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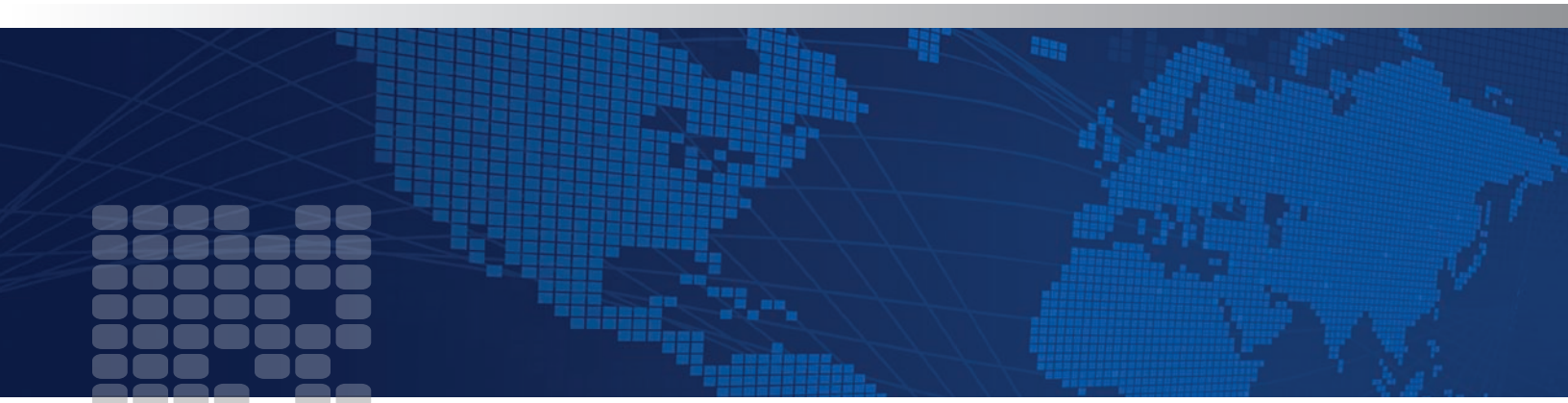

Broadcast-Quality Up/Cross/Downconverter

Installation and Operation Manual

Edition B
175-100159-00

X50

Broadcast-Quality Up/Cross/Downconverter

Installation and Operation Manual

Edition B
December 2009

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Preface

Manual Information

Purpose

This manual details the features, installation, operation, maintenance, and specifications for the X50 Up/Cross/Downconverter.

Audience

This manual is written for engineers, technicians, and operators responsible for the installation, setup, and/or operation of X50 Up/Cross/Downconverter.

Revision History

Table P-1. Document Revision History

Edition	Date	Revision History
A	November 2009	Initial Release
B	December 2009	New specifications added

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Writing Conventions

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

Table P-1. 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 E-mail 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

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

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Unpacking/Shipping Information

Unpacking a Product

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

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.

Keep at least one set of original packaging, in the event that you need to return a product for servicing.

Product Servicing

Except for firmware upgrades and jumper selections, the X50 is not designed for field servicing. Return the X50 unit to the Harris Customer Service Center for all hardware upgrades, modifications, or repairs.

Returning a Product

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

If the original package is not available, you can supply your own packaging as long as it meets the following criteria:

- The packaging must be able to withstand the product's weight.
- The product must be held rigid within the packaging.
- There must be at least 2 in. (5 cm) of space between the product and the container.
- The corners of the product must be protected.

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.

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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

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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.

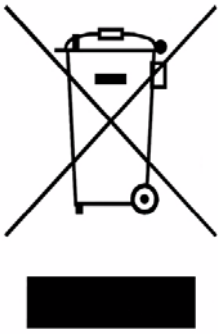

Figure P-2. WEEE Compliance Symbol

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Safety

Carefully review all safety precautions to avoid injury and prevent damage to this product or any products connected to it. If this product is rack-mountable, it should be mounted in an appropriate rack using the rack-mounting positions and rear support guides provided. To protect a frame from circuit overloading, connect each frame to a separate electrical circuit. If this product relies on forced air cooling, all obstructions to the air flow should be removed prior to mounting the frame in the rack.

If this product has a provision for external earth grounding, ground the frame to the earth using the protective earth ground on the rear panel.

IMPORTANT! Only qualified personnel should perform service procedures.

Always disconnect the power supply before removing the lid.

Safety Terms and Symbols in this Manual

WARNING

Statements identifying conditions or practices that may result in personal injury or loss of life. High voltage is present.

CAUTION

Statements identifying conditions or practices that can result in damage to the equipment or other property.

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Chapter 1

Introduction

Product Features

The X50 is a standalone up/down/cross converter in a 1-RU format. The X50 can provide broadcast quality multi-standard conversion along with support for aspect ratio change and AFD processing, closed captioning processing, video processing amplifier and video frame synchronization and delay, with built-in color correction. Audio processing capabilities include handling of 16 channels of embedded audio and 8 channels of discrete audio via AES or analog interfaces, with audio synchronization and delay for audio-to-video tracking.

Full handling of the embedded audio metadata is provided with ability to de-embed and re-embed metadata from external sources. An optional fiber optic transceiver sub-module (SFP) will allow one receiver and one transmitter to be added to complement the SDI electrical inputs and outputs.

Inputs

- Two auto-sensing SD/HD/3G SDI inputs and one SD/HD/3G SDI fiber input with embedded audio, VANC data (WSS/VI/AFD, audio metadata and closed captioning/teletext data)
- One SD/HD component YPrPb/RGB input
- One SD composite input
- One S-Video input
- Error monitoring (EDH, CRC) on each SDI input
- Genlock input with loopback: analog composite with support for tri- and bi-level sync
- DARS input, unbalanced
- Four AES inputs, unbalanced
- Eight-channel analog audio inputs, balanced
- RS-422 serial port for external metadata
- Four GPI inputs, TTL

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Outputs

- Two SD/HD/3G SDI outputs and one SD/HD/3G SDI fiber output carrying the converted program signal with embedded audio, VANC data (WSS/VI/AFD, audio metadata and closed captioning/teletext data)
- One SD/HD component YPrPb/RGB output
- One SD composite output
- One S-Video output
- One HDMI output (audio and video streams)
- User-selectable input and output video standard/formats
- Four AES outputs, unbalanced
- Eight-channel analog audio outputs, balanced
- RS-422 serial port for external metadata
- Four GPIO outputs, TTL

Video Processing

- Dual-output processor supporting simultaneous down- and cross conversion; simultaneous up- and ARC conversion
- Advanced 10-bit image processor
- Motion adaptive de-interlacing for exceptional vertical resolution
- Color space conversion between SD (601) and HD (709)
- User-configurable picture-resizing aspect ratio conversion (H/V size, H/V position and cropping)
- Fixed preset aspect ratios that include 16:9 anamorphic, 16:9 middle cut, 14:9, 4:3 and pixel true
- Variable ARC controls
- Aspect ratio adjustment according to embedded WSS/VI/AFD information
- User-selectable color for the internally-generated background, 1…8 colors
- Support for up to twelve frames of delay through the entire video path
- Clean cut transition during aspect ratio change
- SDI video clipping
- Video noise reduction and detail enhancement
- Video proc amp controls
- Color correction

ANC Processing

- Trans-coding of CC or TT according to input and output video formats
- WSS, VI, and AFD processing: detection, insertion or re-insertion

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Audio Processing

- Embedded audio processing (de-embed, delay/sync, sample rate conversion, embed) for sixteen channels (four groups)
- Discrete audio processing for eight channels (four AES pairs or eight analog mono channels)
- Audio proc amp controls (gain, phase invert)
- Handling of any embedded compressed audio with fixed delay
- 24-bit audio processing; word-length control on embedded and AES outputs
- Support for compressed and linear PCM in the same audio group
- Audio delay that matches video propagation plus additional user delay of up to 2.5 seconds

Other

- 10/100 Ethernet connectivity
- Store-and-recall AFD presets through CCS-P and SNMP
- User-selectable LOV modes: Pass, Freeze, Black, and Test Pattern
- Built-in SD/HD/3G test generator containing cross hatch pattern, color bar signal, black, white, and horizontal sweep with chroma or luma-only signals
- Clean handling of hot switch on input
- Front panel and CCS Pilot control accessibility
- Store-and-recall of control parameters via CCS applications and control panels
- Future support for SD memory card for logo/trouble slide storage and firmware upgrades

Options

Table 1-1. X50 Orderable Options

Name	Description
X50OPT-3G	3.0 Gb/s input and output option for X50
OP+SFP+TR13P	Small Form Factor Pluggable (SFP) for Harris fiber optic modules: 1310 nm wavelength transceiver with pathological support for baseband video
X50OPTCAB-AES	BNC-to-DIN 1.0/2.3 AES interface cable

See page 12 for suggested AES baluns.

Harris recommends the OREMTOOL for removing 1.0/2.3 FPB connectors on the X50. This product is available from White Sands Engineering. See page 5 in the following document:

http://www.whitesandsengineering.com/downloads/catalog.pdf

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Front and Back Views

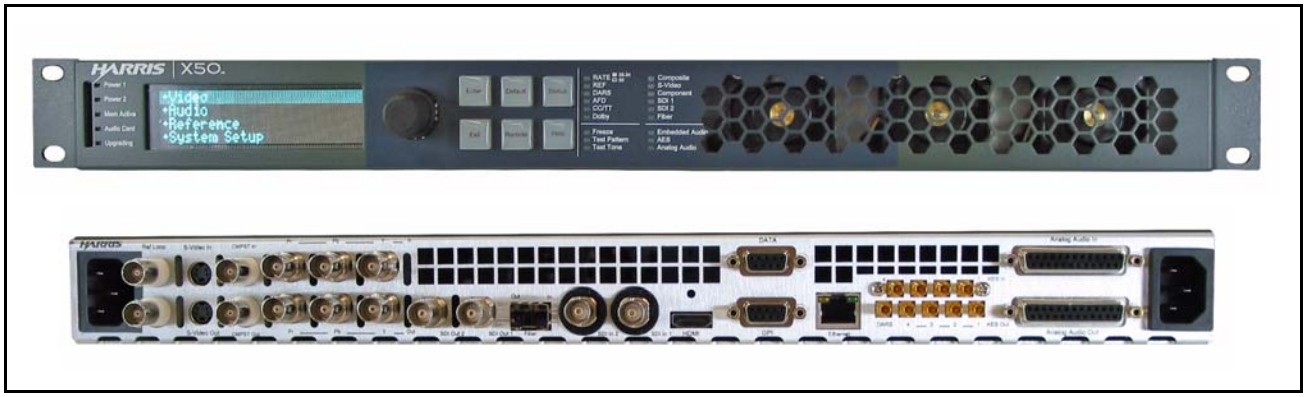

Figure 1-1. Front and Back Views

Pinouts

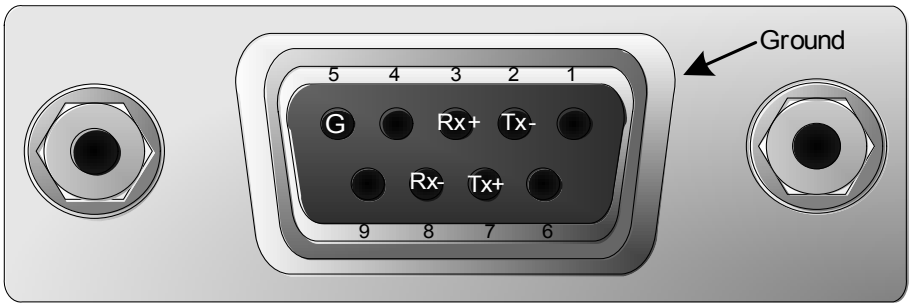

Figure 1-2. Female Back Panel Data Pinouts

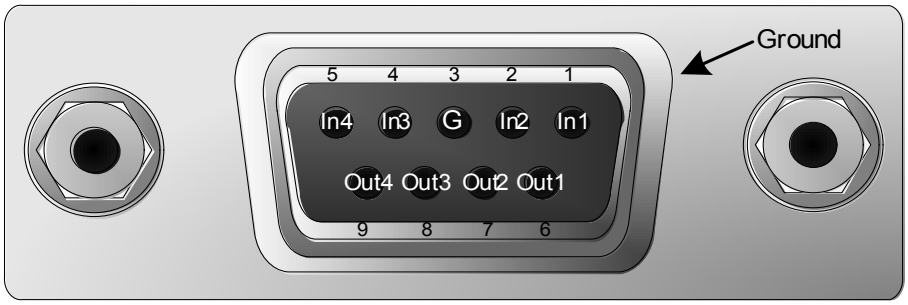

Figure 1-3. Female Back Panel GPI Pinouts

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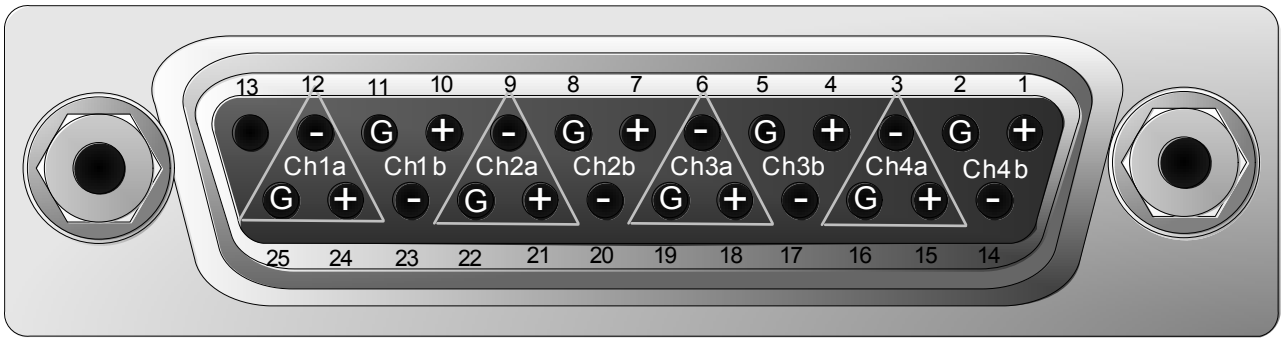

Figure 1-4. Female Back Panel Analog Audio Input and Output Pinouts

Packing List

- X50 frame with two power supplies
- AC Power cords (2).
- X50 Documentation CD-ROM package.

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Signal Flow

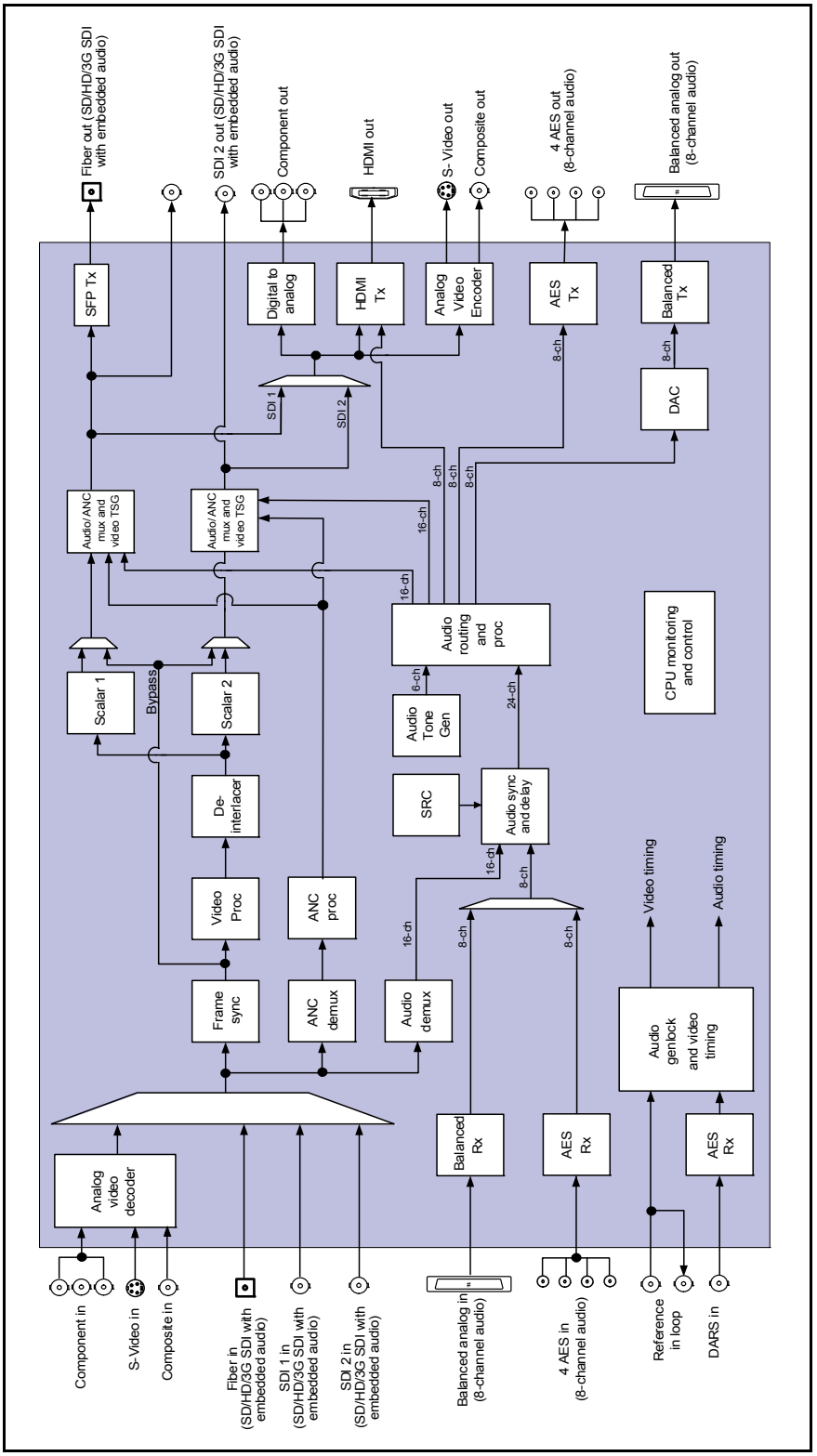

Figure 1-5. X50 Signal Flow

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Chapter 2

Installation

Preparing for Installation

Prior to installing your system, ensure that certain environmental and electrical conditions are met.

Electrical Requirements

The X50 power supplies have a universal input of 100-240 VAC at 47 to 63 Hz (nominal), 75 W. There is no voltage selector switch.

Each frame has space for two power supplies; however, a single power supply can meet the requirements of a fully-loaded frame.

Environmental Requirements

X50 units are cooled by forced air drawn in from the front, and exhausted through the rear. There must be free passage for air flow at the front and back of each unit to allow for adequate ventilation. Take care to select a dry, well-ventilated location with a minimum of dust.

X50 units are designed for mounting in a standard 19-in. (48-cm) rack using front-mounting ears and rear support brackets, occupying a 1RU vertical space of 1.75 in. (4.4 cm).

When installing an X50 in a rack, ensure that there is adequate space behind the mounting ears and clearance for the rear connecting cables. Allow about 10 inches (25 cm) of slack in the rear connecting cables for frame access and maintenance.

After unpacking the frame, and before installing into a console or rack, allow at least 30 minutes for temperatures to equalize and to eliminate any condensation that may have developed. X50 frames require an ambient temperature of 41º to 95º F (5º to 35º C) with a relative humidity of 10-90% (non condensing).

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Rack Mounting

Although the pre-installed frame-mounting ears provide the main support for the X50 within a rack, you must install arms, brackets, and a cable relief bar at the rear of the unit to support the weight of cabling and frame stacking.

Note

The frame mounting ears and the rack support brackets are reversible. You can install them with the ears at the front and support brackets at the rear, or with the ears at the rear and the support brackets at the front.

Figure 2-1. Mounting Ears in Front Position

The following procedure describes how to install the rack supports.

1. Locate the support package in the box, consisting of two support arms, two brackets with screws, a tie bar, and tie bar screws. (See Figure 2-2.)

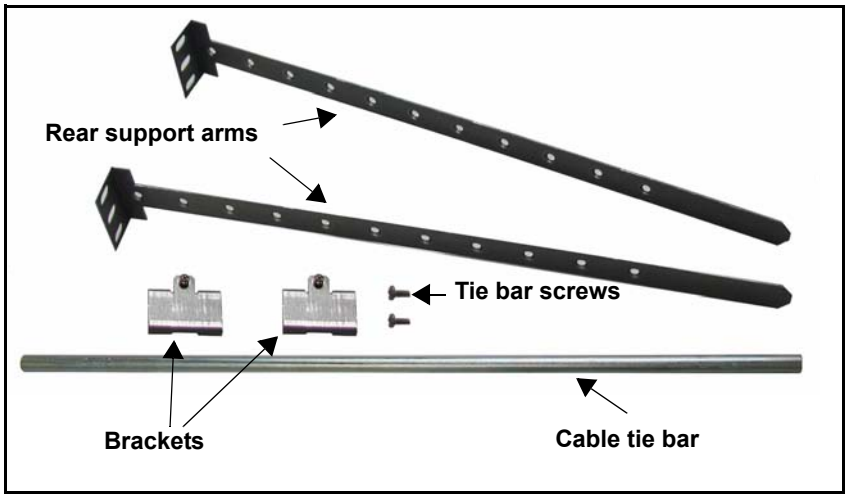

Figure 2-2. Rack Support Brackets

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2. Attach the brackets to the sides of the frame using the screws that are provided. (See Figure 2-3 on page 9.)

Caution

To prevent damage to components inside the frame, do not use screws longer than those provided.

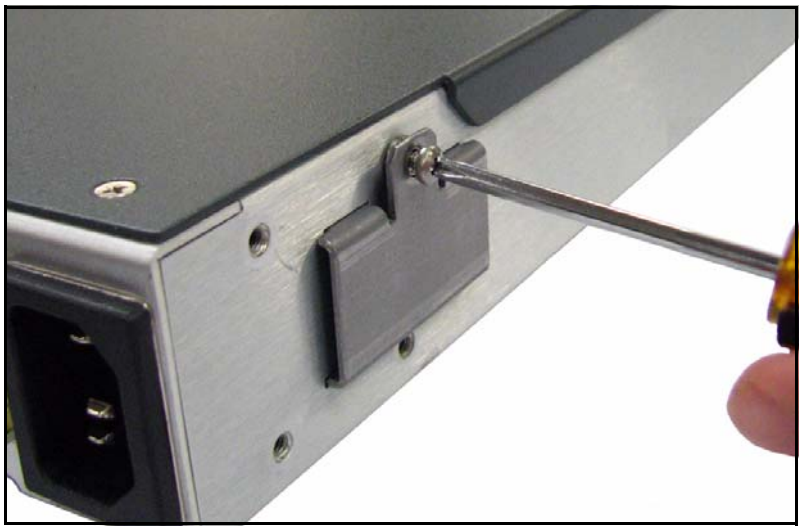

Figure 2-3. Bracket Installation

3. Attach the cable relief bar between the two support arms using the screws that are provided.

   You can secure the cable relief bar through any of the screw holes on the arm. (See Figure 2-4 on page 9.)

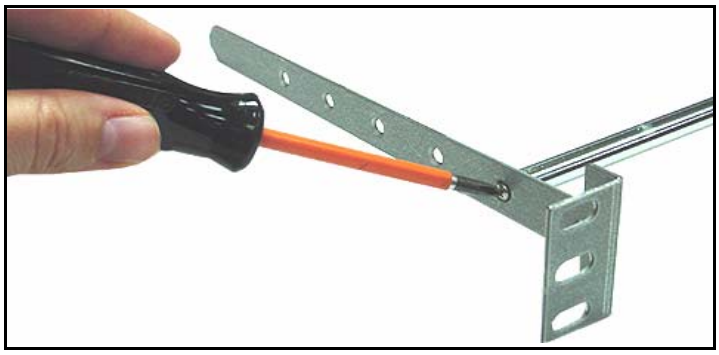

Figure 2-4. Attaching the Cable Relief Bar

4. Push the X50 into the front of the rack, and attach the frame's front-mounting ears to the rack using the appropriate screws (not provided).

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5. Slide the two arms into their slots from the back of the frame and attach the arms to the back of the rack (Figure 2-5).

Figure 2-5. Installed Support Arms and Cable Relief Bar

Jumpers

The analog audio input on the X50 can be set to either **600**Ω or **Hi-Z** impedance (see Figure 2-6 on page 11). There are eight jumpers for this purpose, located near the rear of the main board inside the X50. (The default setting is **Hi-Z**.) The diagram on the circuit board shows how to align the jumpers.

To access the jumpers, follow these steps:

1. Disconnect both AC power cords.
2. Remove 15 screws from the one-piece front panel/lid.
3. Pull the scrolling knob straight off its shaft and then carefully slide the lid off the unit.
4. Set the jumpers as required (Figure 2-6 on page 11).

Warning

You can receive an electric shock from exposed parts of the power supplies. Ensure that you remove AC power from both power supplies before you open the cover.

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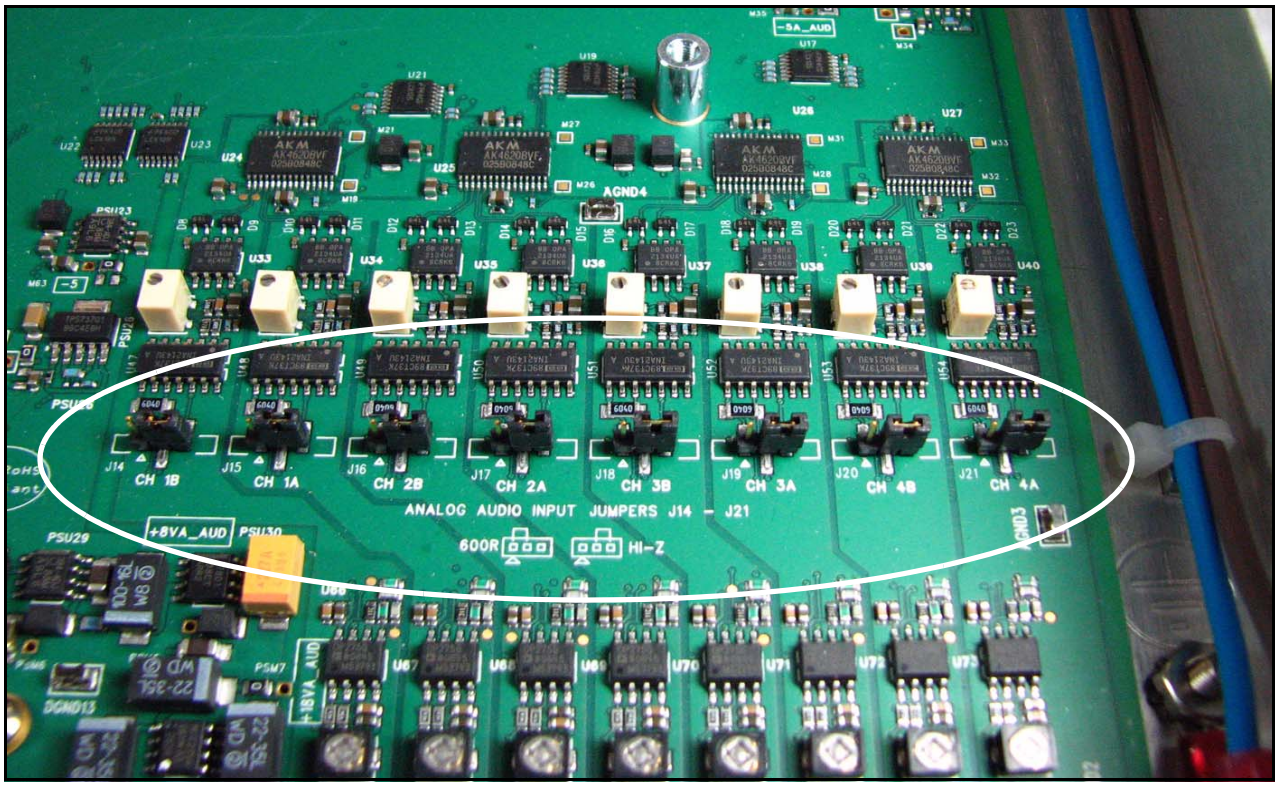

Figure 2-6. Analog Audio Input Jumpers J14 to J21

The rubberized LED light tubes in the center of the control panel will require re-alignment when you replace the lid. Use a pin to help re-insert the light tubes back into their slots. Do *not* attempt to adjust the LEDs located on the left side of the control panel. These are fixed circuit board LEDs.

Figure 2-7. Re-Aligning Rubberized Light Tubes

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Selecting an External Balun

The following baluns from Neutrik are recommended for the unbalanced-to-balanced AES connections on the X50:

- NADITBNC-F: Female chassis XLR 110Ω input to female BNC 75Ω output

  http://www.neutrik.com/fl/en/audio/210_309314683/NADITBNC-F_detail.aspx
- NADITBNC-M: Female BNC 75Ω input to male chassis XLR 110Ω output

  http://www.neutrik.com/fl/en/audio/210_2044239418/NADITBNC-M_detail.aspx
- NADITBNC-FX: Female cable end XLR 110Ω input to-female BNC 75Ω output

  http://www.neutrik.com/fl/en/audio/210_1576769505/NADITBNC-FX_detail.aspx
- NADITBNC-MX: Female BNC 75Ω input to male cable end XLR 110Ω output

  http://www.neutrik.com/fl/en/audio/210_1923043515/NADITBNC-MX_detail.aspx

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Configuring Network Settings

When shipped, the X50 is configured with a default IP address, subnet mask, and default gateway. If you intend to control the unit remotely, or connect it to a network hub/switch along with other X50 units, you will need to reconfigure the IP with unique network settings. Local control (with a direct Ethernet crossover connection to a PC) does not require any IP configuration.

Supported Network Protocols

The X50 supports the following network protocols for remote/network control:

- CCS Protocol
- HTTP
- SNMP

Making Required Hardware Connections

If you are connecting an X50 directly to a PC (no network connection), connect one end of a crossover Ethernet cable to the **Ethernet** RJ-45 port on the back of the frame, and the other end to the PC **Ethernet** port.

If you are establishing a network connection, connect a straight-through 10/100Base-T Ethernet cable between the X50 **Ethernet** port and the network hub/switch.

Setting IP and Subnet Mask Addresses

To allow devices to communicate on a network, you need to set all X50 devices to the same subnet (network location). When shipped, X50 units are configured with the same default IP (device identifier) and subnet addresses. These addresses need to be changed so that each unit is uniquely identified and the network location of all units is accurately reflected.

An IP address is made up of a four-item set of numbers (octet). The default (factory-configured) IP address for every X50 unit is **192.168.100.250**. For a class C network, you must change the first three items in the octet to identify the location (address) of the unit on your network, and also change the last item in the octet to uniquely identify the device from other X50 units.

The default subnet mask address for every X50 is **255.255.255.0**.

Setting the IP Address of a Single Unit with as Local or Remote Control Panel

Follow these steps to configure the network addresses using a local or remote control panel:

1. Follow this path: **System Config** > **Setup** (in the RCP, select **Device Setup**).
2. Scroll to the **Device IP** parameter, and then press **Enter**.

   If this is a new unit being configured, the default IP displays. Otherwise, the current IP address of the unit displays.

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3. Change the IP address by following these steps:
   a. Press **Enter** to navigate to one of the four number sets in the octet.
   b. Modify the address value by using the scroll knob to set a new number.
   c. Press **Enter** to move to the next item in the octet, and then repeat step (b) above.
   d. Press **Exit** when you are finished configuring the address.
4. Scroll to the **Subnet Mask** parameter, and then press **Enter.**

   If this is a new unit being configured, the default subnet mask displays. Otherwise, the current subnet displays.
5. Repeat the procedure described in step 4, this time for the subnet mask.
6. Scroll to the **Gateway** parameter, and then press **Enter**.

   If this is a new unit being configured, the default gateway displays. Otherwise, the current gateway address displays.
7. Repeat the procedure described in step 3, this time for the gateway parameter.
8. Select **Save IP**, and then press **Enter**.
9. Select **Yes** option and then press **Enter**.
10. Press **Exit** to return to the **Setup** menu.

    Rebooting the X50 is not required.

Setting the IP Addresses of Multiple Units

If you have multiple X50 systems that require network configuration, you will need to set unique IP addresses and assign a subnet mask and gateway address for each of them one at a time. The following procedure summarizes the required steps:

1. Apply power to the first X50 unit with a frame-mounted local control panel.

   When ready for configuration, the main X50 menu shows on the display screen.
2. Configure the network settings for the first X50, as described in the procedure on page 13.
3. Restart the X50 unit.
4. Plug in the next X50 system, configure its network information, and then restart the unit.

   Follow this procedure for all remaining X50 units that require configuration.
5. Connect all X50 systems and remote panels to a network hub or switch using a 10/100Base-T Ethernet cable.

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6. Ensure that all configured X50 units are detected on the network.

   To do this, press **Remote** on the front panel. All X50 units configured with the same subnet mask address will display (you will see a list of all detected IP addresses).

   If a unit or RCP is not detected, ensure that the subnet mask address is accurate. Alternatively, confirm that all units were restarted after configuring any network settings.

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Changing the PC Network Settings

In unusual situations, such as correcting a failed software upgrade, you may need to change your PC network settings. Follow these steps to change the settings:

1. Change the IP Address of the PC to match that of the X50, by following theses steps:
   a. Click **Start > Settings** and then click **Control Panel**.

      This opens the Control Panel window.

   b. Double-click **Network and Dial-up Connections,** and then double-click **Local Area Connection.**

   c. Click the **General** tab, and then click **Properties**.

      This opens a new **Local Area Connection Properties** window.

   d. On the **General** tab, select **Internet Protocol (TCP/IP)**, and then click **Properties**..., ensuring you are working on the correct Ethernet adapter for the CCS network.

      The IP Address of the **Internet Protocol TCP/IP Properties** box appears.

      Figure 2-8 shows the portion of the Internet Protocol TCP/IP Properties box where you enter the IP Address, Subnet Mask, and Default Gateway of your PC.

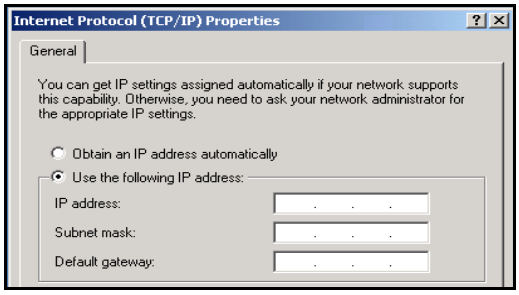

Figure 2-8. Portion of IP Address Box

   e. Note whether **Obtain an IP address automatically** is selected.

      You may need to re-select this option later when you revert back to the original PC IP Address.

   f. Select **Use the following IP address**, and in the **IP address** box, type a new computer IP Address to match the first three octets of the IP Address of the X50, and then add a different fourth octet.

      (For example, if the X50 IP Address is 192.168.100.50, you could type 192.168.100.181).

   g. In the **Subnet Mask** field, type: `255.255.255.0`

      This value applies to Class C IP addresses; confirm the number with your network administrator.

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h. Enter the same **Default Gateway** number as the one on the X50, or leave blank.

i. Click **OK** to close the **TCP/IP Properties** box, and then close the two **Local Area Connection** boxes.

2. Verify the network settings were accepted by following the ipconfig procedure, as described below:

   a. Click **Start**, point to **Programs** > **Accessories** and then click **Command Prompt** to open the **Command Prompt** window on the PC.

   b. Type the following at the MS-DOS command prompt, and then press ENTER:

   ```
   ipconfig
   ```

   The **IP Address**, **Subnet Mask**, and **Default Gateway** of the PC appear. (In some situations, the **Default Gateway** value is not shown. See Figure 2-9 on page 17.)

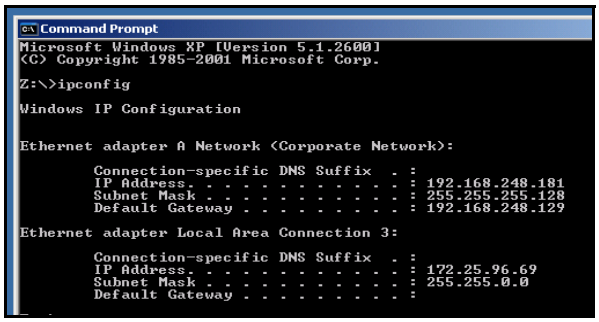

Figure 2-9. IP Address, Subnet Mask and Default Gateway of PC

   c. Write down the **IP Address**, **Subnet Mask,** and **Default Gateway** numbers of your PC.

   d. Compare the network numbers of the X50, with the numbers found in step 2c.

   In general, the two **Subnet Mask** and **Default Gateway** numbers should be identical. The first three octets of the two **IP Addresses** also are generally identical. For example, if the X50 has an **IP Address** of 192.168.248.50, the PC could have an **IP Address** of 192.168.248.181.

3. If the network settings match, click **Close**.

Note

Where more than one network is involved and the Point-to-Point option has been selected (see CCS Navigator online help), the network address values may be entirely different.

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Remote Control of the X50

This section provides the following general configuration procedures:

- "Preparing for Remote Control via Control Panel" (below)
- "Selecting a Remote Unit to Control" on page 19

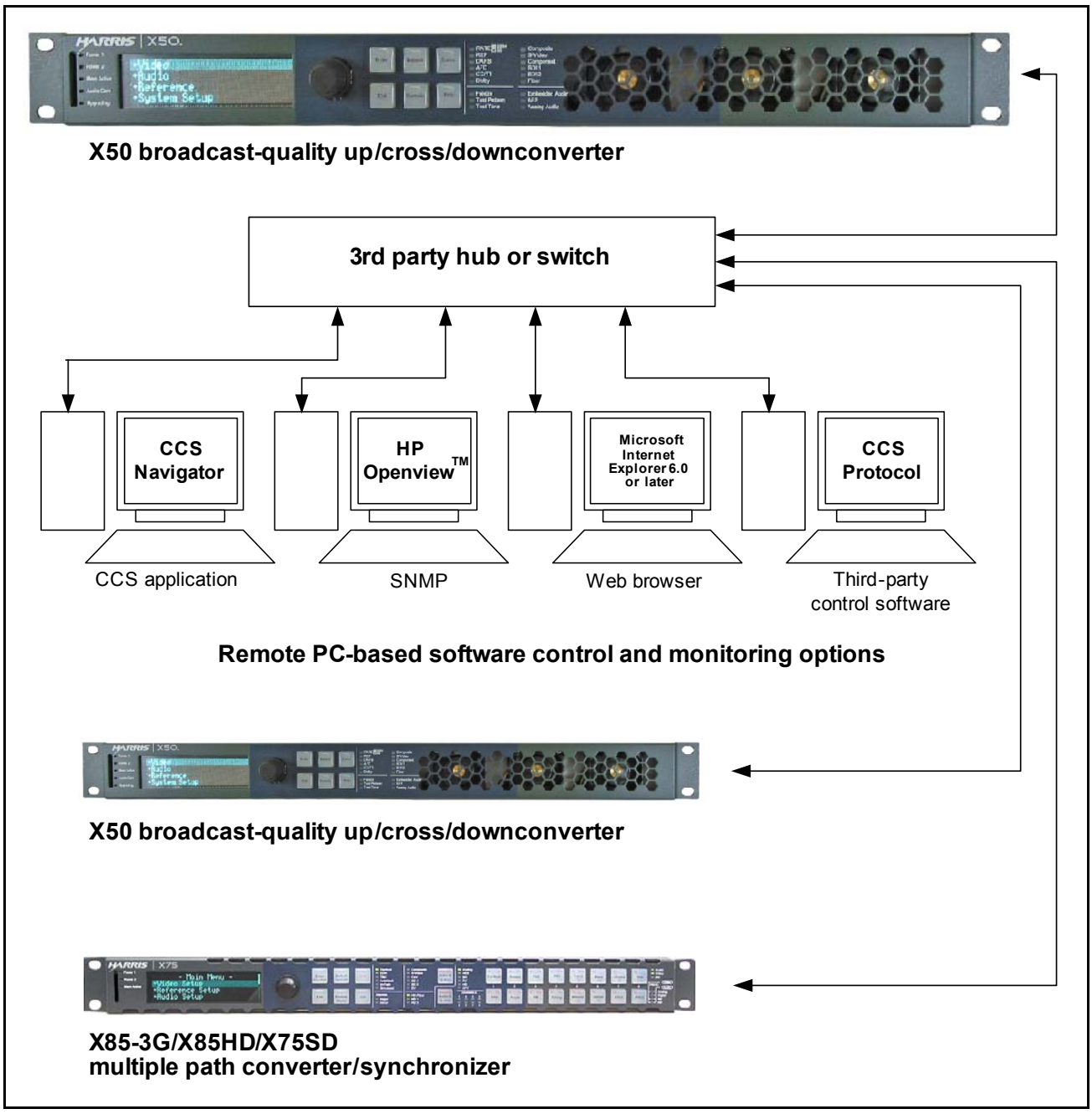

Figure 2-10. Network Configuration Diagram

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Preparing for Remote Control via Control Panel

Control panels remotely control X50 units via broadcast. You will need to configure the switchers and routers in your network accordingly.

Follow these steps to prepare your X50 models for remote control:

1. Reconfigure each X50 with unique IP addresses and other appropriate network settings, including shared subnet mask addresses.

   See "Setting IP and Subnet Mask Addresses" on page 13 for details.

2. Restart each X50, and then wait 20 seconds to allow for network detection.
3. Connect all X50 units to a TCP/IP-based network hub or switch using 10/100Base-T Ethernet cable.
4. Discover all units found on the network, and then select the one you wish to control.

Selecting a Remote Unit to Control

You can remotely control all X50 units that share the same subnet. Follow these steps:

1. Ensure all connections and network settings have been made.
2. On the X50, press the **Remote** button to bring up a list of available units for control (see Figure 2-11).

Figure 2-11. List of Systems Available for Remote Control

The **<local device >** option shown on-screen represents the unit you are using (the local unit that is in front of you), and is always available on this list. An asterisk (*) beside the name indicates that this is the remote system currently being controlled by the panel.

Note

Instead of IP addresses, you can give alphabetical names to individual X50 units that will appear in the list. To do this, see the **Machine Name** parameter.

3. Use the control knob to scroll through the list of available X50 devices, highlight the unit you wish to control, and then press **Enter**.

   The X50 screen reads **Connecting...**

4. Wait a few moments.

   The menu of the selected X50 unit appears along with all of that unit's settings.

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5. Operate the selected unit as required.

   Once a unit is selected for remote control, all front panel features operate as if you were actually at the front panel of the selected remote unit. This means that the VFD panel, status indicators, and buttons (with the exception of the **Remote** and **Option** button) all control and/or reflect the status of the remote unit, *not* the one you are physically operating.

Note

The light on the **Remote** button flashes while the unit is remotely controlling a device.

6. To switch to another unit, or to control the local device you are physically operating, press the **Remote button**, and then select a new device to control.
7. Select **<local device >** to resume normal single-unit operation.

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Configuring for Web Browser Control

Once the networking parameters of the X50 have been configured appropriately, and it is connected to the Ethernet network, the built-in Web server allows a standard Web browser to control the frame. Before controlling your frame in this way, note the following system and browser requirements:

- The X50 supports Web browsers that are compatible with HTML 4.0 (and later).
- Although most standard Web browsers can be used with the X50 for HTTP control, the following browsers have been tested and approved: Microsoft® Internet Explorer 6.0, Netscape® Navigator™ 7.2, and Mozilla® Firefox™ 1.0.

To select a unit for control, follow these steps:

1. Ensure all required connections and network settings have been made locally on your X50 unit(s).
2. Open a supported Web browser, and then type the IP address of the unit you wish to control into the **Address**, **Location**, or **URL** field of your Web browser (the name of the field depends on the Web browser you are using). For example, type the following to control an X50 unit with this IP address:

   ```
   http://192.168.100.250
   ```


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Configuring SNMP Support

With SNMP support, you can use a standard MIB browser to monitor parameters and alarms. You must set SNMP options using CCS Pilot or Navigator. Before you can configure SNMP support, you must discover the X50.

Setting SNMP Options

Devices that support SNMP will have an **SNMP** tab in the **Configuration** window. To configure an X50 that supports SNMP, follow these instructions.

1. While your CCS software is in Build mode, right click on the X50 and choose **Configuration**.

   The **Configuration** window opens.

2. Click the **SNMP** tab, and then click the **Read** button.

   The CCS network polls the module and retrieves its current settings. It fills in all the fields on the **SNMP** tab of the **Configuration** window with the settings that are on the device.

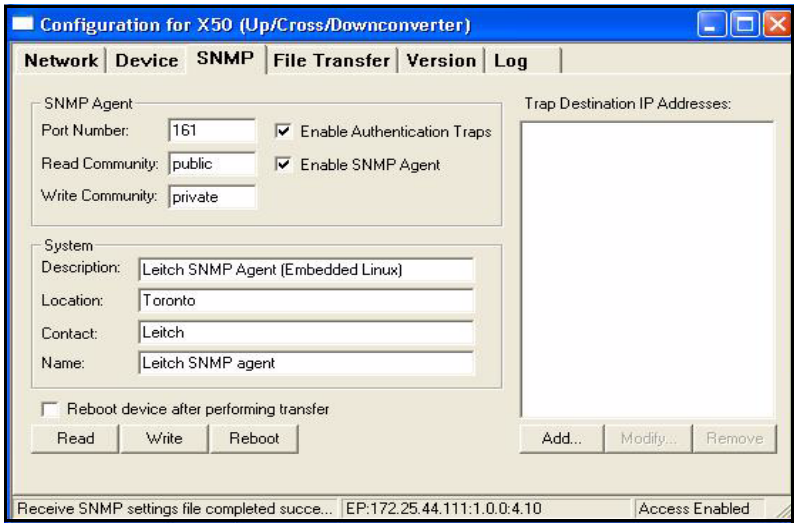

Figure 2-12. SNMP Tab on device Configuration Window

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In the top left portion of the window are SNMP Agent settings.

Table 2-1. SNMP Agent Fields of SNMP Tab

Field	Function
Port Number	(Can be from 0 to 65535) The network port used by the SNMP agent; port 161 is the default for X50
Read Community	Has to match the "read community" setting in your MIB browser
Write Community	Has to match the "write community" setting in your MIB browser
Enable Authentication Traps	When checked, authentication traps are sent if the read or write community doesn't match between the SNMP agent and MIB browser
Enable SNMP Agent	When checked, SNMP support is available; if not checked, SNMP support is disabled

Below the **SNMP Agent** settings are **System** settings. The information in these fields describes the device that is currently selected in the **Navigation** window. This is user-defined information that, once provided by an administrator, is available on the device when it is retrieved by a MIB browser.

Table 2-2. System Fields of SNMP Tab - MIB-2 System Information

Field	Explanation
Description	The default is "Leitch SNMP Agent"
Location	The physical location of the device
Contact	The contact person for this device
Name	Name of the device

The **Trap Destination IP Addresses** field contains a list of IP addresses that will receive SNMP traps. It is in the format IP Address:Port Address:SNMP version.

3. To add new Trap Destination IP Addresses, see "Adding New Addresses for SNMP Traps" on page 24. To modify them, see "Modifying an SNMP Trap Destination" on page 24.
4. (Optional) If you wish the device to reboot automatically when you send the new configuration to it, place a check beside **Reboot device after performing transfer**.
5. Click **Write** to send the new configuration to the device.

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6. If you did not place a check beside **Reboot device after performing transfer** in step 6, click **Reboot** now and your changes to the configuration will take effect.

Note

The device must be rebooted before changes will take effect.

Adding New Addresses for SNMP Traps

To add a new SNMP trap destination, follow this procedure:

1. Click **Add** beneath the **Trap Destination IP Addresses** field. The **Add Trap Destination** window opens.

Figure 2-13. Add Trap Destination Window

2. Choose the SNMP version that you would like to use for traps.
3. Choose the IP address of that trap destination.
4. Choose the port number. The default is 162, but an administrator can set this to any number between 0 and 65535.
5. Click **Apply**. A new line is added in the **Trap Destination IP Addresses** field.
6. Repeat steps 2 through 5 to add more rows to the window.
7. Click **OK** to return to the **SNMP** tab of the **Configuration** window.

Modifying an SNMP Trap Destination

To modify a trap destination, follow this procedure:

1. In the **Trap Destinations IP Addresses** list, click on the item you would like to modify.

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2. Click the **Modify** button. The **Modify Trap Destination** window opens.

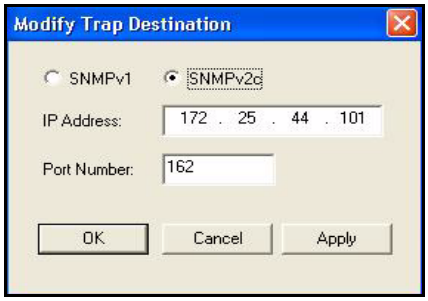

Figure 2-14. Modify Trap Destination Window

3. Choose the SNMP version of the traps using the radio buttons at the top of the window.
4. Enter the IP address of that trap destination in the **IP Address** field.
5. Enter the port number in the **Port Number** field.

   The default value is 162.
6. Click **Apply**. The selected entry in the **Trap Destination IP Addresses** field is updated.
7. Repeat steps 2 through 6 to further update the row.
8. Click **OK** to close the **Modify Trap Destination** window.

Configuring Third-Party SNMP Software Control

SNMP is an industry-standard protocol that allows other manufacturers' control software to remotely monitor and control the X50.

Harris provides MIB files that can be downloaded from the website. Two general MIB files (**leitch.mib** and **ccsAlarm.mib**) set up the structure to define parameters and alarms. Once these two MIBs are installed, you will want to install a MIB for each distinct module for which you wish to set up third-party software control.

You can use any standard MIB browsing software with your X50.

1. Make the required network connections between the X50 unit(s) and your PC with installed SNMP browser/control software.

   The SNMP configuration process for the X50 directs the SNMP agent where to send alarms (SNMP traps). This file must be modified before it is loaded back to the X50. For information on configuring SNMP, see page 22.
2. Load the leitch.mib file into your SNMP browser/control software.

   This MIB sets up the basic structure for product specific Harris MIBs. It can be found under the **Private** > **Enterprise** branch, and sets up the leitchProducts and leitchCommon sub-branches.

   The **leitchCommon** branch is initially empty. The **leitchProducts** branch contains folders for different families of Harris devices—for example, **LeitchX75**, **NEO** and **X50.**

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3. Load **ccsAlarm.mib** into your SNMP browser/control software.

   This MIB adds a **ccsAlarms** sub-branch to the **leitchCommon** folder. When it is installed, you will be able to receive traps with proper information as to where the alarms are triggered from.

4. Load product-specific X50 MIB files into your SNMP browser/control software.

   A product-specific MIB provides a clear path to the parameters and alarms on the device. Harris MIBs can be downloaded from our website.

   X50 MIBs will appear in the X50 folder under the **leitchProducts** folder. See Figure 2-15 on page 27.

5. Configure your MIB browser to connect to the unit by entering the **IP address**, **Port** (if you have changed the Port from its default in the configuration), and other standard configuration settings.

Your browser should now be able to connect to the SNMP agent running on the X50 unit. If you wish to receive traps, start up the trap receiver in your MIB browser software.

Note

To verify that your configurations are correct, you can walk MIB2.

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Monitoring and Control Using MIBs

Each X50 unit's MIB can be fully expanded. When you expand an X50 MIB node in the tree view, there are three sub-folders (see Table 2-3).

Table 2-3. MIB Sub-Folders

Tree View Item	Contents
Objects	Lists the parameters for the device; all configurable and read-only parameters appear here (see Figure 2-15)
Identities	Lists the alarms information for the device which is used by the MIB browser to make trap messages more meaningful (see "Alarms in MIB Browser" on page 28.)
Conformities	A group of standard MIB information that guarantees that the MIB conforms to standard SNMP format

To view a complete list of the parameter settings on the X50, walk the MIB for that X50, walk the X50 at an IP address, or walk the X50 type.

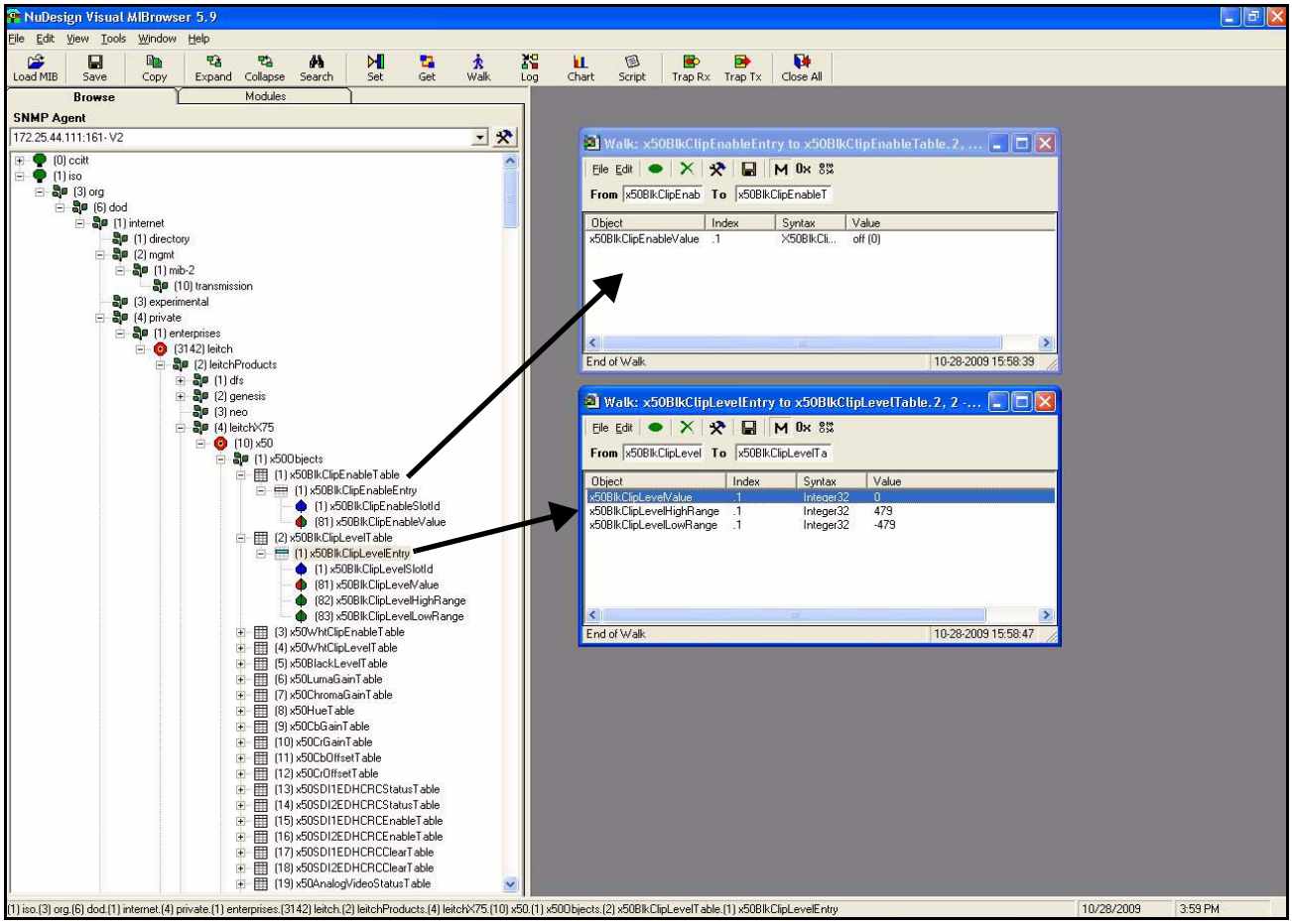

Figure 2-15. Typical MIB Loaded into NuDesign MIB Browser

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Navigating Parameters in a Leitch MIB

X50 MIBs make it possible to view a parameter's range, walk a device or a frame, or receive alarm traps for a device (see Figure 2-16). For details on accessing these features, see the documentation that accompanies your third-party control software.

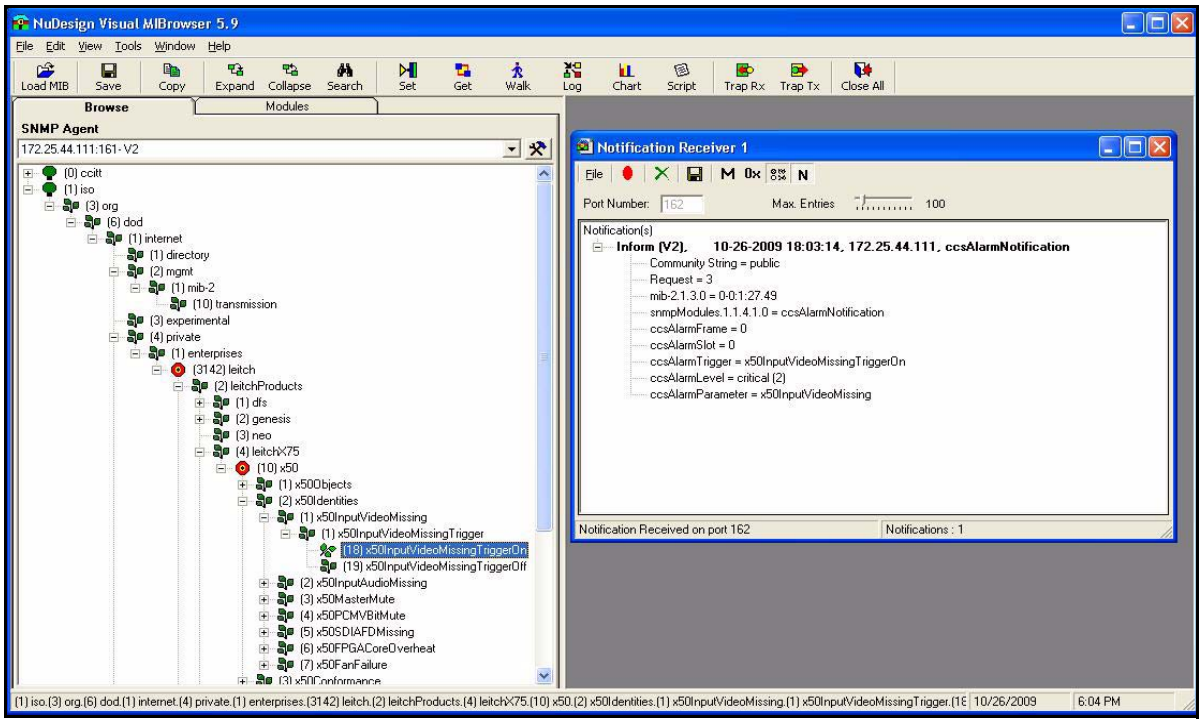

Figure 2-16. Alarms in MIB Browser

Parameters that have a limited list of options have two listings under the **Entry** branch of the tree. Parameters that have a range (as in a slider) of options have four listings under the **Entry** branch of the tree.

Table 2-4. Sub-Branches Under a Parameter in a Leitch MIB

Sub-Branch	Contains
Slot ID	(Does not apply to the X50)
Value	The current setting of this parameter
High Range (slider ranges only)	The top value of this parameter
Low Range (slider ranges only)	The bottom value of this parameter

For information on the parameters for each individual device, see that device's documentation, posted on our website. Some Harris products have HTML forms that display their parameters, and these are also posted on our website.

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Chapter 3

Controls

Overview

You can control the X50 using many different interfaces:

- Local front panel X50 controls
- Remote front panel controls on other X50 units
- CCS Level 3-enabled control hardware and software products
- X50 Web browser

Front Panel Controls

The X50 supports local and remote front panel control, CCS software, CCS-enabled controls panels, SNMP, and web browsers. At the control panel, you can change parameters using the rotary switch, push buttons, status LEDs, and VFD. When using the control panel, you will find some entries in the main menu begin with a ✚ symbol. This indicates there are multiple levels for that item. Complete lists of basic and advanced control parameters are available in the X50/X75/X85 CD-ROM package.

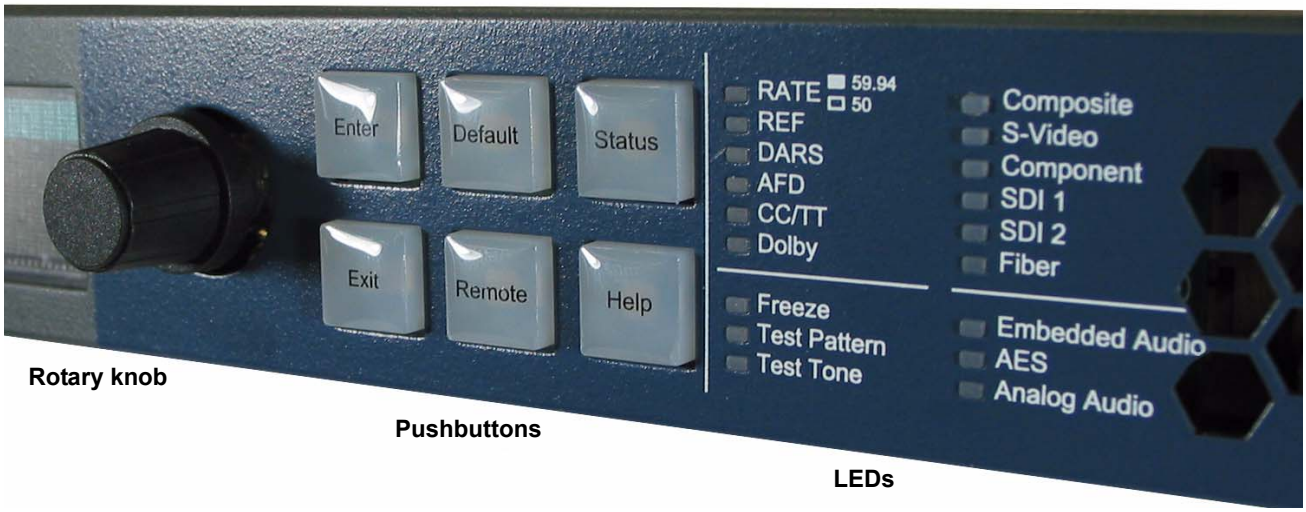

Figure 3-1. X50 Controls and LEDs

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Pushbuttons

Table 3-1. Pushbutton Controls

Name	Function
Enter	Selects or “takes” an option or value in a parameter
Exit	Exits from one level in the parameter tree to a higher lever in the tree
Default	Resets all of the X50 parameters to their default values, and flashes when you have selected a default value for a parameter (to reset all of the parameters using this control, you must press and hold the button for one second)
Remote	Enables the controls to operate other remote X50, X75, and X85 units (to activate this control, you must press and hold the button for one second)
Status	Displays the current machine status and/or error conditions (the VFD switches back to *control* mode to display the menu structure when you press the Enter or Exit button; hold the button for one second to obtain a list of alarms and their options)
Help	Displays a brief description of a selected parameter’s function (hold the button for one second to view the control panel’s display options)

LEDs

When LEDs are *lit*, the item next to the LED is either selected, enabled, or present. A *flashing* LED indicates the item is in an error condition. An LED that remains *unlit* is either not applicable, or—in the case of **Rate**—indicates an output frame rate of 50.

Table 3-2 provides additional information about the left-side LEDs.

Table 3-2. Left-Side LEDs

Name	Meaning when Lit
Power 1 and Power 2	Indicates which power supplies are in use
Mem Active	Shows that the internal or SD card memory is in use; normal operation of the X50 may be interrupted
Audio Card	Indicates the presence of an advanced audio module (future use)
Upgrading	Indicates the X50 software is being upgraded; normal operation is interrupted

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Main Menu Items

Table 3-3. Main Menu

Name	Function
Video	Provides parameters for changing video settings
Audio	Provides parameters for changing audio settings
Reference	Sets the reference standard for the system
System Setup	Sets the options for general system setup; also includes network IP addresses, factory recall , and entry to the advanced controls
Input Video Select	Selects the video source to be processed
SDI 1 Output Format	Selects the output video format on SDI 1
SDI 2 Output Format	Selects the output video format on SDI 2
Analog/HDMI Output Select	Selects the video source for the analog/HDMI video outputs
Output Frame Rate	Sets the output frame rate
Input Audio Select	Selects the source audio to be processed

Advanced Controls

Advanced controls are designed for unusual applications, providing exceptional flexibility for the demands of professional video production facilities.

Note

When you disable **Advanced Controls** in the **System Setup** menu, those controls are hidden from view in the web browser.

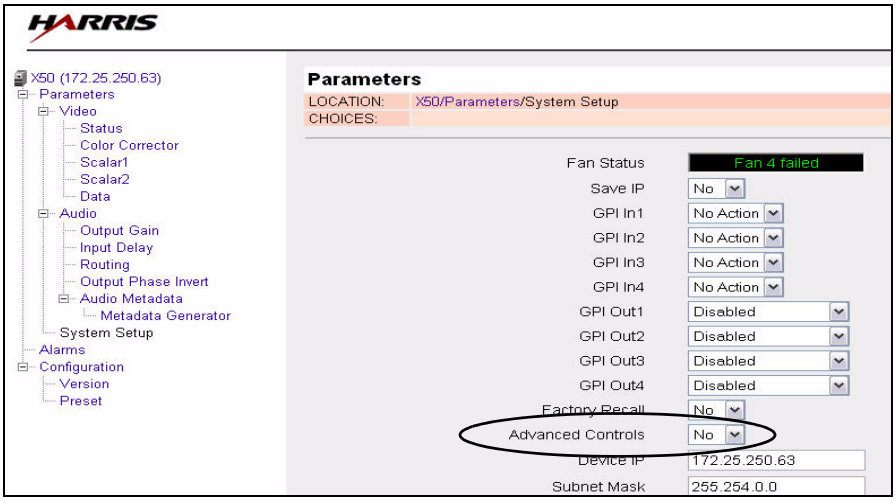

Figure 3-2. Web Browser With Advanced Controls Disabled

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If you are using the web browser control and need to enable the **Advanced Controls** mode, you must refresh the browser to have the full set of menu items appear on the left panel. Similarly, after disabling the **Advanced Controls** mode, you should refresh the browser to have the full set of menu items disappear on the left panel. Otherwise, these menu items will bring you to blank pages.

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Aspect Ratio Conversion

You can set the output aspect ratio conversion using **Custom**, **Standard**, or **Automatic** controls. These three methods are found in the **ARC Preset** parameter, with the following options.

- Custom
- Standard ARCs
  - Anamorphic
  - 4:3 Pillar Box
  - 14:9 Pillar Box
  - 16:9 Cut
  - 4:3->21:9 Ltr
  - 16:9 Letter Box
  - 14:9 Letter Box
  - 4:3 Cut
  - 16:9->21:9 Ltr
- Automatic ARCs
  - AFD
  - AFD - ALTR
  - VI
  - VI - ALTR
  - WSS
  - WSS - ALTR

Depending on the current conversion mode (Up, Down, Cross, or SD-ARC), different subsets of these options will be in effect. Thus, for example, an ARC setting that is visible in upconversion may not be visible in downconversion.

Custom ARC

To make a custom ARC setting, select options in the **Advanced**, **Variable**, and **Crop** parameters of **Scalar 1** and **Scalar 2**.

Note

When individual values are matched with a particular pre-defined standard aspect ratio, **ARC Preset** will change, to reflect that matching standard aspect ratio.

Automatic ARC

Active Format Description (AFD), *Video Index* (VI), and *Wide-Screen Signalling* (WSS) are different systems in which embedded data automatically control the output aspect ratio. When you set **ARC Preset** to **AFD**, **AFD-ALTR**, **VI**, **VI-ALTR**, **WSS**, or **WSS-ALTR,** the X50 converts the aspect ratio according to the upstream AFD, VI, or WSS code.

The **x-ALTR** versions of these options interpret the code in an alternative way.

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AFD transmits data in the VANC space of the SDI signal, enabling both 4:3 and 16:9 television monitors to optimally present video with preset ARC and safe area information. Without AFD, converted video may appear distorted or "cut off" when it appears on different monitors.

See Figure 3-3 on page 34 for a comparison of AFD and non-AFD aspect ratio conversion.

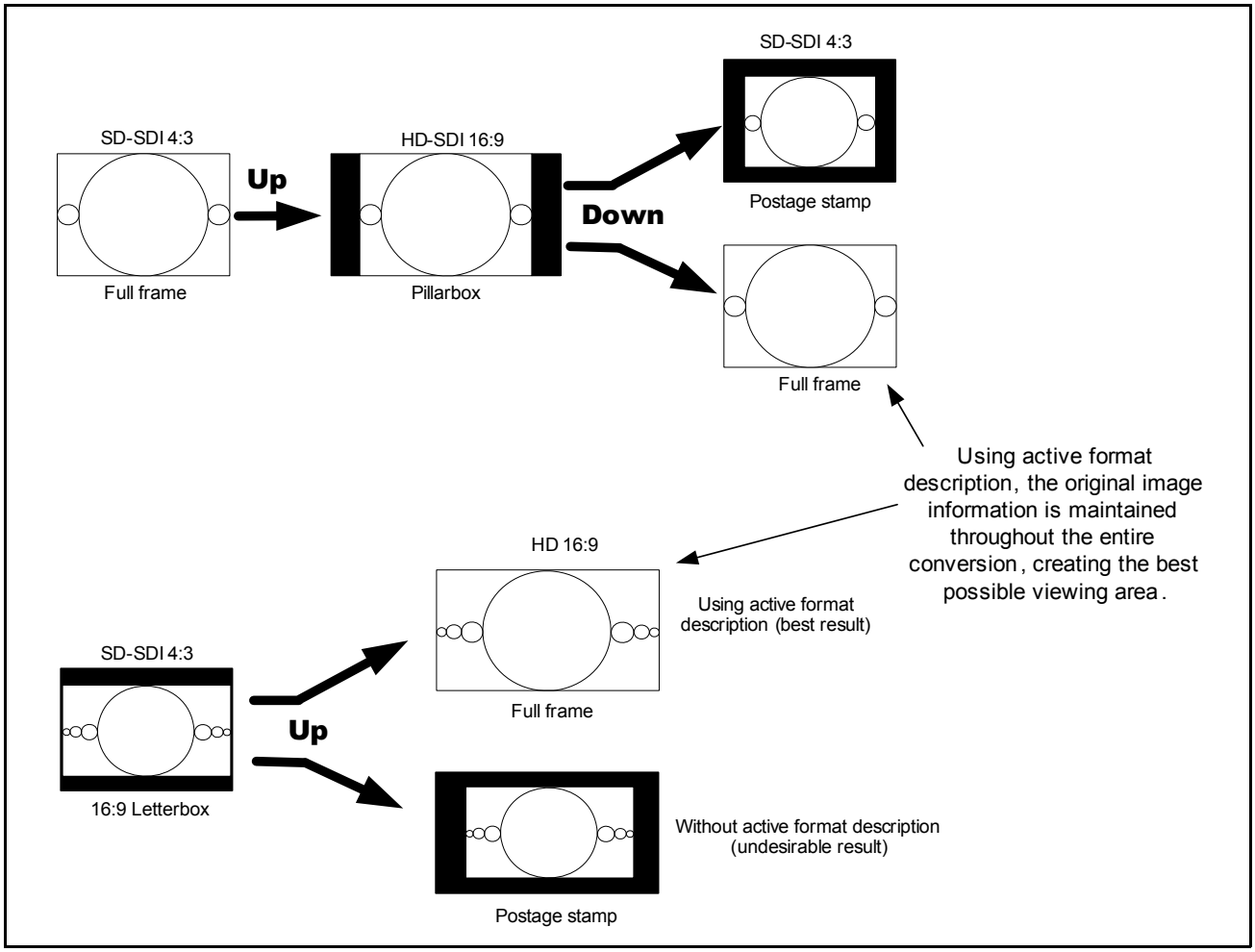

Figure 3-3. AFD and Non-AFD ARC

VI provides embedded code in 525-line and 625-line component digital video signals. This code makes it possible for picture and program related source data to be carried in conjunction with a video signal.

WSS is embedded code in a 625-line system. It contains information on the aspect ratio range of the transmitted signal and its position as it would appear on a conventional 4:3 display.

Figure 3-5 on page 36 and Figure 3-6 on page 37 show the different AFD, VI, and WSS code selections. Figure 3-4 on page 35 explains the meanings of the diagrams.

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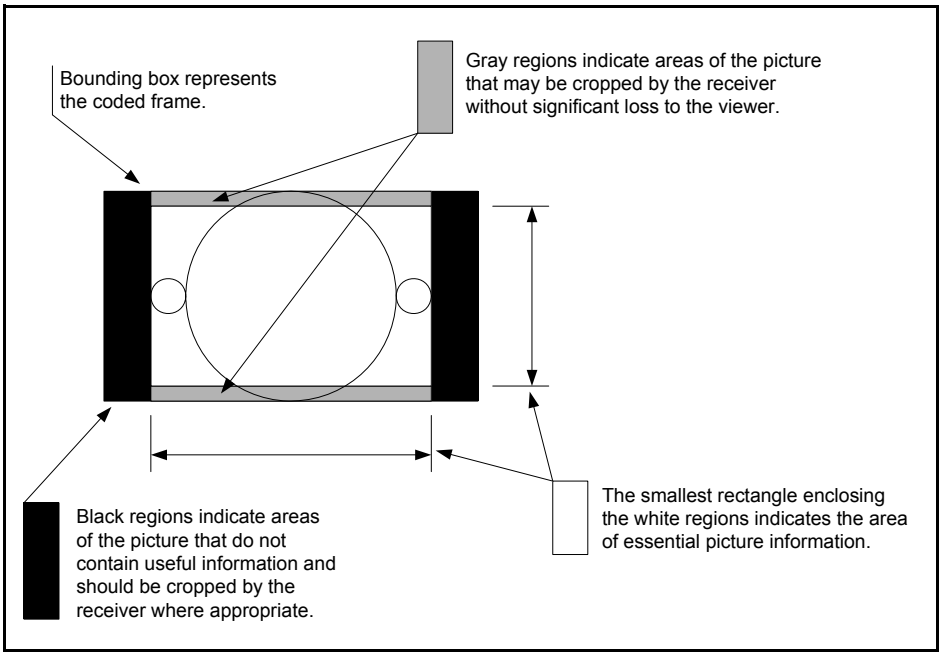

Figure 3-4. AFD Diagram Explanation

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AFD 4:3 code and description

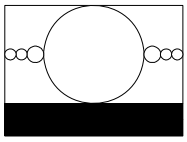
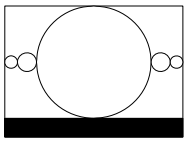
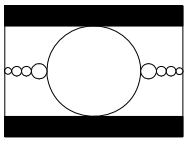
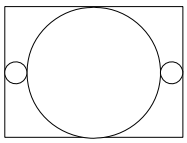
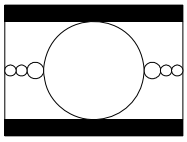
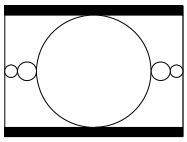
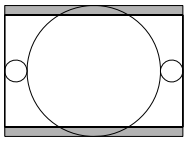
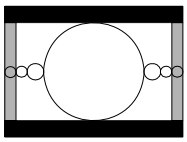
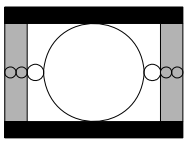
WSS name	AFD and VI Select parameter options	Illustration in a 4:3 coded frame	Description
16:9 Top	16:9 Top		Image with a 16:9 aspect ratio as letterbox at the top of a 4:3 coded frame
14:9 Top	14:9 Top		Image with a 14:9 aspect ratio as letterbox at the top of a 4:3 coded frame
>16:9	>16:9 in 4:3		Image with aspect ratio greater than 16:9 as a vertically centered letterbox in a 4:3 coded frame
Full Frame	4:3 Full		Image is full frame, with an aspect ratio that is the same as the 4:3 coded frame
16:9 Center	16:9 L		Image with a 16:9 aspect ratio as a vertically centered letterbox in a 4:3 coded frame
14:9 Center	14:9 L		Image with 14:9 aspect ratio as a vertically centered letterbox in a 4:3 coded frame
Full A 14:9	4:3 A 14:9		Image with a 4:3 aspect ratio and with an alternative 14:9 center in a 4:3 coded frame
None	16:9 L A 14:9		Image with a 16:9 aspect ratio and with an alternative 14:9 center as a vertically centered letterbox in a 4:3 coded frame
None	16:9 L A 4:3		Image with a 16:9 aspect ratio and with an alternative 4:3 center as a vertically centered letterbox in a 4:3 coded frame

Figure 3-5. AFD Descriptions for 4:3

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AFD 16:9 code and description

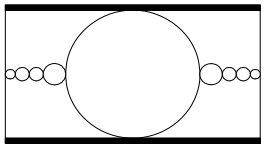
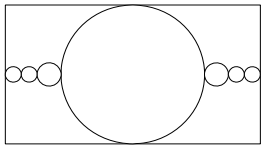
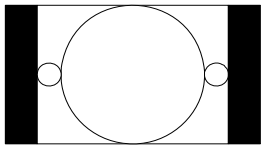
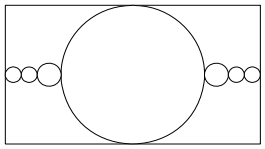
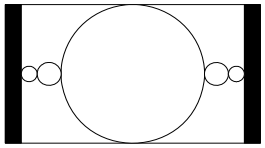
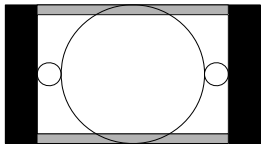
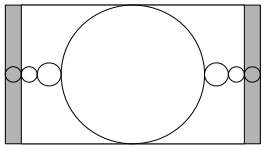
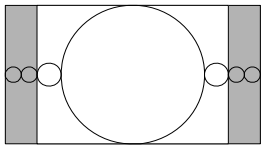
WSS name	AFD and VI Select parameter options	Illustration in a 16:9 coded frame	Description
None	>16:9 in 16:9 AFD Code: 0100		Image with aspect ratio greater than 16:9 as a vertically centered letterbox in a 16:9 coded frame
Anamorphic	16:9 Full AFD Code: 1000		Image is full frame, with an aspect ratio that is the same as the 16:9 coded frame
None	4:3 P AFD Code: 1001		Image with a 4:3 aspect ratio as a horizontally centered pillarbox image in a 16:9 coded frame
None	16:9 Prtctd AFD Code: 1010		Image is full frame, with a 16:9 aspect ratio and with all image areas protected
None	14:9 P AFD Code: 1011		Image with a 14:9 aspect ratio as a horizontally centered pillarbox image in a 16:9 coded frame
None	4:3 P A 14:9 AFD Code: 1101		Image with a 4:3 aspect ratio and with an alternative 14:9 center as a horizontally centered pillarbox image in a 16:9 coded frame
None	16:9 A 14:9 AFD Code: 1110		Image with a 16:9 aspect ratio and with an alternative 14:9 center in a 16:9 coded frame
None	16:9 A 4:3 AFD Code: 1111		Image with a 16:9 aspect ratio and with an alternative 4:3 center in a 16:9 coded frame

Figure 3-6. AFD Descriptions for 16:9

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Examples of Automatic Aspect Ratio Conversion

You can enable automatic ARC controls by setting the **ARC Preset** parameter to **AFD**, **AFD-ALTR**, **VI**, **VI-ALTR**, **WSS,** or **WSS-ALTR**. When you set **ARC Preset** to **AFD** and the upstream video has AFD code embedded in it, the system will present the video signal in the appropriate aspect ratio, and generate new downstream AFD code accordingly. (You can confirm that AFD is available in the input signal by checking the **AFD Present** parameter.)

For example, in upconversion mode, an upstream signal with an AFD code of **1000** indicates the output will be a full frame 4:3 image. The X50 creates a **4:3 Pillar Box** arc, and the output HD image becomes a 4:3 pillar box. The resulting AFD code becomes **1001** (4:3 center).

In another example, the X50 is in downconversion mode. The upstream signal has AFD code **1111,** indicating a 16:9 ratio with alternative 4:3 center. If you set the **ARC Preset** parameter to **AFD**, the X50 creates an output of 16:9 letter box and the resulting AFD code becomes **1111**. If you set **ARC Preset** to **AFD-ALTR**, system does a center cut ARC, the output becomes 4:3 full, and the resulting AFD code becomes **1000**. This result is commonly used in the USA.

Figure 3-7 on page 39 to Figure 3-10 on page 42 show all of the conversion patterns.

In the event that the current ARC is controlled by AFD, VI or WSS, and this data disappears from the input signal, the X50 provides you with two options:

- Retain the current aspect ratio as set by the last AFD, VI, or WSS data.
- Reset to the aspect ratio settings that were in use before the AFD, VI, or WSS data took control

The **Auto ARC Reset** parameter controls this feature. Select **Yes** to have the module reset to older values in the event of loss of data; select **No** (the default) to retain the current ARC.

Some AFD code “encourages” cropping out some of the active video area. To prevent this, set **AFD Crop Enable** to **Disable**.

The **Out Aspect Ratio** parameter controls the output aspect ratio of the SD signal, and it will affect how the AFD performs the automatic conversion. (It is assumed that an SD signal may be either 4:3 or 16:9, but an HD signal will always have a 16:9 ratio.) The default value of the **Out Aspect Ratio** parameter is **4:3.**

Output AFD, VI and WSS

You can insert AFD, VI and WSS data into an output video stream either manually or automatically. This function is controlled by the **AFD Control, VI Control,** and **WSS Control** parameters. If you are using VI according to the SMPTE proposed RP-186+ standard as of January 11, 2007, you must ensure you have enabled the standard by setting **Enable AFD in VI**, (located in the same path as the other output control).

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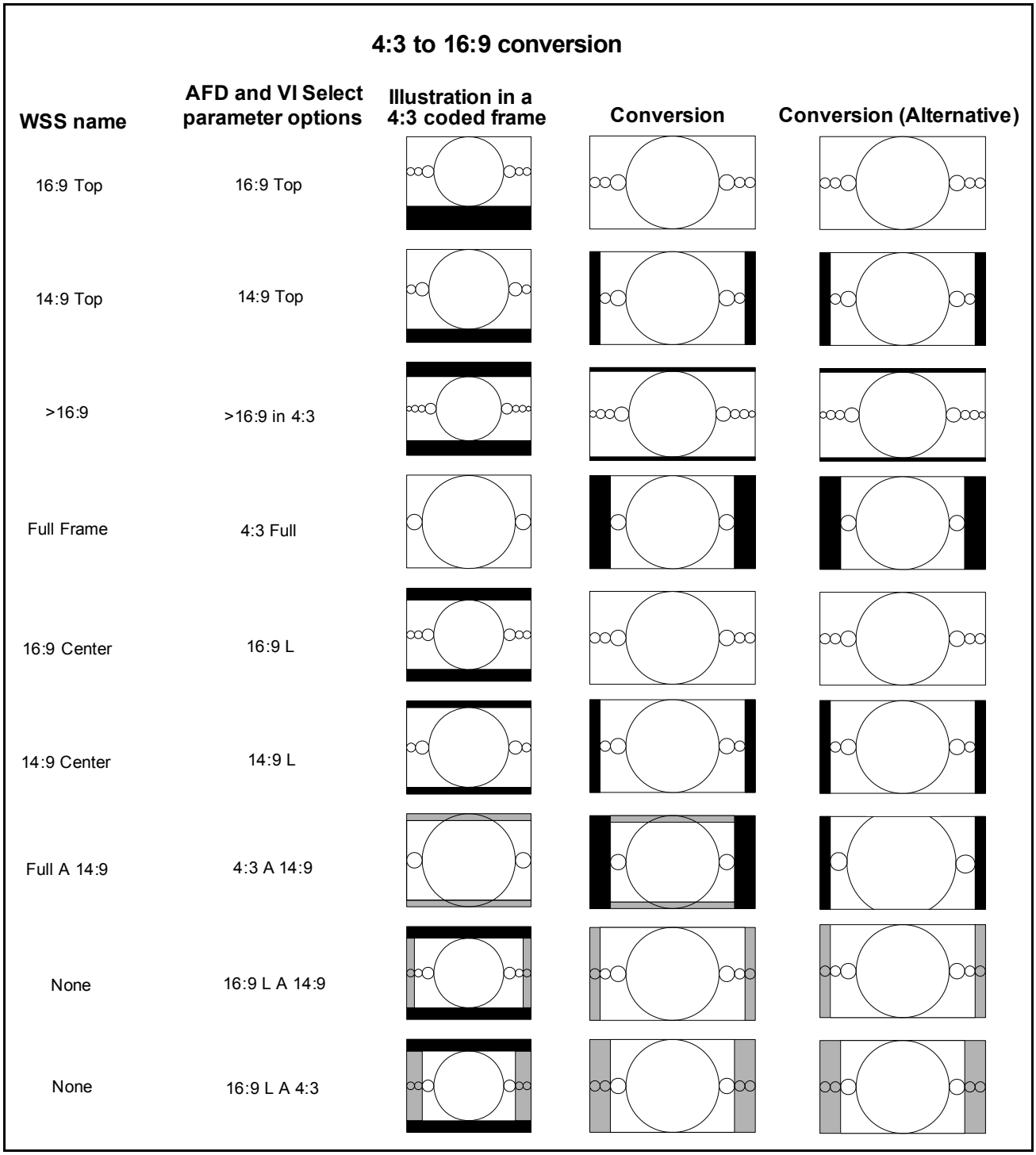

Figure 3-7. 4:3 to 16:9 Conversion

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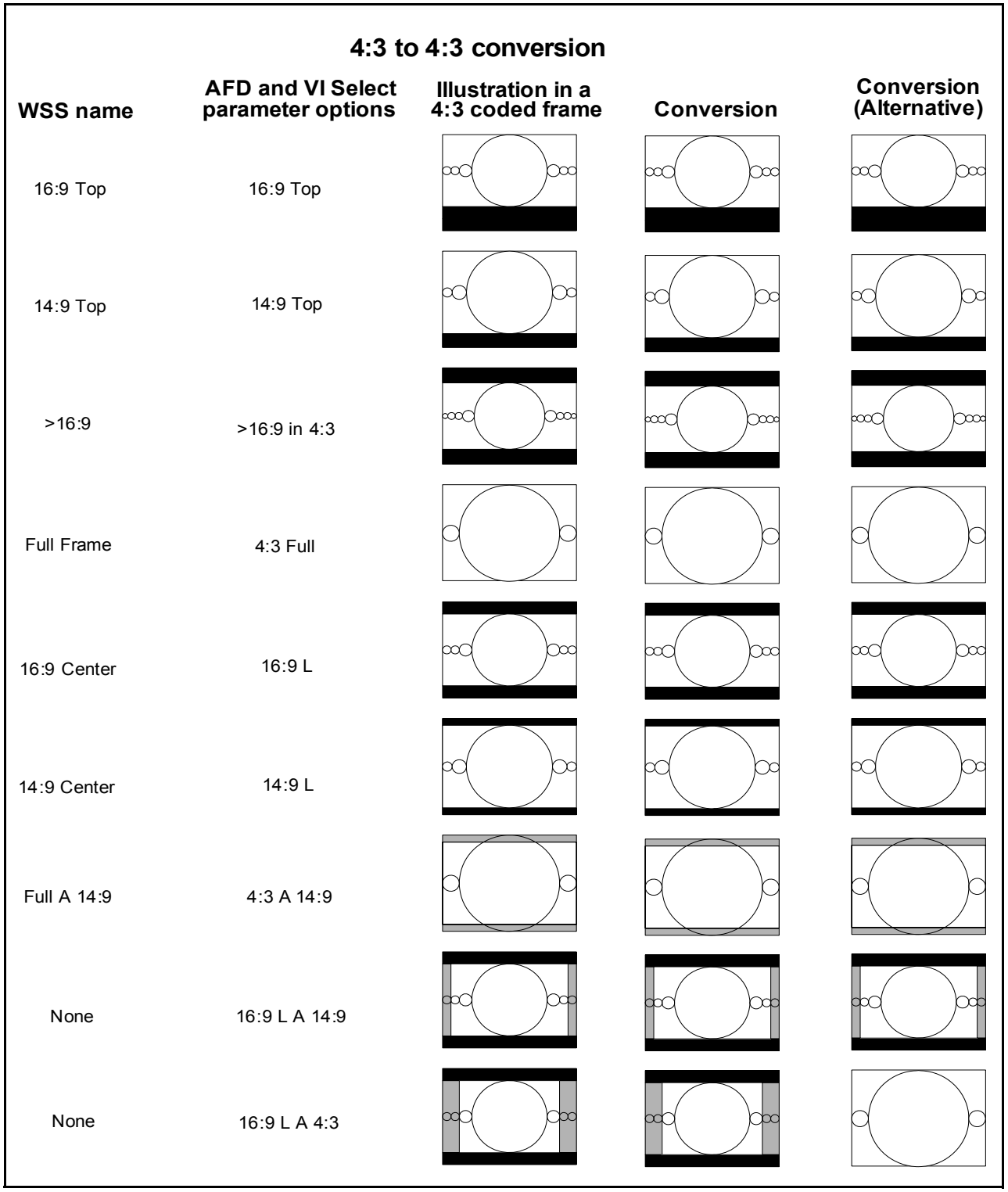

Figure 3-8. 4:3 to 4:3 Conversion

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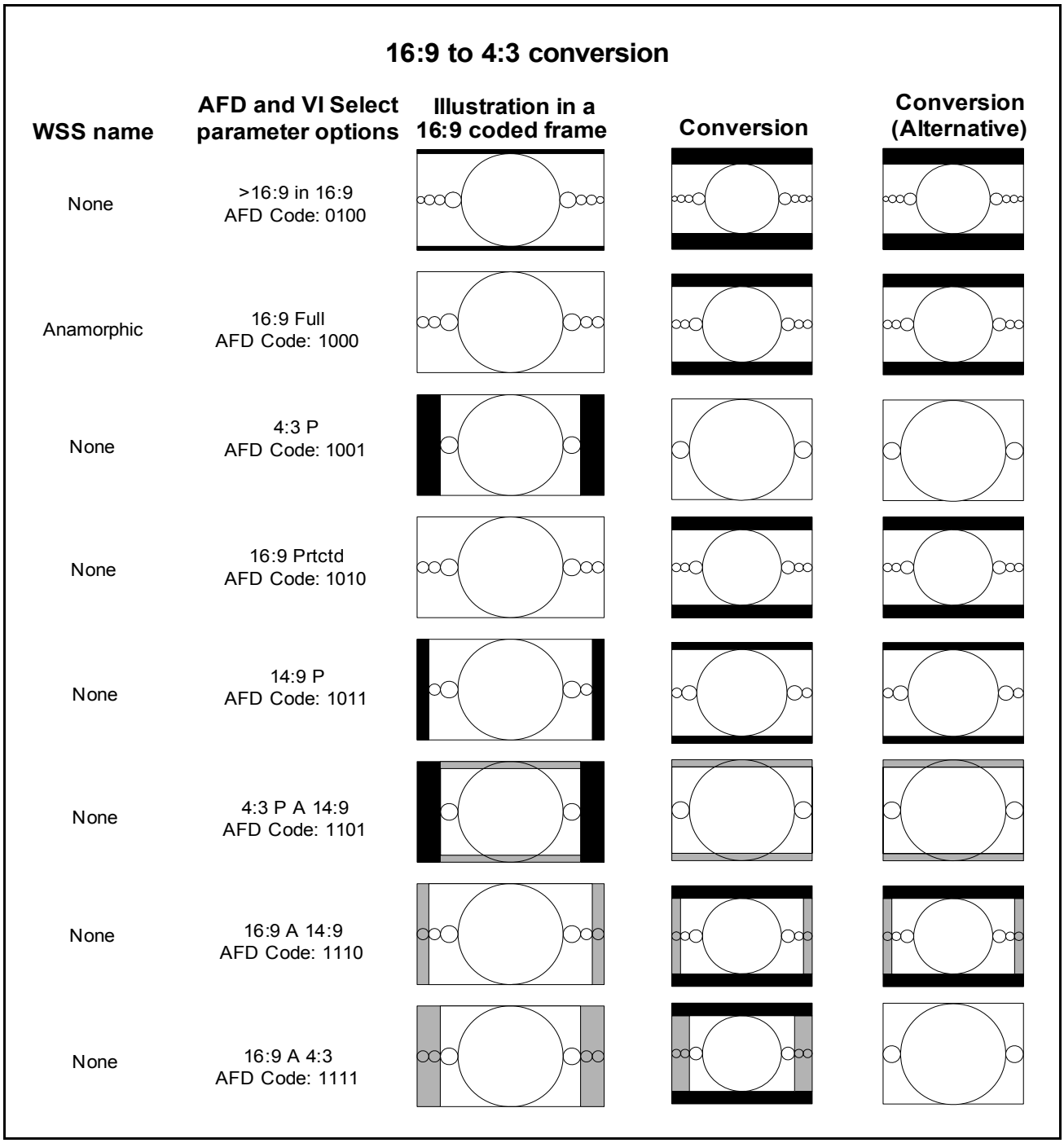

Figure 3-9. 16:9 to 4:3 Conversion

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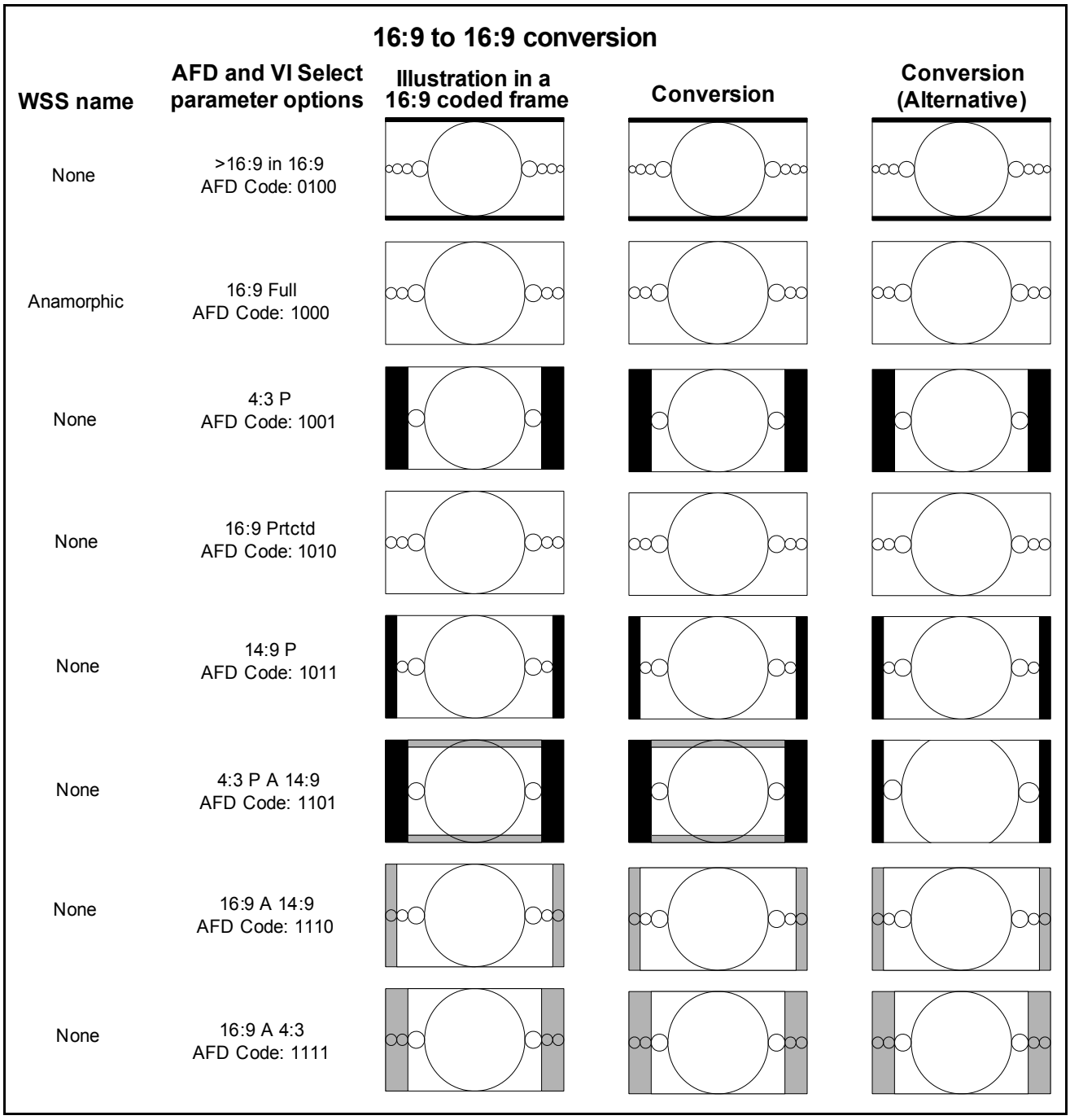

Figure 3-10. 16:9 to 16:9 Conversion

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Closed Captioning and DVB Teletext Captioning

Although North America has dedicated standards for closed captioning of video (EIA-608 and 708), many countries in Europe and elsewhere have not yet adopted formal standards. For these countries, closed captioning is part of the DVB Teletext System as described in ITU-R BT-653-3. These specifications define all Teletext Systems (Systems A, B, C, D) used in the world and are also known as the World System Teletext (WST). A Teletext system is made of several pages of various data information and CC data is described in one these pages. System B is used in Australia, the UK, and Germany, among other countries.

Australian closed captions are inserted on line 21/334 in analog PAL broadcast signals, as per the ITU-R BT-653-3. When analog PAL is produced or converted to SDTV (625 digital), a digitized version of the closed captioning appears on line 21/334 (in the same way line 21 on NTSC signals is digitized and appears on the line 21 of SD-SDI signals). The document proposed by Free TV Australia indicates how to carry this CC data into the VANC area of SD-and HD-SDI signals by use of the SMPTE 334M VANC embedding protocol. For digital broadcasting, Australia intends to use the ETSI EN 300 472 standard that specifies the conveyance of ITU-R System B Teletext in DVB bit streams.

Closed Captioning and Teletext data that is embedded in the input stream is detected by the **CC/TT Present** parameter. This information is re-embedded into output video stream when you set the **CC/TT Embed** parameter to **On**.

Color Correction

The color corrector changes the following attributes of an input signal:

- Gain
- Offset
- White Slope
- Black Stretch
- Gamma Correction

These parameters include “lock” options that make it possible for you to adjust all of the options of a particular group in tandem, rather than separately.

White Slope and Black Stretch

The white slope is comprised of **G White Knee**, **B White Knee**, **R White Knee**, and **GBR White Knee Lock**. **Black Stretch** includes **G Black Knee, B Black Knee, R Black Knee**, and **GBR Black Knee Lock**.

Component knees determine the amount of additional gain applied to segments at the ends of the RGB transfer functions in the look-up tables.

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The values displayed are a percent of the available correction. A positive white knee increases the slope of the last 15% of RGB values, and decreases the slope of the preceding 15%. A positive black knee parameter will increase the slope of the first 15% of the transfer function by the amount entered and decrease the slope of the next 15%, to return to the unmodified transfer function. Each component knee is added to the total knee (the sum cannot exceed 100%) to produce the correction applied to the respective component.

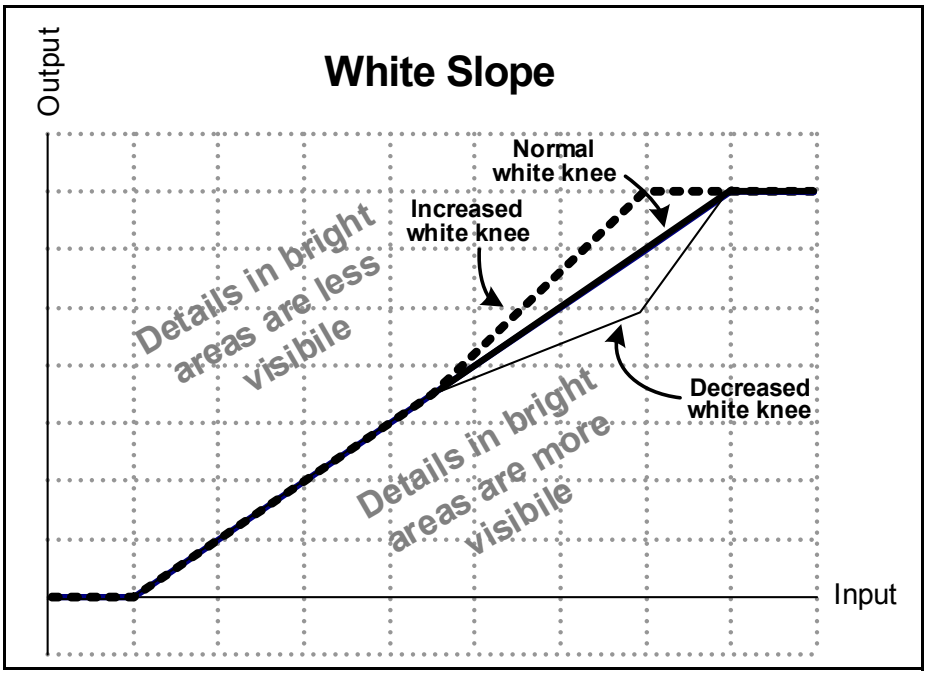

Figure 3-11. Examples of Increased and Decreased White Slope

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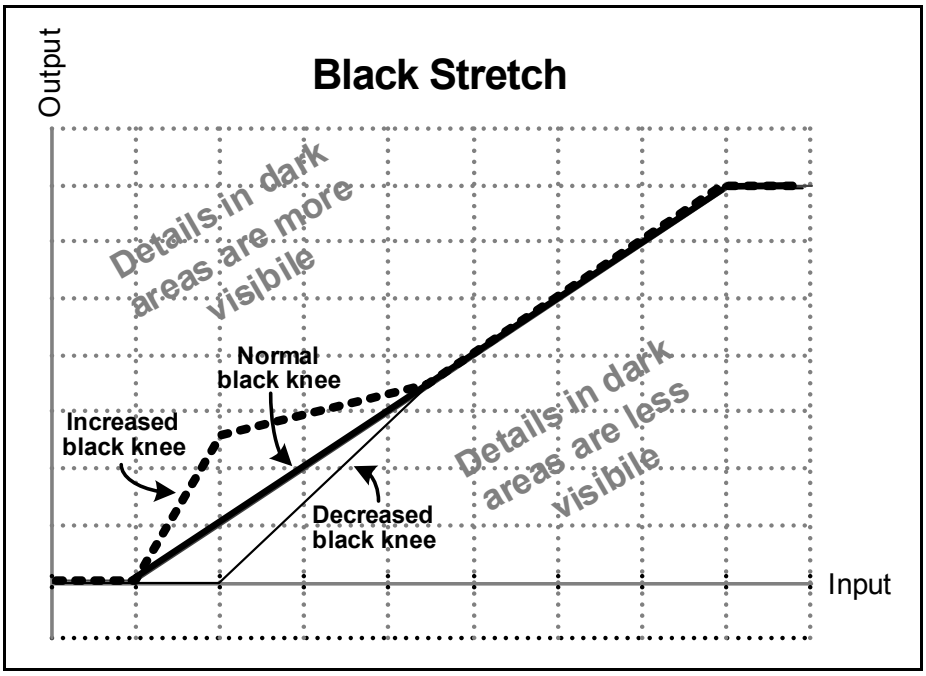

Figure 3-12. Increased and Decreased Black Knees

Gamma Correction

Gamma correction is applied to the RGB as a simple power function, and is applied to each component independently.

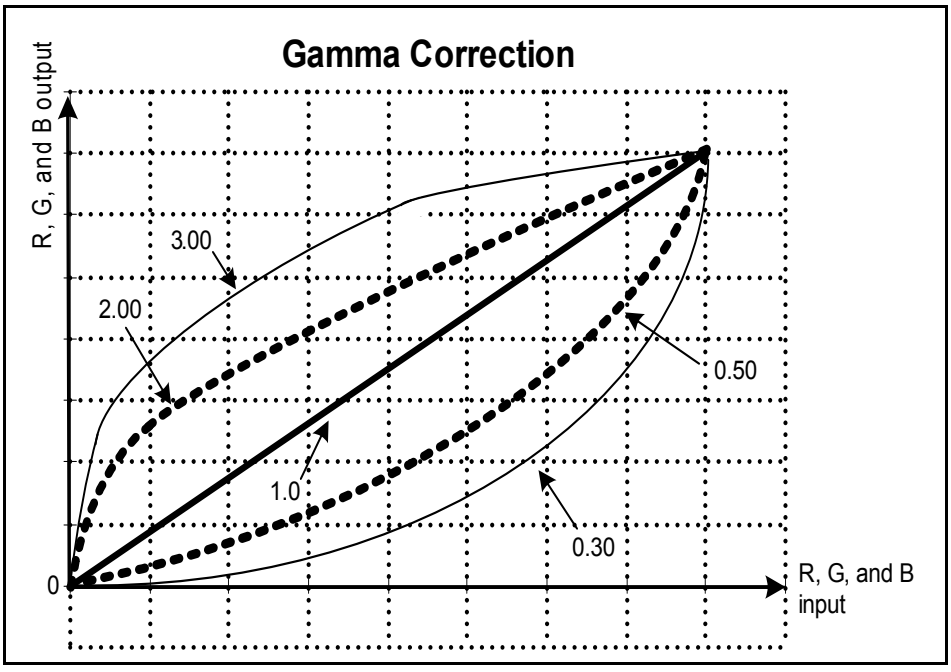

Figure 3-13. Example of Gamma Corrections to R, G, and B

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Custom Splash Screen

You can add your station's logo or any other graphic to the startup splash screen on the VFD of the X50. To add a custom graphic, follow these steps:

1. Create a 24-bit Windows bitmap file of the size 128x32, using a graphics program.
2. If the logo has a background color of black, save the bitmap file as **logo.bmp**

   Or

   If the logo has a background of white, save the bitmap file as **logo-i.bmp** (the application will invert the colors of the logo before displaying).
3. Upload the file via Navigator's file transfer tab (or via FTP) to **/config**
4. Reboot the X50 to see the logo displays briefly.

Note

If both **logo.bmp** and **logo-i.bmp** exist and are valid images, **logo.bmp** will be used.

Limitations on the Secondary Channel

The second video channel of the X50 is subject to certain timing limitations.

H-Phase and **V-Phase** parameters make it possible to adjust reference signals for a wide range of formats. However, these parameters control the timing for both channels of video. The two video channels cannot be phased independently of each other. The ranges of the **H-Phase** and **V-Phase** parameters are based on the output standard of the primary channel.

Similarly, the **Audio/Video Sync** parameter provides automatic tracking of the audio and video signals (see Figure 3-15 on page 49). However, this timing is based on the output of the primary channel. Different formats may have different propagation delays, and thus, caution may be needed to ensure the secondary channel audio and video tracking is correct.

Auto Route Feature

The X50 is designed to automatically route an alternate video source if the **Primary Input** selection fails. The **Backup Input 1** selection is the first alternate video source; if that source fails, the next priority is given to the selected source in **Backup Input 2**.

The **Auto Switch Delay** parameter makes it possible for you to set the amount of delay before the X50 switches to the next backup input. The adjustable range is between 0 and 5 seconds.

If the **Primary Input** signal returns when the X50 is routed to **Backup Inputs 1** or **2**, the X50 reverts to the **Primary Input** signal. The **Auto Route** feature is only available in the **Advanced Controls** mode.

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Proc Bypass

Proc Bypass is an option found in the **SDI1 Out Format** and **SDI2 Out Format** parameters. In the X50, this function bypasses the scalar and all processing (noise reduction, detail enhancement, color correction, etc.) but is downstream of the frame synchronization.

Audio Processing

The **Input Audio Select** parameter selects the audio source to be routed to all audio outputs. This pre-empts individual audio controls. The default **Map Through** option routes demux audio to mux and HDMI outputs, and AES audio to AES and analog outputs.

Figure 3-15 on page 49 shows the audio routing in the X50.

The **AES Present, Analog Present**, and **DMX Channel Present** read-only parameters display the status of the incoming audio feeds. When you select these parameters, each of the eight channels is displayed as a symbol.

The **AES Present** parameter has a unique feature that notifies you when an AES signal is available for that channel (visible as a **P** symbol on the channel), but the channel has been set to an analog input.

See Figure 3-14 on page 47 for an explanation of these symbols .

Caution

The analog audio output of the X50 is always low-impedance. To ensure that you do not overload the audio output, always connect to high impedance downstream.

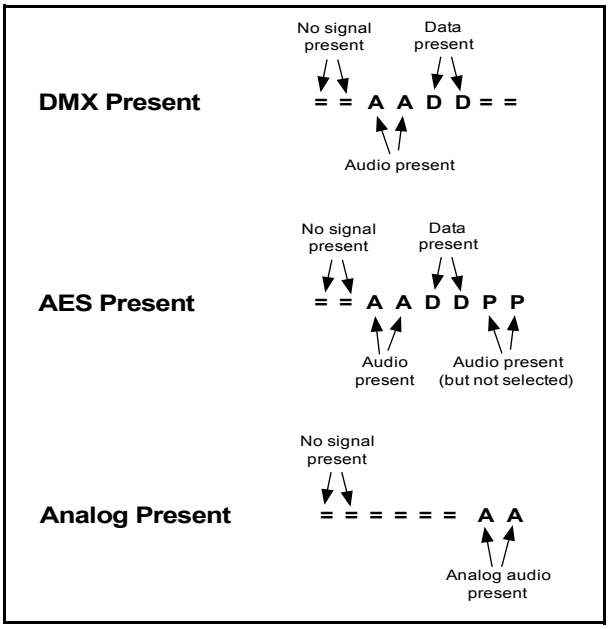

Figure 3-14. Audio Status Parameters

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Audio Metadata

The audio metadata feature de-embeds audio metadata from various sources and then re-embeds the audio metadata into multiple outputs.

The audio metadata source may be one of the following:

- Metadata embedded in SDI (Methods A and B)
- Input of the serial port
- Metadata generator

The audio metadata may be inserted into the following outputs:

- SDI 1 and SDI 2 (Methods A and B)
- Serial port

Once the source is selected, it applies to all of the outputs.

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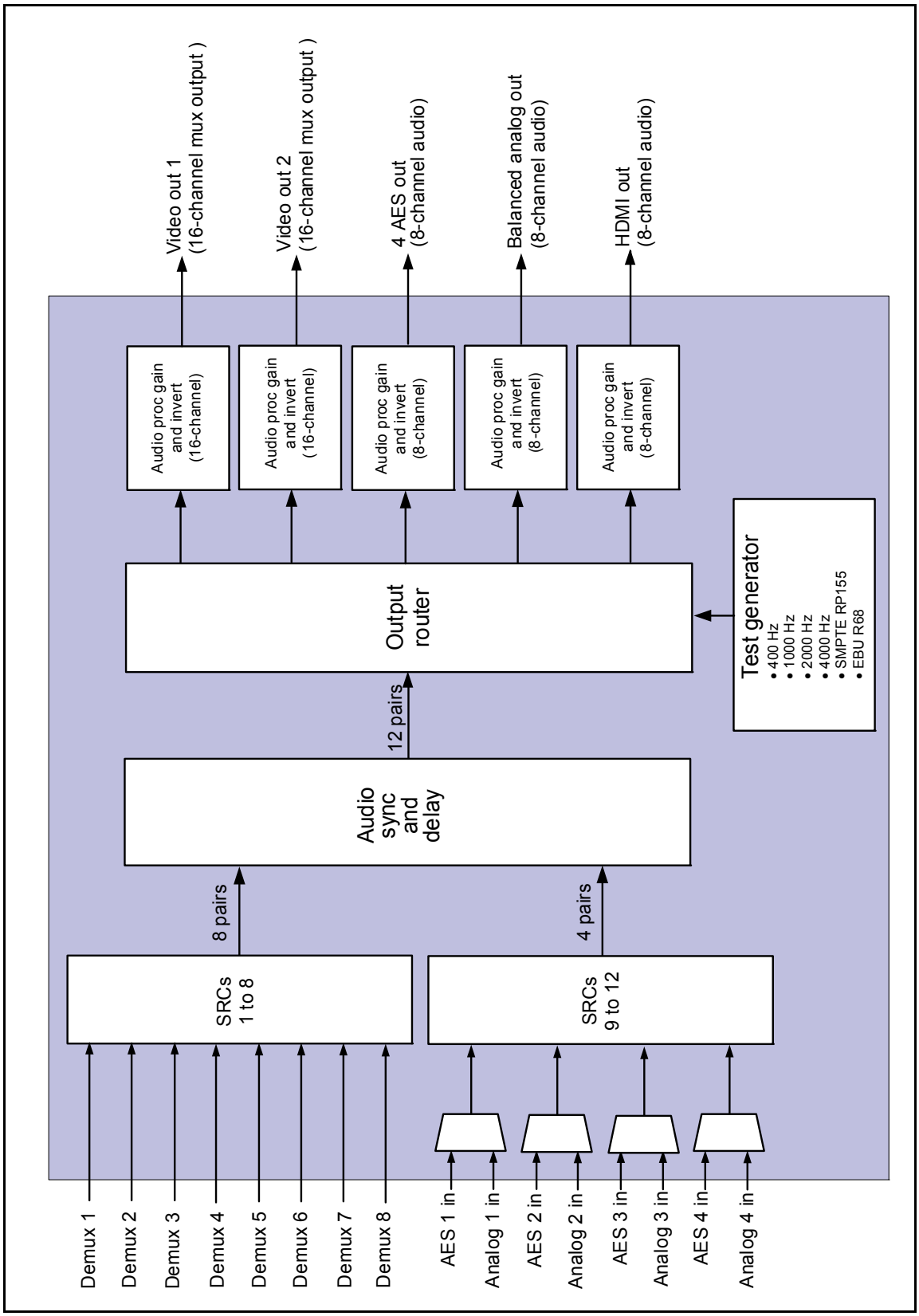

Figure 3-15. X50 Audio Routing

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Chapter 4

Specifications

Conversion Capabilities

The X50 can convert any of the input signals and formats listed in Table 4-1 to any of the specified output signals and formats. (The symbol **Y** indicates that the designated format conversion is supported.).

Table 4-1. X50 Supported Conversion Formats

		Outputs											
		486i/ 59.94	**720p/ 59.94**	**1080i/ 59.94**	**1080p/ 23.98***	**1080p/ 59.94**	**1080p/ 59.94 DL***	**576i/ 50**	**720p/ 50**	**1080i/ 50**	**1080p/ 25**	**1080p/ 50**	**1080p/ 50 DL***
Input	**480i/59.94**	Y	Y	Y	Y2	Y	Y						
	720p/59.94	Y	Y	Y	Y2	Y	Y						
	1080i/59.94	Y	Y	Y	Y2	Y	Y						
	1080p/23.98	Y1	Y1	Y1	Y	Y1	Y1						
	1080psf/23.98	Y1	Y1	Y1	Y	Y1	Y1						
	1080p/59.94	Y	Y	Y	Y2	Y	Y						
	1080p/59.94 DL*	Y	Y	Y	Y2	Y	Y						
	576i/50							Y	Y	Y	Y	Y	Y
	720p/50							Y	Y	Y	Y	Y	Y
	1080i/50							Y	Y	Y	Y	Y	Y
	1080p/25							Y	Y	Y	Y	Y	Y
	1080p/50							Y	Y	Y	Y	Y	Y
	1080p/50 DL*							Y	Y	Y	Y	Y	Y

Y1 indicates that 2:3 cadence is used; Y2 indicates material with 3:2 cadence converted with no motion artifacts

* DL = Dual Link 3 Gb/s and Level B 3 Gb/s

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Video Input

3G/HD/SD-SDI

Table 4-2. 3G/HD/SD-SDI Input Video Specifications

Item	Specification
Number of inputs	2
Standard	• 3G: SMPTE 424M (2.97, 2.97/1.001 Gb/s) • HD: SMPTE 292M (1.485, 1.485/1.001 Gb/s) • SD: SMPTE 259M-C (270 Mb/s, 525/625 component video)
Connector	BNC (IEC169-8)
Impedance	75Ω
Return loss	• >10 dB, typical, from 5 MHz to 2970 MHz • >15 dB, typical, from 5 MHz to 1485 MHz • >20 dB, typical, from 5 MHz to 270 MHz
Equalization	• 3G: Adaptive cable equalization for up to 164 ft (50 m), typical, of Belden 1694A co-axial cable • HD: Adaptive cable equalization for up to 492 ft (150 m) typical, of Belden 1694A co-axial cable • SD: >23 dB Belden 8281 co-axial cable

Fiber (OP+SFP+TR13P Module)

Table 4-3. Fiber Input Specifications

Item	Minimum	Typical	Maximum	Note
Number of LC connector inputs	-	-	1	
Input wavelength	1260 nm	-	1620 nm	
Optical power monitor accuracy	-2 dB	0	2 dB	
Sensitivity at 270 Mb/s (SMPTE 259M)	-	-22 dBm	-20 dBm	Pathological
Sensitivity at 1.5 Gb/s (SMPTE 292M)	-	-22 dBm	-19 dBm	Pathological
Sensitivity at 3 Gb/s (SMPTE 424M)	-	-19 dBm	-18 dBm	Pathological
Overload	0 dBm	-	-	BER = 1E-12 against SDI matrix check field signals for video applications. BER = 1E-12 against PRBS 223-1 for datacom applications.

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S-Video

Table 4-4. S-Video Input Specifications

Item	Specification
Standard	• NTSC • PAL-B • PAL-M
Connector	4-pin DIN

Composite Video

Table 4-5. Composite Video Input Specifications

Item	Specification
Standard	• NTSC (SMPTE 170M) • PAL-B (ITU 624-2) • PAL-M
Connector	BNC (IEC 169-8)
Input level	1.0 V pk-to-pk
Impedance	75Ω
Return loss	>40 dB, 0.1 MHz to 6 MHz
Common mode range	5.0 V
CMRR	60 dB @ 50/60 Hz, 5 V pk-to-pk

Component Video

Table 4-6. Component Video Input Specifications

Item	Specification
Format	Betacam/SMPTE
Connector	BNC (IEC 169-8)
Input level	1.0 V pk-to-pk
Impedance	75Ω
Return loss	>40 dB, 1 kHz to 6 MHz

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Genlock

Table 4-7. Genlock Input Specifications

Item	Specification
Connector	BNC (IEC169-8)
Impedance	75Ω
Return loss	• >40 dB (typical) to 6 MHz • >35 dB (typical) to 30 MHz
Common mode range	5.5 V pk-to-pk
CMRR	60 dB @ 60Hz, 5 V pk-to-pk

Input level	• 1 V pk-to-pk, -5.0 dB to +6.0 dB for NTSC/PAL-B
	• ±300 mV, -3.5 dB to +6.0 dB for Tri-Level Sync:
	  • 1080i: 59.94/50
	  • 1080p: 29.97/25

Signal type	• NTSC/PAL-B Analog Composite • ±300 mV Tri-Level Sync
Standard	• SMPTE 170M (NTSC) • ITU-R BT.470-6 (PAL-B) • SMPTE 274M (1080i, 1080p)

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Video Output

3G/HD/SD-SDI

Table 4-8. 3G/HD/SD-SDI Output Video Specifications

Item	Specification
Number of outputs	2
Standard	• 3G: SMPTE 424M (2.97, 2.97/1.001 Gb/s) • HD: SMPTE 292M (1.485, 1.485/1.001 Gb/s) • SD: SMPTE 259M-C (270 Mb/s, 525/625 component video)
Connector	BNC (IEC169-8)
Impedance	75Ω
Return loss	• >10 dB, typical, from 5 MHz to 2970 MHz • >15 dB, typical, from 5 MHz to 1485 MHz • >20 dB, typical, from 5 MHz to 270 MHz
Signal level	800 mV ± 10%
DC offset	0.0V ± 0.5 V
Rise and Fall Time	• 3G: <135 ps (20% to 80%) • HD: <270 ps (20% to 80%) • SD: 400 - 1500 ps (20% to 80%)
Overshoot	< 10% of amplitude (all outputs terminated)

Jitter	• Timing jitter:
	  • 3G: <2 UI peak to peak
	  • HD: <1 UI peak to peak
	  • SD: <0.2 UI peak to peak
	• Alignment jitter:
	  • 3G: <0.3 UI peak to peak
	  • HD: <0.2 UI peak to peak
	  • SD: <0.2 UI peak to peak

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Fiber (OP+SFP+TR13P Module)

Table 4-9. Fiber Output Specifications

Item	Minimum	Typical	Maximum	Note*
Number of LC connector outputs	-	-	1	
Standards	• 3G: SMPTE 424M • HD: SMPTE 292M • SD: SMPTE 259M			
Peak wavelength	1280 nm	1310 nm	1340 nm	Measured at 25°C
Spectrum width (RMS)	-	1.5 nm	3 nm	
Average output power	-7 dBm	-	0 dBm	
Optical rise/fall time (3G HD-SDI)	-	105/120 ps	165/180 ps	
Extinction ratio	5dB	7 dB	-	
Jitter	-	<110 ps	180 ps	SD-SDI Pathological
	-	<60 ps	100 ps	1.5 G SDI Pathological
	-	<45 ps	70 ps	3G HD-SDI Pathological
Laser safety level	Class 1			

* Rise and fall times, 20% to 80%, are measured following a fourth-order Bessel-Thompson filter with a bandwidth of 0.75 x clock frequency corresponding to the serial data rate.

HDMI

Table 4-10. HDMI Output Specifications

Item	Specification	
Number of outputs	1	
Standards	• 525 • 625 • 1080i/59.94 • 1080i/50	• 1080p/23.98 • 720p/59.94 • 720p/50
Connector	HDMI	
Compliance	HDMI 1.3	

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S-Video

Table 4-11. S-Video Output Specifications

Item	Specification
Standard	• NTSC • PAL-B • PAL-M
Connector	4-pin DIN

Composite Video

Table 4-12. Composite Video Output Specifications

Item	Specification
Standard	• NTSC • PAL-B • PAL-M
Connector	BNC (IEC 169-8)
Resolution	12 bits
Impedance	75Ω
Return Loss	>40 dB, 0.1 MHz to 6 MHz
Frequency response	-1.6 dB at 6 MHz
DC offset	<0.5 mV
Differential gain	<0.5%
Differential phase	≤ 1.2° pk-to-pk
Y/C gain	<1°, typical
Y/C delay	• <10 ns (NTSC) • <23.1 ns (PAL)
Transient response	<0.5% K Factor
SNR	63 dB, typical, luma ramp

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Component Video

Table 4-13. Component Video Output Specifications

Item	Specification
Format	Betacam/SMPTE
Connector	BNC (IEC 169-8)
Resolution	12 bits
Impedance	75Ω
Return loss	>40 dB, 1 kHz to 6 MHz
Frequency Response	• -0.5 dB to 5.5 MHz (Y) • -3.27 to 3.0 MHz (Pb/Pr)
DC offset	<0.0 ±5 mV
Relative delay	<±10 ns
SNR	63 dB, typical, luma ramp

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Audio Input

AES/DARS

Table 4-14. AES/DARS Input Specifications

Item	Unbalanced Specification
Number of inputs	4 x AES, 1 x DARS
Standard	AES3, SMPTE 276M
Type	Unbalanced, AC coupled
Connector	1.0/2.3 DIN
Sensitivity	≥100 mV
Impedance	75Ω
Return loss	>25 dB, 0.1 MHz to 6 MHz
Input audio rate	48 kHz
Bits	16, 20, or 24
Channel status and user bit	Maintained, but professional mode, 48 kHz. See page 66 for details.

Analog

Table 4-15. Analog Audio Input Specifications

Item	Specification
Number of inputs	8 mono channels
Type	Balanced
Connector	DB-25, Tascam-style cable snake for balanced 8-channel audio
Input audio level	28 dBu to 12 dBu (adjustable in 0.5 dB increments)
Input Impedance	High-Impedance or 600Ω, jumper selectable
CMRR	>80 dB @ 60 Hz, typical

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Audio Output

AES

Table 4-16. AES Output Specifications

Item	Unbalanced Specifications
Number of outputs	4
Standard	AES3, SMPTE 276M
Type	Unbalanced, AC coupled
Connector	1.0/2.3 DIN
Signal amplitude	1.0 V pk-to-pk ±10%
Impedance	75Ω
Return loss	>25 dB, 0.1 MHz to 6 MHz
Jitter	<20 ns
DC offset	0.0 ±50 mV
Rise/fall time	30 ns to 44 ns (10% to 90%)
Audio rate	48 kHz
Bits	24, 20 or 16
Channel status and user bit	Maintained, but professional mode, 48 kHz. See "Audio Bit Manipulation" on page 65 for full details.

Analog

Table 4-17. Analog Audio Output Specifications

Item	Specification
Number of inputs	8 mono channels
Type	Balanced
Connector	DB-25, Tascam-style cable snake for balanced 8-channel audio
Output audio level	28 dBu to 16 dBu (adjustable in 2 dB increments)
Output Impedance	66Ω
Frequency response	0.15 dB, 20 Hz to 20 kHz
THD	≥80 dB, 20 Hz to 20 kHz
SNR	>100 dB typical
Crosstalk	>90 dB, 20 Hz to 20 kHz, typical
Linearity	<1.0 dB (-80 dBu to + 20 dBu), typical

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Communications

GPI In/Out

Table 4-18. GPI In/Out Specifications

Item	Specification
Connector	DB-9
Number of inputs	4
Number of outputs	4

RS-422

Table 4-19. RS-422 Specifications

Item	Specification
Standard	RS-422
Connector	DB-9

LAN

Table 4-20. LAN Specifications

Item	Specification
Connector	RJ-45
Type	10/100 Ethernet

Temperature

The X50 requires an ambient temperature of 41º to 95º F (5º to 35º C) with a relative humidity of 10-90% (non condensing).

Power Consumption

The X50 operates at 100-240 VAC, 47-63 Hz, 75 W.

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Dimensions and Weight

Table 4-21. Dimension and Weight Specifications

Item	Specification
Weight	8.45 lb. (3.83 kg), excluding rack and cable supports
Height	1.72 in. (4.37 cm)
Width	17.47 in. (44.4 cm); 17.60 in. (44.7 cm) with rear supports
Depth	21.25 in. (54.0 cm)

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Appendix A

Laser Safety Guidelines

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 cause damage to 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

In its normal operating mode, an optical fiber communication system is totally enclosed and presents no risk of eye injury. However, if the fiber optic cables that interconnect various components of an optical fiber disconnect or break, you may be exposed to laser emissions. Also, technicians may be exposed to laser emissions during installation and servicing.

Unlike some other laser designs, semiconductor lasers have a highly divergent beam that decreases rapidly with distance. The greater the distance, the less energy will enter the eye, and the less potential risk for eye injury.

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.

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

1. Do not stare into optical connectors or broken fibers.
2. Ensure technicians have satisfactorily completed an approved training course before performing installation or maintenance.
3. Ensure there are appropriate warning labels near the optical ports of the modules.

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.

1. Avoid exposing the eye to emissions from unterminated, energized optical connectors at close distances.
2. Ensure that only authorized, trained personnel use optical test equipment during installation or servicing.
3. Turn off all laser sources before scanning a fiber with an optical test set.
4. 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*.

Label

The label shown in Figure A-1 is applicable to Class 1 laser products.

Figure A-1. Label for Class 1 Laser Products

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Appendix B

Audio Bit Manipulation

Overview

This appendix contains information on the manipulation of bits that occur when using the X50 modules.

RX Key: N = not recognized, Y = recognized, S = recognized and stored or passed through or both

TX Key: N = not transmitted, Y = transmitted

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Channel Status Bits

Table B-1. C-Bit Manipulation

Byte	Bit	Function	RX	TX	Remarks
0	0	[0] Consumer use [1] Professional use	N Y	N Y	Set to [1]
0	1	[0] Normal audio mode (linear PCM) [1] Non-audio (non-PCM)	S S	Y Y	Passed unmodified
0	2 to 4	[000] Not indicated [100] No emphasis [110] 50/15 µs [111] CCITT J.17	S S S S	Y Y Y Y	Passed unmodified
0	5	[0] Locked [1] Unlocked	N N	Y N	Set to [0]
0	6 to 7	[00] Not indicated [01] 48 kHz [10] 44.1 kHz [11] 32 kHz	Y Y Y Y	N Y N N	Set to [01]
1	0 to 3	[0000] Not indicated [0001] Two channel [0010] Mono [0011] Prim/sec [0100] Stereo [0101] to [1111] Undefined	N N N N N N	Y N N N N N	Set to [0]
1	4 to 7	[0000] Not indicated [0001] 192 bit block [0010] AES18 (HDLC) [0011] User defined [0100] to [1111] Undefined	N N N N N	Y Y Y Y Y	Set to [0]
2	0 to 2	[000] Not indicated [001] Audio data [010] Co-ordination signal [011] to [111] Undefined	N N N N	N Y N N	Set to [001] for 24-bit or 20-bit output bit width settings; and [000] for 16-bit output bit width setting
2	3 to 5	[000] Not indicated [001] Max length - 1 [010] Max length - 2 [011] Max length - 3 [100] Max length - 4 [101] Max length [110] to [111] Undefined	N N N N N N N	N N N N N Y N	Set to [101] for 24-bit output bit width setting; [100] for 20-bit or 16-bit output bit width settings
2	6 to 7	Reserved	N	Y	Set to [0]
3	0 to 7	Reserved	N	Y	Set to [0]

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Table B-1. C-Bit Manipulation *(Continued)*

Byte	Bit	Function	RX	TX	Remarks
4	0 to 1	[00] Not a reference [01] Grade 1 reference [10] Grade 2 reference [11] Undefined	N N N N	Y N N N	Set to [0]
4	2	Reserved	N	Y	Set to [0]
4	3 to 6	[0000] Not indicated [1000] 24 kHz [0100] 96 kHz [1100] 192 kHz [1100] 22.05 kHz [0101] 88.2 kHz [1101] 176.4 kHz [1111] User defined	N N N N N N N N	Y N N N N N N N	Set to [0000]
4	7	[0] Sample frequency not scaled [1] Sample frequency scaled by 1/1.001	N N	Y N	Set to [0]
5	0 to 7	Reserved	N	Y	Set to [0]
6 to 9	0 to 7	Alphanumeric channel origin data	S	Y	Passed unmodified
10 to 13	0 to 7	Alphanumeric channel destination data	S	Y	Passed unmodified
14 to 17	0 to 7	Local sample address code	S	Y	Passed unmodified
18 to 21	0 to 7	Time-of-day sample address code	S	Y	Passed unmodified
22	0 to 3	Reserved	N	Y	Set to 0
22	4	Bytes 0 to 5 reliability flag	S	Y	Passed unmodified
22	5	Bytes 6 to 13 reliability flag	S	Y	Passed unmodified
22	6	Bytes 14 to 17 reliability flag	S	Y	Passed unmodified
22	7	Bytes 18 to 21 reliability flag	S	Y	Passed unmodified
23	0 to 7	CRC	Y	Y	Calculated on output

Validity and User Bits

Table B-2. V-Bit and U-Bit Manipulation

Bit Manipulation	RX	TX	Remarks
Validity (V) bit	S	Y	Passed unmodified
User (U) bit	S	Y	Passed unmodified

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Miscellaneous Data

Table B-3. Miscellaneous Data

Item	RX Specification	TX Specification
Audio sampling frequency	32 to 48 kHz	48 kHz
Audio sampling word length	16 to 24 bits	24 bits

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N

O

P

R

S

T

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