode
	Out 1A Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1B Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1C Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1D Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2A Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2B Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2C Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2D Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Ch.1 Data Rate [RO]	■ Unknown ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Displays locked data rate for channel 1
	Ch.2 Data Rate [RO]	■ Unknown ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Displays locked data rate for channel 2
	Ch. 1 Re-Clocking Mode ***NOTE**: Only valid with DA-DHRO6804✚ and DA-DSR6804✚D modules*	■ **Auto** ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Selects the reclock rate for channel 1 input
	Ch. 2 Re-Clocking Mode ***NOTE**: Only valid with DA-DHRO6804✚ and DA-DSR6804✚D modules*	■ **Auto** ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Selects the reclock rate for channel 2 input
	Ch1 Loss of Lock Alarm	■ Disabled ■ **Enabled**	Enables or disables Loss of Lock alarm on channel 1 (Loss of Lock alarm indicates the signal is not locked)

Table 3-4 DA-DHR6804✚D/DA-DH6804✚D/DA-DSR6804✚D/DA-DS6804✚D Remotely Controlled Parameters *(Continued)*
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
	Ch2 Loss of Lock Alarm	■ Disabled ■ **Enabled**	Enables or disables Loss of Lock alarm on channel 2 (Loss of Lock alarm indicates the signal is not locked)

Table 3-5 DA-HRO6804✚ Remotely Controlled Parameters
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
Processing	Serial Number [RO]	String	Serial number for the module
	License Key	String	License key number for the module
Other	Output Config.	■ **Ch.1 1×8 with ACO** ■ Ch.1 1×8 ■ Ch.2 1×8 ■ 2×4	Selects module output configuration as dual 1×4 or 1×8, 1 input routed to all outputs; or 1×8 with input 2 routed to all outputs
	Ch.1 Signal Present [RO]	■ No ■ Yes	Indicates if the input signal for channel 1 is present or not
	Ch.2 Signal Present [RO]	■ No ■ Yes	Indicates if the input signal for channel 2 is present or not
	Ch.1 Loss of Input Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Input alarm for channel 1
	Ch.2 Loss of Input Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Input alarm for channel 2
	Current Input [RO] ***NOTE**: Only valid in 1×8 with ACO mode output configuration*	■ N/A ■ Ch. 1 ■ Ch. 2	Indicates if the input signal is channel 1 or channel 2
	Ch. 1 Slew Rate	■ SD ■ HD ■ **Auto**	Controls output/rise fall time for channel 1 ■ SD – Output Rise Fall time complies with SMPTE 259M ■ HD – Output Rise Fall time complies with SMPTE 424M /292M ■ Auto – Automatically selects proper rise fall time based on incoming signal

Table 3-5 DA-HRO6804**+** Remotely Controlled Parameters *(Continued)*
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
	Ch. 2 Slew Rate	■ SD ■ HD ■ **Auto**	Controls output/rise fall time for channel 2 ■ SD – Output Rise Fall time complies with SMPTE 259M ■ HD – Output Rise Fall time complies with SMPTE 424M /292M ■ Auto – Automatically selects proper rise fall time based on incoming signal
	Parameter Hysteresis	0.1 second to **0.5** seconds	Value used to determine how long a condition (that is, signal presence) must be asserted before it is reported to the control system
	Green Mode	■ **Enabled** ■ Disabled	Enables or disables the use of the power-saving (“green”) mode
	Out 1A Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1B Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1C Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1D Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2A Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2B Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2C Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2D Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Ch.1 Data Rate [RO]	■ Unknown ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Displays locked data rate for channel 1
	Ch.2 Data Rate [RO]	■ Unknown ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Displays locked data rate for channel 2

Table 3-5 DA-HRO6804+ Remotely Controlled Parameters *(Continued)*
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
	Ch. 1 Re-Clocking Mode	■ **Auto** ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Selects the reclock rate for channel 1 input
	Ch. 2 Re-Clocking Mode	■ **Auto** ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Selects the reclock rate for channel 2 input
	Ch1 Loss of Lock Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Lock alarm on channel 1 (the Loss of Lock alarm indicates the signal is not locked)
	Ch2 Loss of Lock Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Lock alarm on channel 2 (the Loss of Lock alarm indicates the signal is not locked)
	SFP 1 Type [RO]	■ Transceiver 1A ■ Dual Receiver 1A ■ Dual Transmitter 1A ■ Unknown ■ Transceiver 2A ■ Dual Receiver 2A ■ Dual Transmitter 2A	Displays the SFP type present in SFP slot 1
	Ch. 1 Rx Power [RO]	0.000 mW to 6.535 mW	Internally measured receiver power on optical channel 1

Table 3-6 DA-DHROE6804+ Remotely Controlled Parameters
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
Processing	Serial Number [RO]	String	Serial number for the module
	License Key	String	License key number for the module
Other	Output Config.	■ **Ch.1 1×8 with ACO** ■ Ch.1 1×8 ■ Ch.2 1×8 ■ 2×4	Selects module output configuration as dual 1×4 or 1×8, 1 input routed to all outputs; or 1×8 with input 2 routed to all outputs
	Ch.1 Signal Present [RO]	■ No ■ Yes	Indicates if the input signal for channel 1 is present or not
	Ch.2 Signal Present [RO]	■ No ■ Yes	Indicates if the input signal for channel 2 is present or not
	Ch.1 Loss of Input Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Input alarm for channel 1

Table 3-6 DA-DHROE6804**+** Remotely Controlled Parameters *(Continued)*
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
	Ch.2 Loss of Input Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Input alarm for channel 2
	Current Input [RO] ***NOTE**: Only valid in 1×8 with ACO mode output configuration*	■ N/A ■ Ch. 1 ■ Ch. 2	Indicates if the input signal is channel 1 or channel 2
	Ch. 1 Slew Rate	■ SD ■ HD ■ **Auto**	Controls output/rise fall time for channel 1 ■ SD – Output Rise Fall time complies with SMPTE 259M ■ HD – Output Rise Fall time complies with SMPTE 424M /292M ■ Auto – Automatically selects proper rise fall time based on incoming signal
	Ch. 2 Slew Rate	■ SD ■ HD ■ **Auto**	Controls output/rise fall time for channel 2 ■ SD – Output Rise Fall time complies with SMPTE 259M ■ HD – Output Rise Fall time complies with SMPTE 424M /292M ■ Auto – Automatically selects proper rise fall time based on incoming signal
	Parameter Hysteresis	0.1 second to **0.5** seconds	Value used to determine how long a condition (that is, signal presence) must be asserted before it is reported to the control system
	Green Mode	■ **Enabled** ■ Disabled	Enables or disables the use of the power-saving (“green”) mode
	Out 1A Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1B Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1C Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1D Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2A Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2B Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output

Table 3-6 DA-DHROE6804✚ Remotely Controlled Parameters *(Continued)*
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
	Out 2C Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2D Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Ch.1 Data Rate [RO]	■ Unknown ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Displays locked data rate for channel 1
	Ch.2 Data Rate [RO]	■ Unknown ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Displays locked data rate for channel 2
	Ch. 1 Re-Clocking Mode	■ **Auto** ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Selects the reclock rate for channel 1 input
	Ch. 2 Re-Clocking Mode	■ **Auto** ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Selects the reclock rate for channel 2 input
	Ch1 Loss of Lock Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Lock alarm on channel 1 (the Loss of Lock alarm indicates the signal is not locked)
	Ch2 Loss of Lock Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Lock alarm on channel 2 (the Loss of Lock alarm indicates the signal is not locked)
	SFP 1 Type [RO]	■ Transceiver 1A ■ Dual Receiver 1A ■ Dual Transmitter 1A ■ Unknown ■ Transceiver 2A ■ Dual Receiver 2A ■ Dual Transmitter 2A	Displays the SFP type present in SFP slot 1
	Ch. 1 Rx Power [RO]	0.000 mW to 6.535 mW	Internally measured receiver power on optical channel 1
	Ch. 2 Rx Power [RO]	0.000 mW to 6.535 mW	Internally measured receiver power on optical channel 2

Table 3-7 DA-DHREO6804**+** Remotely Controlled Parameters
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
Processing	Serial Number [RO]	String	Serial number for the module
	License Key	String	License key number for the module
Other	Output Config.	■ **Ch.1 1×8 with ACO** ■ Ch.1 1×8 ■ Ch.2 1×8 ■ 2×4	Selects module output configuration as dual 1×4 or 1×8, 1 input routed to all outputs; or 1×8 with input 2 routed to all outputs
	Ch.1 Signal Present [RO]	■ No ■ Yes	Indicates if the input signal for channel 1 is present or not
	Ch.2 Signal Present [RO]	■ No ■ Yes	Indicates if the input signal for channel 2 is present or not
	Ch.1 Loss of Input Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Input alarm for channel 1
	Ch.2 Loss of Input Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Input alarm for channel 2
	Current Input [RO] ***NOTE**: Only valid in 1×8 with ACO mode output configuration*	■ N/A ■ Ch. 1 ■ Ch. 2	Indicates if the input signal is channel 1 or channel 2
	Ch. 1 Slew Rate	■ SD ■ HD ■ **Auto**	Controls output/rise fall time for channel 1 ■ SD – Output Rise Fall time complies with SMPTE 259M ■ HD – Output Rise Fall time complies with SMPTE 424M /292M ■ Auto – Automatically selects proper rise fall time based on incoming signal
	Ch. 2 Slew Rate	■ SD ■ HD ■ **Auto**	Controls output/rise fall time for channel 2 ■ SD – Output Rise Fall time complies with SMPTE 259M ■ HD – Output Rise Fall time complies with SMPTE 424M /292M ■ Auto – Automatically selects proper rise fall time based on incoming signal
	Parameter Hysteresis	0.1 second to **0.5** seconds	Value used to determine how long a condition (that is, signal presence) must be asserted before it is reported to the control system
	Green Mode	■ **Enabled** ■ Disabled	Enables or disables the use of the power-saving (“green”) mode

Table 3-7 DA-DHREO6804✚ Remotely Controlled Parameters *(Continued)*
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
	Out 1A Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1B Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1C Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1D Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2A Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2B Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2C Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2D Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Ch.1 Data Rate [RO]	■ Unknown ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Displays locked data rate for channel 1
	Ch.2 Data Rate [RO]	■ Unknown ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Displays locked data rate for channel 2
	Ch. 1 Re-Clocking Mode	■ **Auto** ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Selects the reclock rate for channel 1 input
	Ch. 2 Re-Clocking Mode	■ **Auto** ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Selects the reclock rate for channel 2 input
	Ch1 Loss of Lock Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Lock alarm on channel 1 (the Loss of Lock alarm indicates the signal is not locked)

Table 3-7 DA-DHREO6804**+** Remotely Controlled Parameters *(Continued)*
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
	Ch2 Loss of Lock Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Lock alarm on channel 2 (the Loss of Lock alarm indicates the signal is not locked)
	SFP 1 Type [RO]	■ Transceiver 1A ■ Dual Receiver 1A ■ Dual Transmitter 1A ■ Unknown ■ Transceiver 2A ■ Dual Receiver 2A ■ Dual Transmitter 2A	Displays the SFP type present in SFP slot 1

Table 3-8 DA-DHROO6804**+**D Remotely Controlled Parameters
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
Processing	Serial Number [RO]	String	Serial number for the module
	License Key	String	License key number for the module
Other	Output Config.	■ **Ch.1 1×8 with ACO** ■ Ch.1 1×8 ■ Ch.2 1×8 ■ 2×4	Selects module output configuration as dual 1×4 or 1×8, 1 input routed to all outputs; or 1×8 with input 2 routed to all outputs
	Ch.1 Signal Present [RO]	■ No ■ Yes	Indicates if the input signal for channel 1 is present or not
	Ch.2 Signal Present [RO]	■ No ■ Yes	Indicates if the input signal for channel 2 is present or not
	Ch.1 Loss of Input Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Input alarm for channel 1
	Ch.2 Loss of Input Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Input alarm for channel 2
	Current Input [RO] ***NOTE**: Only valid in 1×8 with ACO mode output configuration*	■ N/A ■ Ch. 1 ■ Ch. 2	Indicates if the input signal is channel 1 or channel 2
	Ch. 1 Slew Rate	■ SD ■ HD ■ **Auto**	Controls output/rise fall time for channel 1 ■ SD – Output Rise Fall time complies with SMPTE 259M ■ HD – Output Rise Fall time complies with SMPTE 424M /292M ■ Auto – Automatically selects proper rise fall time based on incoming signal

Table 3-8 DA-DHROO6804✚D Remotely Controlled Parameters *(Continued)*
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
	Ch. 2 Slew Rate	■ SD ■ HD ■ **Auto**	Controls output/rise fall time for channel 2 ■ SD – Output Rise Fall time complies with SMPTE 259M ■ HD – Output Rise Fall time complies with SMPTE 424M /292M ■ Auto – Automatically selects proper rise fall time based on incoming signal
	Parameter Hysteresis	0.1 second to **0.5** seconds	Value used to determine how long a condition (that is, signal presence) must be asserted before it is reported to the control system
	Green Mode	■ **Enabled** ■ Disabled	Enables or disables the use of the power-saving (“green”) mode
	Out 1A Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1B Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1C Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 1D Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2A Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2B Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2C Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Out 2D Cable Fault [RO]	■ Yes ■ No	Reports loss of signal or termination fault for the corresponding output
	Ch.1 Data Rate [RO]	■ Unknown ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Displays locked data rate for channel 1
	Ch.2 Data Rate [RO]	■ Unknown ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Displays locked data rate for channel 2

Table 3-8 DA-DHROO6804+D Remotely Controlled Parameters *(Continued)*
Bold text = Default setting [RO] = Read only/feedback

Path	Parameter	Range	Description
	Ch. 1 Re-Clocking Mode	■ **Auto** ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Selects the reclock rate for channel 1 input
	Ch. 2 Re-Clocking Mode	■ **Auto** ■ 270 Mb/s ■ Bypass ■ HD ■ 3G	Selects the reclock rate for channel 2 input
	Ch1 Loss of Lock Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Lock alarm on channel 1 (the Loss of Lock alarm indicates the signal is not locked)
	Ch2 Loss of Lock Alarm	■ Disabled ■ **Enabled**	Enables or disables the Loss of Lock alarm on channel 2 (the Loss of Lock alarm indicates the signal is not locked)
	SFP 1 Type [RO]	■ Transceiver 1A ■ Dual Receiver 1A ■ Dual Transmitter 1A ■ Unknown ■ Transceiver 2A ■ Dual Receiver 2A ■ Dual Transmitter 2A	Displays the SFP type present in SFP slot 1
	Ch. 1 Rx Power [RO]	0.000 mW to 6.535 mW	Internally measured receiver power on optical channel 1
	Ch. 2 Rx Power [RO]	0.000 mW to 6.535 mW	Internally measured receiver power on optical channel 2
	SFP 2 Type [RO]	■ Transceiver 1A ■ Dual Receiver 1A ■ Dual Transmitter 1A ■ Unknown ■ Transceiver 2A ■ Dual Receiver 2A ■ Dual Transmitter 2A	Displays the SFP type present in SFP slot 2
	SFP 3 Type [RO]	■ Transceiver 1A ■ Dual Receiver 1A ■ Dual Transmitter 1A ■ Unknown ■ Transceiver 2A ■ Dual Receiver 2A ■ Dual Transmitter 2A	Displays the SFP type present in SFP slot 3

Changing Parameter Settings

You can change module parameter settings locally with the card-edge jumpers as described in ***Setting Locally Controlled Parameters*** on page 34.

You can change module parameter settings remotely via CCS software. See your CCS control software application installation and operation manual for instructions on how to change parameter settings.

Recalling Default Parameter Settings

You cannot recall default parameter settings for these modules.

Reading the Software and Hardware Versions

The current software version of these modules can only be viewed using a CCS-enabled control panel or a CCS software application. See the appropriate control panel installation and operation manual, CCS software application user manual, or CCS software application online help for information on viewing software and hardware version numbers.

4 Specifications

NOTE: *Specifications and designs are subject to change without notice.*

Inputs

Table 4-1 Electrical Channel Input Specifications

Item	Specification
Number of inputs	DA-DHR6804✚D: 2 DA-DH6804✚D: 2 DA-DSR6804✚D: 2 DA-DS6804✚D: 2 DA-HRO6804✚D: 1 DA-DHROE6804✚D: 0 DA-DHREO6804✚D: 2 DA-DHROO6804✚D: 0
Signal type	3G-SDI, HD-SDI, SD-SDI, ASI
Connector	BNC per IEC169-8
Impedance	75Ω
Return loss	> 15 dB, 5 MHz to 1.5 GHz > 10 dB, 1.5 GHz to 3.0 GHz
Maximum signal level	0.88 V
Cable equalization 3.0 Gb/s* 1.5 Gb/s* 270 Mb/s	 0 – 410 ft (0 – 125 m) 0 – 656 ft (0 – 200 m) 0 – 1,312 ft (0 – 400 m)

* Not for DA-DSR6804✚D or DA-DS6804✚D

Table 4-2 Fiber Optical Channel Input Specifications

Item	**Specification**
Number of inputs	DA-HRO6804✚D: 1 DA-DHROE6804✚D: 2 DA-DHROO6804✚D: 2
Wavelength	1260 – 1610 nm
Signal type	3G-SDI, HD-SDI, SD-SDI, ASI
Connector	LC
Overload input	0 dBm
Sensitivity 3G-SDI HD-SDI SD-SDI, ASI	 <-17 dBm <-20 dBm <-20 dBm

Outputs

Table 4-3 Electrical Channel Output Specifications

Item	Specification
Number of outputs	DA-DHR6804✚D: 8 DA-DH6804✚D: 8 DA-DSR6804✚D: 8 DA-DS6804✚D: 8 DA-HRO6804✚D: 7 DA-DHROE6804✚D: 8 DA-DHREO6804✚D: 6 DA-DHROO6804✚D: 4
Signal type	3G HD-SDI, 1.5G HD-SDI, SD-SDI, ASI
Connector	BNC per IEC169-8
Impedance	75Ω
Return loss	>15 dB, 5 MHz to 1.5 GHz >10 dB, 1.5 GHz to 3.0 GHz
Signal amplitude	800 mV ± 10%
DC offset	0.0 V ± 0.5 V
Rise and fall time 3G-SDI HD-SDI SD-SDI, ASI	 <135 ps <270 ps 400-700 ps
Overshoot	<10%
Reclocking rate	270 Mb/s, 1.485 Gb/s, 2.97 Gb/s
Jitter 3G-SDI HD-SDI, SD-SDI, ASI	 <0.3 UI <0.2 UI

Table 4-4 Fiber Optical Channel Output Specifications

Item	Specification
Number of outputs	DA-HRO6804✚D: 1 DA-DHREO6804✚D: 2 DA-DHROO6804✚D: 4
Wavelength	1310 nm
Signal type	3G-SDI, HD-SDI, SD-SDI, ASI
Connector	LC
Maximum output	0 dBm
Minimum output	-5 dBm
Extinction ratio	>5 dB

Table 4-4 Fiber Optical Channel Output Specifications *(Continued)*

Item	Specification
Rise and fall time 3G-SDI HD-SDI SD-SDI, ASI	 <135 ps <270 ps <800 ps
Jitter 3G-SDI HD-SDI, SD-SDI, ASI	 <0.3 UI <0.2 UI

Temperature

Table 4-5 Temperature Specifications

Item	Specification
Performance	41° to 104°F (5° to 40°C)
Operating	32° to 122°F (0° to 50°C)

Power Consumption

Table 4-6 Power Consumption Specifications

Item	Specification
DA-DHR6804✚D DA-DH6804✚D DA-DSR6804✚D DA-DS6804✚D	<3.8 W <1.5 W sleeping
DA-HRO6804✚D DA-DHROE6804✚D DA-DHREO6804✚D	<5.0 W
DA-DHROO6804✚D	<6.0 W

Start-Up Time

Module start-up time is approximately 3 seconds.

A Laser Safety Guidelines

WARNING: Use of controls, adjustments, and procedures other than those specified in this document may result in hazardous laser radiation exposure.

Optical fiber telecommunication systems, their associated test sets, and similar operating systems use semiconductor laser transmitters that emit infrared (IR) light at wavelengths between approximately 800 nanometers and 1600 nanometers. The emitted light is above the red end of the visible spectrum, which is normally not visible to the human eye. Although radiant energy at near-IR wavelengths is officially designated invisible, some people can see the shorter wavelength energy even at power levels several orders of magnitude below any that have been shown to cause injury to the eye.

General Laser Information

Conventional lasers can produce an intense beam of monochromatic light. (The term "monochromaticity" means a single wavelength output of pure color that may be visible or invisible to the eye.) A conventional laser produces a small-sized beam of light, and because the beam size is small the power density (also called "irradiance") is very high. Consequently, for their safe operation, lasers and laser products are subject to federal and applicable state (USA) regulations, as well as international standards.

A conventional laser beam expands very little over distance, or is said to be very well "collimated"; thus, conventional laser irradiance remains relatively constant over distance. Lasers used in lightwave systems, however, have a large beam divergence, which is typically 10 to 20 degrees. Here, irradiance obeys the inverse square law (doubling the distance reduces the irradiance by a factor of 4) and rapidly decreases over distance.

Lasers and Eye Damage

The optical energy emitted by laser and high-radiance LEDs in the 400-1400 nm range may cause eye damage. When a beam of light enters the eye, the eye magnifies and focuses the energy on the retina, magnifying the irradiance. The irradiance of the energy that reaches the retina is approximately 10^5 or 100,000 times more than at the cornea and, if sufficiently intense, may burn the retina.

The damage mechanism at the wavelengths used in an optical fiber telecommunications is thermal in origin, i.e., damage caused by heating. A specific amount of energy is required for a definite time to heat an area of retinal tissue. Damage to the retina occurs only when you look at the light sufficiently long that the product of the retinal irradiance and the viewing time exceeds the damage threshold. Optical energies above 1400 nm cause corneal and skin burns but do not affect the retina. The thresholds for injury at wavelengths greater than 1400 nm are significantly higher than for wavelengths in the retinal hazard region

Classification of Lasers

Manufacturers of lasers and laser products in the U.S. are regulated by the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) under 21 CFR 1040. These regulations require manufacturers to certify each laser or laser product as belonging to one of four major Classes: I, II, IIa, IIIa, IIIb, or IV.

The International Electro-Technical Commission is an international standards body that writes laser safety standards under IEC-60825. Classification schemes are similar with Classes divided into Classes 1, 2, 3A, 3B, and 4.

Lasers are classified according to the accessible emission limits and their potential for causing injury. Optical fiber telecommunication systems are generally classified as Class I/1 because, under normal operating conditions, all energized laser transmitting modules are terminated on optical fibers which enclose the laser energy with the fiber sheath forming a protective housing.

Also, a protective housing/access panel is typically installed in front of the laser modules frames. The modules themselves, however, may be FDA/CDRH Class I or IIIb; or IEC Class 1, 3A, or 3B.

Laser Safety Precautions for Optical Fiber Communication Systems

In its normal operating mode, an optical fiber communication system is totally enclosed and presents no risk of eye injury. It is a Class I/1 system under the FDA and IEC classifications. The fiber optic cables that interconnect various components of an optical fiber can disconnect or break, and may expose people to laser emissions. Also, certain measures and maintenance procedures may expose the technician to emission from the semiconductor laser during installation and servicing.

Unlike more familiar laser devices, such as solid-state and gas lasers, the emission pattern of a semiconductor laser results in a highly divergent beam. In a divergent beam, the irradiance (power density) decreases rapidly with distance. The greater the distance, the less energy will enter the eye, and the less potential risk for eye injury.

Inadvertently viewing an unterminated fiber or damaged fiber with the unaided eye at distances greater than 5 to 6 in. (127 to 152 mm) normally will not cause eye injury, provided that the power in the fiber is less than a few milliwatts at the near IR wavelengths and a few tens of milliwatts at the far IR wavelengths.

Laser Safety

WARNING: Use of controls, adjustments, and procedures other than those specified in this document may result in hazardous laser radiation exposure.

Optical fiber telecommunication systems use semiconductor laser transmitters that emit infrared light that is normally not visible to the human eye. Although a conventional laser produces a small beam of light, the power density is very high, and it can damage your eyes.

If a beam of laser light enters the eye, the eye magnifies and focuses the energy on the retina. The energy that reaches the retina can be as much as 100,000 times more than at the cornea and, as a result, it can burn the retina.

Laser transmission products are classified in four major groups (Class 1, 2, 3, and 4), according to their emissions and potential for causing injury. Fiber optic transmitter modules in this series are designated Class 1.

Precautions for Enclosed Systems

Under normal operating conditions, optical fiber telecommunication systems are completely enclosed; nonetheless, observe the following precautions:

- Because of the potential for eye damage, technicians should not stare into optical connectors or broken fibers.
- Under no circumstance shall laser/fiber optic operations be performed by a technician before satisfactorily completing an approved training course.
- Since viewing laser emissions directly in excess of Class I/1 limits with an optical instrument such as an eye loupe greatly increases the risk of eye damage, appropriate labels must appear in plain view, in close proximity to the optical port on the protective housing/access panel of the terminal equipment.

WARNING: Eye damage may occur if an optical instrument such as a microscope, magnifying glass, or eye loupe is used to stare at the energized fiber end.

Precautions for Unenclosed Systems

During service, maintenance, or restoration, an optical fiber telecommunication system is considered unenclosed. Under these conditions, follow these practices:

CAUTION: Only authorized, trained personnel shall be permitted to do service, maintenance, and restoration.

- Avoid exposing the eye to emissions from unterminated, energized optical connectors at close distances.

  Laser modules associated with the optical ports of laser circuit packs are typically recessed, which limits the exposure distance. Optical port shutters, Automatic Power Reduction (APR), and Automatic Power Shut Down (APSD) are engineering controls that are also used to limit the emissions. However, technicians removing or replacing laser modules should not stare or look directly into the optical port with optical instruments or magnifying lenses. (Normal eyewear or indirect viewing instruments such as Find-R-Scopes are not considered magnifying lenses or optical instruments).
- Ensure that only authorized, trained personnel use optical test equipment during installation or servicing.
- Turn off all laser sources before scanning a fiber with an optical test set.
- Keep all unauthorized personnel away from the immediate area of the optical fiber systems during installation and service.

For guidance on the safe use of optical fiber communication systems in the workplace, consult ***ANSI Z136.2, American National Standard for Safe Use of Lasers*** in the U.S. or outside the U.S., *IEC-60825, Part 2*.

Specifications

See page 50 and page 51 for a list of optical specifications for DA6804+D modules.

B Inspecting and Cleaning Fiber Optic Connections

Small amounts of microscopic dust or other contaminants can seriously impair or disable a fiber optic network. To ensure that your network operates reliably, you must carefully inspect and clean each connection when installing fiber optical products.

Table B-1 lists some typical contaminants of a fiber optic connection. The inspection and cleaning procedure begins on page 61.

Table B-1 Typical Contaminants

Contaminant	Comments
Dust particle, 1 micron	Can block up to 1% of the light transmission, creating a loss of 0.05 dB
Dust particle, 9 microns	Although microscopic, the particle can completely block the fiber core
Human hair	Typically 50 to 75 microns in diameter
Oil	Frequently caused by touching
Film residues	Can accumulate from vapors or smoke
Powdery coatings	Can be left behind after water or other solvents evaporate

Important Points

- Before you begin cleaning, always inspect the fiber connections.
- Inspect and clean both fiber ends every time you make a connection.
- Keep a protective cap on unplugged fiber connectors.
- Do not touch the end of a fiber.
- Store unused protective caps in a clean resealable container, located nearby for easy access.
- Do not reuse cleaning tissues or swabs.
- Do not allow alcohol or another wet cleaning agent to dry on a fiber end.
- Never touch the dispenser tip of an alcohol bottle or any clean portion of a tissue or swab.
- Use care when handling the fiber; do not twist or pull.
- Keep your cleaning fluids away from open flame or spark.

Figure B-1 describes the acceptable limits of defects in a fiber connection.

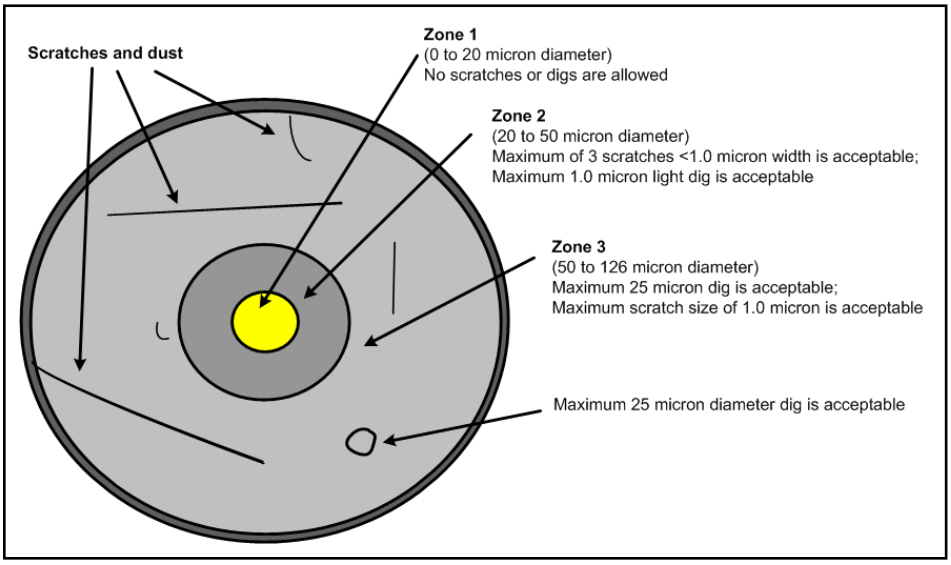

Figure B-1 Fiber Optic Cross-Section

Inspection

To inspect and clean the fibers, follow these steps:

1 Ensure the fiber is not "live."

I ON ☐ ☐ **Eye damage may occur if an optical instrument such as a microscope, magnifying glass, or eye loupe is used to stare at an energized fiber end.**

2 Inspect the fiber endface with a fiberscope.

If the connector is dirty, proceed to the dry cleaning instructions below.

Dry Cleaning

If you are using cartridge or pocket-style dry cleaning tools, follow the manufacturer's directions. If you are using lint-free wipes, follow these steps:

1 Fold the lint-free wipe four to eight times into a square, taking care to avoid touching the cleaning surface of the wipe.

2 Lightly wipe the fiber tip in the central portion of the lint-free wipe.

***CAUTION*: Do not scrub the fiber. Excessive rubbing will leave scratches.**

3 Repeat the wiping action on another clean section of the wipe or a new wipe.

4 Inspect the connector again with the fiberscope.

5 If the connection is clean, return to the installation steps on page 24.

If the connector is still dirty, proceed to the wet cleaning instructions.

Wet Cleaning

Using 99% isopropyl alcohol and lint-free wipes, follow these steps to wet clean the fiber:

1 Fold the wipe into a square, about 4 to 8 layers thick.

2 Moisten one section of the lint-free wipe with one drop of 99% alcohol, ensuring that a portion of the wipe remains dry.

3 Lightly wipe the fiber end in the alcohol-moistened portion of the lint-free wipe.

4 Immediately repeat the wiping action on the dry section of the wipe, removing any residual alcohol.

5 Inspect the fiber endface again, and if necessary, repeat the wet cleaning with another clean section of the lint-free wipe.

***CAUTION*: Do not scrub the fiber. Excessive rubbing will leave scratches.**

6 Dry clean any remaining residue, and then inspect the connector again.

7 If the contamination persists, repeat the dry and wet cleaning procedure until the endface is clean.

If the fiber end still remains dirty after repeated cleaning attempts, call Customer Service for further instructions.

If the fiber end is clean, return to the installation instructions on page 24.

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