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1. Provide a Superior Customer Experience
   • offer the best product quality and support
2. Make Cool Practical Technology
   • develop great products that customers love

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If anything at all with your Ross experience does not live up to your expectations be sure to reach out to us at solutions@rossvideo.com.

David Ross
CEO, Ross Video
dross@rossvideo.com

Ross Video Code of Ethics

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2. We will do our best to understand our customers' requirements.
3. We will not ship crap.
4. We will be great to work with.
5. We will do something extra for our customers, as an apology, when something big goes wrong and it's our fault.
6. We will keep our promises.
7. We will treat the competition with respect.
8. We will cooperate with and help other friendly companies.
9. We will go above and beyond in times of crisis. *If there's no one to authorize the required action in times of company or customer crisis - do what you know in your heart is right. (You may rent helicopters if necessary.)*
Ultrix · Installation Guide

- Ross Part Number: 2101DR-003-18
- Release Date: June 24, 2022.
- Software Issue: 4.8

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Safety Notices

Refer to the "Important Regulatory and Safety Notices" document that accompanied your product.

Statement of Compliance

This product has been determined to be compliant with the applicable standards, regulations, and directives for the countries where the product is marketed.
Compliance documentation, such as certification or Declaration of Compliance for the product is available upon request by contacting techsupport@rossvideo.com. Please include the product; model number identifiers and serial number and country that compliance information is needed in request.

**EMC Notices**

**United States of America - FCC Part 15**

This equipment has been tested and found to comply with the limits for a class A Digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a Commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

**Canada**

This Class A device complies with Canadian ICES-003 and part 15 of the FCC Rules.

Cet appareil numerique de la classe “A” est conforme a la norme NMB-003 du Canada.

⚠️ **Notice** — Changes or modifications to this equipment not expressly approved by Ross Video Ltd. could void the user’s authority to operate this equipment.

**European Union**

This equipment is in compliance with the essential requirements and other relevant provisions established under regulation (EC) No 765/2008 and Decision No 768/2008/EC referred to as the “New Legislative Framework”.

⚠️ **Warning** — This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.

**Australia/New Zealand**

This equipment is in compliance with the provisions established under the Radiocommunications Act 1992 and Radiocommunications Labeling (Electromagnetic Compatibility) Notice 2008.

**Korea**

This equipment is in compliance with the provisions established under the Radio Waves Act.

Class A equipment (Broadcasting and communications service for business use).

This device is a business-use (Class A) EMC-compliant device. The seller and user are advised to be aware of this fact. This device is intended for use in areas outside home.

<table>
<thead>
<tr>
<th>Type of Equipment</th>
<th>User’s Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>A급 기기 (업무용 방송통신기자재)</td>
<td>이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바랍니다. 가정외의 지역에서 사용하는 것을 목적으로 합니다.</td>
</tr>
<tr>
<td>Class A Equipment (Industrial Broadcasting &amp; Communication Equipment)</td>
<td>This equipment is <em>Industrial (Class A) electromagnetic wave suitability equipment</em> and seller or user should take notice of it, and this equipment is to be used in the places except for home.</td>
</tr>
</tbody>
</table>
International

This equipment has been tested under the requirements of CISPR 22:2008 or CISPR 32:2015 and found to comply with the limits for a Class A Digital device.

⚠️ Notice — This is a Class A product. In domestic environments, this product may cause radio interference, in which case the user may have to take adequate measures.

Warranty and Repair Policy

The product is backed by a comprehensive one-year warranty on all components.

⚠️ Notice — Changes or modifications to this equipment not expressly approved by Ross Video Ltd. could void the user's authority to operate this equipment.

If an item becomes defective within the warranty period Ross will repair or replace the defective item, as determined solely by Ross.

Warranty repairs will be conducted at Ross, with all shipping FOB Ross dock. If repairs are conducted at the customer site, reasonable out-of-pocket charges will apply. At the discretion of Ross, and on a temporary loan basis, plug in circuit boards or other replacement parts may be supplied free of charge while defective items undergo repair. Return packing, shipping, and special handling costs are the responsibility of the customer.

This warranty is void if products are subjected to misuse, neglect, accident, improper installation or application, or unauthorized modification.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profit). Implied warranties, including that of merchantability and fitness for a particular purpose, are expressly limited to the duration of this warranty.

This warranty is TRANSFERABLE to subsequent owners, subject to Ross' notification of change of ownership.

Environmental Information

The equipment may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.

If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration. You can also contact Ross Video for more information on the environmental performances of our products.

This appliance may contain a Coin type battery which should not be treated as household waste.

To ensure that the battery will be treated properly use the appropriate take-back systems in your area. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.
### Company Address

<table>
<thead>
<tr>
<th>Ross Video Limited</th>
<th>Ross Video Incorporated</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 John Street</td>
<td>P.O. Box 880</td>
</tr>
<tr>
<td>Iroquois, Ontario</td>
<td>Ogdensburg, New York</td>
</tr>
<tr>
<td>Canada, K0E 1K0</td>
<td>USA 13669-0880</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>General Business Office:</td>
<td>(+1) 613 • 652 • 4886</td>
</tr>
<tr>
<td>Fax</td>
<td>(+1) 613 • 652 • 4425</td>
</tr>
</tbody>
</table>

| Technical Support:    | (+1) 613 • 652 • 4886         |
| After Hours Emergency:| (+1) 613 • 349 • 0006         |

E-mail (Technical Support): techsupport@rossvideo.com  
E-mail (General Information): solutions@rossvideo.com  
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- Environmental
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## Software Licenses
- BSD
- Dual GPL
- GPL
- LGPL
- MIT
- zlib

## Glossary
Introduction

This guide is for system administrators and installers of the Ross Video Ultrix router. It provides instructions on how to physically install your router.

This guide contains the following chapters that cover the installation of an Ultrix router:

- "Introduction" summarizes the guide and provides important terms, and conventions.
- "Getting Started" provides an overview for creating a routing system using the Ultrix routers, and general information to keep in mind before installing and configuring your Ultrix routers.
- "Hardware Overview" provides a basic introduction to the Ultrix front and rear panels.
- "Physical Installation" provides instructions for the basic physical installation of the Ultrix routers.
- "Video Reference" provides instructions on how to connect the Ultrix router to a network, connecting a video reference signal, cabling for a Multiviewer Head, and connecting to source and destination devices.
- "Connecting the SDI Sources" outlines the SDI input cabling for each blade.
- "Connecting the SDI Destinations" outlines the SDI output cabling for each blade.
- "Gearbox Cabling" outlines the Gearbox cabling designations.
- "Cabling for UltriScape" outlines the available connections for UltriScape Heads based on the type of blade.
- "SFP Cabling" outlines how to connect to a third-party device via an AUX port on a router blade.
- "Cabling for IP Streaming" outlines how to cable an ULTRIX-IP-IO port for IP streaming.
- "Connecting to Ross Devices" provides workflow examples with other Ross devices.
- "ULTRIX-HDBNC-IO Overview" provides a summary of the cabling designations for the ULTRIX-HDBNC-IO blade.
- "ULTRIX-HDX-IO Overview" provides a summary of the cabling designations for the ULTRIX-HDX-IO blade.
- "ULTRIX-IP-IO Overview" provides a summary of the cabling designations for the ULTRIX-IP-IO blade.
- "ULTRIX-SFP-IO Overview" provides a summary of the cabling designations for the ULTRIX-SFP-IO blade.
- "Technical Specifications" provides the specifications, such as pinouts and power consumption, for the Ultrix routers.
- "Software Licenses" provides third-party software license information for your Ultrix router.

If you have questions pertaining to installation of this Ross Video product, please contact us at the numbers listed in "Contacting Technical Support". Our technical staff is always available for consultation, training, or service.

Related Publications

It is recommended to consult the following Ross documentation before installing your Ultrix router:

- **DashBoard User Manual**, Ross Part Number: 8351DR-004
- **Ultricore User Guide**, Ross Part Number: 2201DR-104
- **Ultrix Quick Start Guide**, Ross Part Number: 2101DR-002
- **Ultrix SFP Modules Guide**, Ross Part Number: 2101DR-008
- **Ultrix User Guide**, Ross Part Number: 2101DR-004
The user documentation is available for download from our website.

Documentation Conventions

Special text formats are used in this guide to identify parts of the user interface, text that a user must enter, or a sequence of menus and sub-menus that must be followed to reach a particular command.

Interface Elements

Bold text is used to identify a user interface element such as a dialog box, menu item, or button. For example:

In the **Save Layout** dialog, click **OK**.

User Entered Text

Courier text is used to identify text that a user must enter. For example:

In the **Language** box, enter **English**.

Referenced Guides

Italic text is used to identify the titles of referenced guides, manuals, or documents. For example:

For more information, refer to the section “**Assigning an IP Address**” in the **Ultrix User Guide**.

Menu Sequences

Menu arrows are used in procedures to identify a sequence of menu items that you must follow. For example, if a step reads “**File** > **Save**,” you would click the **File** menu and then click **Save**.

Important Instructions

Star icons are used to identify important instructions or features. For example:

* When the Ultrix router cannot connect to the network, a **Message** dialog box opens to report the connection problem.

Contacting Technical Support

At Ross Video, we take pride in the quality of our products, but if problems occur, help is as close as the nearest telephone.

Our 24-hour Hot Line service ensures you have access to technical expertise around the clock. After-sales service and technical support is provided directly by Ross Video personnel. During business hours (Eastern Time), technical support personnel are available by telephone. After hours and on weekends, a direct emergency technical support phone line is available. If the technical support person who is on call does not answer this line immediately, a voice message can be left and the call will be returned shortly. This team of highly trained staff is available to react to any problem and to do whatever is necessary to ensure customer satisfaction.

- **Technical Support**: (+1) 613-652-4886
- **After Hours Emergency**: (+1) 613-349-0006
- **E-mail**: techsupport@rossvideo.com
- **Website**: http://www.rossvideo.com
Getting Started

A routing system requires careful planning. This can include allocating common connector numbers across several router levels or partitions within the routing system to ensure that source and destination equipment switch on just one switch command.

General Overview

*Figure 1* provides a simplified example and may differ from what your facility requires.

**Figure 1**  Example of a Routing System

Signal Distribution

A broadcast router is a device that switches signals generated by broadcast equipment from a nominated input to a nominated output. An input is a physical socket on a router, a source is a virtual grouping of inputs tied together under a label. The inputs may be routed to any number of outputs providing signal distribution.
Routing Layers or Levels
Each physical router (or signal type) may be thought of as a layer or level of the routing system (e.g. a video level, an audio level). Ultrix can assign a level to a matrix or signal type and even individual ports on unrelated matrices if required.

Interface and Connectivity
Keep in mind that the Ultrix router uses ethernet protocols to communicate to other devices in your routing system. An Ultrix routing system may use distributed control across the Internet, a LAN, or a VPN. Use your DashBoard client to set up each router via the router interfaces or using the options available for each device in your system.

Ensure that you are using the latest version of the DashBoard client software. The DashBoard software and user manual are available from the Ross Video website.

For More Information on...
• configuring the Ultrix router in DashBoard, refer to the Ultrix User Guide.

Remote Control Panels
Remote control panels (e.g. RCP-QE, RCP-ME) provide a physical switching surface to control the router switching. Each panel uses data derived from the Ultrix database to display text on LCDs and assign functions to the buttons.

When the system is powered up, the router restores its crosspoint status. The remote control panel requests the status of the router and displays the current status for the selected destination.

Marketing Codes
The Ultrix routers is expandable depending on the chassis.

<table>
<thead>
<tr>
<th>Table 1 List of Ultrix Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Number</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>1RU Models</td>
</tr>
<tr>
<td>ULTRIX-FR1(-NS)</td>
</tr>
<tr>
<td>ULTRIX-HDB-IO</td>
</tr>
<tr>
<td>ULTRIX-HDX-IO</td>
</tr>
<tr>
<td>ULTRIX-IP-IO</td>
</tr>
<tr>
<td>ULTRIX-SFP-IO</td>
</tr>
<tr>
<td>2RU Models</td>
</tr>
<tr>
<td>ULTRIX-FR2(-NS)</td>
</tr>
<tr>
<td>ULTRIX-HDB-IO</td>
</tr>
<tr>
<td>ULTRIX-HDX-IO</td>
</tr>
<tr>
<td>ULTRIX-IP-IO</td>
</tr>
<tr>
<td>ULTRIX-SFP-IO</td>
</tr>
</tbody>
</table>
Small Form-factor Pluggable (SFP+) Modules

The AUX ports and SFP ports can be populated with one of the following options listed in Table 2.

Table 2 List of SFP Modules

<table>
<thead>
<tr>
<th>Model</th>
<th>Supported ULTRIX Blades</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFP-ANA-IO</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-FIBER-3G</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-FIBER-12G</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-HDB-IO-3G</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-HDB-IO-12G</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-HDB-IN-12G</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-HDB-OUT-12G</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-HDM-OUT</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-HDM-OUT-12G</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-HDM-IN</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-HDM-IN-12G</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-MADI-850MM</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-MADI-1300MM</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-MADI-1310SM</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SFP-MADI-COAX</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>


Getting Started

When installing devices in a network topology, consider the physical placement of the devices in the network and how the communications (data) will flow within that network. Consideration must also be given to the distances between devices, physical interconnections, transmission rates, and signal types that you are installing.

![Figure 2 Example of a Possible Layout](image)

* The Ultrix family communicates via a standard IT Ethernet communications network (1Gbe). For installations comprising a managed switch, ensure TCP ports 15000 and 5000 are not blocked for inter-device communications.

MC1 Connection

Communication between the MC1-MK or MC1-UHD and an Ultrix router is via an Ethernet connection. Ultrix can support up to ten MC1 connections.

For More Information on...
- the MC1-MK, refer to the **MC1-MK Installation** and **Operation Guides**.
- the MC-UHD, refer to the **MC1-UHD User Guide**.
Hardware Overview

There are three router models in the Ultrix family: ULTRIX-FR1(-NS), ULTRIX-FR2(-NS), and ULTRIX-FR5. All routers fit into the standard 19” rack. This chapter presents information on the Ultrix front and rear panels.

* The ULTRIX-FR1-NS and ULTRIX-FR2-NS have updated frame components to allow the support of more advanced IO modules such as ULTRIX-IP. The ULTRIX-FR1-NS and ULTRIX-FR2-NS may be identified by the blue dot above the i on the front panel Ultrix logo (Figure 3).

Front Panel Overview

The Ultrix router is designed to be operated with the door closed to ensure adequate cooling via the fans. The front panel includes the same features regardless of the router model. Figure 3 shows an ULTRIX-FR1-NS.

![Figure 3 Front Panel — ULTRIX-FR1-NS](image)

1) Front Panel Wave Light 3) Navigation Positioner
2) LCD Display 4) ENET Port LEDs

1. Front Panel Wave Light

The front panel provides various system status indication via the ‘wave light’. The concave section of the black front panel bezel emits light of various colors to indicate system function.

<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>When lit blue, this indicates normal operation.</td>
</tr>
<tr>
<td>Red</td>
<td>When lit red, this indicates a serious issue that requires immediate attention.</td>
</tr>
</tbody>
</table>

2. LCD Display

The LCD display reports on the overall system status, IP address of the panel, and current fault conditions. During normal operations, the display reports the Device Name (user assigned) and the active IP address of the panel. Under some conditions, fault conditions are reported such as: device boot status, Walkabout locate mode indication, SRAM battery warnings, and firmware upgrade states. The information on the display alternates between normal operation and the error messages.

3. Navigation Positioner

The front panel includes a five-direction round finger joystick that is used to navigate the messages on the LCD Display.
Use the following actions to navigate the parameters:

- **In** — pressing once brings the menu system onto the monitor output; holding for two seconds exits the menu system. This position is also used to enter the menu values/parameters.
- **Up** — pressing once selects the menu, item, or value above the current selection; holding scrolls to the top of the available selections.
- **Down** — pressing once selects the menu, item, or value below the current selection; holding scrolls to the bottom of the available selections.
- **Forward** — pressing once moves from menu to item to value.
- **Back** — pressing once moves from value to item to menu.

4. ENET Port LEDs

Table 4 describes the two Ultrix front panel LEDs that are used to monitor ethernet communication activity of the Ultrix router. When facing the front panel, the left LED reports the status of the **ENET 1** port while the right LED reports the status of the **ENET 2** port. Refer to the section “Rear Panel Overview” for details.

<table>
<thead>
<tr>
<th>LED</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENET #</td>
<td>Bright</td>
<td>A valid physical Ethernet connection is established, and the port is active. There is data transfer activity on the indicated Ethernet port.</td>
</tr>
<tr>
<td></td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dim Blue</td>
<td>A valid physical Ethernet connection is established, but the port is not the active one. There is no data transfer activity on the indicated Ethernet port.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>No valid Ethernet connection to the indicated Ethernet port.</td>
</tr>
</tbody>
</table>

**Interior of the Router**

The interior of the router is accessed by removing the door from the chassis.

**Caution** — For reliable performance, it is recommended that the Ultrix front panel not be opened for longer than one minute.
1. Main Board

The Main board is the main switching matrix for the I/O Boards. It also distributes power and communication from the main control and the I/O Boards.

**ESD Susceptibility** — Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments such as carpeted areas and when synthetic fiber clothing is worn. Always exercise proper grounding precautions when working on circuit boards and related equipment.
2. Cooling Fan Module

The Ultrix router comes standard with a Cooling Fan Module installed in the right-side of the chassis. This module mates directly to the control board of the router (located in the back of the chassis).

**Caution** — *The two sides of the Ultrix router have perforations that are needed to ventilate the boards and components inside the chassis. Do not block these perforations.*

The fans intake air at the right-side of the chassis, then the fans blow the air over the I/O Boards. The air flows from right to left, to the exit ventilation holes on the left-side of the chassis.

On the ULTRIX-FR1(-NS) and ULTRIX-FR2(-NS) chassis, the Cooling Fan Module also houses the MicroSD card that is a key component of the router operating system. Do not remove this card unless directed by Ross Technical Support.

* A three-way jumper is available on the ULTRIX-FR1(-NS) and ULTRIX-FR2(-NS) Cooling Fan Modules. Do not change its settings unless directed by Ross Technical Support.

3. Micro SD Card (ULTRIX-FR5 only)

The Micro SD provides system storage and a default software build. Do not remove this card unless directed by Ross Technical Support.

4. Battery

The ULTRIX-FR5 uses this battery to serve as an emergency backup power source for the essential memory of the router. On the ULTRIX-FR1(-NS) and ULTRIX-FR2(-NS) chassis, this battery is located on the Cooling Fan Module. Refer to the *Ultrix User Guide* for information on monitoring and replacing this battery.

**Rear Panel Overview**

The rear panel provides a support structure for connecting input or output signals, and two looping reference connections. Note that the number of populated slots in your router may differ from what is presented here.
1. Ethernet Connections
Each Ethernet port is an RJ45 connector used to connect the router to an external 1Gbe Ethernet network. Each port has its RJ45 connector wired as a Network Interface Card (NIC).

**Notice** — *The Ethernet ports do not provide Power-over-Ethernet (PoE).*

At least one Ethernet connection is required to bridge the external Ethernet network to the local communications bus for monitoring and control of the router.

2. USB Port
The USB port provides the ability for various USB-serial converts to be attached for serial communications with the Ultrix router. Refer to the section “**Supported USB-Serial Converters**” for a list.

3. PSU Connections
There are four power supply connectors located on the rear of each Ultrix router numbered 1-4 starting from the leftmost connector. Each connector requires a 15VDC connection to an external power supply.

**Caution** — *The Ultrix router automatically powers on when power is applied.*

- The ULTRIX-FR1(-NS) ships with one power supply. An option is available to order a second power supply for redundancy.
- The ULTRIX-FR2(-NS) ships with two power supplies. An option is available to order a third power supply to enable n+1 redundancy or two additional power supplies for full redundancy.

**Caution** — *The ULTRIX-FR2(-NS) chassis requires a minimum of two power supplies.*
• The ULTRIX-FR5 requires power from an Ultripower power supply only.

4. Video Reference Connections

Two (individual or looping) HD-BNC inputs are provided to accept reference signals supporting the following reference types: analog black, tri-level sync, and AES/DARs. The REF A port is the primary reference port.

★ The REF B port is not implemented. Use this port only in a loop-through work flow.

★ A switch is located between the HD-BNCs. Do not move this switch from its default position.

5. Auxiliary SFP+ Ports

The AUX ports can be populated with Small Form-factor Pluggable (SFP+) modules from the factory or by installing modules in the field. For a list of SFP+ modules available from Ross Video, refer to Table 2.

If an AUX port is populated on the Ulrix rear panel, its status is reported in DashBoard and options are provided for mapping and labeling the I/O as required.

6. SDI Input and Output Connections

The number of input and output HD-BNCs depends on the router model you are using. Each row of 16x16 HD-BNCs is a separate Ultrix-HDBNC-I/O or ULTRIX-HDX-IO blade (known as a slot in the Frame Slot Port Channel (FSPC) nomenclature). These I/O blades provide non-blocking connectivity for up to 32x32 inputs/outputs in the ULTRIX-FR1(-NS), 64x64 inputs/outputs in the ULTRIX-FR2(-NS), or 144x144 inputs/outputs in the ULTRIX-FR5.

★ The Slots are numbered sequentially with Slot 1 as the topmost slot except on the ULTRIX-FR5. On the ULTRIX-FR5, the topmost slot is identified as the FLEX Slot with the second topmost slot identified as Slot 1. Refer to “Chassis Slot Numbering”.

★ The FLEX slot has an inputs limitation of 16x16 I/O. Depending on the blade, this may impact the blade functionality.

7. ULTRIX-IP-IO Blade

The ULTRIX-IP-IO blade is installed in any available slot of an ULTRIX-FR1-NS, ULTRIX-FR2-NS, or an ULTRIX-FR5. Each ULTRIX-IP-IO blade provides four ENET ports with 25Gb bandwidth per port. The ports are grouped into two pairs where the first pair is ENET 1 and ENET 2; the second pair is ENET 3 and ENET 4. Refer to the Ultrix User Guide for more information on this optional blade.

★ The ULTRIX-FR1-NS and ULTRIX-FR2-NS routers can be identified by the Ultrix logo on the front door with an “i” with a blue dot. Refer to Figure 3 for an example of the ULTRIX-FR1-NS front door.

8. ULTRIX-SFP-IO Blade

The ULTRIX-SFP-IO blade is installed in any available slot of an ULTRIX-FR1-NS, ULTRIX-FR2-NS, or an ULTRIX-FR5. Each ULTRIX-SFP-IO blade provides two AUX ports, and sixteen SFP ports. Each port can be populated with Small Form-factor Pluggable (SFP+) modules from the factory or by installing modules in the field. For a list of SFP+ modules available from Ross Video, refer to Table 2.

★ AUX A and AUX B are not available when the ULTRIX-SFP-IO blade is installed in a FLEX slot.

If a port is populated on the ULTRIX-SFP-IO blade, its status is reported in DashBoard and options are provided for mapping and labeling the I/O as required.

1. The ULTRIX-HDX-IO blade can only be installed in the ULTRIX-FR1-NS, ULTRIX-FR2-NS, and ULTRIX-FR5.
9. Ultrix-UCCI Slots (ULTRIX-FR5 only)

By default, the left Ultrix-UCCI slot is populated. If you have the Ultrix-UCCI redundancy option, the right Ultrix-UCCI slot is also populated.

Each Ultrix-UCCI slot houses an Ultricore-CC Internal board which includes a Micro SD Card slot, a USB port, and four status LEDs.

Table 4 describes the Ultrix-UCCI status LEDs.

<table>
<thead>
<tr>
<th>LED</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATUS</td>
<td>Green</td>
<td>Indicates the Ultrix-UCCI is powered and the last re-boot was successful</td>
</tr>
<tr>
<td></td>
<td>Flashing Green</td>
<td>Indicates the Ultrix-UCCI is powered and in the progress of a re-boot</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Indicates the Ultrix-UCCI is powered but requires a re-boot</td>
</tr>
<tr>
<td>PRIM/SEC</td>
<td>Green</td>
<td>Indicates the Ultrix-UCCI is configured and functioning as a Master</td>
</tr>
<tr>
<td></td>
<td>Flashing Green</td>
<td>Indicates the Ultrix-UCCI is in standby mode</td>
</tr>
<tr>
<td>ALARM</td>
<td>Red</td>
<td>Indicates the Ultrix-UCCI is experiencing an error condition; verify the message(s) on the router front panel LCD display and DashBoard</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Indicates the Ultrix-UCCI is operating correctly and is not experiencing any errors</td>
</tr>
<tr>
<td>AUX</td>
<td>This LED is not implemented.</td>
<td></td>
</tr>
</tbody>
</table>

For More Information on...

• installing and configuring a second Ultrix-UCCI in your ULTRIX-FR5 in an existing routing system, contact Ross Technical Support.

10. Protective Earth Stud

⚠️ The protective earth stud may not be present on all hardware.

The ULTRIX-FR1-NS, ULTRIX-FR2-NS, and ULTRIX-FR5 include a protective earth ground stud.

⚠️ Caution — Risk of electrical shock. Enclosure shall be connected to earth ground via protective earth stud and 18AWG conductor or larger.

Chassis Slot Numbering

This section summarizes the slot numbering based on the router model.

ULTRIX-FR1(-NS)

Figure 11 outlines the numbering scheme for the ULTRIX-FR1 and ULTRIX-FR1-NS chassis. Note that Slot 1 is the topmost slot.
ULTRIX-FR2(-NS)

**Figure 12** outlines the numbering scheme for the ULTRIX-FR2 and ULTRIX-FR2-NS chassis. Note that **Slot 1** is the topmost slot.

![Slot Numbering — ULTRIX-FR2 and ULTRIX-FR2-NS](image)

ULTRIX-FR5

**Figure 13** outlines the numbering scheme for the ULTRIX-FR5 chassis. Note that the **FLEX** slot is the topmost slot.

![Slot Numbering — ULTRIX-FR5](image)
Physical Installation

If you have questions pertaining to the installation of your Ultrix router, please contact us at the numbers listed in the section “Contacting Technical Support”.

Before You Begin

⚠️ **Caution** — The Ultrix router utilizes side-to-side airflow management (right to left looking at the front of the chassis). It is a requirement that the sides of the mounted Ultrix router are not obscured.

These installation guidelines assume the following:

- The relevant Ross equipment is installed into a ventilated rack frame. The relative humidity in the environment of the equipment should be <70% (non-condensing). The ambient temperature of the air entering the front panel should not exceed 40°C (104°F), and should not fall below 0°C (32°F). It is recommended to leave a 1RU gap between each module.
- Ensure that adequate space exists in front, behind, and on both sides of the router for airflow exhaust.
- Ensure that adequate space exists on both sides of the router and side access is not blocked from the rear.
- If a Ross openGear frame is included in the installation, it is recommended that the Ultrix router be installed directly above the openGear frame.
- If the ambient temperature of the installation site is likely to reach temperatures at the high end of the specified operating range, you may choose to set the fan speed to medium or high to reduce any potential risk. Refer to the **Ultrix User Guide** for instructions on setting the fan speed.
- The install location of the router should be accessible, dry, and dust-free.
- The socket/outlet should be installed near the equipment and be easily accessible.
- The routing system is well planned and designed. Consideration must be given to inputs and outputs across multiple router levels and typical operating scenarios for breakaways.
- Valid IP addresses are assigned to the equipment.

Static Discharge

Throughout this chapter, please heed the following cautionary note:

⚠️ **ESD Susceptibility** — Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments such as carpeted areas and when synthetic fiber clothing is worn. Always exercise proper grounding precautions when working on circuit boards and related equipment.

Mounting Requirements

The Ultrix router is designed for installation into a standard 19” equipment rack. It has integrated rack ears, allowing it to be screwed in using standard screws and cage nuts.

The Ultrix mounts in the rack frame by means of four rack screws fastened through the front and back mounting ears. This should normally be sufficient to carry the load, including the weight of accompanying cables.

Under some conditions, the ambient air temperature inside rack-mount cabinets can be greater than the ambient temperatures within a room. For safe long term reliability, ensure the ambient air
temperatures at the router right-side intake are within the router’s specified operating temperature range. Adequate ventilation within a rack frame must also be maintained.

For More Information on...
• the technical specifications for the Ultrix router, refer to the chapter “Technical Specifications”.

Connecting the Ultrix Router to a Network

Each Ethernet port is a standard RJ45 Ethernet connector and is used to exchange data and communicate with other devices in your router system.

* Contact your IT department before connecting to your facility network to ensure that there are no conflicts. They will provide you with an appropriate value for the IP Address, Subnet Mask, and Gateway for your device.

The Ultrix router is connected directly to your network so that it can interface with the devices and the computer running the DashBoard client. After a physical connection is established, DashBoard is used to configure the network settings for the Ultrix. While this section uses the ULTRIX-FR1 as an example, it is applicable to all Ultrix models.

For More Information on...
• downloading and installing DashBoard, refer to the DashBoard User Manual.

* If difficulties or problems are experienced when connecting the Ultrix router to a network hub, or with assigning IP addresses, please contact your network administrator.

To establish a physical connection to the network

* A 1GbE connection is required.

1. To connect the primary network connection for the Ultrix router:
   a. Connect one free end of a standard CAT 5/5e/6 Ethernet cable to a free port of the network hub.
   b. Connect the other end of the same cable to the ENET 1 port on the rear of the Ultrix router.

2. To connect the redundant network connection for the Ultrix router:
   a. Connect one free end of a second straight through CAT 5/5e/6 cable to a free port of the network hub.
   b. Connect the other end of the same cable to the ENET 2 port on the rear of the Ultrix router.
Powering on the Router

There are four PSU sockets on the back of each Ultrix router. The minimum number of PSU your router requires is based on the router size.

**Warning Hazardous Voltages** — The safe operation of this product requires that a protective earth connection be provided. This protective earth is provided by the ground conductor in the equipment’s supply cord. To reduce the risk of electrical shock to operator and service personnel, this ground connector must be connected to an earthed ground.

**Warning** — In some countries it may be necessary to supply the correct mains supply cord. Use only certified cords for the country of use.

Powering on the ULTRIX-FR1(-NS) and ULTRIX-FR2(-NS)

Before you begin, keep in mind that:

- Each ULTRIX-FR1(-NS) router requires a minimum of one +15V DC, 32A PSU. For redundancy and load sharing, up to 3 optional PSU can be used.
- Each ULTRIX-FR2(-NS) router requires a minimum of two +15V DC, 32A PSU. For redundancy and load sharing, up to 2 optional PSU can be used.
- For redundancy, each power cord should be connected to a separate power source for protection against failure of the A/C power circuit. In the event of one power supply failure, the panel load is seamlessly transferred to the other connected redundant power supplies.

**Notice** — The Ultrix router automatically powers on when power is applied.

To connect the power cables to the ULTRIX-FR1(-NS) or ULTRIX-FR2(-NS)

1. Connect the female end of the provided power cable into the socket marked PS1.

   ![Figure 15](image)

   **Note:** It is recommended that you always connect the Power Supply Unit to the Ultrix before connecting to Mains Power.

   *Figure 15 ULTRIX-FR1(-NS) — Primary Power Connection*

2. Connect the remaining three power cables into the separate power supply sockets.

   **Notice** — The ULTRIX-FR2(-NS) requires a minimum of two power supplies.

3. Connect the supplied AC power cable into the power module.
4. Connect the supplied power cable’s three-prong male connector to Mains Power.
Powering on the ULTRIX-FR5

Each ULTRIX-FR5 router requires powering from an Ultripower Rack Mount Power Supply Unit. Powering an ULTRIX-FR5 from individual external power supplies is not supported. Ultripower is a 1RU 1200W power supply specifically designed for the Ultrix series routers.

* Refer to the **ULTRIX-FR5 Quick Start Guide** for more information on connecting to the Ultripower.

**To connect an Ultripower to an ULTRIX-FR5**

1. Connect the ends of four power cables to the Ultripower rear panel OUT sockets.
2. Connect the free ends of the same power cables to the ULTRIX-FR5 rear panel.

---

**Notice** — Ensure that the power cable end with the ferrite bead connects to the Ultripower port.

---

**Notice** — The ULTRIX-FR5 automatically powers on when power is applied to Ultripower. Connect DC cables prior to connecting AC power source to the Ultripower. This prevents the ULTRIX-FR5 from trying to draw too much power while only one DC cable is installed.

* Refer to the **Ultripower User Guide** for more information on connecting the Ultripower to a power source.

3. Connect an AC power cable to the Ultripower PSU 1 socket.
4. If Ultripower is fitted with a second power module, connect a second AC power cable to the Ultripower PSU 2 socket.

---

Figure 16  ULTRIX-FR5 — Power Connections
Video Reference

The Ultrix routers handle high-bandwidth, broadcast-quality, digital video and audio signals, and embedded audio signals. Digital video signals can be 12G, 3G, high definition, or standard definition. The Ultrix routers support SMPTE standards 424M, 344M, 259M, and 292M.

Overview

All Ultrix routers accept a video reference signal. If connected, a video references ensures that switching occurs in the default vertical interval across all router levels. The default switching pulse complies with \textit{SMPTE RP168} as follows:

- line 6 for SD (PAL reference)
- line 10 for SD (NTSC reference)
- line 7 for HD (1080i)
- line 7 for HD (720p)
- line 7 for 3G (1080p)

Alternatively, you can set your own custom switching point to meet the requirements of your system. For example, if the default settings for the switching pulse occur within the data elements of your signal, you need to assign your own switching trigger.

For More Information on...

- setting a custom switching trigger, refer to the \textit{Ultrix User Guide}.
- supported reference formats for Frame Sync/Clean Switch, refer to the section “\textit{Supported FSCS Video Formats for Conversion}”.

Cabling for the ULTRIX-FR1(-NS) and ULTRIX-FR2(-NS)

The ULTRIX-FR1(-NS) and ULTRIX-FR2(-NS) each accept a single composite or tri-level sync signal to feed timing information to the routing system.

To connect the video reference source to the ULTRIX-FR1(-NS) or ULTRIX-FR2(-NS)

1. Connect a 75ohm coaxial cable between the video reference signal output and the REF A port on the rear panel of the Ultrix router.

2. If you have multiple routers that will switch on with the same reference:

---

1. Requires installing an Ultraspeed license key for each slot. Refer to the \textit{Ultrix User Guide} for details.
a. Connect the **REF B** connector on the rear panel of the router to the **REF A** connector on the rear panel of another router using a 75ohm coaxial cable.

b. Continue looping the **REF** connectors across the routers that you want referenced to this signal.

c. Ensure that the last router in the video referencing loop has a 75ohm termination connected to its **REF B** connector.

---

**Cabling for the ULTRIX-FR5**

The ULTRIX-FR5 consists of two independent reference connections (REF A, REF B). Each may be configured for loop-through or terminating functionality. The ULTRIX-FR5 requires at least one reference connection.

**To connect the video reference source to the ULTRIX-FR5**

1. Connect a valid reference signal to either BNC in the BNC pair labeled **REF A**.
2. Select either **TERM** or **LOOP** on the DIP switch A to select the preferred BNC mode.

![Figure 20  ULTRIX-FRS — DIP Switch in the TERM Positions](image-url)
Connecting the SDI Sources

The Ultrix routers handle high-bandwidth, broadcast-quality, digital video and audio signals, and embedded audio signals. Digital video signals can be 12G\(^1\), 3G, high definition, or standard definition. The Ultrix routers support SMPTE standards 424M, 344M, 259M, and 292M.

Overview

The Source connections on the Ultrix rear panel are located on the right-hand side and are clearly defined with white text on a black background around the HD-BNCs.

ESD Susceptibility — Anti-static precautions must be taken when fitting or removing all cables. Wear an earthed wrist wrap strap if possible, or place both hands on the metal rack frame before handling the cables.

To connect SDI source devices to the Ultrix router

1. Refer to the following sections to learn more about the specific input designations for your blade.
2. Connect the end of a 75ohm coaxial cable with HD-BNC connectors to an IN HD-BNC on the rear panel.
3. Connect the other end of the coaxial cable to the device that will supply the signal to that IN HD-BNC on the router.

ULTRIX-HDBNC-IO Cabling

The ULTRIX-HDBNC-IO blade can be installed in an ULTRIX-FR1, ULTRIX-FR1-NS, ULTRIX-FR2, ULTRIX-FR2-NS, and ULTRIX-FR5 router. This section outlines the HD-BNCs for each router model. The BNCs are numbered starting with IN 1 and the total number of BNCs depends on the router model you are using.

ULTRIX-HDX-IO Cabling

The ULTRIX-HDX-IO blade can be installed in an ULTRIX-FR1-NS, ULTRIX-FR2-NS, and ULTRIX-FR5 router. Each blade provides 16 SDI inputs. The BNCs are numbered starting with IN 1 and the total number of BNCs depends on the router model you are using.

1. Requires installing an Ultrispeed license key for each slot. Refer to the Ultrix User Guide for details.
Figure 22  ULTRIX-HDX-IO Blade — SDI Inputs
Connecting the SDI Destinations

The Ultrix routers handle high-bandwidth, broadcast-quality, digital video and audio signals, and embedded audio signals. Digital video signals can be 12G\(^1\), 3G, high definition, or standard definition. The Ultrix routers support SMPTE standards 424M, 344M, 259M, and 292M.

Overview

The Destination connections on the Ultrix rear panel are located on the left-hand side and are clearly defined with black text on a gray background around the HD-BNCs.

ESD Susceptibility — Anti-static precautions must be taken when fitting or removing all cables. Wear an earthed wrist wrap strap if possible, or place both hands on the metal rack frame before handling the cables.

To connect SDI destination devices to the Ultrix router

1. Refer to the following sections to learn more about the specific output designations for your blade.
2. Connect the end of a 75ohm coaxial cable with HD-BNC connectors to an OUT HD-BNC on the rear panel.
3. Connect the other end of the coaxial cable to the device that will ingest the signal from that OUT HD-BNC on the router.

ULTRIX-HDBNC-IO Cabling

The ULTRIX-HDBNC-IO blade can be installed in an ULTRIX-FR1, ULTRIX-FR1-NS, ULTRIX-FR2, ULTRIX-FR2-NS, and ULTRIX-FR5 router. This section outlines the HD-BNCs for each router model. The SDI destinations are numbered starting with OUT 1 and the total number of BNCs depends on the router model you are using.

ULTRIX-HDX-IO Cabling

The ULTRIX-HDX-IO blade can be installed in an ULTRIX-FR1-NS, ULTRIX-FR2-NS, and ULTRIX-FR5 router. Each blade provides 16 SDI outputs. The BNCs are numbered starting with OUT 1 and the total number of BNCs depends on the router model you are using.

---

1. Requires installing an Ultrispeed license key for each slot. Refer to the Ultrix User Guide for details.
Figure 24  ULTRIX-HDX-IO Blade — SDI Outputs
Gearbox Cabling

A Gearbox is a group of four consecutive inputs or four consecutive outputs that are automatically grouped together in the Ultrix database. The first port of the Gearbox group is used for routing and Ultriscape, while the remaining three ports in the group are reserved but not used (they are not listed in the Third Party Matrices, Sources, and Destinations tabs of the database).

* An Ultrispeed license is required for Gearbox functionality. Refer to the *Ultrix User Guide* for details on installing license keys.

For More Information on...
* supported video formats for a Gearbox, refer to “Supported Video Formats”.

ULTRIX-HDBNC-IO Cabling

This section outlines the Gearbox cabling designations when using an ULTRIX-HDBNC-IO blade. *Figure 25* illustrates the connections allocated for Gearbox groups on an ULTRIX-HDBNC-IO blade.

*Figure 25  Example of Gearbox Mapping on a Single Ultrix-HDBNC-IO Blade*

**Outputs**

When you configure a Gearbox output group, Ultrix takes the signals of the four 3G Level A channels together and provides a single 12G signal to an output. *Table 6* outlines the default output groups for the ULTRIX-HDBNC-IO blade.

*Table 6 Gearbox Mapping — Default Output Groups*

<table>
<thead>
<tr>
<th>Group</th>
<th>Channel 1</th>
<th>Channel 2</th>
<th>Channel 3</th>
<th>Channel 4</th>
</tr>
</thead>
</table>

**Inputs**

When you enable a Gearbox input group, Ultrix multiplexes the signals of the four 3G Level A channels together. *Table 7* outlines the default inputs for the ULTRIX-HDBNC-IO blade.

*Table 7 Gearbox Mapping — Default Input Groups*

<table>
<thead>
<tr>
<th>Group</th>
<th>Channel 1</th>
<th>Channel 2</th>
<th>Channel 3</th>
<th>Channel 4</th>
</tr>
</thead>
</table>

ULTRIX-HDX-IO Cabling

*Figure 25* illustrates the connections allocated for Gearbox groups on the ULTRIX-HDX-IO blade.
Outputs

When you configure a Gearbox output group, Ultrix takes the signals of the four 3G Level A channels together and provides a single 12G signal to an output. Table 8 outlines the default output groups for the ULTRIX-HDX-IO blade.

<table>
<thead>
<tr>
<th>Group</th>
<th>Channel 1</th>
<th>Channel 2</th>
<th>Channel 3</th>
<th>Channel 4</th>
</tr>
</thead>
</table>

Inputs

When you enable a Gearbox input group, Ultrix multiplexes the signals of the four 3G Level A channels together. Table 9 outlines the default inputs for the ULTRIX-HDX-IO blade.

<table>
<thead>
<tr>
<th>Group</th>
<th>Channel 1</th>
<th>Channel 2</th>
<th>Channel 3</th>
<th>Channel 4</th>
</tr>
</thead>
</table>
Cabling for UltriScape

The number of UltriScape (Multiviewer) Heads for your Ultrix router depends on the number of UltriScape licenses enabled and the total number slots populated with I/O Boards.

Overview

Table 10 lists the connections on the rear panel that are available for UltriScape Heads based on the type of blade installed in the slot.

Table 10  Outputs Allocated for UltriScape Heads

<table>
<thead>
<tr>
<th>Blade Model</th>
<th>Slot</th>
<th>UltriScape Head 1</th>
<th>UltriScape Head 2</th>
<th>UltriScape Head 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULTRIX-HDBNC-IO</td>
<td>Slot #</td>
<td>AUX A or OUT 1</td>
<td>OUT 5 or OUT 7</td>
<td>OUT 11 or OUT 13</td>
</tr>
<tr>
<td>ULTRIX-HDX-IO</td>
<td>Slot #</td>
<td>AUX A or OUT 1</td>
<td>AUX B or OUT 5</td>
<td>OUT 13</td>
</tr>
<tr>
<td>ULTRIX-IP-IO</td>
<td>Slot #</td>
<td>AUX 1</td>
<td>AUX 2</td>
<td>--</td>
</tr>
<tr>
<td>ULTRIX-SFP-IO</td>
<td>Slot #</td>
<td>AUX A or SFP 1</td>
<td>SFP 5 or SFP 7</td>
<td>SFP 11 or SFP 13</td>
</tr>
</tbody>
</table>

Cabling Designations

This section outlines the UltriScape Head cabling designations for each I/O blade.

ULTRIX-HDBNC-IO Cabling

Figure 27 illustrates the connections allocated for UltriScape Heads on the ULTRIX-HDBNC-IO blade.

ULTRIX-HDX-IO Cabling

Figure 28 illustrates the connections allocated for UltriScape Heads on the ULTRIX-HDX-IO blade.
ULTRIX-IP-IO Cabling

Figure 29 illustrates the connections allocated for UltriScape Heads on the ULTRIX-IP-IO blade.

ULTRIX-SFP-IO Cabling

Figure 27 illustrates the connections allocated for UltriScape Heads on the ULTRIX-SFP-IO blade.
SFP Cabling

The primary function of SFP+ modules is to provide inputs and outputs different to the formats that the HD-BNCs provide. The number of ports you have depends on the model of Ultix router you are using, the blade(s) installed in the router, and the number of SFP+ modules you have chosen to install for each blade.

* The AUX ports on the ULTRIX-IP-IO blade can only be used for Ultriscape Head outputs.

Working with Fiber Optic Connectors

Keep the following in mind if the SFP+ module(s) installed in a port includes a fiber optic connector:

- Every time you are required to insert a connector into a device or mating sleeve, you must clean the connector. All exposed surfaces of the ceramic ferrule must be clean. Follow your facility practices of cleaning fiber optic connectors.
- Connectors must always be inserted into a device or have a dust cap on.
- A poor optical connection is often similar to a poor electrical connection. Try removing the connector, cleaning, and re-inserting the connector. A bad connection can result in experiencing instability of signal, high loss, or a noisy signal.

For More Information on...
- the available SFP+ modules, refer to "Supported SFP Modules".

Cabling Overview

* AUX port I/O are not available in the FLEX slot (topmost slot of the ULTRIX-FR5).

To connect to a third-party device via an AUX port on the ULTRIX-HDBNC-IO blade
1. Connect the end of an interface cable to an AUX port on the blade.
2. Connect the other end of the interface cable to the device that will communicate with the router via the AUX port.

ULTRIX-HDBNC-IO Cabling

The ULTRIX-HDBNC-IO blades can be installed in an ULTRIX-FR1, ULTRIX-FR1-NS, ULTRIX-FR2, ULTRIX-FR2-NS, and ULTRIX-FR5 router. Each blade provides up to two AUX ports that can be connected to a third-party device. Refer to Figure 31 for AUX port designations.

Figure 31 AUX Ports — ULTRIX-HDBNC-IO Blade
ULTRIX-HDX-IO Cabling

The ULTRIX-HDX-IO blade can be installed in an ULTRIX-FR1-NS, ULTRIX-FR2-NS, and ULTRIX-FR5 router. Each blade provides AUX ports that can be connected to a third-party device. (Figure 32) 

★ The AUX C and AUX D ports are not implemented.

ULTRIX-IP-IO Cabling

The ULTRIX-IP-IO blade can be installed in an ULTRIX-FR5 router. Each blade provides up to two AUX ports that can be connected to a third-party device. (Figure 33) 

★ The AUX ports on the ULTRIX-IP-IO blade can only be used for Ultriscape Head outputs.

ULTRIX-SFP-IO Cabling

The ULTRIX-SFP-IO blade can be installed in an ULTRIX-FR5 router. Each blade provides up to two AUX ports that can be connected to a third-party device. (Figure 33) 

★ AUX port I/O are not available in the FLEX slot (topmost slot of the ULTRIX-FR5).
Cabling for IP Streaming

This chapter applies when an ULTRIX-IP-IO blade is installed in an ULTRIX-FR5. The primary function of each ULTRIX-IP-IO PORT (1-4) is to provide a 25GbE network interface (SFP28) that can be configured as a Receiver and/or a Sender in DashBoard.

* Refer to the document *Ultrix Important Regulatory and Safety Notices* that shipped with your module, for safety information when handling fiber optic components.

Working with Fiber Optic Connectors

Keep the following in mind if the SFP+ module(s) installed in a port includes a fiber optic connector:

- Every time you are required to insert a connector into a device or mating sleeve, you must clean the connector. All exposed surfaces of the ceramic ferrule must be clean. Follow your facility practices of cleaning fiber optic connectors.
- Connectors must always be inserted into a device or have a dust cap on.
- A poor optical connection is often similar to a poor electrical connection. Try removing the connector, cleaning, and re-inserting the connector. A bad connection can result in experiencing instability of signal, high loss, or a noisy signal.

For More Information on...

- the available SFP+ modules, refer to the section “Supported SFP Modules”.

To cable an ULTRIX-IP-IO PORT

1. Remove the dust caps from each PORT connector on the ULTRIX-IP-IO blade.
2. Ensure that the exposed surface of the ceramic ferrule of each connector is clean. Refer to the section “Working with Fiber Optic Connectors” for cleaning tips.
3. Cable your SFP+ module as required. (Figure 35)

![Figure 35 ULTRIX-IP-IO — PORT Connections](image)

For More Information on...

- configuring the senders and receivers for the ULTRIX-IP-IO, refer to the *Ultrix User Guide*. 
Connecting to Ross Devices

This chapter provides workflow examples with other Ross devices.

Connecting to an Ultricore BCS

Adding an Ultricore BCS allows for greater connectivity and router control. It adds support for advanced features such as Ultrix-IP IO modules, NMOS interoperability, tie-line management, and control system redundancy.

![Figure 36 Example of a Simple Routing System with Ultrix and Ultricore BCS](image)

Connecting to a Ross NK Series Device

Ross NK Series devices, such as routers and remote control panels, communicate within the routing system via the Ross T-BUS interface. However, the Ultrix routers communicate only via an Ethernet protocol via a network connection. If you wish to establish communications between an Ultrix router and a Ross NK series device, you have two options: establish an Ethernet connection from the Ross NK Series device to your facility network via an NK-IPS or NK-NET device, or use an Ultricore CC to establish an NK native T-BUS connection.

To establish communication between an Ross NK device, such as an RCP-NKM, and your Ultrix router

- Connect the NK device to the same Ethernet network as your Ultrix router using an NK-NET or an NK-IPS, and then set up communications via the Ultricore interface in DashBoard. (**Figure 38**)
- Connect the NK device via the T-Bus connections on an Ultricore and then set up communications via the Ultricore interface in DashBoard. (**Figure 37**)

For More Information on...

- connecting your Ross NK Series device to your facility network, refer to its user documentation.

Adding an Ultricore Central Controller (CC) to the system allows for native T-BUS devices to be added to the system, as well as RS-232 or RS-422 third-party control. The Ultricore communicates over Ethernet to devices in your routing system. **Figure 37** shows a typical connection of Ultricore.
with other routing system components. Note that in this arrangement, Ultricore will act as a system master for all switching and database related functions.

Figure 37 Example of a Routing System with Ross NK Devices and an ULTRIX-FR1 Router

**Figure 38** provides an example of a system with an Ultrix and several Ross NK devices over T-Bus.

* The NK-NET requires any Ross NK router to supply phantom power for operation.

**Figure 38** Connection Example with an NK-NET
ULTRIX-HDBNC-IO Overview

This chapter outlines the default input and output cabling designations for an ULTRIX-HDBNC-IO blade. The SDI cabling designations are the same regardless of the router model.

SDI Input Cabling

Figure 39 outlines the SDI input cabling designations for an ULTRIX-HDBNC-IO blade. The input BNCs are located on the right side of each blade.

Figure 39  Ultrix Rear Panel — IN BNC Mapping for an ULTRIX-HDBNC-IO Blade

SDI Output Cabling

Figure 40 outlines the SDI output cabling designations for an ULTRIX-HDBNC-IO blade. The output BNCs are located on the left side of each blade.

Figure 40  Ultrix Rear Panel — OUT BNC Mapping for an ULTRIX-HDBNC-IO Blade

AUX Ports Designations

Figure 41 outlines the AUX port cabling designations for an ULTRIX-HDBNC-IO blade.

Figure 41  Ultrix Rear Panel — AUX Mapping for an ULTRIX-HDBNC-IO Blade
**UltriScape Cabling**

Figure 42 illustrates the connections allocated for UltriScape Heads on the ULTRIX-HDBNC-IO blade.

*Figure 42  Ultrix Rear Panel — UltriScape Head Mapping for an ULTRIX-HDBNC-IO Blade*
ULTRIX-HDX-IO Overview

This chapter outlines the default cabling designations for an ULTRIX-HDX-IO blade.

SDI Input Cabling

Figure 43 outlines the input cabling designations for an ULTRIX-HDX-IO blade. The input BNCs are located on the right side of each blade.

SDI Output Cabling

Figure 44 outlines the output cabling designations for an ULTRIX-HDX-IO blade. The output BNCs are located on the left side of each blade.

AUX Ports Designations

Figure 45 outlines the AUX designations for an ULTRIX-HDX-IO blade.

★ AUX C and D are not implemented.
**Ultriscape Cabling**

Figure 46 outlines the mapping of the Ultriscape Heads on an ULTRIX-HDX-IO blade.
ULTRIX-IP-IO Overview

This chapter outlines the default cabling designations for an ULTRIX-IP-IO blade.

For More Information on...
• the available SFP+ modules, refer to “Supported SFP Modules”.

ENET Ports

There are four ports on the ULTRIX-IP-IO blade that can be populated with supported SFP modules and designated as ethernet connections.

* These ports are labeled as ENET ports in the DashBoard interfaces.

AUX Ports

* The AUX ports on the ULTRIX-IP-IO blade can only be used for Ultriscape Head outputs.
ULTRIX-SFP-IO Overview

This chapter outlines the default input and output cabling designations for an ULTRIX-SFP-IO blade.

For More Information on...

• the available SFP+ modules, refer to “Supported SFP Modules”.

SFP Ports

The ULTRIX-SFP-IO blade provides up to 16 ports that can be populated with supported SFP+ modules.

![Figure 49 Location of SFP Ports on the ULTRIX-SFP-IO Blade](image)

AUX Ports

* AUX port I/O are not available in the FLEX slot (topmost slot of the ULTRIX-FR5).

![Figure 50 Location of AUX Ports on the ULTRIX-SFP-IO Blade](image)
Technical Specifications

This chapter provides technical information for Ultrix routers. Note that specifications are subject to change without notice.

Physical Dimensions

<table>
<thead>
<tr>
<th>Item</th>
<th>ULTRIX-FR1(-NS)</th>
<th>ULTRIX-FR2(-NS)</th>
<th>ULTRIX-FR5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>17.5” (44.45cm)</td>
<td>17.5” (44.45cm)</td>
<td>17.5” (44.45cm)</td>
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<tr>
<td>Depth</td>
<td>7.9” (20cm)</td>
<td>7.9” (20cm)</td>
<td>7.9” (20cm)</td>
</tr>
<tr>
<td>Height</td>
<td>1.74” (4.40cm)</td>
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<td>8.7” (22cm)</td>
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<td>Weight (approx.)</td>
<td>12lb (5.4kg)</td>
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Inventory

<table>
<thead>
<tr>
<th>Item</th>
<th>ULTRIX-FR1(-NS)</th>
<th>ULTRIX-FR2(-NS)</th>
<th>ULTRIX-FR5</th>
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</thead>
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<tr>
<td>Video Matrix Size (max.)</td>
<td>36x36</td>
<td>72x72</td>
<td>160x160</td>
</tr>
<tr>
<td>Fixed I/O Slots&lt;sup&gt;a&lt;/sup&gt;</td>
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<td>1 (16x16)</td>
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</tr>
<tr>
<td>Optional I/O Slots&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1 (16x16)</td>
<td>3 (48x48)</td>
<td>9 (144x144)</td>
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Audio

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<tr>
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<th>ULTRIX-FR5</th>
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<td>Audio Matrix Size (with Optional MADI SFPs)</td>
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MultiViewer

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<tr>
<td>Ultriscape Licenses per slot</td>
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<td>Maximum Multiviewer Heads per System</td>
<td>6</td>
<td>12</td>
<td>27</td>
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UHD

<table>
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<tr>
<th>Item</th>
<th>ULTRIX-FR1(-NS)</th>
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<tr>
<td>UltriSpeed Licenses per frame</td>
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<sup>a</sup> Optional SFP AUX I/O available to support up to 18x18 per slot.
# Supported FSCS Video Formats for Conversion

## Table 13 Reference Formats — FSCS Video

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<thead>
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<th>Provided Reference Format</th>
<th>Frame Sync/Clean Switch Video</th>
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<tr>
<td></td>
<td>1080p Level A 59.94Hz</td>
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<tr>
<td>Tri-Level 1080i 59.94Hz</td>
<td>480i 59.94Hz</td>
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<tr>
<td></td>
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## Supported Video Formats

### Table 14 Technical Specifications — Supported Formats

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<th>Interlace / Progressive</th>
<th>Frame Rate (Hz)</th>
<th>SDI Routing</th>
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<th>Ultriscape</th>
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</table>
ULTRIX-FR1(-NS) and ULTRIX-FR2(-NS) Power Specifications

The ULTRIX-FR1(-NS) and ULTRIX-FR2(-NS) are powered from up to four external power supplies. Each PSU port on the Ultrix rear panel accepts 15V DC power.

<table>
<thead>
<tr>
<th>Table 15 Technical Specifications — Power Supply Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td>Output</td>
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<table>
<thead>
<tr>
<th>Table 16 Technical Specifications — Power Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td>ULTRIX-FR1(-NS)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>ULTRIX-FR2(-NS)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

ULTRIX-FR5 Power Specifications

* The ULTRIX-FR5 requires the Ultripower Rack Mount Power Supply Unit.

<table>
<thead>
<tr>
<th>Table 17 Technical Specifications — Power Supply Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td>Output</td>
</tr>
<tr>
<td>Output Power</td>
</tr>
<tr>
<td>Input</td>
</tr>
<tr>
<td>Input Current</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 18 Technical Specifications — Power Supply Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td>ULTRIX-FR5</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Maximum Power Ratings

Table 19 outlines the maximum power ratings for fully loaded Ultrix router models.

<table>
<thead>
<tr>
<th>Table 19 Technical Specifications — Maximum Power Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td>ULTRIX-FR1(-NS) with 2 ULTRIX-HDBNC-IO blades</td>
</tr>
<tr>
<td>ULTRIX-FR2(-NS) with 4 ULTRIX-HDBNC-IO blades</td>
</tr>
<tr>
<td>ULTRIX-FR5 with 8 ULTRIX-HDBNC-IO blades</td>
</tr>
</tbody>
</table>
Table 19 Technical Specifications — Maximum Power Ratings

<table>
<thead>
<tr>
<th>Item</th>
<th>Specificationsa</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULTRIX-FR5 with 8 ULTRIX-IP-IO blades</td>
<td>~763W</td>
</tr>
<tr>
<td>ULTRIX-FR1-NS with 2 ULTRIX-HDX-IO blades</td>
<td>204W typical</td>
</tr>
<tr>
<td>ULTRIX-FR2-NS with 4 ULTRIX-HDX-IO blades</td>
<td>395W typical</td>
</tr>
<tr>
<td>ULTRIX-FR5 with 8 ULTRIX-HDX-IO blades</td>
<td>979W typical</td>
</tr>
</tbody>
</table>

a. For the latest power numbers for your configuration, refer to the Ross Configuration Tool on our website.

SDI Inputs

Table 20 ULTRIX-HDBNC-IO Blade — Inputs

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Input</td>
<td>HD-BNC</td>
</tr>
<tr>
<td>Signal Type (SDI Formats)</td>
<td>270MB/s, 1.5GB/s, 3GB/s, 12GB/s</td>
</tr>
<tr>
<td>Impedance</td>
<td>75ohm</td>
</tr>
<tr>
<td>Max. Input Level</td>
<td>880mV</td>
</tr>
<tr>
<td>Return Loss</td>
<td>Per SMPTE 2082-1</td>
</tr>
<tr>
<td>Equalization (typical)</td>
<td>UHD: 50m (160ft), HD, 3G: 200m (650ft), SD: 400m (1300ft)</td>
</tr>
<tr>
<td>SFP AUX Connector</td>
<td>Refer to “Supported SFP Modules” for a list of AUX options. Refer to the Ultrix SFP Modules Guide for more information on these options.</td>
</tr>
</tbody>
</table>

SDI Outputs

Table 21 ULTRIX-HDBNC-IO Blade — Outputs

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Output</td>
<td>HD-BNC</td>
</tr>
<tr>
<td>Signal Type (SDI Formats)</td>
<td>270MB/s, 1.5GB/s, 3GB/s, 12GB/s</td>
</tr>
<tr>
<td>Impedance</td>
<td>75ohm</td>
</tr>
<tr>
<td>Amplitude</td>
<td>800mV +/-10%</td>
</tr>
</tbody>
</table>
Table 21  ULTRIX-HDBNC-IO Blade — Outputs

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rise and Fall Time</td>
<td>270MB/s: 400-800ps</td>
</tr>
<tr>
<td></td>
<td>1.5GB/s, 3GB/s: &lt; 135ps</td>
</tr>
<tr>
<td></td>
<td>12GB/s: &lt;45ps</td>
</tr>
<tr>
<td>DC Offset</td>
<td>0.0V +/-0.5V</td>
</tr>
<tr>
<td>Jitter</td>
<td>&lt;0.15UI up to 3G</td>
</tr>
<tr>
<td></td>
<td>&lt;0.20UI 3G and 12G typical (&lt;0.30UI max.)</td>
</tr>
<tr>
<td>Return Loss</td>
<td>Per SMPTE 2082-1</td>
</tr>
<tr>
<td>SFP AUX Connector</td>
<td>Refer to “Supported SFP Modules” for a list of AUX options. Refer to the Ultrix SFP Modules Guide for more information on these options.</td>
</tr>
</tbody>
</table>

Embedded Audio

Table 22  Technical Specifications — Audio Inputs

<table>
<thead>
<tr>
<th>Item</th>
<th>ULTRIX-FR1(-NS)</th>
<th>ULTRIX-FR2(-NS)</th>
<th>ULTRIX-FR5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio Channels per SDI I/O</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Audio Channels per MADI I/O</td>
<td></td>
<td>Selectable 56 or 64</td>
<td></td>
</tr>
</tbody>
</table>

Environmental

Table 23  Technical Specifications — Environmental

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Ambient Temperature Range</td>
<td>0°C to 40°C (32°F to 104°F)</td>
</tr>
<tr>
<td>Humidity, non-condensing</td>
<td>&lt; 95%</td>
</tr>
</tbody>
</table>

MicroSD Card

Table 24  Technical Specifications — MicroSD Card

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types Supported</td>
<td>Contact Ross Technical Support</td>
</tr>
<tr>
<td>Operating Systems Supported</td>
<td></td>
</tr>
</tbody>
</table>
Ultriscape Output Specifications

<table>
<thead>
<tr>
<th>Format</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultriscape Output</td>
<td></td>
</tr>
<tr>
<td>1080i 50Hz</td>
<td></td>
</tr>
<tr>
<td>1080i 59.94Hz</td>
<td></td>
</tr>
<tr>
<td>1080p 50Hz</td>
<td></td>
</tr>
<tr>
<td>1080p 59.94Hz</td>
<td></td>
</tr>
</tbody>
</table>

Ethernet Port Connectors

Each Ultrix router comes standard with two Ethernet ports. Each port uses a standard single 8-pin, RJ45 connector to interface to an 802.3x Ethernet network. While Ultrix supports 1000Mbps (1GbE), 100Mbps, or 10Mbps network interface speeds, an 1GbE network connection is required. The Ethernet ports are operated in a link aggregated or bonded configuration to provide failover functionality.

* An 1GbE network connection is required.

Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standards Accommodated</td>
<td>1000BASE-T (GbE) network</td>
</tr>
<tr>
<td>Connector Type</td>
<td>RJ45</td>
</tr>
</tbody>
</table>

Supported USB-Serial Converters

The following USB-Serial chip-sets are supported:

- FTDI
- Silicon Labs CP210x
- Prolific PL2303
- Belkin

Supported SFP Modules

Some of the blades installed in the Ultrix rear panel can be populated with small form-factor pluggable (SFP) modules. Refer to the document *Ultrix SFP Modules Guide* for more information on the supported SFP models and their specifications.
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subsection 6b.

d. Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the
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**zlib**

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The data format used by the zlib library is described by RFCs (Request for Comments) 1950 to 1952 in the files ftp://ds.internic.net/rfc/rfc1950.txt (zlib format), rfc1951.txt (deflate format) and rfc1952.txt (gzip format).
Glossary

The following terms are used throughout this guide:

**Connection Point** — setting to define a communication connection between an Ultrix and a device in the routing system.

**Crosspoint** — a switch within a matrix. For example, the connection of signal IN 1 to OUT 1 requires one crosspoint.

**Destination** — a label applied to a router output (or group of outputs).

**Device** — a physical, virtual, or software application that may include multiple sources, destinations, senders, or receivers.

**Hard Panel** — a physical hardware panel of buttons that is used to control the routing system.

**Head** — An OUT port on the Ultrix router that is assigned as an Ultriscape (Multiviewer) output.

**IP Address** — a setting that defines the Internet protocol address of a device within a network.

**Logical (virtual) Label** — a name for a group of routing system inputs or outputs.

**Logical (virtual) Routing** — the action of switching a group of otherwise unrelated signals via a common label (name).

**Map** — a table that defines the allocation of names (labels) to router input and output sockets.

**Matrix** — the part of the routing system that performs the actual signal switching tasks.

**Partition** — matrices may be partitioned to behave as smaller independent matrices.

**Picture in Picture (PIP)** — a sub-picture in an Ultriscape (Multiviewer) output.

**Remote Control Panel (RCP)** — a physical hardware panel of buttons that is used to control the routing system.

**Resource** — a source or destination of a router configuration; an external device providing some conversion functionality for use within the routing control system.

**Soft Panel** — a DashBoard interface that represents a panel of buttons that is used to control the routing system.

**Source** — a label applied to a router input (or group of inputs).

**T-Bus** — the Ross Video proprietary routing communication method via a defined physical interface.

**UltriClean** — clean switch functionality of the Ultrix routers.

**Ultricore** — refers to the Ultricore-CC and the Ultricore-BCS unless otherwise stated.

**UltriMix** — SDI embedded audio manipulation sub-system of the Ultrix routers.

**Ultriscape** — licensed Multiviewer option for Ultrix routers.

**UltriSpeed** — licensed 12Gbps SDI video option.

**UltriSync** — a per input licensed frame synchronizer.

**ULTRIX-FR1-NS** — refers to the next generation of the ULTRIX-FR1 router. This router displays the Ultrix logo on the front door with a blue dot in the “i”.

**ULTRIX-FR2-NS** — refers to the next generation of the ULTRIX-FR2 router. This router displays the Ultrix logo on the front door with a blue dot in the “i”.