



**ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5
Installation Guide**

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A handwritten signature in black ink that reads "David Ross". The "D" is large and stylized, with a small "a" written above it. The "R" is also large and stylized, with a small "o" written above it. The "o" in "Ross" has a small "s" written to its left.

David Ross
CEO, Ross Video
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Ultrix · Installation Guide

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Patents

Patent numbers US 7,034,886; US 7,508,455; US 7,602,446; US 7,802,802 B2; US 7,834,886; US 7,914,332; US 8,307,284; US 8,407,374 B2; US 8,499,019 B2; US 8,519,949 B2; US 8,743,292 B2; GB 2,419,119 B; GB 2,447,380 B; and other patents pending.

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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.

Type of Equipment	User's Guide
A급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
Class A Equipment (Industrial Broadcasting & Communication Equipment)	This equipment is Industrial (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

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.

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Introduction

This guide is for system administrators and installers of the Ross Video ULTRIX-(NS)-FR1, ULTRIX-(NS)-FR2, and ULTRIX-(NS)-FR5 routers. If you are installing an ULTRIX-FR12, refer to the ***ULTRIX-FR12 Installation Guide***.

This guide contains the following chapters that cover the installation and physical setup of your 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.
- “**Ultriscape Cabling**” 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 a blade port for IP streaming.
- “**UltriProc Cabling**” outlines the cable designations for the UltriProc licensed feature.
- “**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 ULTRIX-IPX-IO blade.
- “**ULTRIX-IPX-IO Overview**” provides a summary of the ULTRIX-IPX-IO blade.
- “**ULTRIX-SFP-IO Overview**” provides a summary of 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, 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 Guide**, Ross Part Number: 8351DR-004
- **Ultronics BCS User Guide**, Ross Part Number: 2201DR-106
- **Ultronicscape User Guide**, Ross Part Number: 2101DR-018
- **Ultrix and Ultronics Database Guide**, Ross Part Number: 2201DR-109
- **ULTRIX-NS-FR1 and ULTRIX-NS-FR2 Quick Start Guide**, Ross Part Number: 2101DR-002
- **ULTRIX-FR5 Quick Start Guide**, 2101DR-502
- **ULTRIX-NS-FR5 Quick Start Guide**, 2101DR-503
- **ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 User Guide**, Ross Part Number: 2101DR-004
- **ULTRIX-FR12 Installation Guide**, Ross Part Number: 2101DR-603
- **ULTRIX-FR12 User Guide**, Ross Part Number: 2101DR-604
- **ULTRIX-MODX-IO User Guide**, Ross Part Number: 2101DR-020
- **Ultronics SFP Modules User Guide**, Ross Part Number: 2101DR-008

★ 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 **ULTRIX-FR12 Installation 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 Ultronics 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.

- **Toll Free Technical Support (North America):** 1-844-652-0645
- **Toll Free Technical Support (International):** +800 1005 0100
- **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.

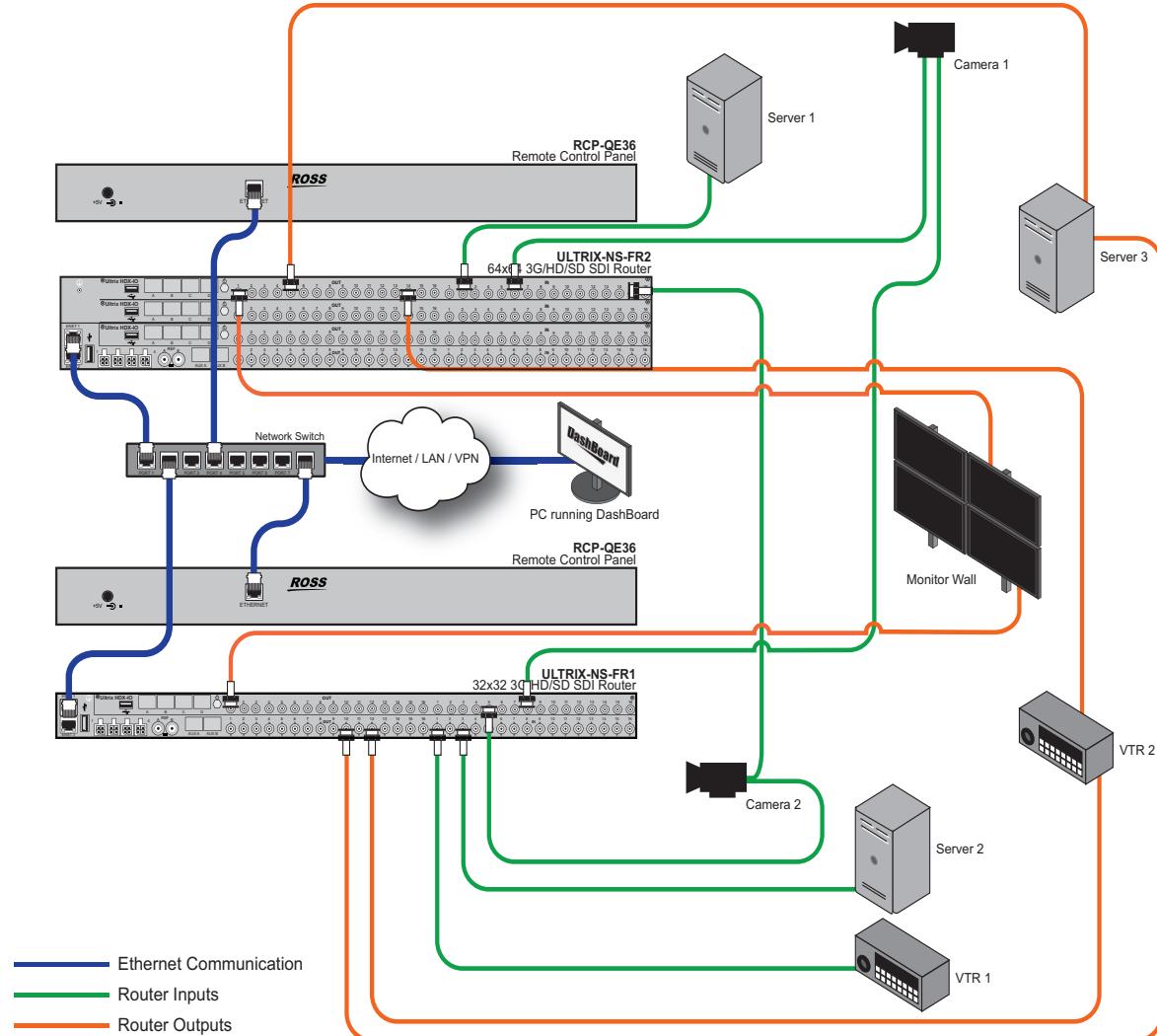


Figure 1 Example of a Routing System

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-FR1, ULTRIX-FR2, and ULTRIX-FR5 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 1 List of Ultrix Products

Model Number	Description
1RU Models	
ULTRIX-FR1(-NS)	Provides 16x16 inputs/outputs on HD-BNCs and 2 unpopulated AUX ports in a 1RU chassis
ULTRIX-HDB-IO	Provides additional 16x16 inputs/outputs on HD-BNCs and 2 unpopulated AUX ports
ULTRIX-HDX-IO	Provides additional 16x16 inputs/outputs on HD-BNCs and 4 unpopulated AUX ports
ULTRIX-IP-IO	Provides 4x25GE advanced connectivity and 2 unpopulated AUX ports
ULTRIX-IPX-IO	Provides 4x100Gigabit Ethernet (100GbE) ethernet connections and 4 unpopulated AUX ports ^a
ULTRIX-MODX-IO	Provides 4 x Plug-and-Play I/O modules and 2 unpopulated AUX ports
ULTRIX-SFP-IO	Provides 16x16 inputs/outputs via SFP modules and 2 unpopulated AUX ports
2RU Models	
ULTRIX-FR2(-NS)	Provides 16x16 inputs/outputs on HD-BNCs and 2 unpopulated AUX ports in a 2RU chassis
ULTRIX-HDB-IO	Provides additional 16x16 inputs/outputs on HD-BNCs and 2 unpopulated AUX ports

Table 1 List of Ultrix Products (Continued)

Model Number	Description
ULTRIX-HDX-IO	Provides additional 16x16 inputs/outputs on HD-BNCs and 4 unpopulated AUX ports
ULTRIX-IP-IO	Provides 4x25GE advanced connectivity and 2 unpopulated AUX ports
ULTRIX-IPX-IO	Provides 4x100Gigabit Ethernet (100GbE) ethernet connections and 4 unpopulated AUX ports ^a
ULTRIX-MODX-IO	Provides 4 x Plug-and-Play I/O modules and 2 unpopulated AUX ports
ULTRIX-SFP-IO	Provides 16x16 inputs/outputs via SFP modules and 2 unpopulated AUX ports
5RU Models	
ULTRIX-FR5	Provides 16x16 inputs/outputs on HD-BNCs and 2 unpopulated AUX ports in a 5RU chassis
ULTRIX-HDB-IO-A	Provides additional 16x16 inputs/outputs on HD-BNCs and 2 unpopulated AUX ports
ULTRIX-HDX-IO	Provides additional 16x16 inputs/outputs on HD-BNCs and 4 unpopulated AUX ports
ULTRIX-IP-IO	Provides 4x25GE advanced connectivity and 2 unpopulated AUX ports
ULTRIX-IPX-IO	Provides 4x100Gigabit (100GbE) ethernet connections and 4 unpopulated AUX ports ^a
ULTRIX-MODX-IO	Provides 4 x Plug-and-Play I/O modules and 2 unpopulated AUX ports
ULTRIX-SFP-IO	Provides 16x16 inputs/outputs via SFP modules and 2 unpopulated AUX ports

a. The AUX C and AUX D ports are not implemented in the Ultrix v5.3 software.

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

Model	Supported ULTRIX Blades					Description
	HDB-IO	HDX-IO	IP-IO	IPX-IO	SFP-IO	
SFP-ANA-IO	✓	✓			✓	Composite CODEC Transceiver that provides 1 analog input and 1 analog output
SFP-FIBER-3G	✓	✓			✓	3G SDI Optical Transceiver that provides 1 optical input and 1 optical output
SFP-FIBER-12G	✓	✓			✓	12G SDI Optical Transceiver that provides 1 optical input and 1 optical output
SFP-HDB-IO-3G	✓	✓	✓	✓	✓	3G SDI HD-BNC Transceiver that provides 1 SDI input and 1 SDI output
SFP-HDB-IO-12G	✓	✓	✓	✓	✓	12G/3G/HD SDI Coax Transceiver that provides 1 SDI input and 1 SDI output
SFP-HDB-IN-12G	✓	✓			✓	12G SDI HD-BNC Dual Receiver that provides 1 SDI input
SFP-HDB-OUT-12G	✓	✓			✓	12G SDI HD-BNC Dual Receiver that provides 1 SDI output
SFP-HDM-OUT	✓	✓	✓	✓	✓	SDI to HDMI/DVI Transmitter
SFP-HDM-OUT-12G	✓	✓	✓	✓	✓	12G/3G/HD-SDI to HDMI 2.0/DVI Transmitter

Table 2 List of SFP Modules (Continued)

Supported ULTRIX Blades						
Model	HDB-IO	HDX-IO	IP-IO	IPX-IO	SFP-IO	Description
SFP-HDM-IN	✓	✓			✓	HDMI/DVI to SDI Receiver
SFP-HDM-IN-12G	✓	✓			✓	HDMI/DVI to 12G/3G/HD-SDI Receiver
SFP-MADI-850MM	✓	✓			✓ ^a	3G SDI multi-mode optical transceiver (850 nanometer)
SFP-MADI-1300MM	✓	✓			✓ ^a	3G SDI multi-mode optical transceiver (1330 nanometer)
SFP-MADI-1310SM	✓	✓			✓ ^a	3G SDI optical transceiver that supports MADI
SFP-MADI-COAX	✓	✓			✓ ^a	MADI Transceiver that provides a MADI Link with up to 64 channels in and out

a. Only supported in the AUX A and/or AUX B ports only.

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.

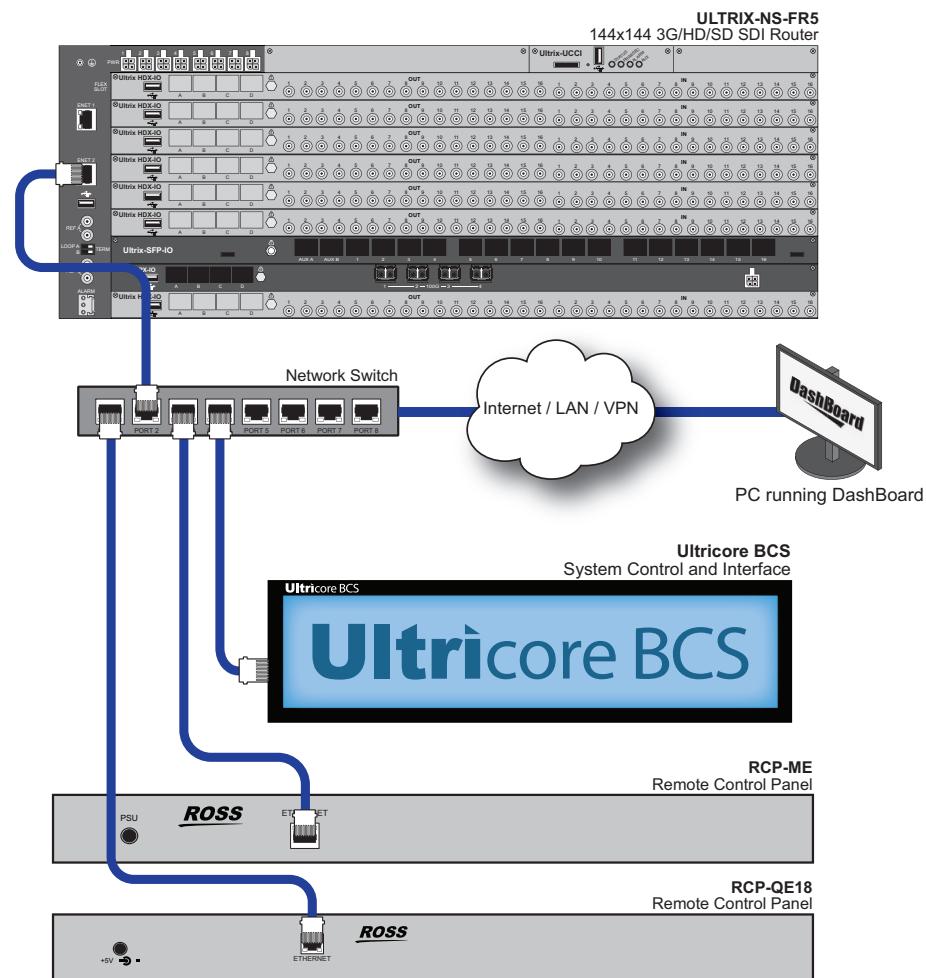


Figure 2 Example of a Simple Workflow

- ★ 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 Guide***.
- the MC-UHD, refer to the ***MC1-UHD User Guide***.

Hardware Overview

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

- ★ The ULTRIX-NS-FR1 and ULTRIX-NS-FR2 have updated frame components to allow the support of more advanced IO modules such as ULTRIX-IPX-IO. The ULTRIX-NS-FR1 and ULTRIX-NS-FR2 may be identified by the blue dot above the i on the front panel Ultrix logo (**Figure 3**).
- ★ The ULTRIX-NS-FR5 may be identified by the number of PSU connections. The ULTRIX-NS-FR5 includes 8 PSU connections, while the ULTRIX-FR5 includes 4 PSU connections.

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-NS-FR1.

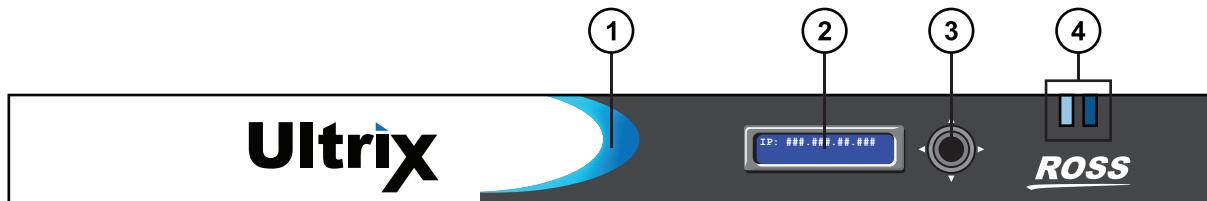


Figure 3 Front Panel — ULTRIX-NS-FR1

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 3 Front Panel Wave Light

Status	Description
Blue	When lit blue, this indicates normal operation.
Red	When lit red, this indicates a serious issue that requires immediate attention.

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.

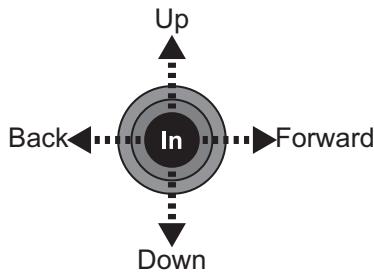


Figure 4 Positioner Movement

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 “[Rear Panel Overview](#)” for details.

Table 4 Front Panel LEDs

LED	Status	Description
ENET #	Bright Blue	A valid physical Ethernet connection is established, and the port is active. There is data transfer activity on the indicated Ethernet port.
	Dim Blue	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.
	Off	No valid Ethernet connection to the indicated Ethernet port.

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.



Figure 5 Overview of the Chassis Interior — ULTRIX-FR1(-NS)

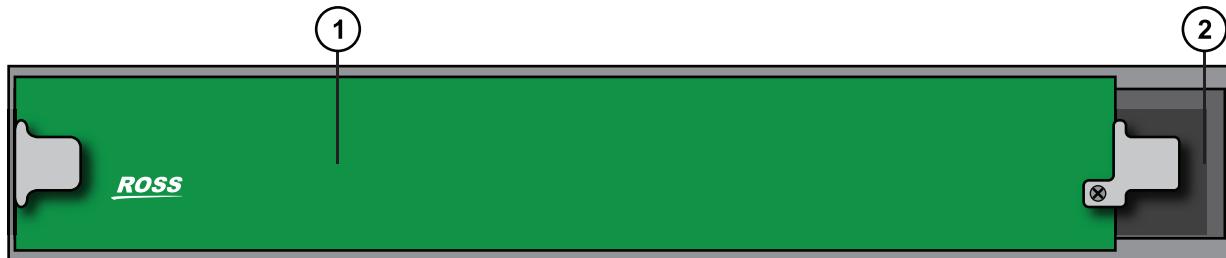


Figure 6 Overview of the Chassis Interior — ULTRIX-FR2(-NS)

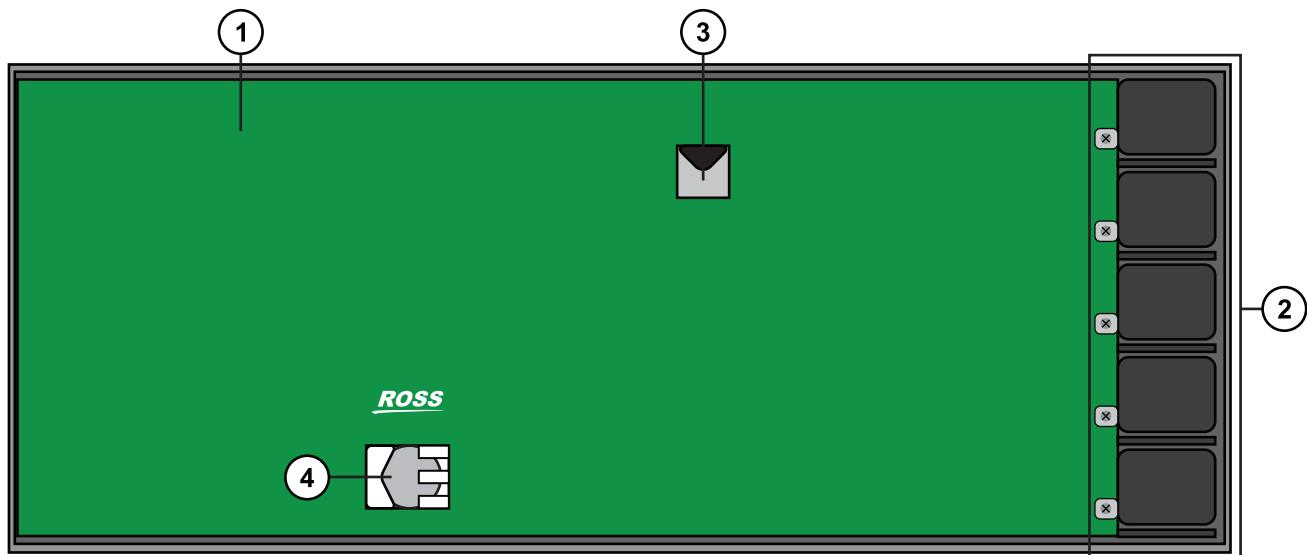


Figure 7 Overview of the Chassis Interior — ULTRIX-FR5 and ULTRIX-NS-FR5

1) Main Board	3) Micro SD Card
2) Cooling Fan Module(s)	4) Battery

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(-NS)-FR1 and ULTRIX(-NS)-FR2 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(-NS)-FR1 and ULTRIX(-NS)-FR2 Cooling Fan Modules. Do not change its settings unless directed by Ross Technical Support.

3. Micro SD Card (ULTRIX-NS-FR5 and 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-NS-FR1 and ULTRIX-NS-FR2 chassis, this battery is located on the Cooling Fan Module. Refer to the **ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 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.

- ★ The ULTRIX-NS-FR1 and ULTRIX-NS-FR2 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-NS-FR1 front door.

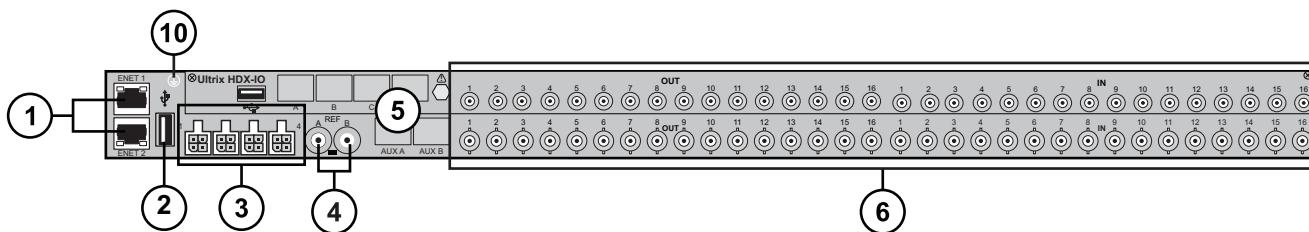


Figure 8 Rear Panel — ULTRIX(-NS)-FR1

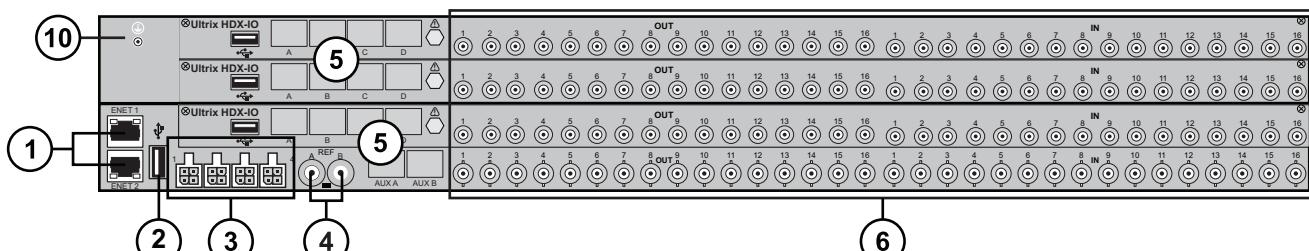


Figure 9 Rear Panel — ULTRIX(-NS)-FR2

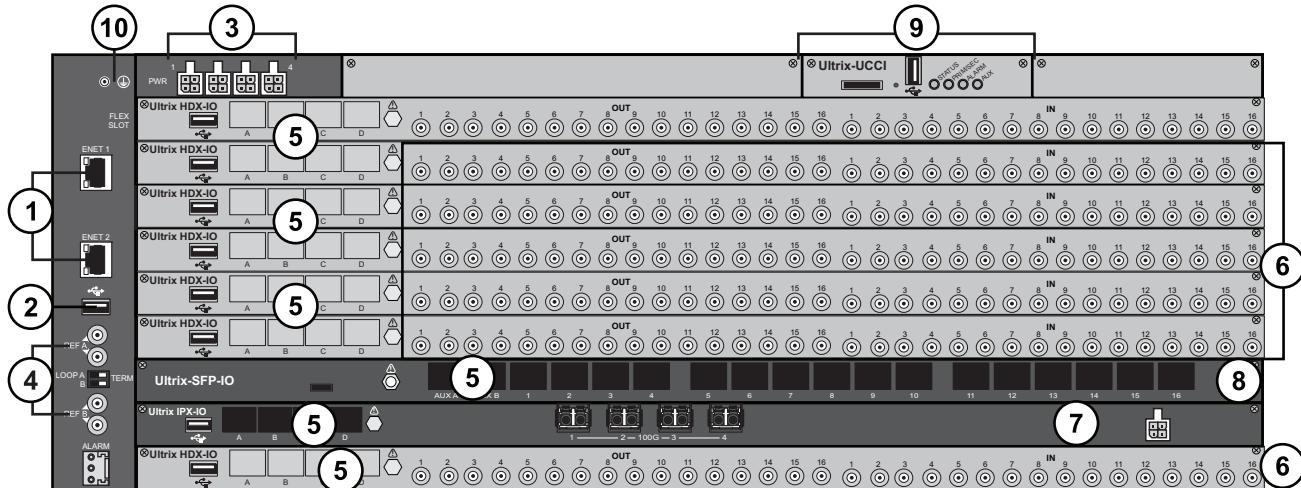


Figure 10 Rear Panel — UTRIX-FR5

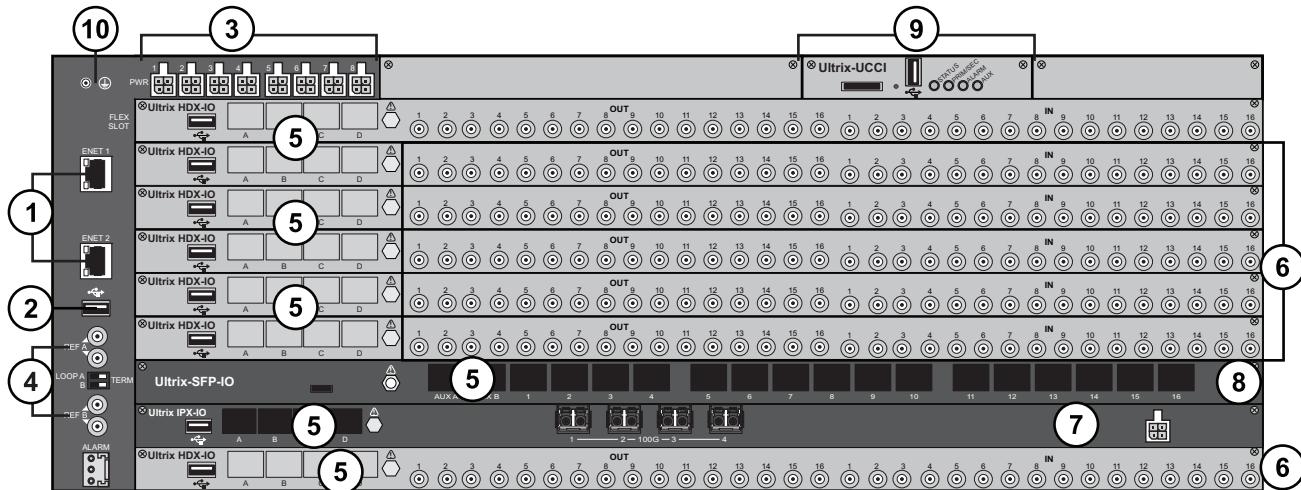


Figure 11 Rear Panel — UTRIX-NS-FR5

1) Ethernet Connections	5) Auxiliary SFP+ Ports	9) UTRIX-UCCI Slots
2) USB Port	6) SDI IN and OUT Connections	10) Protective Earth Stud
3) PSU Connections	7) UTRIX-IPX-IO Blade	
4) Video Reference Connections	8) UTRIX-SFP-IO Blade	

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). Connect ENET1 as the primary ethernet connection to bridge the external Ethernet network to the local communications bus for monitoring and control of the router. Only connect ENET2 when a redundant connection is required



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 **“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(-NS)-FR1 ships with one power supply. An option is available to order a second power supply for redundancy.
- The ULTRIX(-NS)-FR2 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(-NS)-FR2 chassis requires a minimum of two power supplies.*

- The ULTRIX(-NS)-FR5 requires power from an Ultripower power supply.

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.

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

Refer to **Table 5** to learn what REF ports are supported on each type of blade and router.

Table 5 Supported Blades for Each Router

Blade	ULTRIX-FR1	ULTRIX-NS-FR1	ULTRIX-FR2	ULTRIX-NS-FR2	ULTRIX(-NS)-FR5
SDPE-ACUITY	N/S	N/S	N/S	N/S	REF A
SDPE-CARBONITE	REF A	REF A	REF A	REF A	REF A or REF B
ULTRIX-HDX-IO	REF A	REF A	REF A	REF A	REF A or REF B
ULTRIX-IP-IO	REF A	REF A	REF A	REF A	REF A or REF B
ULTRIX-IPX-IO	REF A	REF A	REF A	REF A	REF A or REF B
ULTRIX-MODX-IO	REF A	REF A	REF A	REF A	REF A or REF B
ULTRIX-SFP-IO	REF A	REF A	REF A	REF A	REF A or REF B

N/S is Not Supported

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 Ultrix rear panel, its status is reported in DashBoard and options are provided for mapping and labeling the I/O as required.

6. SDI IN and OUT 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-IO or ULTRIX-HDX-IO¹ 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-NS-FR1, 64x64 inputs/outputs in the ULTRIX-NS-FR2, or 144x144 inputs/outputs in the ULTRIX(-NS)-FR5.

- ★ The Slots are numbered sequentially with Slot 1 as the topmost slot except on the ULTRIX(-NS)-FR5. On the ULTRIX(-NS)-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-IPX-IO Blade

The ULTRIX-IPX-IO blade is installed in any available slot of an ULTRIX-NS-FR1, ULTRIX-NS-FR2, or an ULTRIX(-NS)-FR5. Each ULTRIX-IPX-IO blade provides four QSFP28 ports with 100GbE bandwidth per port. Refer to "**ULTRIX-IPX-IO Overview**" for more information on this optional blade.

8. ULTRIX-SFP-IO Blade

The ULTRIX-SFP-IO blade is installed in any available slot of an ULTRIX-NS-FR1, ULTRIX-NS-FR2, or an ULTRIX(-NS)-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**. Refer to "**ULTRIX-SFP-IO Overview**" for more information on this optional blade.

- ★ 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.

9. Ultrix-UCCI Slots (ULTRIX(-NS)-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 6 describes the Ultrix-UCCI status LEDs.

Table 6 Ultrix-UCCI LEDs

LED	Status		Description
STATUS	Green		Indicates the Ultrix-UCCI is powered and the last re-boot was successful
	Flashing Green		Indicates the Ultrix-UCCI is powered and in the progress of a re-boot
	Red		Indicates the Ultrix-UCCI is powered but requires a re-boot
PRIM/SEC	Green		Indicates the Ultrix-UCCI is configured and functioning as a Master
	Flashing Green		Indicates the Ultrix-UCCI is in standby mode

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

Table 6 Ultrix-UCCI LEDs (Continued)

LED	Status	Description
ALARM	Red	Indicates the Ultrix-UCCI is experiencing an error condition; verify the message(s) on the router front panel LCD display and DashBoard
	Off	Indicates the Ultrix-UCCI is operating correctly and is not experiencing any errors
AUX	This LED is not implemented.	

For More Information on...

- installing and configuring a second Ultrix-UCCI in your ULTRIX(-NS)-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-NS-FR1, ULTRIX-NS-FR2, and ULTRIX(-NS)-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(-NS)-FR1

Figure 12 outlines the numbering scheme for the ULTRIX-FR1 and ULTRIX-NS-FR1 chassis. Note that **Slot 1** is the topmost slot.

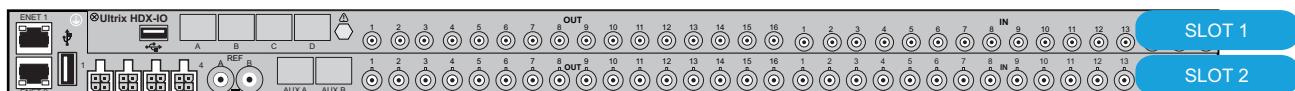


Figure 12 Slot Numbering — ULTRIX-FR1 and ULTRIX-NS-FR1

ULTRIX(-NS)-FR2

Figure 13 outlines the numbering scheme for the ULTRIX-FR2 and ULTRIX-NS-FR2 chassis. Note that **Slot 1** is the topmost slot.

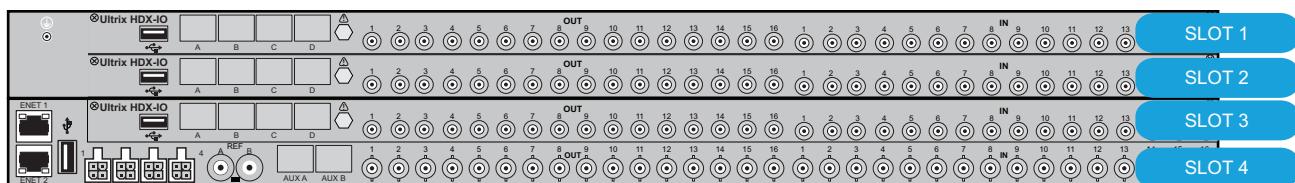


Figure 13 Slot Numbering — ULTRIX-FR2 and ULTRIX-NS-FR2

ULTRIX-NS-FR5

Figure 14 outlines the numbering scheme for the ULTRIX-NS-FR5 chassis. Note that the **FLEX** slot is the topmost slot.

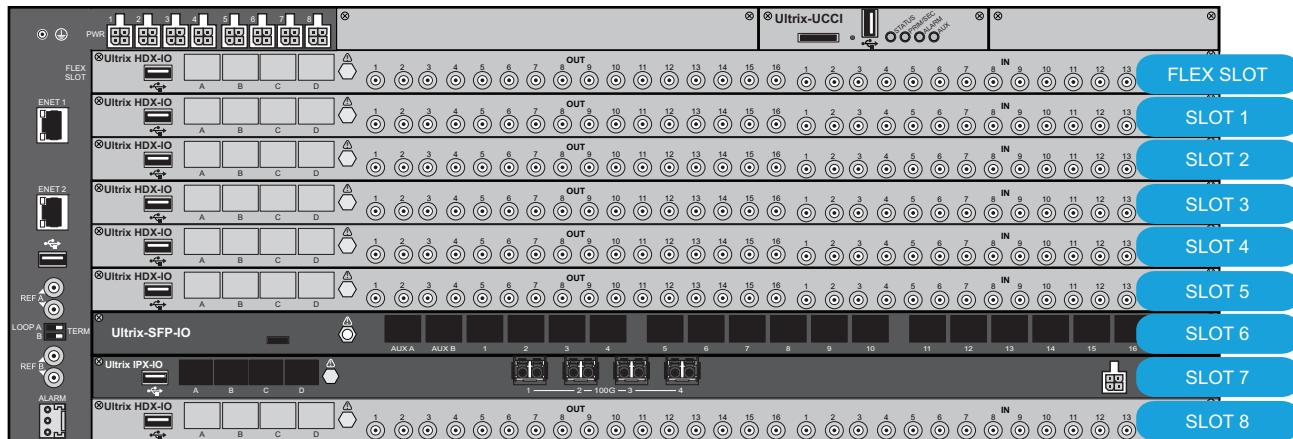


Figure 14 Slot Numbering — ULTRIX-NS-FR5

ULTRIX-FR5

Figure 15 outlines the numbering scheme for the ULTRIX-FR5 chassis. Note that the **FLEX** slot is the topmost slot.

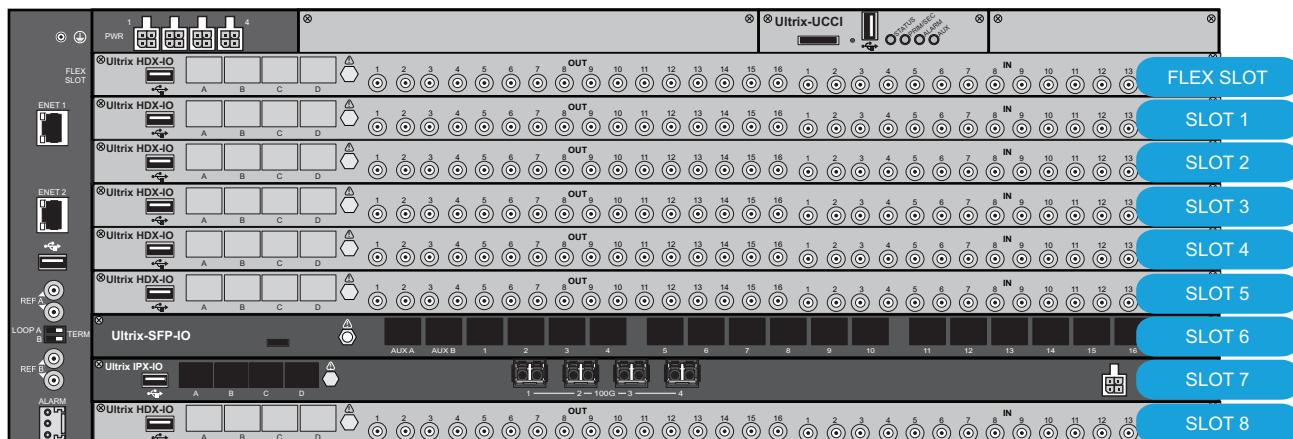


Figure 15 Slot Numbering — ULTRIX-FR5

Physical Installation

If you have questions pertaining to the installation of your Ultrix router, contact us at the numbers listed in **“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-FR1, ULTRIX-FR2, and ULTRIX-FR5 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 **“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 Guide***.
- ★ 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.

Primary Network Connection

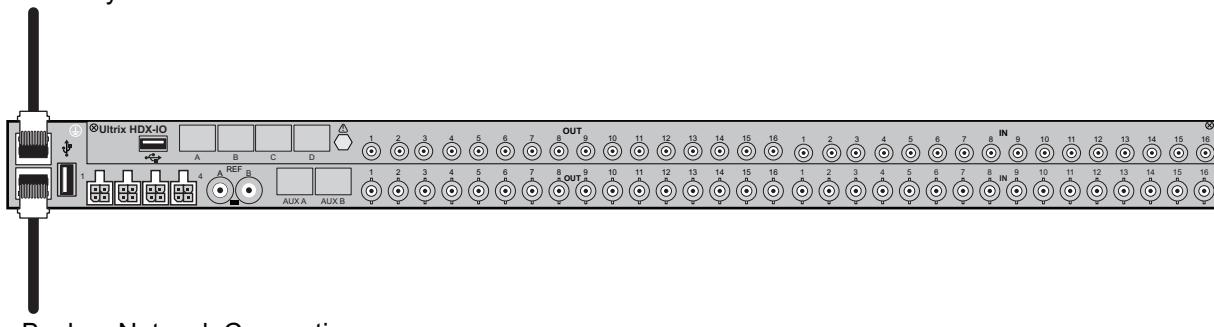


Figure 16 ULTRIX-NS-FR1 — Network Connections

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(-NS)-FR1 and ULTRIX(-NS)-FR2

Before you begin, keep in mind that:

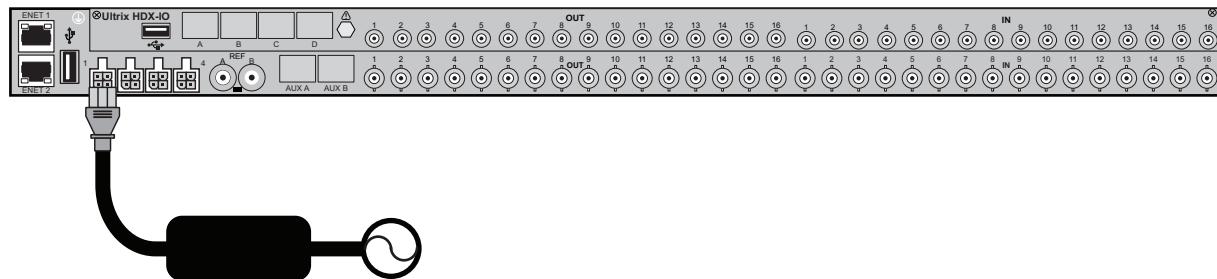
- Each ULTRIX(-NS)-FR1 router requires a minimum of one +15V DC, 32A PSU. For redundancy and load sharing, up to 3 optional PSU can be used.
- Each ULTRIX(-NS)-FR2 router requires a minimum of two +15V DC, 32A PSU. For redundancy and load sharing, up to 2 optional PSU can be used.
- For redundancy, each 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(-NS)-FR1 or ULTRIX(-NS)-FR2

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



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

Figure 17 ULTRIX(-NS)-FR1 — Primary Power Connection

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



Notice — *The ULTRIX(-NS)-FR2 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(-NS)-FR5

Each ULTRIX(-NS)-FR5 router requires powering from an Ultripower Rack Mount Power Supply Unit. Powering an ULTRIX(-NS)-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** or **ULTRIX-NS-FR5 Quick Start Guide** for more information on connecting to the Ultripower.

To connect an Ultripower to an ULTRIX(-NS)-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 router rear panel.



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



Notice — *The ULTRIX(-NS)-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(-NS)-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.

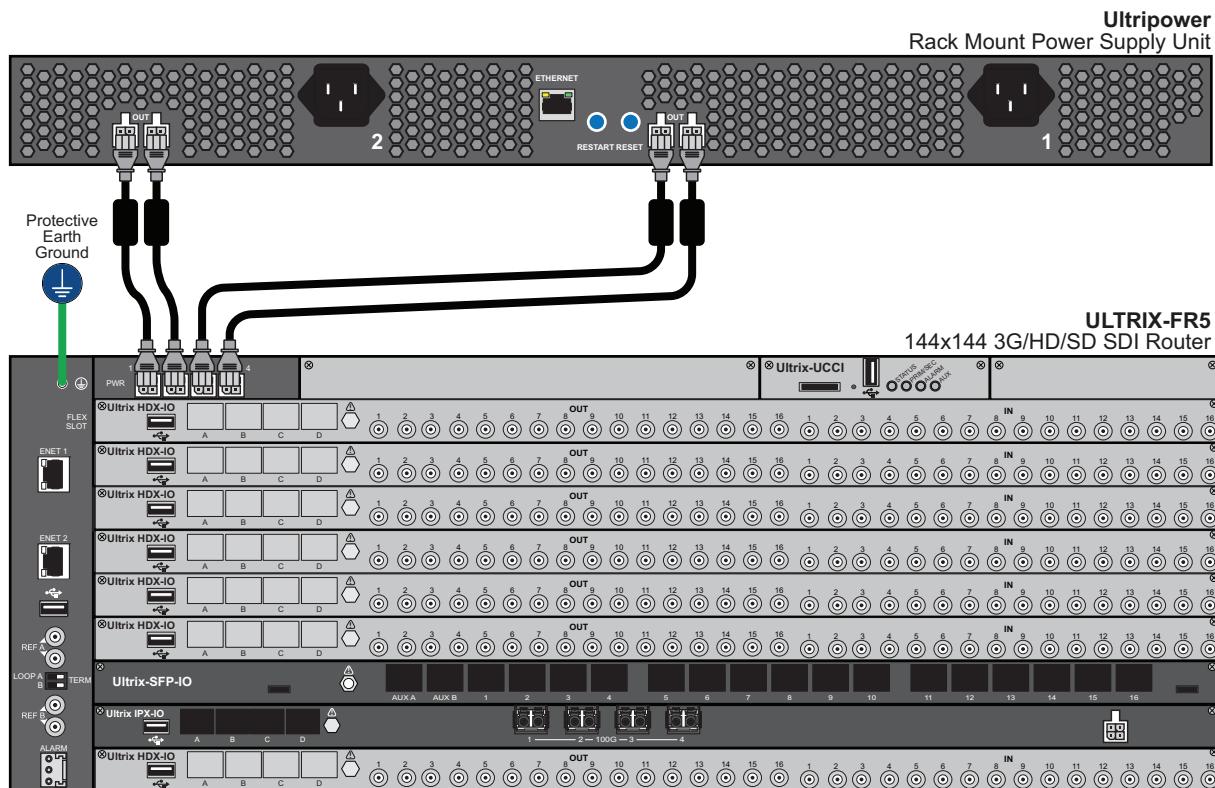


Figure 18 ULTRIX-FR5 — Power Connections

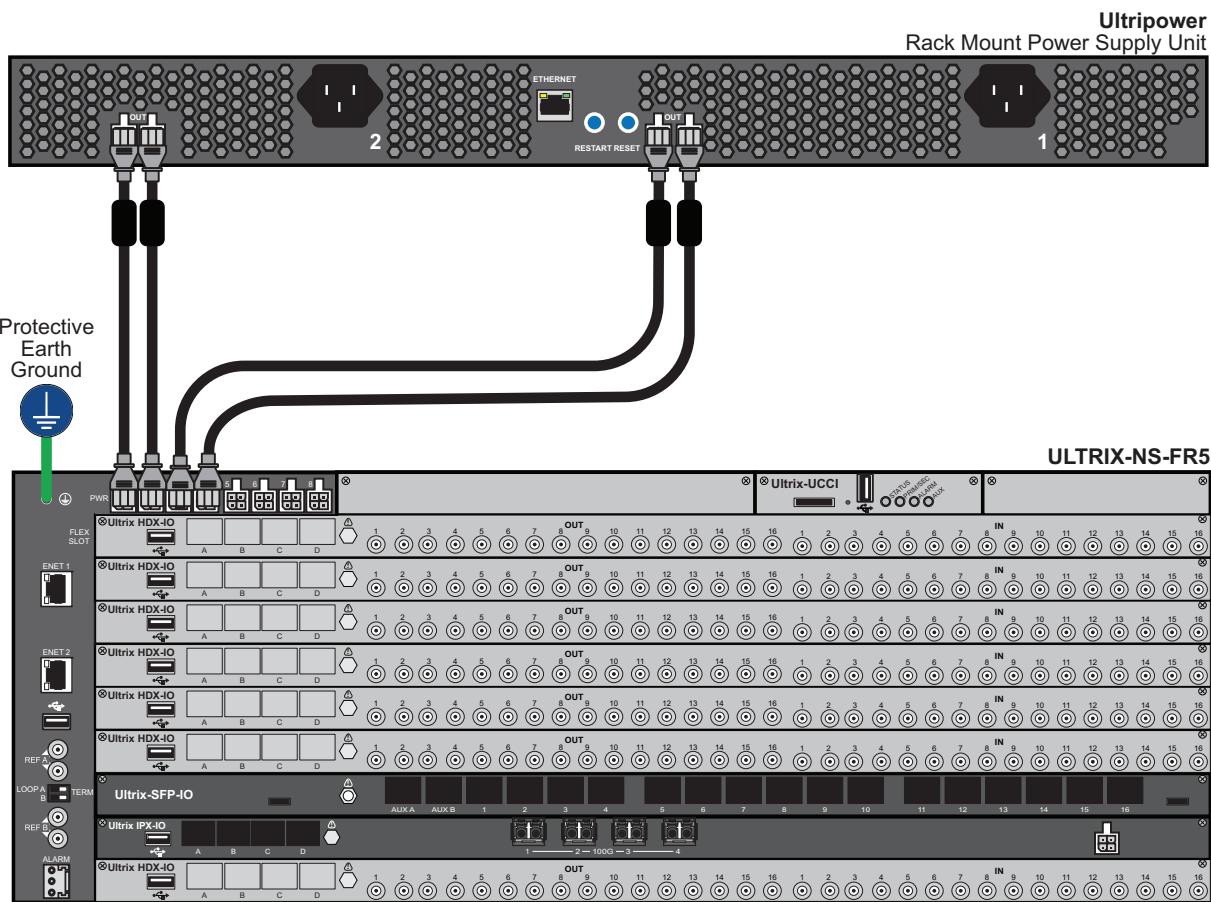


Figure 19 ULTRIX-NS-FR5 — Power Connections

Video Reference

The Ultrix routers handle high-bandwidth, broadcast-quality, digital video and audio signals, and embedded audio signals. Digital video signals can be 12G¹, 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 reference ensures that switching occurs in the default vertical interval across all router levels. The default switching pulse complies with **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 **ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 User Guide**.
- supported reference formats for Frame Sync/Clean Switch, refer to **"Supported Frame Sync/Clean Switch Video Formats for Conversion"**.

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

The ULTRIX(-NS)-FR1 and ULTRIX(-NS)-FR2 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(-NS)-FR1 or ULTRIX(-NS)-FR2

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.
- ★ Use the **REF B** port only as a loop when configuring the ULTRIX(-NS)-FR1 and ULTRIX(-NS)-FR2 for a loop-through work flow.

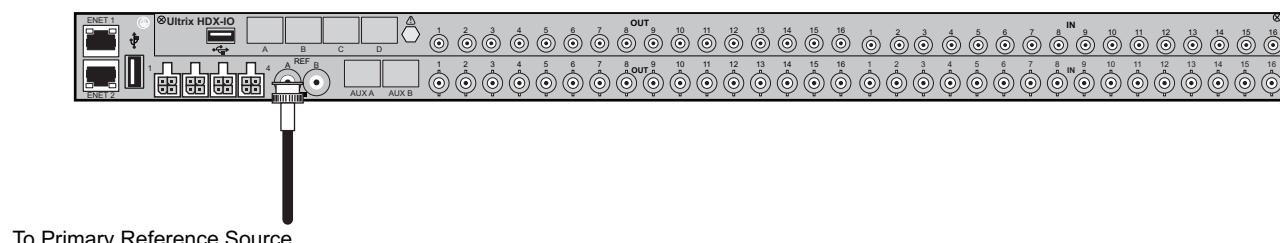


Figure 20 Video Reference Cabling — ULTRIX(-NS)-FR1 or ULTRIX(-NS)-FR2

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

1. Requires installing an Ultrispeed license key for each slot. Refer to the **ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 User Guide** for details.

- 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.
- Continue looping the **REF** connectors across the routers that you want referenced to this signal.
- Ensure that the last router in the video referencing loop has a 75ohm termination connected to its **REF B** connector.

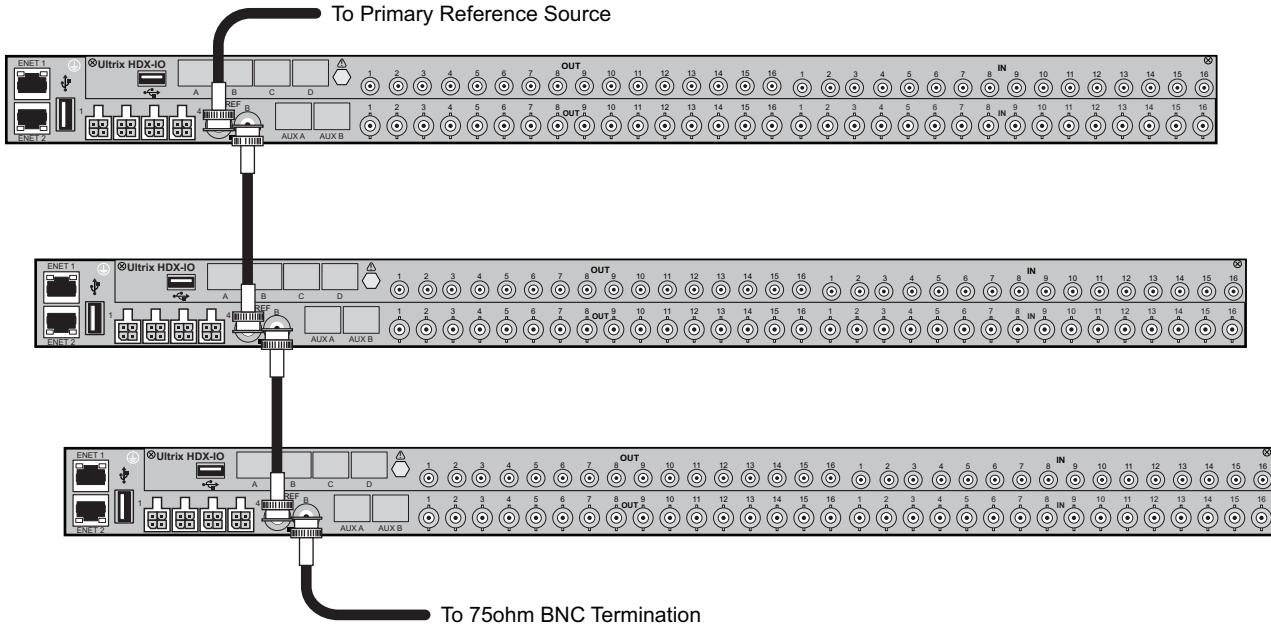


Figure 21 Connecting Multiple Routers for Simultaneous Switching

Cabling for the ULTRIX(-NS)-FR5

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

To connect the video reference source to the ULTRIX(-NS)-FR5

- Connect a valid reference signal to either BNC in the BNC pair labeled **REF A**.

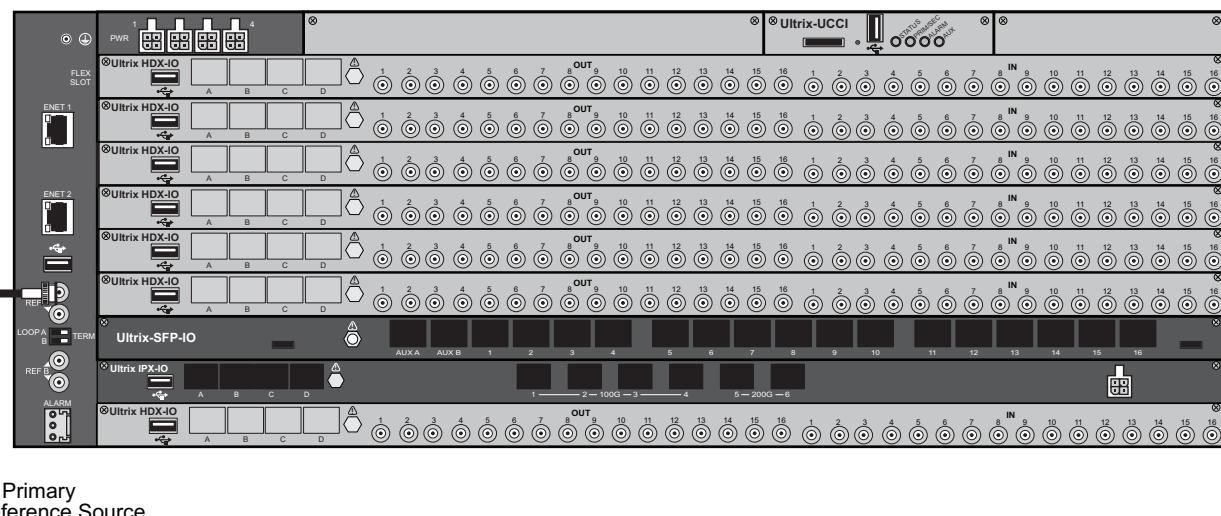


Figure 22 Video Reference Cabling — REF A Port on the ULTRIX-FR5

2. Select either **TERM** or **LOOP** on the DIP switch **A** to select the preferred BNC mode.

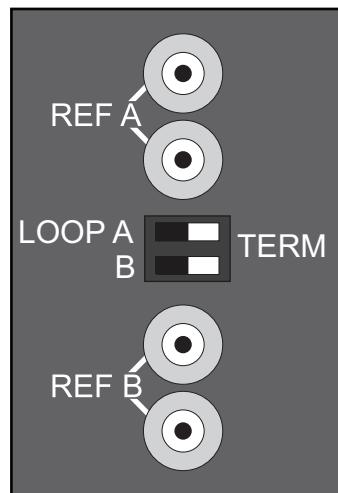


Figure 23 *ULTRIX(-NS)-FR5 — DIP Switch in the TERM Positions*

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 12G¹, 3G, high definition, or standard definition. The Ultrix routers support SMPTE standards 424M, 344M, 259M, and 292M.

For More Information on...

- cabling the ULTRIX-MODX-IO blade, refer to the ***ULTRIX-MODX-IO User Guide***.

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-NS-FR1, ULTRIX-FR2, ULTRIX-NS-FR2, and ULTRIX(-NS)-FR5 router. The BNCs are numbered starting with **IN 1**. (Figure 24)

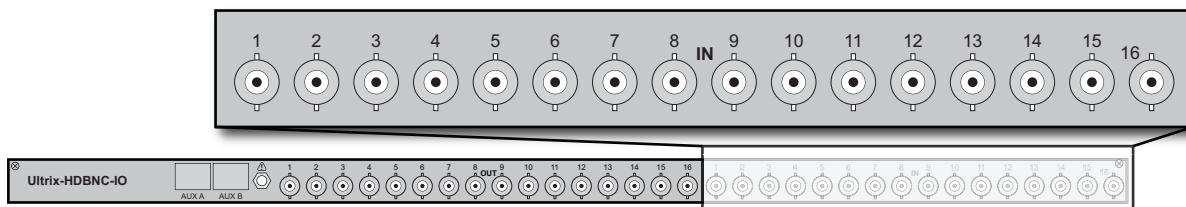


Figure 24 ULTRIX-HDBNC-IO Blade — SDI Inputs

1. Requires installing an Ulrispeed license key for each slot. Refer to the ***ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 User Guide*** for details.

ULTRIX-HDX-IO Cabling

The ULTRIX-HDX-IO blade can be installed in an ULTRIX-NS-FR1, ULTRIX-NS-FR2, and ULTRIX(-NS)-FR5 router. Each blade provides 16 SDI inputs. The BNCs are numbered starting with **IN 1**. (**Figure 25**)

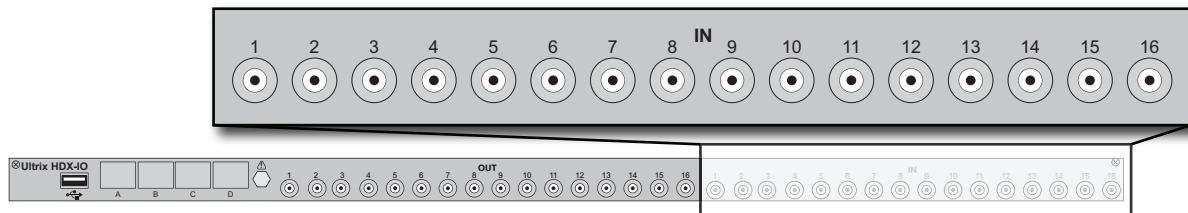


Figure 25 ULTRIX-HDX-IO Blade — SDI Inputs

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 12G¹, 3G, high definition, or standard definition. The Ultrix routers support SMPTE standards 424M, 344M, 259M, and 292M.

For More Information on...

- cabling the ULTRIX-MODX-IO blade, refer to the ***ULTRIX-MODX-IO User Guide***.

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-NS-FR1, ULTRIX-FR2, ULTRIX-NS-FR2, and ULTRIX(=NS)-FR5 router. The SDI destinations are numbered starting with **OUT 1**. (Figure 26)

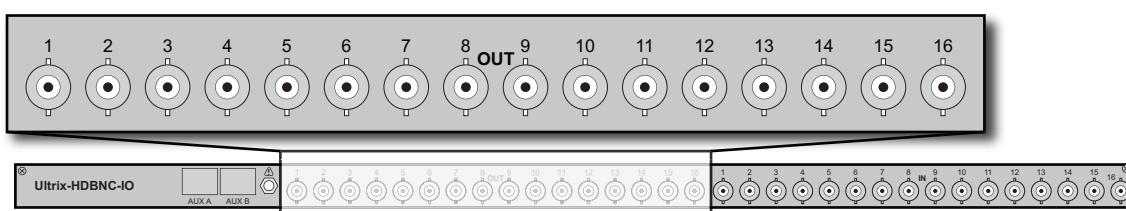


Figure 26 ULTRIX-HDBNC-IO Blade — SDI Outputs

1. Requires installing an Ulrispeed license key for each slot. Refer to the ***ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 User Guide*** for details.

ULTRIX-HDX-IO Cabling

The ULTRIX-HDX-IO blade can be installed in an ULTRIX-NS-FR1, ULTRIX-NS-FR2, and ULTRIX(-NS)-FR5 router. Each blade provides 16 SDI outputs. The BNCs are numbered starting with **OUT 1**. (Figure 27)

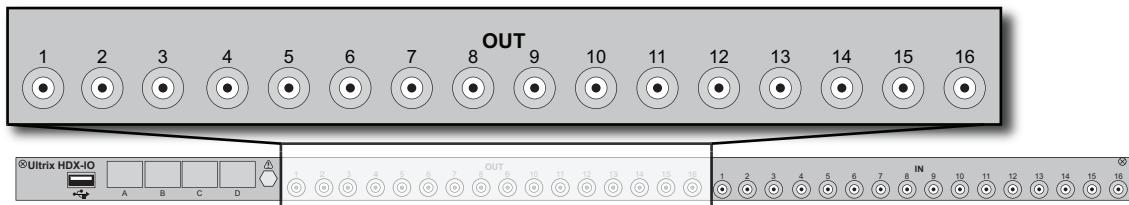


Figure 27 *ULTRIX-HDX-IO Blade — SDI Outputs*

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-FR1, ULTRIX-FR2, and ULTRIX-FR5 User Guide** for details on installing license keys.

For More Information on...

- supported video formats for a Gearbox, refer to **“Supported Video Formats”**.
- cabling the ULTRIX-MODX-IO blade, refer to the **ULTRIX-MODX-IO User Guide**.

ULTRIX-HDBNC-IO Cabling

This section outlines the Gearbox cabling designations when using an ULTRIX-HDBNC-IO blade. **Figure 28** illustrates the connections allocated for Gearbox groups on an ULTRIX-HDBNC-IO blade.

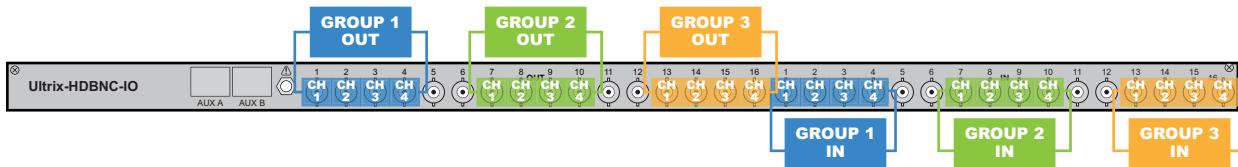


Figure 28 Example of Gearbox Mapping on a Single Ultrix-HDBNC-IO Blade

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 7** outlines the default output groups for the ULTRIX-HDBNC-IO blade

Table 7 Gearbox Mapping — Default Output Groups

Group	Channel 1	Channel 2	Channel 3	Channel 4
1	slot#.out[1]	slot#.out[2]	slot#.out[3]	slot#.out[4]
2	slot#.out[7]	slot#.out[8]	slot#.out[9]	slot#.out[10]
3	slot#.out[13]	slot#.out[14]	slot#.out[15]	slot#.out[16]

Inputs

When you enable a Gearbox input group, Ultrix multiplexes the signals of the four 3G Level A channels together. **Table 8** outlines the default inputs for the ULTRIX-HDBNC-IO blade

Table 8 Gearbox Mapping — Default Input Groups

Group	Channel 1	Channel 2	Channel 3	Channel 4
1	slot#.in[1]	slot#.in[2]	slot#.in[3]	slot#.in[4]
2	slot#.in[7]	slot#.in[8]	slot#.in[9]	slot#.in[10]
3	slot#.in[13]	slot#.in[14]	slot#.in[15]	slot#.in[16]

ULTRIX-HDX-IO Cabling

Figure 29 illustrates the connections allocated for Gearbox groups on the ULTRIX-HDX-IO blade.

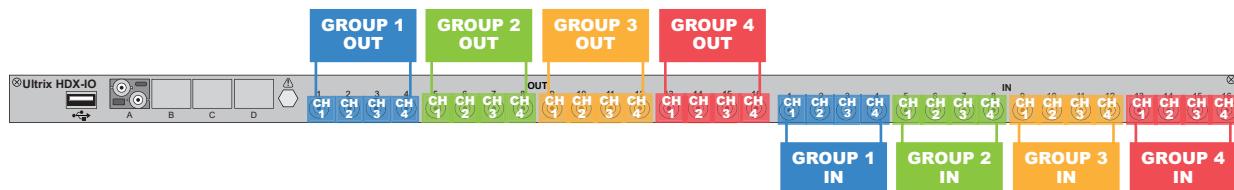


Figure 29 Example of Gearbox Mapping on a Single ULTRIX-HDX-IO Blade

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 9** outlines the default output groups for the ULTRIX-HDX-IO blade.

Table 9 Gearbox Mapping — Default Output Groups on the ULTRIX-HDX-IO

Group	Channel 1	Channel 2	Channel 3	Channel 4
1	slot#.out[1]	slot#.out[2]	slot#.out[3]	slot#.out[4]
2	slot#.out[5]	slot#.out[6]	slot#.out[7]	slot#.out[8]
3	slot#.out[9]	slot#.out[10]	slot#.out[11]	slot#.out[12]
4	slot#.out[13]	slot#.out[14]	slot#.out[15]	slot#.out[16]

Inputs

When you enable a Gearbox input group, Ultrix multiplexes the signals of the four 3G Level A channels together. **Table 10** outlines the default inputs for the ULTRIX-HDX-IO blade.

Table 10 Gearbox Mapping — Default Input Groups on the ULTRIX-HDX-IO

Group	Channel 1	Channel 2	Channel 3	Channel 4
1	slot#.in[1]	slot#.in[2]	slot#.in[3]	slot#.in[4]
2	slot#.in[5]	slot#.in[6]	slot#.in[7]	slot#.in[9]
3	slot#.in[9]	slot#.in[10]	slot#.in[11]	slot#.in[12]
4	slot#.in[13]	slot#.in[14]	slot#.in[15]	slot#.in[16]

Ultriscape Cabling

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.

For More Information on...

- the ULTRIX-MODX-IO blade, refer to the **ULTRIX-MODX-IO User Guide**.

Overview

Table 11 lists the connections on the rear panel that are available for Ultriscape Heads based on the type of blade installed in the slot.

Table 11 Outputs Allocated for Ultriscape Heads

Blade Model	Ultriscape Head 1	Ultriscape Head 2	Ultriscape Head 3
ULTRIX-HDBNC-IO	AUX A or OUT 1	OUT 5 or OUT 7	OUT 11 or OUT 13
ULTRIX-HDX-IO	AUX A or OUT 1	AUX B or OUT 5	OUT 13
ULTRIX-IP-IO	AUX A or OUT 1	AUX B or OUT 9	--
ULTRIX-IPX-IO	AUX A or OUT 1	AUX B or OUT 5	OUT 13
ULTRIX-MODX-IO	AUX A or MOD1.out1	AUX B or MOD2.out1	MOD4.out1
ULTRIX-SFP-IO	AUX A or SFP 1	SFP 5 or SFP 7	SFP 11 or SFP 13

Cabling Designations

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

ULTRIX-HDBNC-IO Cabling

Figure 30 illustrates the connections allocated for Ultriscape Heads on the ULTRIX-HDBNC-IO blade.

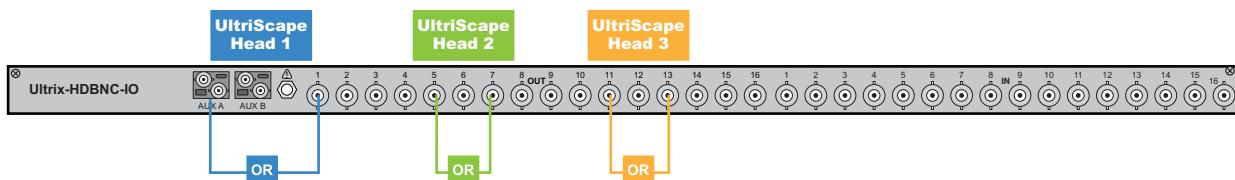


Figure 30 Example of Ultriscape Head Mapping on a Single ULTRIX-HDBNC-IO Blade

ULTRIX-HDX-IO Cabling

Figure 31 illustrates the connections allocated for Ultriscape Heads on the ULTRIX-HDX-IO blade.

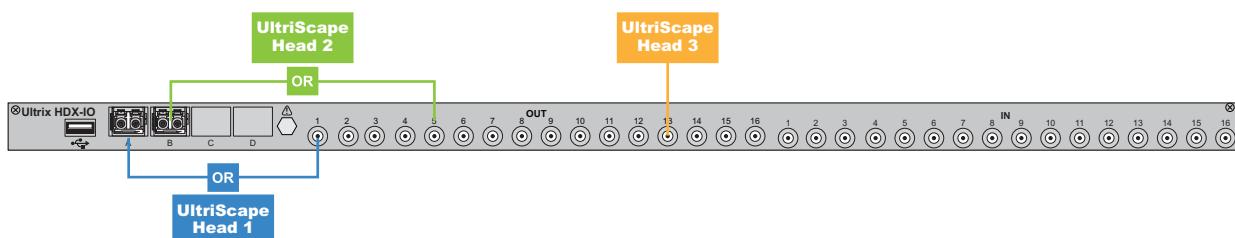


Figure 31 Example of Ultriscape Head Mapping on a Single ULTRIX-HDX-IO Blade

ULTRIX-IP-IO Cabling

Figure 32 illustrates the connections allocated for Ultriscape Heads on the ULTRIX-IP-IO blade.

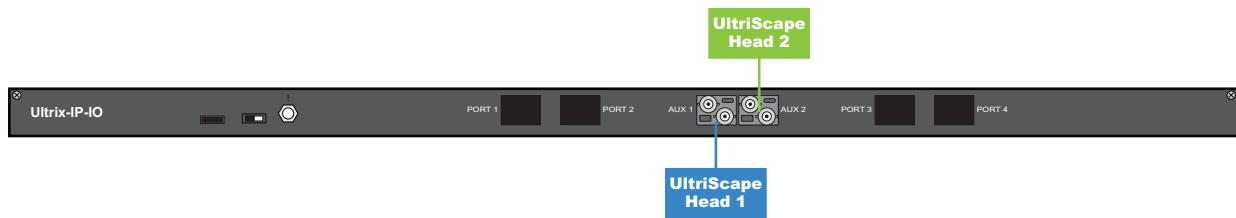


Figure 32 Example of Ultriscape Head Mapping on a Single ULTRIX-IP-IO Blade

ULTRIX-IPX-IO Cabling

Figure 33 illustrates the connections allocated for Ultriscape Heads on the ULTRIX-IPX-IO blade.

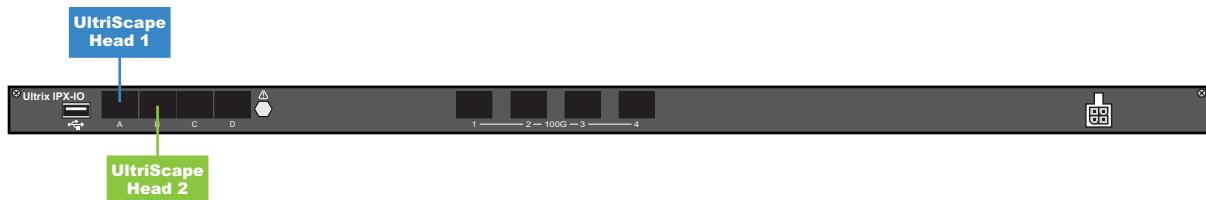


Figure 33 Example of Ultriscape Head Mapping on a Single ULTRIX-IPX-IO Blade

ULTRIX-SFP-IO Cabling

Figure 34 illustrates the connections allocated for Ultriscape Heads on the ULTRIX-SFP-IO blade.

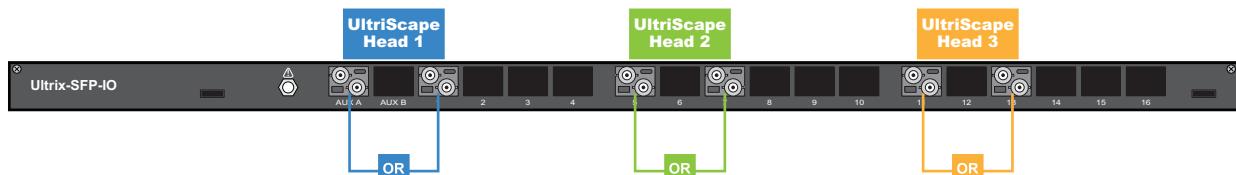


Figure 34 Example of Ultriscape Head Mapping on a Single ULTRIX-SFP-IO Blade

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 Ultrix 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 and ULTRIX-IPX-IO blades can only be used for Ultriscape Head outputs.

For More Information on...

- the ULTRIX-MODX-IO blade, refer to the ***ULTRIX-MODX-IO User Guide***.

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 ***Ulrix SFP Modules User Guide***.

Cabling Overview

- ★ AUX port I/O are not available in the FLEX slot (topmost slot of the ULTRIX(-NS)-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-NS-FR1, ULTRIX-FR2, ULTRIX-NS-FR2, and ULTRIX(-NS)-FR5 router. Each blade provides up to two AUX ports that can be connected to a third-party device. Refer to **Figure 35** for AUX port designations.

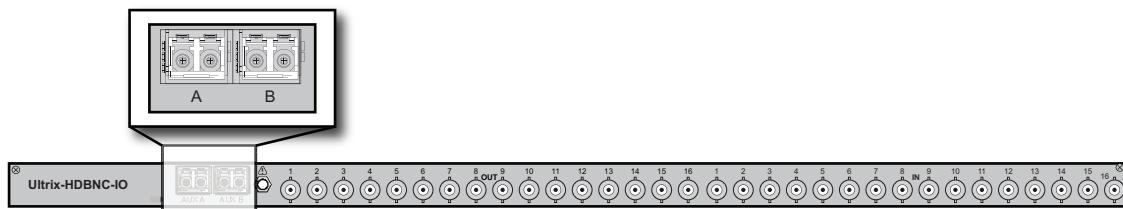


Figure 35 AUX Ports — ULTRIX-HDBNC-IO Blade

ULTRIX-HDX-IO Cabling

The ULTRIX-HDX-IO blade can be installed in an ULTRIX-NS-FR1, ULTRIX-NS-FR2, and ULTRIX(-NS)-FR5 router. Each blade provides AUX ports that can be connected to a third-party device. (Figure 36)

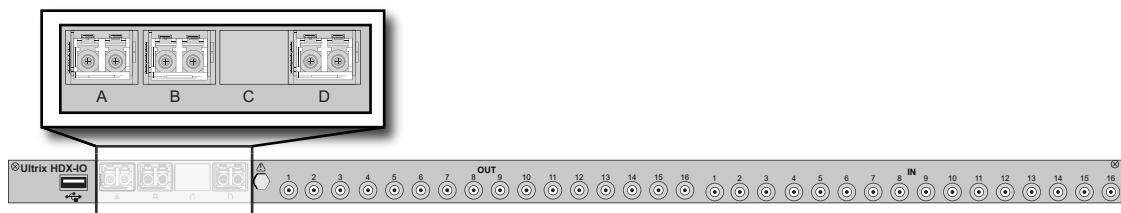


Figure 36 AUX Ports — ULTRIX-HDX-IO Blade

ULTRIX-IP-IO Cabling

Each ULTRIX-IP-IO blade provides two AUX ports that can be connected to a third-party device. (Figure 37)

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

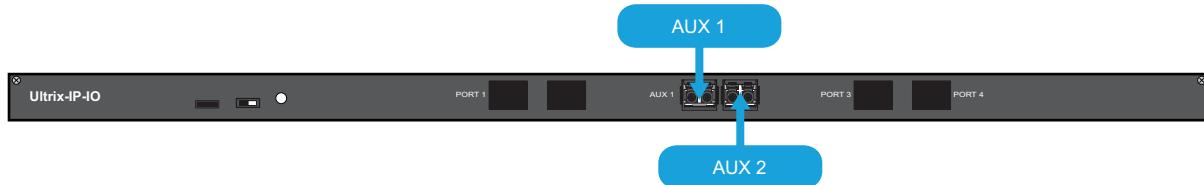


Figure 37 Location of the AUX Ports on the ULTRIX-IP-IO Blade

ULTRIX-IPX-IO Cabling

Each ULTRIX-IPX-IO blade includes four AUX ports that can be connected to a third-party device. (Figure 38)

- ★ The AUX A and B ports on the ULTRIX-IPX-IO blade can only be used for Ultriscape Head outputs.

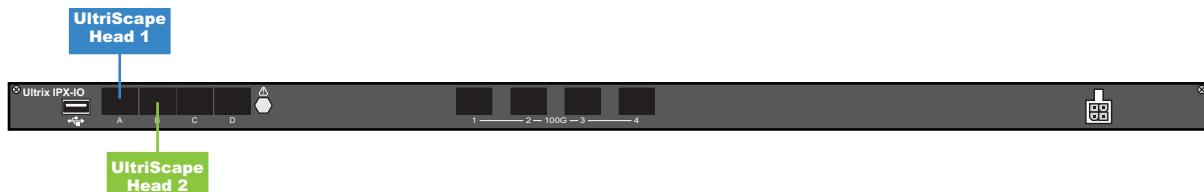


Figure 38 Location of the AUX Ports on the ULTRIX-IPX-IO Blade

ULTRIX-SFP-IO Cabling

The ULTRIX-SFP-IO blade provides up to 16 ports that can be populated with supported SFP+ modules. (Figure 39)

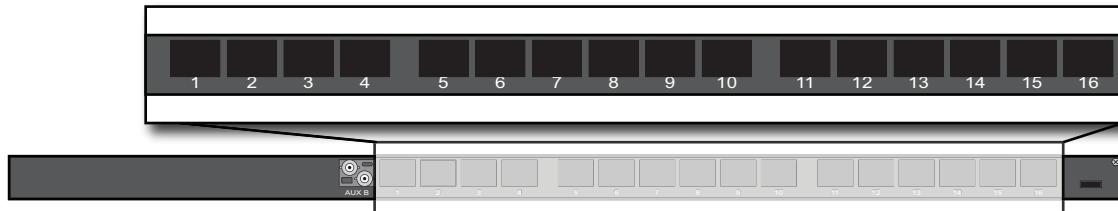


Figure 39 Location of SFP Ports on the ULTRIX-SFP-IO Blade

Each blade also provides two AUX ports that can be connected to a third-party device. (Figure 40)

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



Figure 40 ULTRIX-SFP-IO Blade — AUX Ports

Cabling for IP Streaming

This chapter applies when an UTRIX-IP-IO or UTRIX-IPX-IO blade is installed in your router and a port is populated with an SFP+ module.

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

Working with Fiber Optic Connectors

Keep the following in mind if the QSFP28 module 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 ***Ultrix SFP Modules User Guide***.

To cable an port on the blade



Caution — *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.*

1. Remove the dust caps from each port on the blade.
2. Ensure that the exposed surface of the ceramic ferrule of each connector is clean. Refer to “[Working with Fiber Optic Connectors](#)” for cleaning tips.
3. Cable your port as required. ([Figure 41](#) or [Figure 42](#))

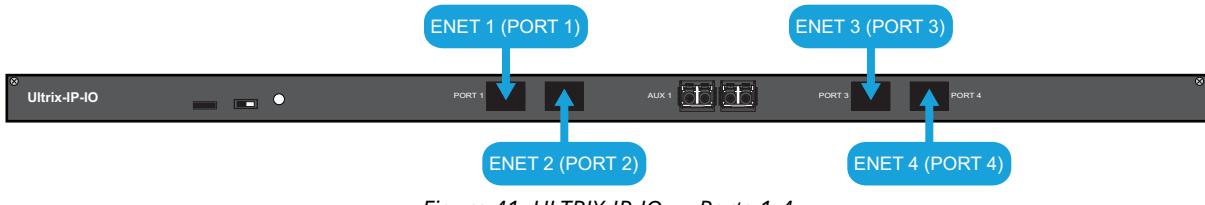


Figure 41 UTRIX-IP-IO — Ports 1-4

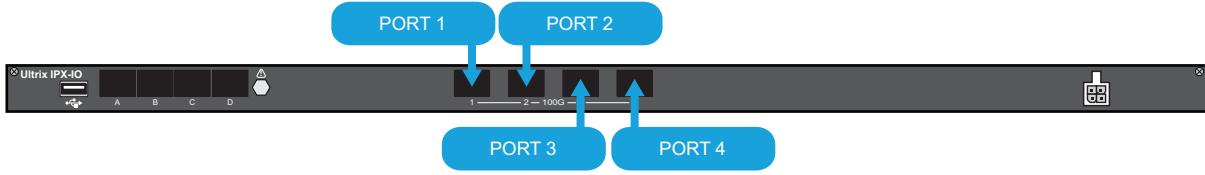


Figure 42 UTRIX-IPX-IO — Ports 1-4

For More Information on...

- configuring the senders and receivers, refer to the ***UTRIX-FR1, UTRIX-FR2, and UTRIX-FR5 User Guide***.

UltriProc Cabling

The number of UltriProc ports for your Ultrix router depends on the number of UltriProc licenses enabled on a slot, and the data rate the UltriProc will operate in. Each UltriProc license provides one proc amp engine that can be assigned to one physical port on the router.

★ The UltriProc licenses are supported on the ULTRIX-HDX-IO or ULTRIX-MODX-IO blades only.

For More Information on...

- setting the data rate for UltriProc, refer to the **ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 User Guide**.
- the ULTRIX-MODX-IO blade, refer to the **ULTRIX-MODX-IO User Guide**.

ULTRIX-HDX-IO Cabling

The UltriProc cabling designations depend on the data rate mode.

Data Rates of 3Gbps

When the UltriProc operates at data rates up to 3Gbps¹, the license is available on the even numbered inputs (Input 2, 4, 6, 8, 10, 12, 14, 16) or outputs (Output 2, 4, 6, 8, 10, 12, 14, 16) per blade.

Figure 43 illustrates the connections allocated for UltriProc on the ULTRIX-HDX-IO blade for data rates up to 3Gbps.

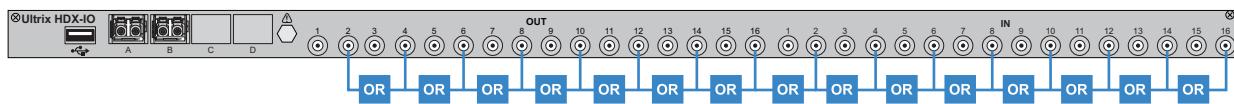


Figure 43 Example of UltriProc 3Gbps Mapping on a Single ULTRIX-HDX-IO Blade

Data Rates of 6Gbps or 12Gbps

When the UltriProc operates at data rates up to 6Gbps² and 12Gbps³, the license is available on 4 inputs (Input 2, Input 6, Input 10, Input 14) or 4 outputs per blade (Output 2, Output 6, Output 10, Output 14). This mode also requires an UltriSpeed license.

Figure 44 illustrates the connections allocated for UltriProc on the ULTRIX-HDX-IO blade for data rates up to 6Gbps and 12Gbps.

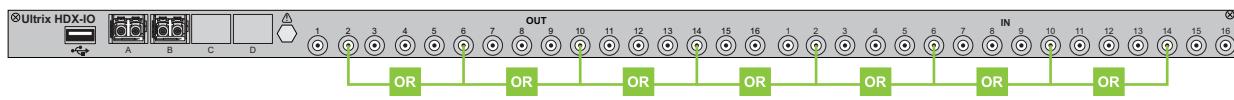


Figure 44 Example of UltriProc 6Gbps or 12Gbps Mapping on a Single ULTRIX-HDX-IO Blade

1. 1080p 50/59.94/60Hz
2. 2160p 23.98/24/25/29.97/30Hz
3. 2160p 50/59.94/60Hz

Connecting to Ross Devices

This chapter provides workflow examples with Ross Ultricore, RCP, and NK 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-IPX-IO blades, NMOS interoperability, tie-line management, and control system redundancy.

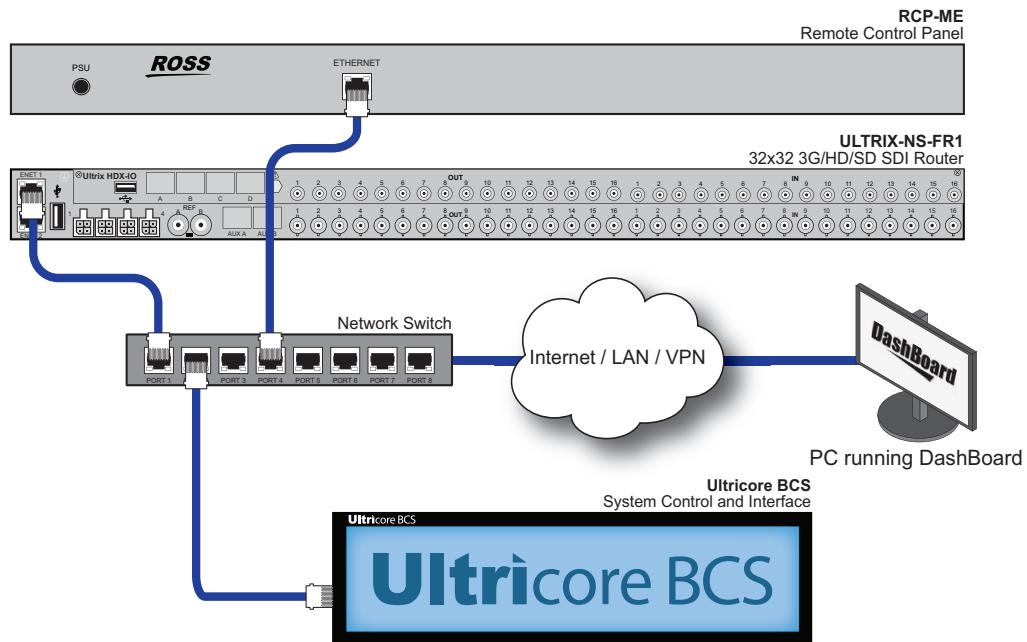


Figure 45 Example of a Simple Routing System with Ultrix and Ultricore BCS

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 47**)
- Connect the NK device via the T-Bus connections on an Ultricore and then set up communications via the Ultricore interface in DashBoard. (**Figure 46**)

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 46** shows a typical connection of Ultricore

with other routing system components. Note that in this arrangement, Ultrixcore will act as a system master for all switching and database related functions.

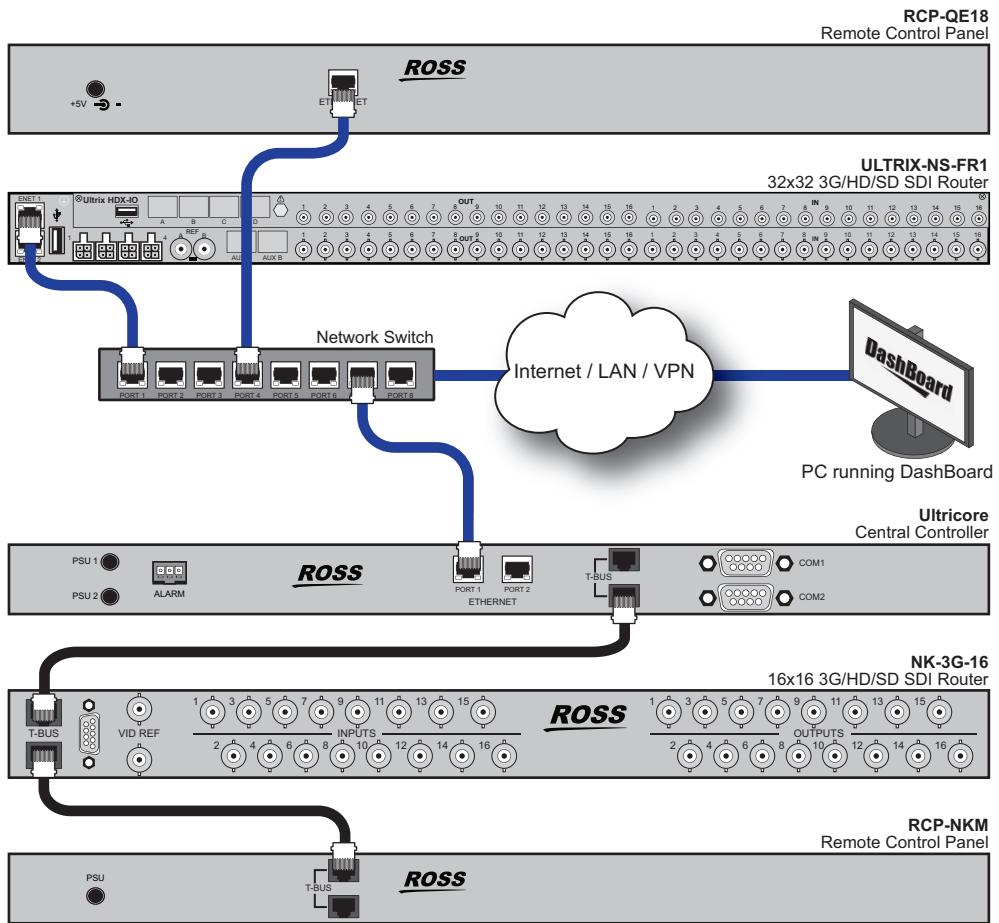


Figure 46 Example of a Routing System with Ross NK Devices and an ULTRIX-FR1 Router

Figure 47 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.

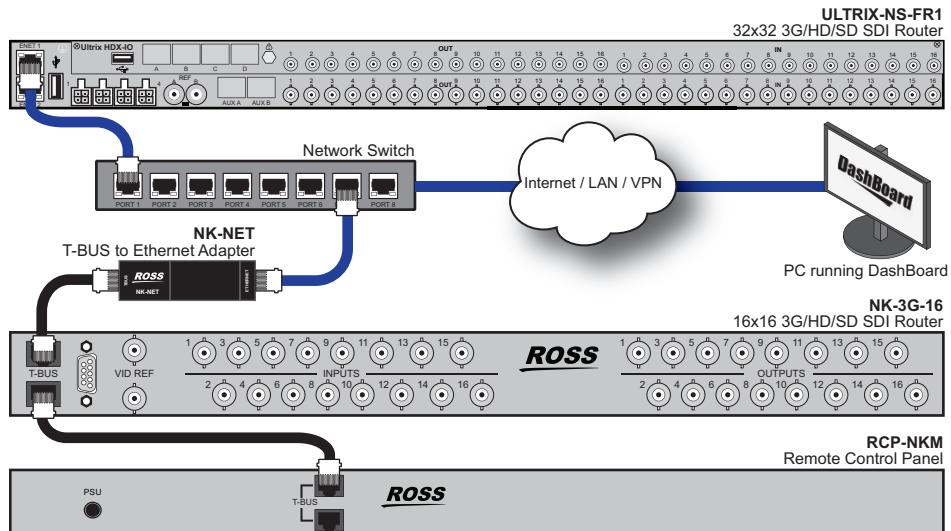


Figure 47 Connection Example with an NK-NET

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

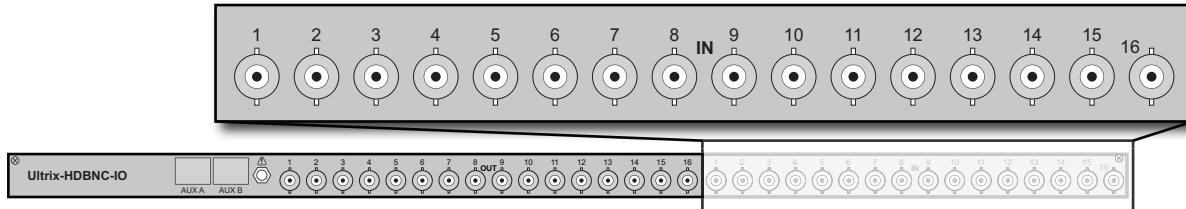


Figure 48 Ultrix Rear Panel — IN BNC Mapping for an ULTRIX-HDBNC-IO Blade

SDI Output Cabling

Figure 49 outlines the SDI output cabling designations for an ULTRIX-HDBNC-IO blade. The output BNCs are located on the left side of each blade.

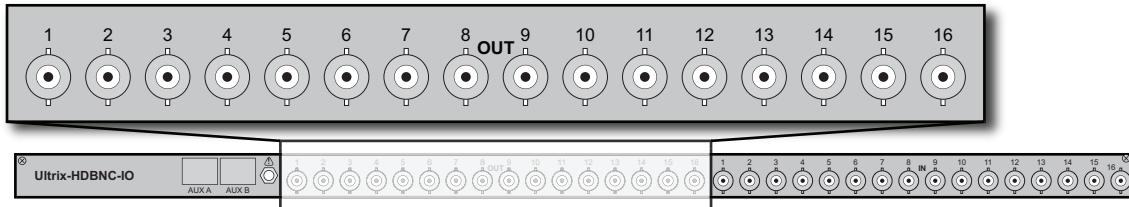


Figure 49 Ultrix Rear Panel — OUT BNC Mapping for an ULTRIX-HDBNC-IO Blade

AUX Ports Designations

Figure 50 outlines the AUX port cabling designations for an ULTRIX-HDBNC-IO blade.

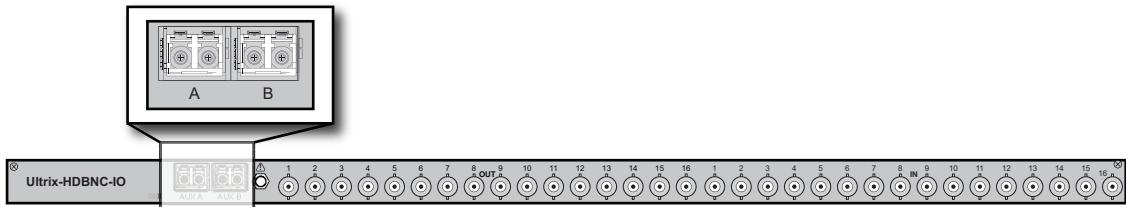


Figure 50 Ultrix Rear Panel — AUX Mapping for an ULTRIX-HDBNC-IO Blade

UltriScape Cabling

Figure 51 illustrates the connections allocated for UltriScape Heads on the ULTRIX-HDBNC-IO blade.

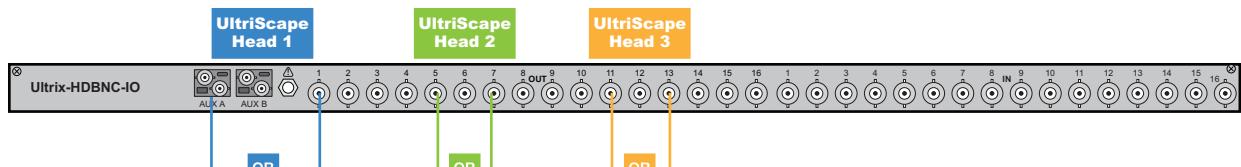


Figure 51 *Ultrix Rear Panel — UltriScape Head Mapping for an ULTRIX-HDBNC-IO Blade*

ULTRIX-HDX-IO Overview

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

SDI Input Cabling

Figure 52 outlines the input cabling designations for an ULTRIX-HDX-IO blade. The input BNCs are located on the right side of each blade.

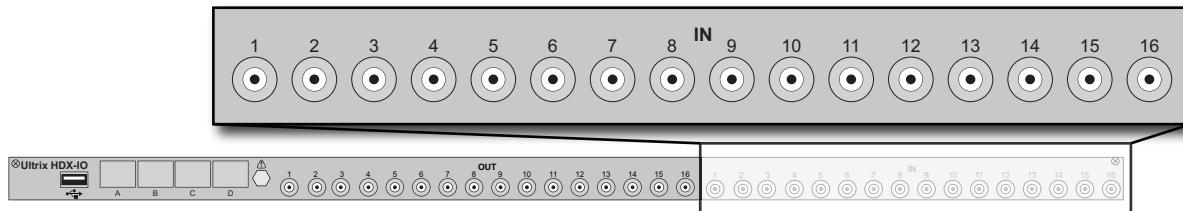


Figure 52 Ultrix Rear Panel — SDI Input BNC Mapping for an ULTRIX-HDX-IO Blade

SDI Output Cabling

Figure 53 outlines the output cabling designations for an ULTRIX-HDX-IO blade. The output BNCs are located on the left side of each blade.

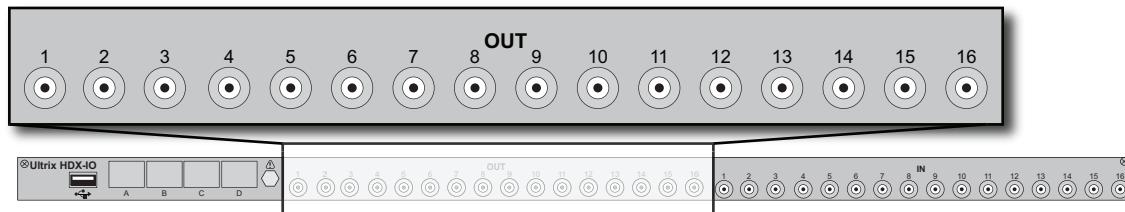


Figure 53 Ultrix Rear Panel — SDI Output BNC Mapping for an ULTRIX-HDX-IO Blade

AUX Ports Designations

Figure 54 outlines the AUX designations for an ULTRIX-HDX-IO blade.

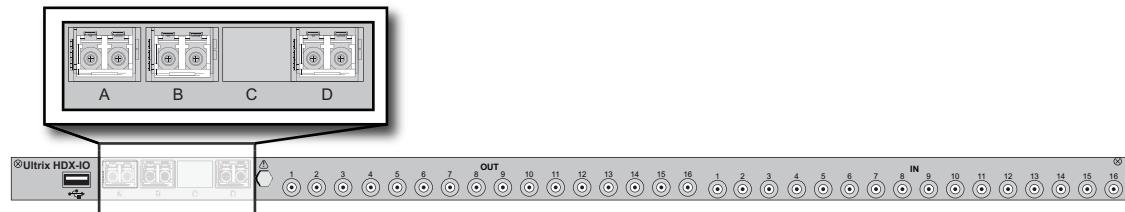


Figure 54 Ultrix Rear Panel — AUX Port Mapping for an ULTRIX-HDX-IO Blade

★ AUX C is required for the Ultrimix-Dante licensed feature. Refer to **“Ultrimix-Dante Cabling”**.

★ AUX D is only required for the UltriStream licensed feature. Refer to the **ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 User Guide** for details.

UltriScape Cabling

Figure 55 outlines the mapping of the UltriScape Heads on an ULTRIX-HDX-IO blade.

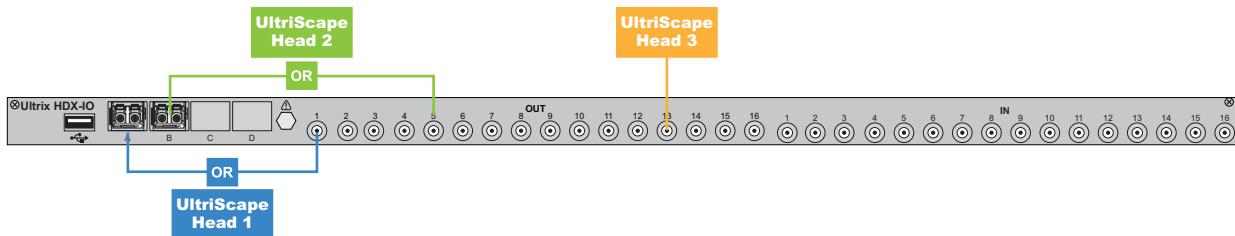


Figure 55 Ultrix Rear Panel — UltriScape Head Mapping for an ULTRIX-HDX-IO Blade

UltriProc Cabling

Figure 56 illustrates the connections allocated for UltriProc on the ULTRIX-HDX-IO blade for data rates up to 3Gbps.

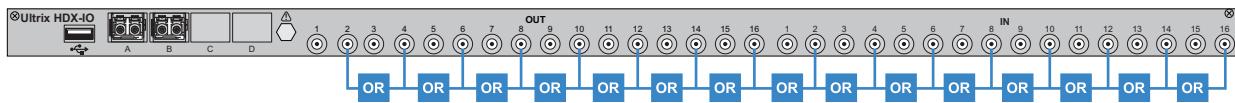


Figure 56 Example of UltriProc 3Gbps Mapping on a Single ULTRIX-HDX-IO Blade

Figure 57 illustrates the connections allocated for UltriProc on the ULTRIX-HDX-IO blade for data rates up to 6Gbps and 12Gbps.

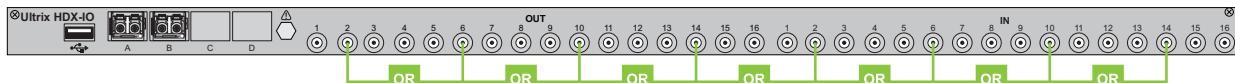


Figure 57 Example of UltriProc 6Gbps or 12Gbps Mapping on a Single ULTRIX-HDX-IO Blade

Ultrumix-Dante Cabling

The Ultrumix-Dante license provides 64 x 64 input/output audio channels accessible via ethernet on the AUX C port of the ULTRIX-HDX-IO and ULTRIX-MODX-IO blades. (**Figure 58**) It utilizes the Audinate® Dante® proprietary IP-based audio transport system.

The Ultrix identifies the Dante channels as a single pipeline consisting of 64 input and 64 output channels. Ultrumix-Dante enables the Ultrix router to include Audinate Dante audio inputs and outputs into the Ultrix routing matrix. Audio sources from a Dante network can be configured as inputs into the Ultrix router. The Ultrix router can also output audio channels to the same Dante network.

- ★ The AUX B audio channels are not available for use when Ultrumix-Dante is enabled on a blade. AUX B can still be used to route SDI video. Refer to the **ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 User Guide** for details.

Before cabling for Ultrumix-Dante, ensure that the AUX C port on the ULTRIX-HDX-IO blade is populated with an **SFP-RJ45-1G** module.

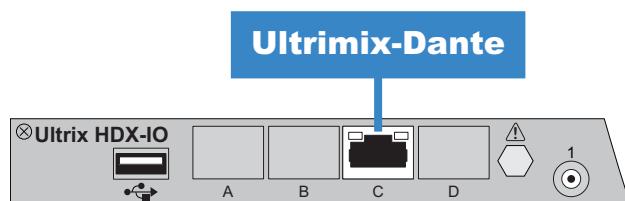


Figure 58 Ultrumix-Dante Cabling

For More Information on...

- cabling the ULTRIX-MODX-IO blade for Ultrimix-Dante, refer to the [**ULTRIX-MODX-IO User Guide**](#).

UltriStream Cabling

The UltriStream licensed feature provides the ability to encode one NDI stream of a configured Ultriscape Multiviewer Head per the AUX D port on an ULTRIX-HDX-IO and ULTRIX-MODX-IO blades. (Figure 59)

Before cabling for UltriStream, ensure that the AUX D port on the ULTRIX-HDX-IO blade is populated with an **SFP-RJ45-1G** module.

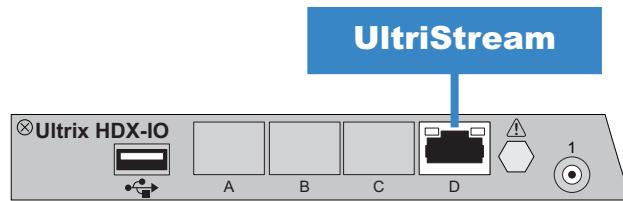


Figure 59 UltriStream Cabling

- ★ The Multiviewer Head for the video source must be one from the same blade that is transmitting the NDI stream. For example, a licensed ULTRIX-MODX-IO blade in Slot 1 cannot send an NDI stream of a Multiviewer Head from a licensed ULTRIX-HDX-IO blade in Slot 2.

For More Information on...

- configuring the UltriStream licensed feature, refer to the [**ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 User Guide**](#).
- enabling and configuring the Ultriscape Head(s), refer to the [**Ultriscape User Guide**](#).
- cabling the ULTRIX-MODX-IO blade for UltriStream, refer to the [**ULTRIX-MODX-IO User Guide**](#).

ULTRIX-IP-IO Overview

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

★ The ULTRIX-IP-IO blade cannot be installed in the FLEX slot of an ULTRIX-FR5.

For More Information on...

- the available SFP+ modules, refer to the to the ***Ultrix SFP Modules User Guide***.

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. (Figure 60) 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.

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

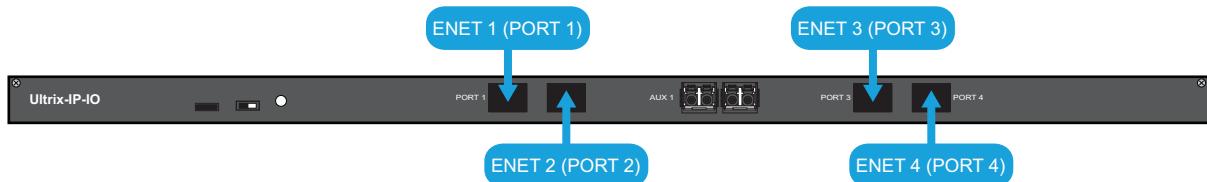


Figure 60 Location of the ENET Ports on the ULTRIX-IP-IO

AUX Ports

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

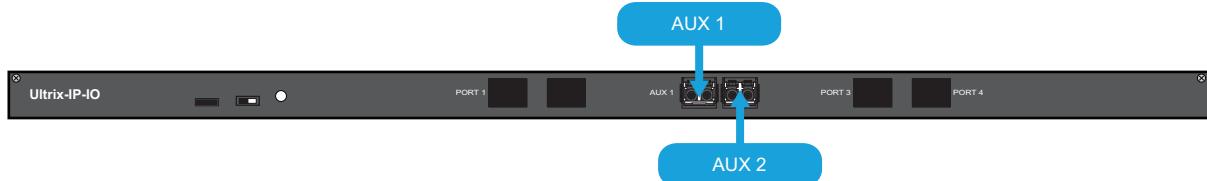


Figure 61 Location of the AUX Ports on the ULTRIX-IP-IO

ULTRIX-IPX-IO Overview

The ULTRIX-IPX-IO blades seamlessly integrate SMPTE ST-2110 IP streams into the Ultrix platform, without compromising on its powerful features and licensing capabilities. The ULTRIX-IPX-IO offers scalability and high total bandwidth, making it suitable for a range of IP applications.

Features

- Can be installed in the:
 - › ULTRIX-NS-FR1
 - › ULTRIX-NS-FR2
 - › ULTRIX-FR5
 - › ULTRIX-NS-FR5
 - › ULTRIX-FR12
- Video streams per blade:
 - › UHD: 8+8 redundant¹
 - › 3G/HD: 16+16 redundant
- Supported video formats:
 - › 720p 25/ 29.97/ 30/ 50 / 59.94 / 60
 - › 1080i 50 / 59.94 / 60
 - › 1080p 25/ 29.97/ 30/ 50 / 59.94 / 60
 - › 2160p 25/ 29.97/ 30/ 50 / 59.94/60
- IP transport support:
 - › SMPTE ST 2110-10, System Timing and Definitions
 - › SMPTE ST 2110-20, Uncompressed Active Video
 - › SMPTE ST 2110-30, PCM Digital Audio
 - › SMPTE ST 2110-40, ANC Data
- System timing: PTP Follower (SMPTE 2059, AES67 and IEEE-1588 default profiles)
- Control and setup via:
 - › NMOS IS-04 and IS-05 for AIMS-compliant discovery, registration, and connection control
 - › Ember+ discovery, registration, and connection control from popular third-party control systems (requires an Ultricore-EMBER+ license)²
 - › Provisioning and monitoring via DashBoard and/or our published JSON API

Hardware

The Ultrix software currently supports:

- 100Gb QSFP28 transceiver modules based on 4x25Gb NRZ optical lanes, either requiring no FEC or RS(528,514) KR4 FEC, for multi-mode or single-mode fibers, up to power class 7 (5W). For example, 100GBASE-SR4, 100GBASE-SWDM4, 100GBASE-PSM4, 100GBASE-CWDM4, 100GBASE-4WDM-10/20/40, 100GBASE-CLR4, 100GBASE-LR4.
- 100Gb QSFP28 transceiver modules based on 1x100Gb PAM4 optical lane, either requiring no FEC or providing built-in RS(544,514) KP4 FEC, for multi-mode or single-mode fibers, up to power

1. Due to software limitations.

2. Ultrix implements BESS v1.1 for Ember+ support.

class 7 (5W). Compliant with the 100G Lambda MSA, including built-in RS(544,514) KP4 FEC. For example, 100GBASE-DR, 100GBASE-FR, 100GBASE-LR.

- 100Gb QSFP28 transceiver modules based on 4x25Gb NRZ over shielded balanced copper cabling, requiring RS(528,514) KR4 FEC. For example, 100GBASE-CR4.

★ Contact Ross Technical Support about other QSFP28 transceiver modules not listed above.

QSFP28 Ports

The ULTRIX-IPX-IO blade includes four QSFP28 ports (1-4). (Figure 62) Each port is a:

- fiber optical transceiver module that integrates four transmit and four receiver lanes
- 100Gigabit Ethernet (100GbE) ethernet connection (supports 100G QSFP28 Direct Attach Cable (DAC))

★ The ULTRIX-IPX-IO only supports active QSA adapters.

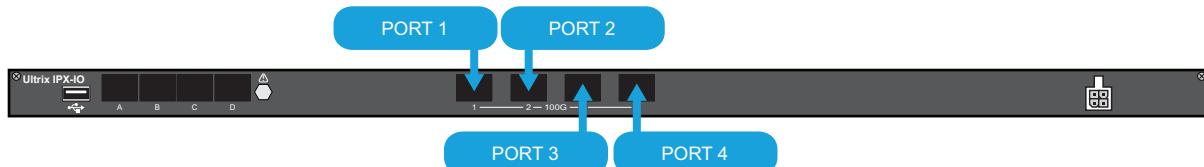


Figure 62 Location of Ports 1-4 on the ULTRIX-IPX-IO

AUX Ports

The AUX A and AUX B ports can only be used for Ultriscape Head outputs. (Figure 63)

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

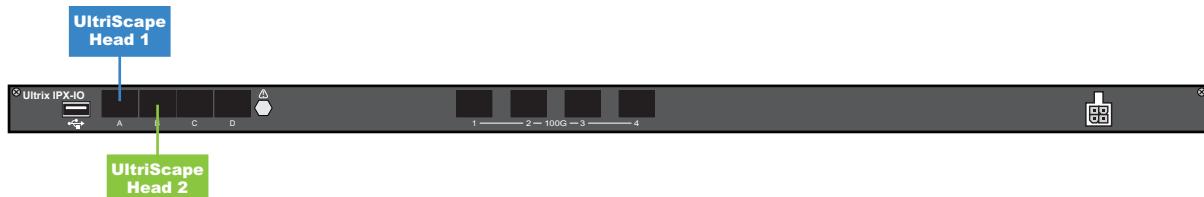


Figure 63 Location of the AUX Ports on the ULTRIX-IPX-IO

PSU Port

The power supply connector located on the ULTRIX-IPX-IO blade requires a 15VDC connection to an external power supply. Refer to the Ross Configuration Tool on our website for the power requirements of your configuration.



Figure 64 Location of the PSU Port on the ULTRIX-IPX-IO

USB Port

The USB Type B port is used for recovery only.

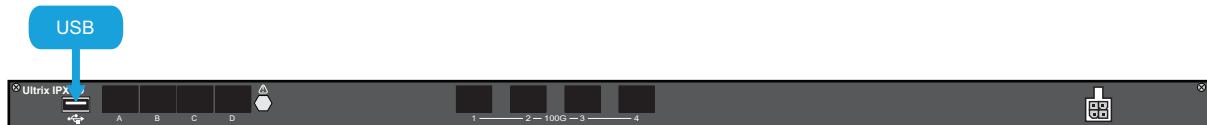


Figure 65 Location of the USB Port on the ULTRIX-IPX-IO

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 the *Ultrix SFP Modules User Guide*.

SFP Ports

The ULTRIX-SFP-IO blade provides up to 16 ports that can be populated with supported SFP+ modules. (Figure 66)

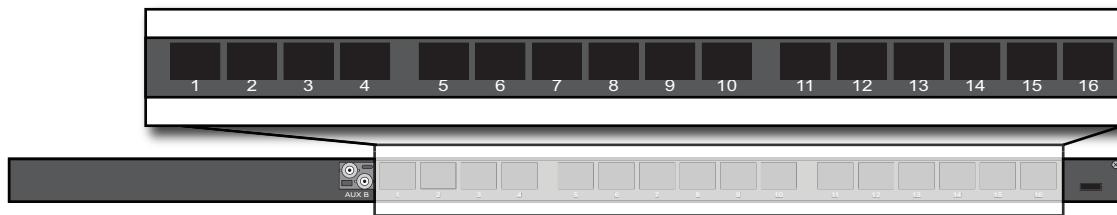


Figure 66 Location of SFP Ports on the ULTRIX-SFP-IO Blade

AUX Ports

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

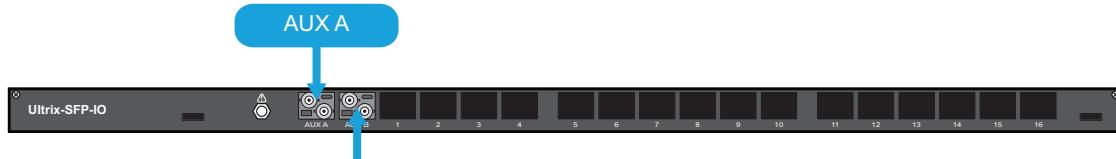


Figure 67 Location of AUX Ports on the ULTRIX-SFP-IO Blade

Technical Specifications

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

Physical Dimensions

Table 12 Technical Specifications — Physical Dimensions

Item	ULTRIX(-NS)-FR1	ULTRIX(-NS)-FR2	ULTRIX(-NS)-FR5
Width	17.5" (44.45cm)	17.5" (44.45cm)	17.5" (44.45cm)
Depth	7.9" (20cm)	7.9" (20cm)	7.9" (20cm)
Height	1.74" (4.40cm)	3.48" (8.80cm)	8.7" (22cm)
Weight (approx.)	12lb (5.4kg)	17lb (7.70kg)	42.5lb (19.3kg)

Inventory

Table 13 Technical Specifications — Inventory

Item	ULTRIX(-NS)-FR1	ULTRIX(-NS)-FR2	ULTRIX(-NS)-FR5
Video Matrix Size (max.)	36x36	72x72	160x160
Fixed I/O Slots ^a	1 (16x16)	1 (16x16)	0
Optional I/O Slots ^a	1 (16x16)	3 (48x48)	9 (144x144)
Audio			
Audio Matrix Size (max.) ^b	512x512	1024x1024	2592x2592
Audio Matrix Size (with Optional MADI SFPs)	768x768	1536x1536	3456x3456
MultiViewer			
Ultriscape Licenses per slot	3	3	3
Maximum Multiviewer Heads per System	6	12	27
UHD			
UltriSpeed Licenses per frame	1	1	1

a. Optional SFP AUX I/O available to support up to 18x18 per slot.

Supported Frame Sync/Clean Switch Video Formats for Conversion

Table 14 Reference Formats — FSCS Video

Provided Reference Format	Frame Sync/Clean Switch Video
NTSC	480i 59.94Hz
	720p 29.97Hz
	720p 59.94Hz
	1080i 59.94Hz
	1080p 29.97Hz
	1080p Level A 59.94Hz
	1080p Level B 59.94Hz
	1080pSF 29.97Hz
	2160p 29.97Hz
	2160p 59.94Hz
PAL	576i 50Hz
	720p 25Hz
	720p 50Hz
	1080i 50Hz
	1080p 25Hz
	1080p Level A 50Hz
	1080p Level B 50Hz
	1080pSF 25Hz
	2160p 25Hz
	2160p 50Hz
720p^a	
50Hz	720p 50Hz
	1080p Level A 50Hz
	1080p Level B 50Hz
	2160p 50Hz
59.94Hz	720p 59.94Hz
	1080p Level A 59.94Hz
	1080p Level B 59.94Hz
	2160p 59.94Hz
60Hz	720p 60Hz
	1080p 60Hz
	2160p 60Hz

Table 14 Reference Formats — FSCS Video (Continued)

Provided Reference Format	Frame Sync/Clean Switch Video
1080i^b	
50Hz	576i 50Hz 720p 25Hz 720p 50Hz 1080i 50Hz 1080p 25Hz 1080p Level A 50Hz 1080p Level B 50Hz 1080pSF 25Hz 2160p 25Hz 2160p 50Hz
59.94Hz	480i 59.94Hz 720p 29.97Hz 720p 59.94Hz 1080i 59.94Hz 1080p 29.97Hz 1080p Level A 59.94Hz 1080p Level B 59.94Hz 1080pSF 29.97Hz 2160p 29.97Hz 2160p 59.94Hz
60Hz	720p 30Hz 720p 60Hz 1080i 60Hz 1080p 30Hz 1080p Level A 60Hz 1080p Level B 60Hz 1080pSF 30Hz 2160p 30Hz 2160p 60Hz
1080p	
23.98Hz	1080p 23.98Hz
24Hz	1080p 24Hz

Table 14 Reference Formats — FSCS Video (Continued)

Provided Reference Format	Frame Sync/Clean Switch Video
1080p	
25Hz	576i 50Hz 720p 25Hz 720p 50Hz 1080i 50Hz 1080p 25Hz 1080p Level A 50Hz 1080p Level B 50Hz 1080pSF 25Hz 2160p 25Hz 2160p 50Hz
29.97Hz	480i 59.94Hz 720p 29.97Hz 720p 59.94Hz 1080i 59.94Hz 1080p 29.97Hz 1080p Level A 59.94Hz 1080p Level B 59.94Hz 1080pSF 29.97Hz 2160p 29.97Hz 2160p 59.94Hz
30Hz	720p 30Hz 720p 60Hz 1080i 60Hz 1080p 30Hz 1080p Level A 60Hz 1080p Level B 60Hz 1080pSF 30Hz 2160p 30Hz 2160p 60Hz
1080pSF^c	
23.98Hz	1080pSF 23.98Hz
24Hz	1080pSF 24Hz

a. The Frame Sync does not support 720p dual stream 60/59.94/50 formats. The Clean Switch does.

b. The Frame Sync does not support 1080i dual stream 60/59.94/50 formats. The Clean Switch does.

c. The Frame Sync does not support 1080pSF 30/29.97/25 formats. The Clean Switch does.

Supported Video Formats

Table 15 Technical Specifications — Supported Formats

Resolution (lines)	Interlace / Progressive	Frame Rate (Hz)	SDI Routing	UltriMix	Ultriscape	Gearbox
SD						
525	I	59.94	✓	✓	✓	
625	I	50	✓	✓	✓	
HD						
720	P	60	✓	✓	✓	
720	P	59.94	✓	✓	✓	
720	P	50	✓	✓	✓	
1080	I	60	✓	✓	✓	
1080	I	59.94	✓	✓	✓	
1080	I	50	✓	✓	✓	
1080	P	30	✓	✓	✓	
1080	P	29.97	✓	✓	✓	
1080	P	25	✓	✓	✓	
1080	P	24	✓	✓	✓	
1080	P	23.98	✓	✓	✓	
1080	PSF	30	✓	✓	✓	
1080	PSF	29.97	✓	✓	✓	
1080	PSF	25	✓	✓	✓	
1080	PSF	24	✓	✓	✓	
1080	PSF	23.98	✓	✓	✓	
3G						
720	P (dual stream)	60	✓	✓ ^a	✓ ^a	
720	P (dual stream)	59.94	✓	✓ ^a	✓ ^a	
720	P (dual stream)	50	✓	✓ ^a	✓ ^a	
1080	I (dual stream)	60	✓	✓ ^a	✓ ^a	
1080	I (dual stream)	59.94	✓	✓ ^a	✓ ^a	
1080	I (dual stream)	50	✓	✓ ^a	✓ ^a	
1080	P	60	✓	✓	✓	✓
1080	P	59.94	✓	✓	✓	✓
1080	P	50	✓	✓	✓	✓
1080	Level B	60	✓	✓	✓	
1080	Level B	59.94	✓	✓	✓	
1080	Level B	50	✓	✓	✓	

Table 15 Technical Specifications — Supported Formats (Continued)

Resolution (lines)	Interlace / Progressive	Frame Rate (Hz)	SDI Routing	UltriMix	Ultriscape	Gearbox
6G						
2160	P	30	✓	✓	✓	
2160	P	29.97	✓	✓	✓	
2160	P	23.98	✓	✓	✓	
2160	P	25	✓	✓	✓	
2160	P	24	✓	✓	✓	
12G (UHD)						
2160	P	50	✓	✓	✓	
2160	P	59.94	✓	✓	✓	
2160	P	60	✓	✓	✓	

a. First stream is processed (same as Level B).

ULTRIX(-NS)-FR1 and ULTRIX(-NS)-FR2 Power Specifications

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

Table 16 Technical Specifications — Power Supply Ratings

Item	Specifications
Output	15VDC @ 17A
Output Power	255W
Input	100-240VAC, 50/60Hz
Input Current	4.5A

Table 17 Technical Specifications — Power Connections

Item	Specifications
ULTRIX(-NS)-FR1	Minimum 1 power supply required
	2+ for redundancy
ULTRIX(-NS)-FR2	Minimum 2 power supplies required
	4 for full redundancy

ULTRIX(-NS)-FR5 Power Specifications

★ The ULTRIX(-NS)-FR5 requires the Ultripower Rack Mount Power Supply Unit.

Table 18 Technical Specifications — Power Supply Ratings

Item	Specifications
Output	15VDC @ 20A per connection
Output Power	1200W max. De-rates to 1100W with 110VAC mains supply

Table 18 Technical Specifications — Power Supply Ratings (Continued)

Item	Specifications
Input	100-264VAC, 50/60Hz
Input Current	10A

Table 19 Technical Specifications — Power Supply Connections

Item	Specifications
ULTRIX-FR5	Minimum 1 Ultripower fitted with 1 power module
	1 Ultripower fitted with 2 power modules
ULTRIX-NS-FR5	Minimum 1 Ultripower fitted with 1 power module
	1 Ultripower fitted with 2 power modules

Maximum Power Ratings

Table 20 outlines the maximum power ratings for fully loaded Ultrix router models.

Table 20 Technical Specifications — Maximum Power Ratings

Item	Specifications ^a
ULTRIX(-NS)-FR1 with 2 ULTRIX-HDBNC-IO blades	~150W
ULTRIX(-NS)-FR2 with 4 ULTRIX-HDBNC-IO blades	~310W
ULTRIX-FR5 with 8 ULTRIX-HDBNC-IO blades	~630W
ULTRIX-FR5 with 8 ULTRIX-IP-IO blades	~763W
ULTRIX-NS-FR1 with 2 ULTRIX-HDX-IO blades	204W typical
ULTRIX-NS-FR2 with 4 ULTRIX-HDX-IO blades	395W typical
ULTRIX-FR5 with 8 ULTRIX-HDX-IO blades	979W typical

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

SDI Inputs

Table 21 ULTRIX-HDBNC-IO Blade — Inputs

Item	Specification
Standard Input	HD-BNC
Signal Type (SDI Formats)	270MB/s 1.5GB/s 3GB/s 12GB/s
Impedance	75ohm
Max. Input Level	880mV
Return Loss	Per SMPTE 2082-1

Table 21 ULTRIX-HDBNC-IO Blade — Inputs (Continued)

Item	Specification
Equalization (typical)	UHD: 50m (160ft) HD, 3G: 200m (650ft) SD: 400m (1300ft)
SFP AUX Connector	Refer to “ Small Form-factor Pluggable (SFP+) Modules ” and the <i>Ultrix SFP Modules User Guide</i> for more information.

SDI Outputs

Table 22 ULTRIX-HDBNC-IO Blade — Outputs

Item	Specification
Standard Output	HD-BNC
Signal Type (SDI Formats)	270MB/s 1.5GB/s 3GB/s 12GB/s
Impedance	75ohm
Amplitude	800mV +/-10%
Rise and Fall Time	270MB/s: 400-800ps 1.5GB/s, 3GB/s: < 135ps 12GB/s: <45ps
DC Offset	0.0V +/-0.5V
Jitter	<0.15UI up to 3G <0.20UI 3G and 12G typical (<0.30UI max.)
Return Loss	Per SMPTE 2082-1
SFP AUX Connector	Refer to “ Small Form-factor Pluggable (SFP+) Modules ” and the <i>Ultrix SFP Modules User Guide</i> .

Embedded Audio

Table 23 Technical Specifications — Audio Inputs

Item	ULTRIX-FR1(-NS)	ULTRIX-FR2(-NS)	ULTRIX-FR5
Audio Channels per SDI I/O	16	16	16
Audio Channels per MADI I/O	Selectable 56 or 64		

Environmental

Table 24 Technical Specifications — Environmental

Item	Specifications
Max. Ambient Temperature Range	0°C to 40°C (32°F to 104°F)
Humidity, non-condensing	< 95%

MicroSD Card

Table 25 Technical Specifications — MicroSD Card

Item	Specifications
Types Supported	Contact Ross Technical Support
Operating Systems Supported	

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 26 Technical Specifications — Ethernet Ports

Item	Specifications
Standards Accommodated	1000BASE-T (GbE) network
Connector Type	RJ45

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 ***Ultrix SFP Modules User Guide*** for more information on the supported SFP models and their specifications.

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zlib

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madler@alumni.caltech.edu

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](ftp://ds.internic.net/rfc/rfc1951.txt) (deflate format) and [rfc1952.txt](ftp://ds.internic.net/rfc/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.

QSFP28 — Quad Small Form-factor Pluggable 28

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-NS-FR1 — 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-NS-FR2 — 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".

