Ultrix

ULTRIX-FR12 Installation Guide

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Our mission is to:

1. Provide a Superior Customer Experience
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Ross has become well known for the Ross Video Code of Ethics. It guides our interactions and empowers our employees. I hope you enjoy reading it below.

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

David Ross
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Ross Video Code of Ethics

Any company is the sum total of the people that make things happen. At Ross, our employees are a special group. Our employees truly care about doing a great job and delivering a high quality customer experience every day. This code of ethics hangs on the wall of all Ross Video locations to guide our behavior:

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

ULTRIX-FR12 · Installation Guide

- Ross Part Number: **2101DR-603-05**
- Revision: 3
- Release Date: September 13, 2024.
- Software Version: **6.1**

The information contained in this Guide is subject to change without notice or obligation.

Copyright

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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Safety Notices

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

Statement of Compliance

This product has been determined to be compliant with the applicable standards, regulations, and directives for the countries where the product is marketed.

Compliance documentation, such as certification or Declaration of Compliance for the product is available upon request by contacting techsupport@rossvideo.com. Please include the product; model number identifiers and serial number and country that compliance information is needed in request.

EMC Notices

United States of America - FCC Part 15

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

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

Canada

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

Cet appariel 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.*

Cleaning Instructions

This section provides important instructions for the cleaning and disinfection of your ULTRIX-FR12.

- The ULTRIX-FR12 front display panel must not be exposed to liquids.
- ONLY use damp disinfecting wipes or a cloth dampened with a cleaning solution on the display panel surface.
- AVOID getting any liquid on the display panel of the ULTRIX-FR12.

Notice — *Care must be taken to ensure that no liquids leak into the display panel.*

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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Contents

Introduction

This guide is for system administrators and installers of the Ross Video ULTRIX-FR12 router. It provides instructions on how to physically install your router. If you are installing an ULTRIX-(NS)-FR1, ULTRIX-(NS)-FR2, or ULTRIX-(NS)-FR5, refer to the ***ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 Installation Guide***.

This guide contains the following chapters that cover the installation of an ULTRIX-FR12 router:

- "**Introduction**" summarizes the guide and provides important terms, and conventions.
- "**Getting Started**" provides an overview for creating a routing system using the ULTRIX-FR12, and general information to keep in mind before installing and configuring your router.
- "**Hardware Overview**" provides a basic introduction to the ULTRIX-FR12 front and rear panels.
- "**Physical Installation**" provides instructions for the basic physical installation of the ULTRIX-FR12.
- "**Powering the ULTRIX-FR12**" outlines the required steps to powering on the ULTRIX-FR12 including how to configure power linking for the Ultripowers in your system.
- "**Cabling Your Router**" provides instructions on how to connect the ULTRIX-FR12 to a video reference signal, connect to a Multiviewer Head, and connect inputs and outputs.
- "**Cabling Designations**" provides additional information on the input and output designations for each supported ULTRIX-FR12 blade.
- "**Technical Specifications**" provides the specifications for the ULTRIX-FR12.
- "**Software Licenses**" provides third-party software license information for your ULTRIX-FR12.

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-FR12:

- ***DashBoard User Guide***, Ross Part Number: 8351DR-004
- ***Ultricore BCS User Guide***, Ross Part Number: 2201DR-106
- ***Ultriscape User Guide***, Ross Part Number: 2101DR-018
- ***Ultripower User Guide***, Ross Part Number: 2101DR-304
- ***Ultrix and Ultricore Database Guide***, Ross Part Number: 2201DR-109
- ***ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 Installation Guide***, Ross Part Number: 2101DR-003
- ***ULTRIX-FR1, ULTRIX-FR2, and ULTRIX-FR5 User Guide***, Ross Part Number: 2101DR-004
- ***ULTRIX-FR12 Quick Start Guide***, Ross Part Number: 2101DR-602
- ***ULTRIX-FR12 User Guide***, Ross Part Number: 2101DR-604
- ***ULTRIX-MODX-IO User Guide***, Ross Part Number: 2101DR-020
- ***Ultrix 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 User Guide***.

Menu Sequences

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

Important Instructions

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

✶ When the ULTRIX-FR12 cannot connect to the network, a **Message** dialog box opens to report the connection problem.

Contacting Technical Support

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

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

- **Technical Support**: (+1) 613-228-0688
- **After Hours Emergency**: (+1) 844-652-0645
- **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.

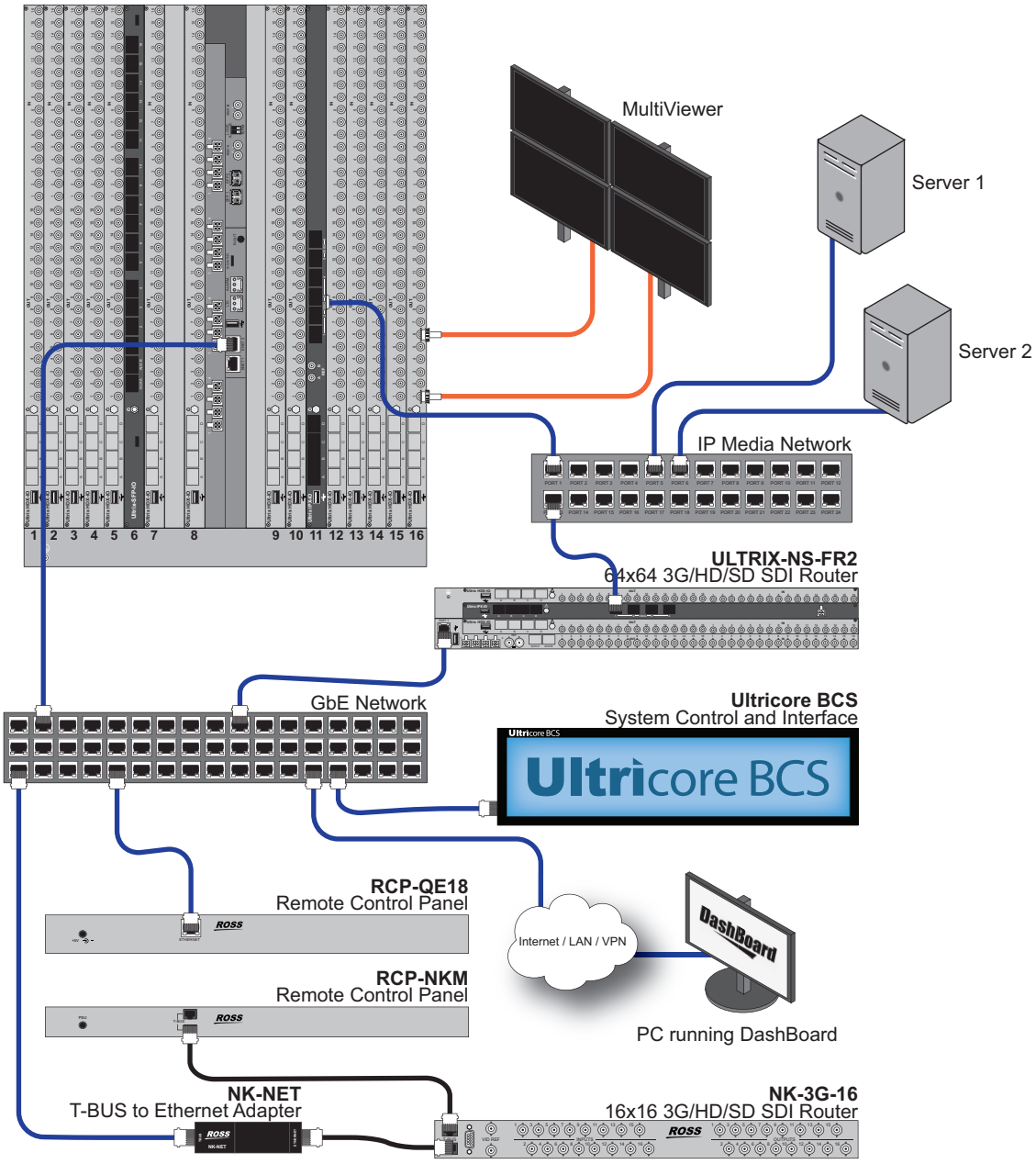


Figure 1 Example of a Routing System

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-FR12 can assign a level to a matrix or signal type and even individual ports on unrelated matrices if required.

Interface and Connectivity via an Ultricore BCS

Keep in mind that the ULTRIX-FR12 router uses ethernet protocols to communicate to other devices in your routing system. An ULTRIX-FR12 routing system may use distributed control across the Internet, a LAN, or a VPN. A Ultricore BCS (Central System Controller) is required 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 Ultricore BCS, refer to the ***Ultricore BCS User Guide***.
- database configuration, refer to the ***Ultrix and Ultricore Database Guide***.
- configuring the ULTRIX-FR12 in DashBoard, refer to the ***ULTRIX-FR12 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 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.

Before You Begin

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.

Hardware Overview

This chapter outlines the features of the ULTRIX-FR12, including the front and rear panels.

For More Information on…

- other Ultrix routers, refer to the ***ULTRIX-NS-FR1, ULTRIX-NS-FR2, and ULTRIX-FR5 Installation Guide***.

Features

The ULTRIX-FR12 includes the following features:

- Up to 288 x 288 ports
- 6144 x 6144 audio fabric with up to 2048 x 2048 discrete audio I/O
- Up to 48 Multiviewers[1], each with 100 PiPs
- 288 (12G[2]) audio embedders/de-embedders
- 288 (12G) clean/quiet switches
- 288 (3G[3]/12G[4]) frame syncs
- 128 x 64 virtual audio mixer

Supported Ultrix I/O Blades

Table 1 lists the Ultrix I/O blades that the ULTRIX-FR12 supports.

Table 1 List of ULTRIX-FR12 Products

Model Number	Description
ULTRIX-HDX-IO	Provides 16x16 SDI inputs/outputs on HD-BNCs, 2 reference ports, 4 unpopulated AUX ports, and one USB port
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

a. The Ultrix software does not support the AUX C and AUX D ports.

1. Each Multiviewer requires an Ultriscape license.
2. Support for 12G requires an UltriSpeed license.
3. Requires an Ultrisync or Ultrisync-18 license.
4. Requires an Ultrisync-UHD or Ultrisync-UHD16 license.

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 I/O Blades				Description
	HDX-IO	IP-IO	IPX-IO	SFP-IO	
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-OUT-12G	✓			✓	12G SDI HD-BNC Dual Receiver that provides 1 SDI output
SFP-HDM-IN-12G	✓	✓	✓	✓	HDMI/DVI to SDI Receiver
SFP-HDM-OUT-12G	✓	✓	✓	✓	12G/3G/HD-SDI to HDMI 2.0/DVI Transmitter
SFP-MADI-1300MM	✓			✓	3G SDI multi-mode optical transceiver (1330nm)
SFP-MADI-1310SM	✓			✓	3G SDI optical transceiver that supports MADI
SFP-MADI-COAX	✓			✓	MADI Transceiver that provides a MADI Link with up to 64 channels in and out

Front Panel Overview

The ULTRIX-FR12 is designed to operate with the door closed to ensure adequate cooling via the fans.

Caution — *Before opening the front panel door, ensure that the ULTRIX-FR12 is disconnected from the power source and fully powered off.*

Features

The ULTRIX-FR12 front door is:

- designed to improve engineering efficiency
- high resolution
- password protected
- DashBoard enabled
- smart monitoring made easy via
  - priority display of system alarms
  - configurable severity and hysteresis
  - quick link to port/function
- smart control via
  - pushbutton routing control
  - configurable layouts
  - AFV and breakaways
  - salvos

› destination status

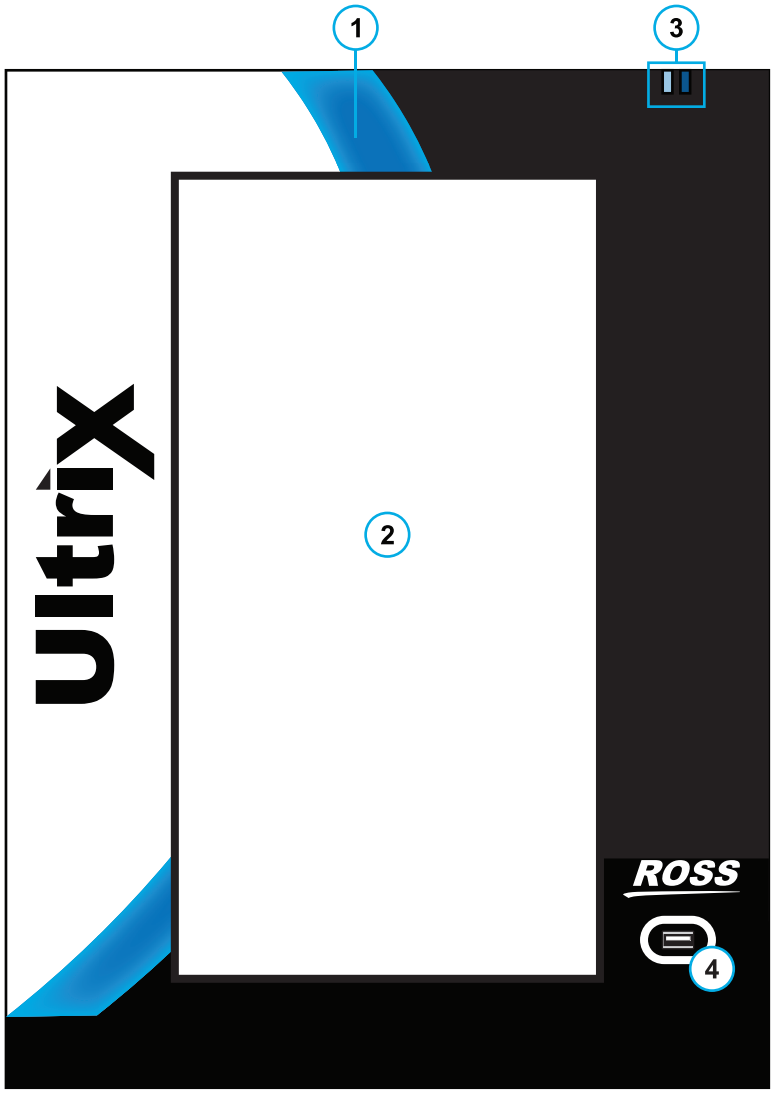


Figure 2 Example of an ULTRIX-FR12 —Front Panel

1) Front Panel Wave Light	3) ENET Port LEDs
2) Display Panel	4) USB Port

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. Display Panel

The touchscreen provides a simple and intuitive DashBoard interface to configure and monitor the ULTRIX-FR12.

3. ENET Port LEDs

Table 4 describes the two ULTRIX-FR12 front panel LEDs that are used to monitor ethernet communication activity of the 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.

4. USB Port

This is an USB 3.0 Type A port and is reserved for future use.

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.

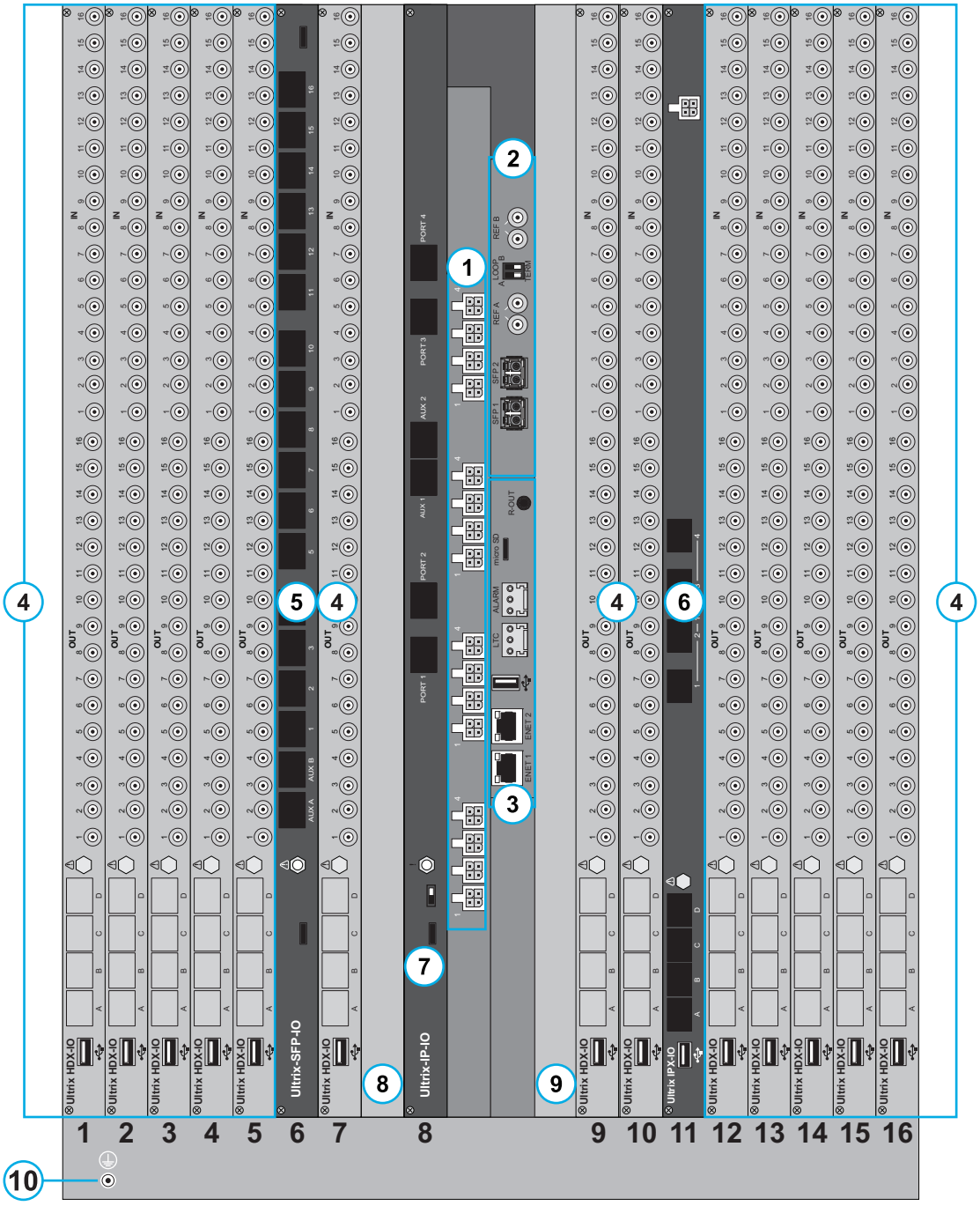


Figure 3 Example of an ULTRIX-FR12 — Rear Panel

1) PSU Connections	4) ULTRIX-HDX-IO Blade	7) ULTRIX-IP-IO Blade	10) Protective Earth Stud
2) Frame Reference Module	5) ULTRIX-SFP-IO Blade	8) Reserved Slot	
3) Frame Control Module	6) ULTRIX-IPX-IO Blade	9) Reserved Slot	

1. PSU Connections

There are four power input modules located on the back of the ULTRIX-FR12. Each input module includes four power connectors that correspond to the four connectors on an Ultripower power supply.

Caution — *The ULTRIX-FR12 requires a minimum of two Ultripower units and has a specific power up process. Refer to "***Powering the ULTRIX-FR12***".*

Notice — *Always connect one Ultripower unit to one ULTRIX-FR12 power input module.*

2. Frame Reference Module

This module provides two (individual or looping) HD-BNC inputs that accept reference signals supporting the following reference types: analog black, tri-level sync, and AES/DARs. The **REF A** port is the primary reference port.

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

Table 5 ***Blades — Supported REF Ports***

Blade	ULTRIX-FR12
SDPE-ACUITY	REF A
SDPE-CARBONITE	REF A or REF B
ULTRIX-HDX-IO	REF A or REF B
ULTRIX-IP-IO	REF A or REF B
ULTRIX-IPX-IO	REF A or REF B
ULTRIX-MODX-IO	REF A or REF B
ULTRIX-SFP-IO	REF A or REF B

3. Frame Control Module

This module provides the following 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).*

› USB 3.0 Type A Port — This port provides the ability for various USB-serial converts to be attached for serial communications with the ULTRIX-FR12 router. Refer to "**Supported USB-Serial Converters**".

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

› ALARM Connector — This 3-pin connector provides a hard-wired alarm output. An output is triggered on this port when the ULTRIX-FR12 detects a configured alarm. Refer to "**Cabling the ALARM Port**".

✶ The LTC and R-OUT ports are not implemented.

4. ULTRIX-HDX-IO Blade

Each ULTRIX-HDX-IO blade provides 2 AUX ports and 16x16 HD-BNCs of non-blocking connectivity for up to 384x384 SDI inputs/outputs in the ULTRIX-FR12. When populated, two additional AUX ports can be configured as Ultriscape outputs (heads), or as MADI inputs/outputs.

5. ULTRIX-SFP-IO Blade

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**.

6. ULTRIX-IPX-IO Blade

Each ULTRIX-IPX-IO blade provides four QSFP28 ports with 100GbE bandwidth per port. Refer to "**ULTRIX-IPX-IO Blade**" for more information on this optional blade.

7. ULTRIX-IP-IO Blade

Each ULTRIX-IPX-IO blade provides four ENET ports with 25Gb bandwidth per port. The ports are grouped into two pairs where the first pair is ENET 1 and ENET 2; the second pair is ENET 3 and ENET 4. Refer to the ***ULTRIX-FR12 User Guide*** for more information on this optional blade.

8. Reserved Slot

This slot is reserved for future use.

9. Reserved Slot

This slot is reserved for future use.

10. Protective Earth Stud

The ULTRIX-FR12 includes a protective earth ground stud.

Caution — *Risk of electrical shock. Enclosure shall be connected to earth ground via protective earth stud and 12AWG conductor or larger.*

Physical Installation

If you have questions pertaining to the installation of your ULTRIX-FR12 router, contact us at the numbers listed in "**Contacting Technical Support**".

Notice — *We recommend that the equipment be installed by qualified and experienced service personnel, to any relevant standards and approvals.*

For More Information on...

- installing an ULTRIX-FR12, refer to the ***ULTRIX-FR12 Quick Start Guide***.

Before You Begin

Caution — *The ULTRIX-FR12 utilizes front-to-back airflow management (looking at the front of the chassis). It is a requirement that the front and back of the mounted ULTRIX-FR12 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 the router and other equipment.
- 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 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-FR12 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.*

Unpacking the Equipment

On receiving your ULTRIX-FR12, check the contents against the packing list. Make sure that all equipment itemized on the packing list is present and that there are no signs of damage before you start installing the ULTRIX-FR12 into your system.

If anything is missing or damaged, contact Ross Video immediately to obtain the correct warranty service procedures. This ensures prompt assistance, minimal turnaround time, and avoids any freight issues.

Mounting Requirements

Warning — *When servicing or moving equipment, always observe safe handling practices. Get help to move heavy items. Use safe lifting techniques. Follow all safety rules of your workplace.*

Caution — *The ULTRIX-FR12 weighs approximately 122lbs (55.34kg). Two people should work together to lift it into place to avoid physical injury.*

- The ULTRIX-FR12 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. It is recommended to use M6 x 10mm screws with 40in-lbs [4.5N·m] of torque.
- Before working on any rack, ensure that it is stable. Make sure that any rack is level and stable before extending a component from the rack.
- Always load the rack from the bottom up, and load the heaviest item in the rack first.
- 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 intake are within the router's specified operating temperature range. Adequate ventilation within a rack frame must also be maintained.
- The ULTRIX-FR12 mounts in the rack frame by means of 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. There are 4 slots in each rack ear which need to be populated with a total of 8 screws.
- After installing equipment/components within a rack, never pull more than one component out of the rack on its slide assemblies at one time. The weight of more than one extended component could cause the rack to tip over and may result in serious injury.

For More Information on...

- the technical specifications for the ULTRIX-FR12, refer to "**Technical Specifications**".

Connecting the ULTRIX-FR12 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-FR12 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-FR12.

✶ The ULTRIX-FR12 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.

For More Information on...

- downloading and installing DashBoard, refer to the ***DashBoard User Guide***.

✶ If difficulties or problems are experienced when connecting the ULTRIX-FR12 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. Locate the ENET ports on the Frame Control CPU Module of the ULTRIX-FR12 rear panel. Refer to **Figure 3** for module location.
2. To connect the primary network connection for the ULTRIX-FR12 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-FR12 router.

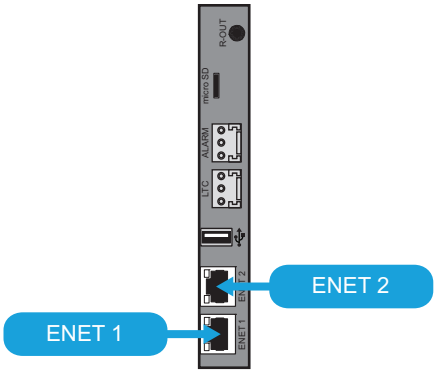


Figure 4 ULTRIX-FR12 — Network Connections

3. To connect the redundant network connection for the ULTRIX-FR12:
   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-FR12.

Powering the ULTRIX-FR12

If you have questions pertaining to the installation of your ULTRIX-FR12, contact us at the numbers listed in "**Contacting Technical Support**".

Notice — *We recommend that the equipment be installed by qualified and experienced service personnel, to any relevant standards and approvals.*

Overview

The ULTRIX-FR12 requires powering from multiple Ultripower units. These Ultripower units must be set to allow communication within a defined group known using the **Ultripower Manager** feature of the primary Ultricore BCS. It is important that a linked Ultripower group be configured prior to DC cable connection between the Ultripower units and the ULTRIX-FR12 chassis.

✶ The ULTRIX-FR12 requires a minimum of two Ultripower units. The remaining two power input groups are provided for high power configurations.

Before You Begin

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.*

Caution — *Risk of electrical shock. Enclosure shall be connected to earth ground via protective earth stud and 12AWG conductor or larger.*

Notice — *An Ultripower connected to more than one PSU input group is not supported.*

Before you set up and operate your ULTRIX-FR12, refer to the:

- "***Important Regulatory and Safety Notices to Service Personnel***" document for your router.
- ***Ultricore BCS User Guide*** for details about the **Ultripower Manager** feature.
- ***Ultripower User Guide*** before starting work or operating the ULTRIX-FR12.

Workflow for Initial Power Up

When powering up the ULTRIX-FR12 for the first time, you will need to:

1. Configure the Ultripower units into an Ultripower group via the Ultripower Manager on the Ultricore BCS interface.
2. Ensure the Ultripower Group state is set to 'OFF' in DashBoard.
3. Connect the cables from each Ultripower unit to the ULTRIX-FR12.
4. Access the Ultripower Manager via the Ultricore BCS in DashBoard to enable power output. Refer to the ***Ultricore BCS User Guide*** for details.

Ultripower Manager

Notice — *The Ultripower units must be grouped prior to connecting the power connections to the ULTRIX-FR12 chassis.*

The ULTRIX-FR12 requires multiple Ultripower power supply units (with a minimum of two units). It is required that these power cycle together. The primary Ultricore BCS has the Ultripower Manager feature to group up to 4 Ultripower units. When the Ultripower Group output state is changed, via the Ultripower Manager interface, the grouped units will follow suit.

For More Information on...

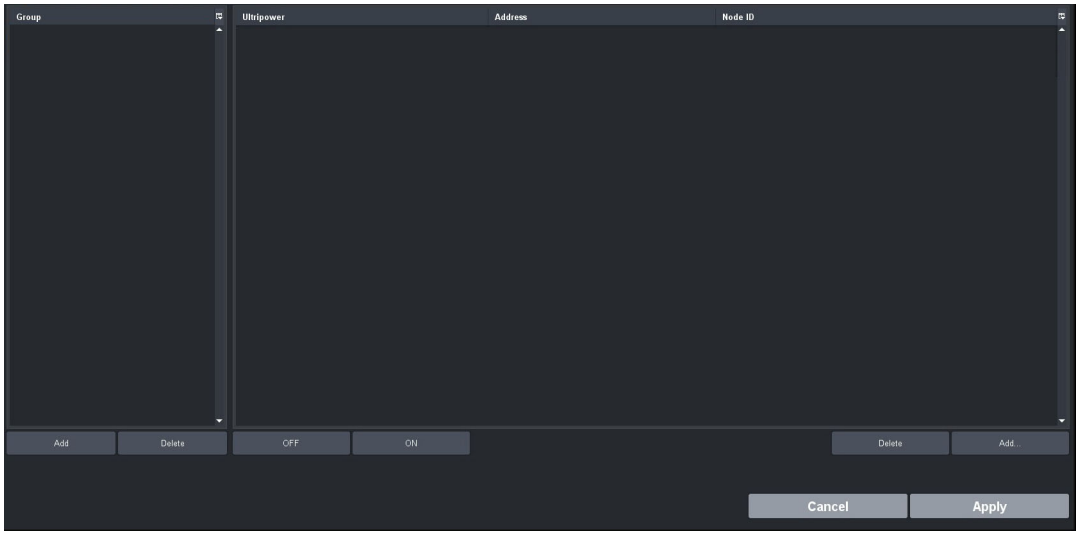
- connecting an Ultripower to a power source, refer to the ***Ultripower User Guide***.
- configuring the Ultripower Manager, refer to the ***Ultricore BCS User Guide***.

To set up an Ultripower group

Notice — *Do not connect the Ultripower units to the ULTRIX-FR12 until the Ultripower units are configured and grouped.*

1. Connect each Ultripower unit to mains AC and your facility network.
2. Configure Ultripower network IP addresses via **DashBoard** > **Walkabout**. Refer to the ***Ultripower User Guide*** for details.
3. Change the names of the Ultripower units for easy identification in the DashBoard Tree View.
4. Add the Ultripower units to the DashBoard Tree View. Refer to the ***Ultripower User Guide***.
5. For each Ultripower, navigate to the Setup tab and ensure the output ports are grouped together.
6. Locate the **Ultricore BCS** node in the Tree View of DashBoard.
7. Expand the main **Ultricore BCS** node.
8. Expand the **Ultricore BCS** sub-node to display a list of sub-nodes in the Tree View.
9. Expand the **Devices** sub-node.
10. Double-click the **Ultripower Manager** sub-node.

    The Ultripower Manager interface displays.



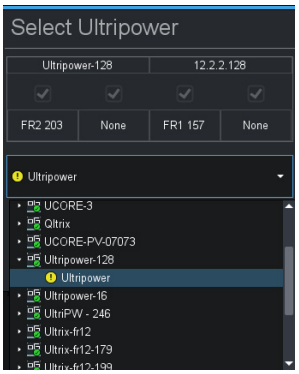
11. Click **Add** under the **Group** pane.

The **Group** pane displays a new entry "**`New Group`**".

12. To assign a unique identifier for the group, click "**`New Group`**" and edit as required.
13. Select the group from the list in the **Group** pane.
14. Click **Add** under the **Ultripower** pane.

    The **Select Ultripower** dialog opens.
15. From the drop-down menu, expand the node for the Ultripower unit to include in this group.
16. Double-click the sub-node.

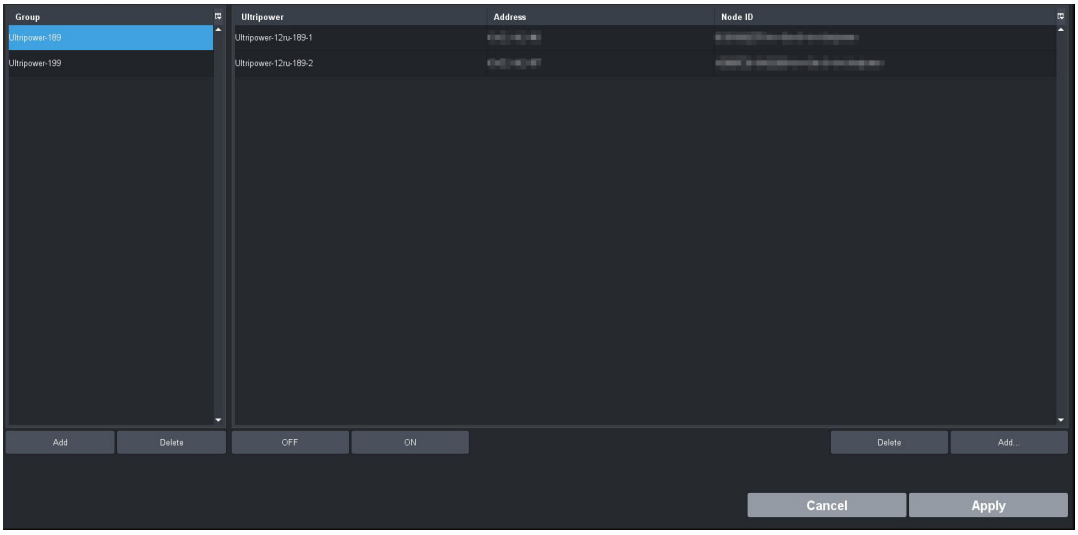
    The top panel of the dialog updates to report the name, IP address, status, and number of power modules for the selected Ultripower. In the example below, the user selected an Ultripower that is reporting an error (yellow indicator).



17. Verify that the information is correct.
18. Click **OK**.

    The **Select Ultripower** dialog closes and the Ultripower pane updates to list the selected unit.
19. Repeat steps 14 to 18 to add the second Ultripower unit to the group.

✶ If you are setting up a redundant system or a high-powered system, you will need to include 4 Ultripower units to the group.



In the example above, the user created two Ultripower groups.

20. Click **OFF**.

Cabling the Ultripowers to the ULTRIX-FR12

Notice — *The Ultripower group must be set to **OFF** before connecting to the ULTRIX-FR12.*

There are 16 PSU sockets organized into 4 groups on the back of each ULTRIX-FR12. Each PSU group connects to one Ultripower Rack Mount Power Supply unit. Each Ultripower is a 1RU 1200W power supply specifically designed for the Ultrix series routers. Powering an ULTRIX-FR12 from individual power supplies is not supported.

Verify the Output State of each Ultripower

Before connecting the ULTRIX-FR12 to the Ultripowers, you must first verify that the Output state of each Ultripower is set to Off. Once all Ultripowers are connected to the ULTRIX-FR12, you must toggle the Ultripower Group to ON.

To verify that the Ultripower group state is toggled to Off

1. Locate the **Ultricore BCS** node in the Tree View of DashBoard.
2. Expand the main **Ultricore BCS** node.
3. Expand the **Ultricore BCS** sub-node to display a list of sub-nodes in the Tree View.
4. Expand the **Devices** sub-node.
5. Double-click the **Ultripower Manager** sub-node.
6. From the **Group** list, select the required Ultripower group.
7. Click **OFF**.
8. Verify that each Ultripower is the same state (**Off**). Refer to the ***Ultripower User Guide*** for details.

Cabling the Ultripowers to the ULTRIX-FR12

For redundancy, each Ultripower may be fitted with an additional power supply module (ULTRIPOWER-PS). Refer to the ***Ultripower User Guide*** for details.

To cable the primary and second Ultripowers to the ULTRIX-FR12

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

1. To connect the primary Ultripower to the ULTRIX-FR12:
   a. Connect the ends of four power cables to the primary Ultripower rear panel **OUT** sockets.
   b. Connect the free ends of the same power cables to the ULTRIX-FR12 rear panel.
2. To connect the second Ultripower to the ULTRIX-FR12:
   a. Connect the ends of four power cables to the second Ultripower rear panel **OUT** sockets.
   b. Connect the free ends of the same power cables to the ULTRIX-FR12 rear panel.

To cable additional Ultripowers (optional)

✶ This procedure is only required for high power configurations or for further isolated power redundancy.

1. To connect a third Ultripower to the ULTRIX-FR12:
   a. Connect the ends of four power cables to the third Ultripower rear panel **OUT** sockets.
   b. Connect the free ends of the same power cables to the ULTRIX-FR12 rear panel.
2. To connect a fourth Ultripower to the ULTRIX-FR12:
   a. Connect the ends of four power cables to the fourth Ultripower rear panel **OUT** sockets.
   b. Connect the free ends of the same power cables to the ULTRIX-FR12 rear panel.

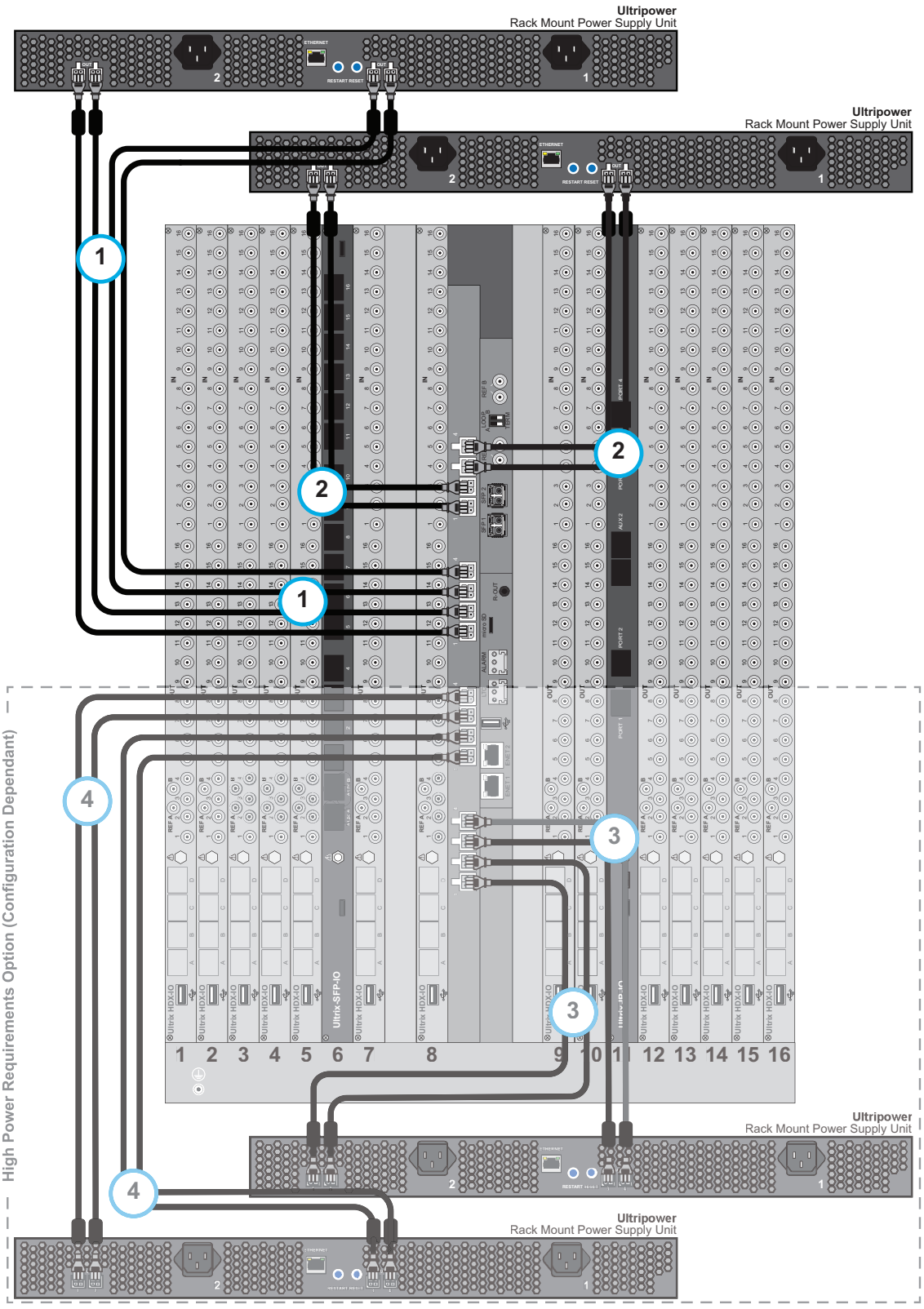


Figure 5 ULTRIX-FR12 — Power Connections

Powering on the ULTRIX-FR12 via DashBoard

Caution — *Before setting an Ultripower Group to ON, ensure its Ultripower PSU average power output is below 5W.*

Notice — *The ULTRIX-FR12 does not have a physical power switch.*

The ULTRIX-FR12 is powered on via the controlling Ultricore BCS interface.

To toggle the Ultripower Group to ON

1. Locate the **Ultricore BCS** node in the Tree View of DashBoard.
2. Expand the main **Ultricore BCS** node.
3. Expand the **Ultricore BCS** sub-node to display a list of sub-nodes in the Tree View.
4. Expand the **Devices** sub-node.
5. Double-click the **Ultripower Manager** sub-node.
6. Click **ON**.

✶ Click **OFF** to power down the ULTRIX-FR12.

Cabling Your Router

This chapter provides instructions on how to connect the ULTRIX-FR12 to a video reference signal, cabling for a Multiviewer Head, and connecting to source and destination devices.

Cabling the ALARM Port

The **ALARM** port is a normally closed relay output. The relay output is open when the ULTRIX-FR12 is powered on and there are no alarms present. **Table 6** outlines the conditions that will assert the ALARM port output.

Table 6 Alarm Conditions

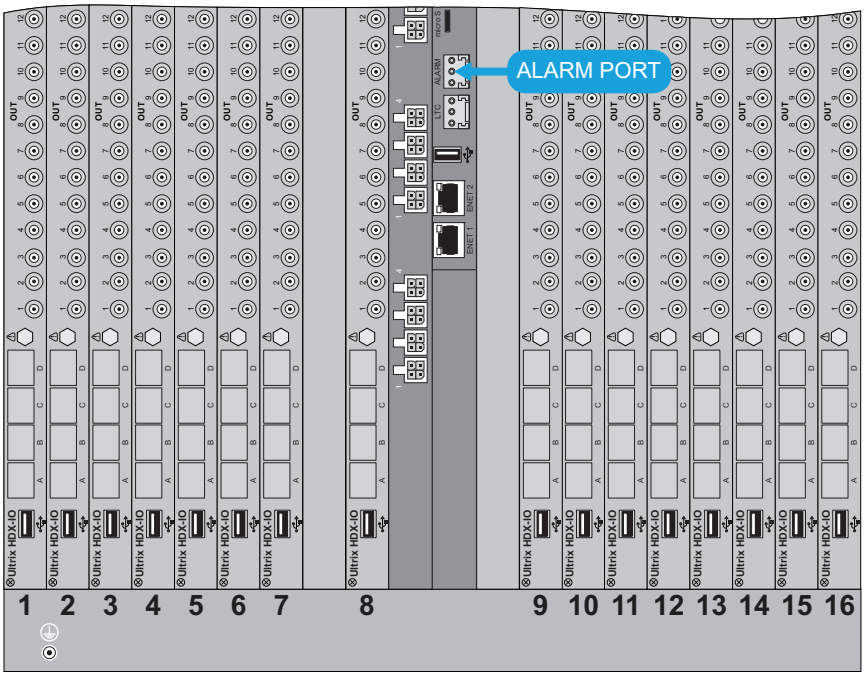
Component	Possible Reason
Matrix	Fan failure
	Overheating
	Power failure
I/O Blades	Overheating
	Power failure
Power	PSU failure
	PSU removed

The conditions that generate an alarm are critical incidents that stop the ULTRIX-FR12 from working. If the ULTRIX-FR12 is not supervised or at a remote site, such an alarm is used to alert system technicians that a failure has occurred, or the alarm can be used to trigger a backup system.

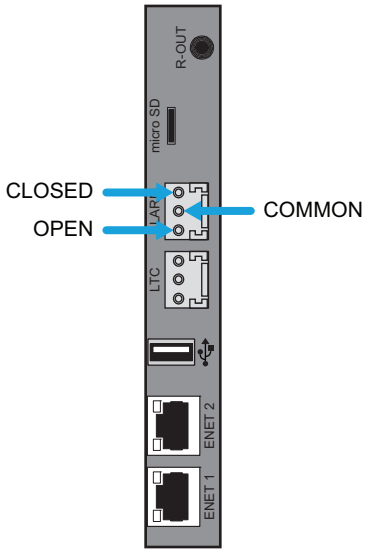
✶ Ross Video does not supply these cables.

To connect to the ALARM port on the ULTRIX-FR12

1. Locate the **ALARM** port on the ULTRIX-FR12 back panel.



2. Wire the **ALARM** mating connector to match the pinout as shown in the following diagram.



3. Once the cable is wired to the connector, plug the connector into the **ALARM** port on the ULTRIX-FR12 back panel.

Connecting the Video Reference Source

All ULTRIX-FR12 routers accept a video reference signal. If connected, a video references ensures that switching occurs in the default vertical interval across all router levels. The default switching pulse complies with ***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...

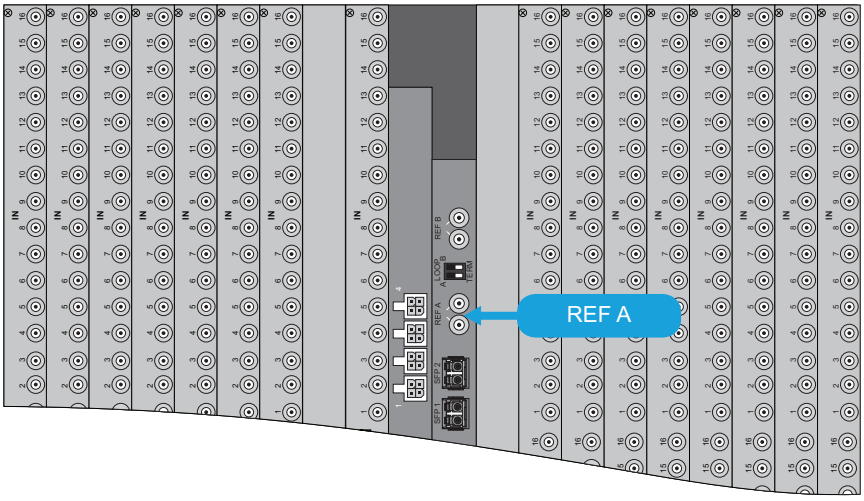
- setting a custom switching trigger, refer to the ***ULTRIX-FR12 User Guide***.
- supported reference formats for Frame Sync/Clean Switch, refer to "**Supported FSCS Video Formats for Conversion**".

Reference Cabling for the ULTRIX-FR12

The ULTRIX-FR12 consists of two independent reference connections (REF A, REF B). Each may be configured for loop-through or terminating functionality. The ULTRIX-FR12 requires at least one reference connection.

To connect the video reference source to the ULTRIX-FR12

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



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

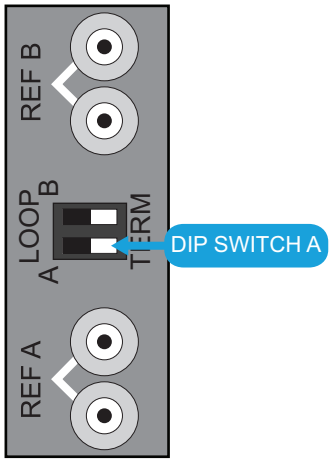


Figure 6 ULTRIX-FR12 — DIP Switch in the TERM Positions

Cabling for an Ultriscape Head

The number of Ultriscape (Multiviewer) Heads for your ULTRIX-FR12 router depends on the number of Ultriscape licenses enabled and the total number slots populated with I/O blades. **Table 7** lists the connections on the rear panel that are available for Ultriscape Heads based on the type of blade installed in the slot.

Table 7 Outputs Allocated for Ultriscape Heads

Blade Model	Slot	Head 1	Head 2	Head 3
Ultrix HDX-IO	Slot #	AUX A or OUT 1	AUX B or OUT 5	OUT 13
ULTRIX-IP-IO	Slot #	AUX 1	AUX 2	--
ULTRIX-IPX-IO	Slot #	AUX A	AUX B	--
ULTRIX-MODX-IO	Refer to the ***ULTRIX-MODX-IO User Guide***.			
ULTRIX-SFP-IO	Slot #	AUX A or SFP 1	SFP 5 or SFP 7	SFP 11 or SFP 13

Figure 7, **Figure 8**, and **Figure 9** illustrate the output connections allocated for Ultriscape Heads on each type of I/O blade.

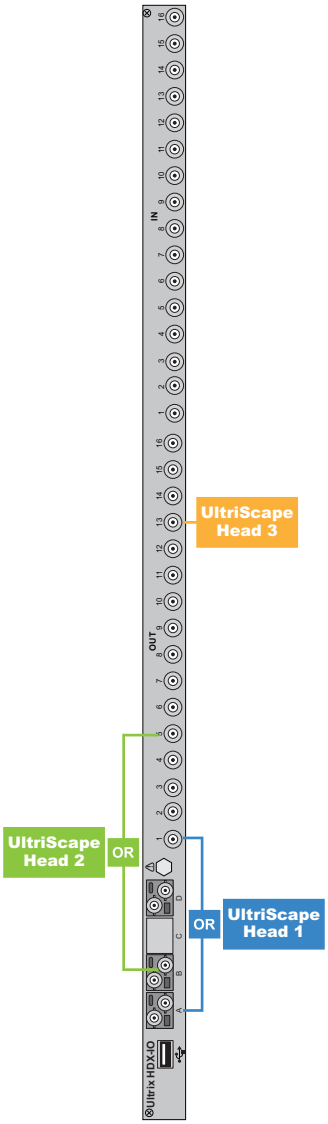


Figure 7 Ultriscape Heads — ULTRIX-HDX-IO

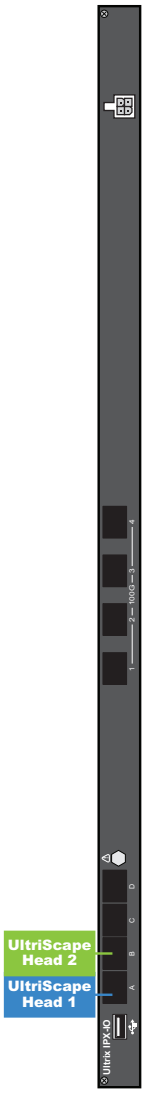


Figure 8 Ultriscape Heads — ULTRIX-IPX-IO

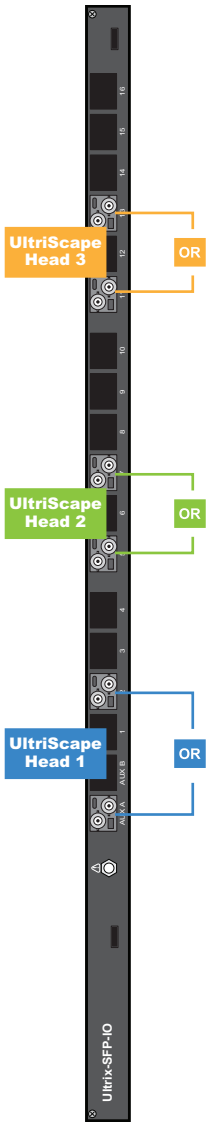


Figure 9 Ultriscape Heads — ULTRIX-SFP-IO

To cable ports for an Ultriscape Head

1. If your blade requires an HD-BNC connection:
   a. Connect the end of a 75ohm coaxial cable with an HD-BNC connector on one end to an **OUT** HD-BNC on the ULTRIX-FR12 rear panel.
   b. Connect the other end of the coaxial cable to the device that displays the Ultriscape Head from that **OUT** HD-BNC on the router.
2. If your blade requires a fiber optic connection, refer to "**Connecting the SFP Ports**".
3. Make a note of the port you have chosen for the Ultriscape Head as this information is needed when you configure the Ultriscape Head settings in DashBoard.

Connecting Source Devices

The ULTRIX-FR12 manages high-bandwidth, broadcast-quality, digital video and audio signals, and embedded audio signals. Digital video signals can be 12G[1], 3G, high definition, or standard definition. The ULTRIX-FR12 supports SMPTE standards 259M, 292M, 344M, 424M, 425, 2081, and 2082.

The total number of sources depends on the number and type of blades installed in the chassis.

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.*

For More Information on…

- cabling designations for your blade, refer to "**Cabling Designations**".

To connect source devices to an I/O blade

1. Connect the end of a 75ohm coaxial cable with HD-BNC connectors to an **IN** port on the rear panel.
2. Connect the other end of the coaxial cable to the device that will supply the signal to that **IN** port on the router.

Connecting Destination Devices

The ULTRIX-FR12 manages high-bandwidth, broadcast-quality, digital video and audio signals, and embedded audio signals. Digital video signals can be 12G[2], 3G, high definition, or standard definition. The ULTRIX-FR12 supports SMPTE standards 259M, 292M, 344M, 424M, 425, 2081, and 2082.

The total number of destinations depends on the number and type of blades installed in the chassis.

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.*

For More Information on…

- cabling designations for your blade, refer to "**Cabling Designations**".

To connect destination devices to an I/O blade

1. Connect the end of a 75ohm coaxial cable with HD-BNC connectors to an **OUT** port on the rear panel.
2. Connect the other end of the coaxial cable to the device that will ingest the signal from that **OUT** port on the router.

Gearbox Cabling

A Gearbox is a group of four consecutive SDI inputs or four consecutive SDI outputs that are automatically grouped together in the 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).

1. Requires installing an Ultrispeed license key for each slot. Refer to the ***ULTRIX-FR12 User Guide*** for details.
2. Requires installing an Ultrispeed license key for each slot. Refer to the ***ULTRIX-FR12 User Guide*** for details.

Figure 10 illustrates the connections allocated for Gearbox groups on the ULTRIX-HDX-IO blade.

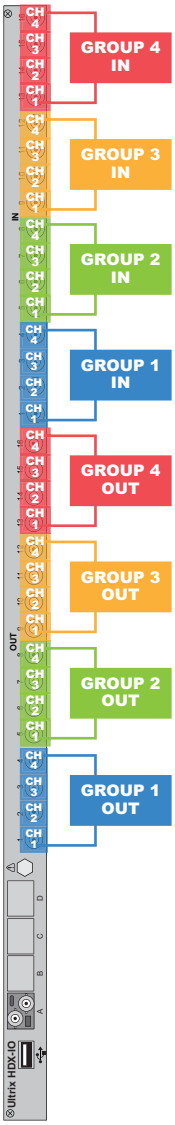


Figure 10 Example of Gearbox Mapping on a Single ULTRIX-HDX-IO Blade

✶ An Ultrispeed license is required for Gearbox functionality. Refer to the ***ULTRIX-FR12 Configuration 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***.

Outputs

When you configure a Gearbox output group, ULTRIX-FR12 takes the signals of the four 3G Level A channels together and provides a single 12G signal to an output.

Table 8 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]

Table 8 Gearbox Mapping — Default Output Groups on the Ultrix HDX-IO

Group	Channel 1	Channel 2	Channel 3	Channel 4
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-FR12 multiplexes the signals of the four 3G Level A channels together.

Table 9 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[8]
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]

Cabling for UltriProc

The number of UltriProc ports for your ULTRIX-FR12 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-FR12 User Guide***.
- cabling 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 3Gbps[1], 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 11** illustrates the connections allocated for UltriProc on the ULTRIX-HDX-IO blade for data rates up to 3Gbps.

Data Rates of 6Gbps or 12Gbps

When the UltriProc operates at data rates up to 6Gbps[2] and 12Gbps[3], 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 12** illustrates the connections allocated for UltriProc on the ULTRIX-HDX-IO blade for data rates up to 6Gbps and 12Gbps.

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

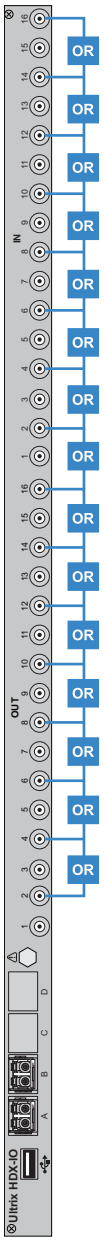


Figure 11 Example of UltriProc 3Gbps Mapping on a Single ULTRIX-HDX-IO Blade

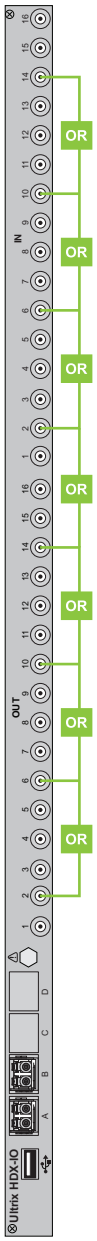


Figure 12 Example of UltriProc 6Gbps or 12Gbps Mapping on a Single ULTRIX-HDX-IO Blade

Cabling for Ultrimix-Dante

The Ultrimix-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. It utilizes the Audinate® Dante® proprietary IP-based audio transport system.

The ULTRIX-FR12 identifies the Dante channels as a single pipeline consisting of 64 input and 64 output channels. Ultrimix-Dante enables the ULTRIX-FR12 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-FR12 router. The ULTRIX-FR12 router can also output audio channels to the same Dante network.

✶ The AUX B audio channels are not available for use when Ultrimix-Dante is enabled on a blade. AUX B can still be used to route SDI video. Refer to the ***ULTRIX-FR12 User Guide*** for details.

For More Information on...

- configuring Ultrimix-Dante, refer to the ***ULTRIX-FR12 User Guide***.
- cabling the ULTRIX-MODX-IO blade, refer to the ***ULTRIX-MODX-IO User Guide***.

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

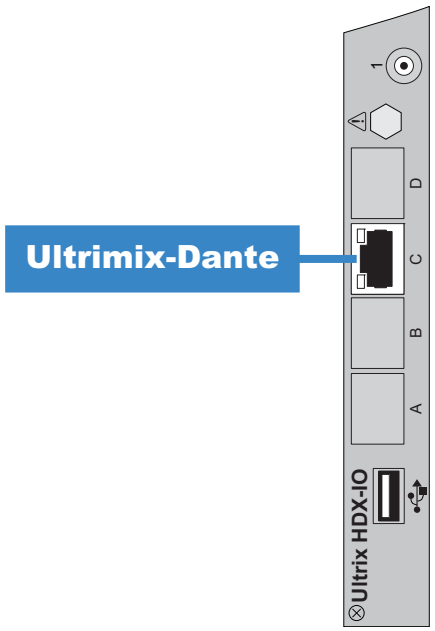


Figure 13 Ultrimix-Dante Cabling

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.

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

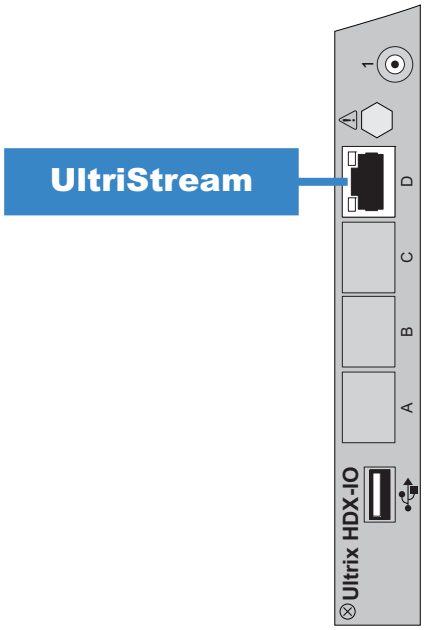


Figure 14 UltriStream Cabling

✶ 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-FR12 User Guide***.
- enabling and configuring the Ultriscape Head(s), refer to the ***Ultriscape User Guide***.
- cabling the ULTRIX-MODX-IO blade, refer to the ***ULTRIX-MODX-IO User Guide***.

Connecting the SFP Ports

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 blade(s) installed in the router, and the number of SFP+ modules you have chosen to install for each blade.

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

Working with Fiber Optic Connectors

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

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

For More Information on...

- the available SFP+ modules, refer to "**Supported SFP Modules**" and the ***Ultrix SFP Modules User Guide***.
- the AUX ports for your blade(s), refer to "**Cabling Designations**"

To connect to a third-party device via an AUX port

1. Connect the end of an interface cable to an **AUX** port on the ULTRIX-FR12 rear panel.
2. Connect the other end of the interface cable to the device that will communicate with the router via the **AUX** port.

Cabling for IP Streaming

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

To cable an IP PORT

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 connector 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 SFP+ module as required. (**Figure 15**)

For More Information on…

- configuring the senders and receivers for the blade, refer to the ***ULTRIX-FR12 User Guide***.
- ULTRIX-IP-IO blade, refer to "**Cabling Designations**".
- ULTRIX-IPX-IO blade, refer to "**Cabling Designations**".

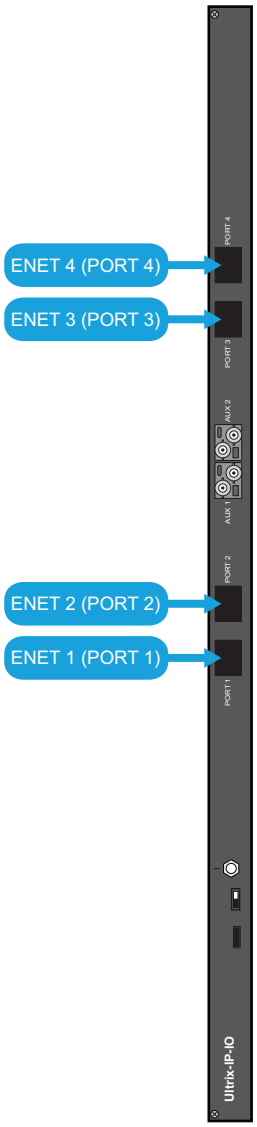


Figure 15 ULTRIX-IP-IO — PORT Connections

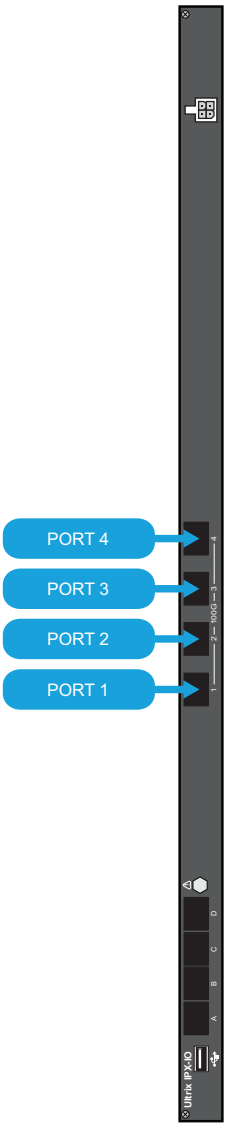


Figure 16 ULTRIX-IPX-IO — QSFP28 Connections

Connecting to an Ultricore BCS

An Ultricore BCS is required when using an ULTRIX-FR12. This allows for connectivity and router control, and database configuration. It enables support for advanced features such as Ultrix-IP IO modules, NMOS interoperability, tie-line management, and control system redundancy.

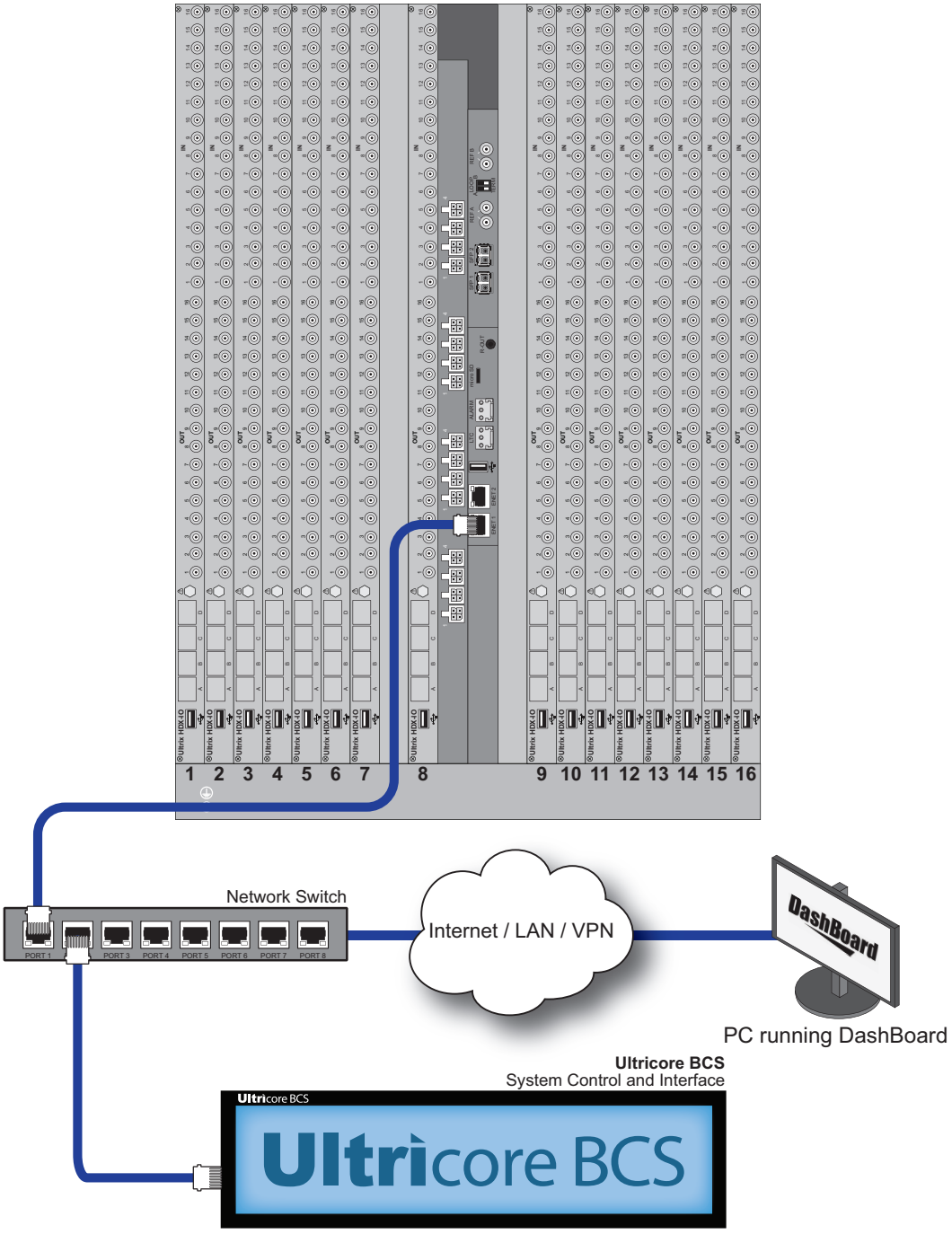


Figure 17 Example of Connection between the ULTRIX-FR12 and Ultricore BCS

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-FR12 communicates only via an ethernet protocol via a network connection. An ethernet connection from the Ross NK device to your facility network via an NK-IPS or NK-NET is required for communication with the ULTRIX-FR12.

To establish communications between a Ross NK device and your ULTRIX-FR12

1. Connect the NK device to the same Ethernet network as your ULTRIX-FR12 router using an NK-NET or an NK-IPS. The NK-NET requires a Ross NK router to supply phantom power for operation.
2. Set up communications via the Ultricore BCS interface in DashBoard.

For More Information on...

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

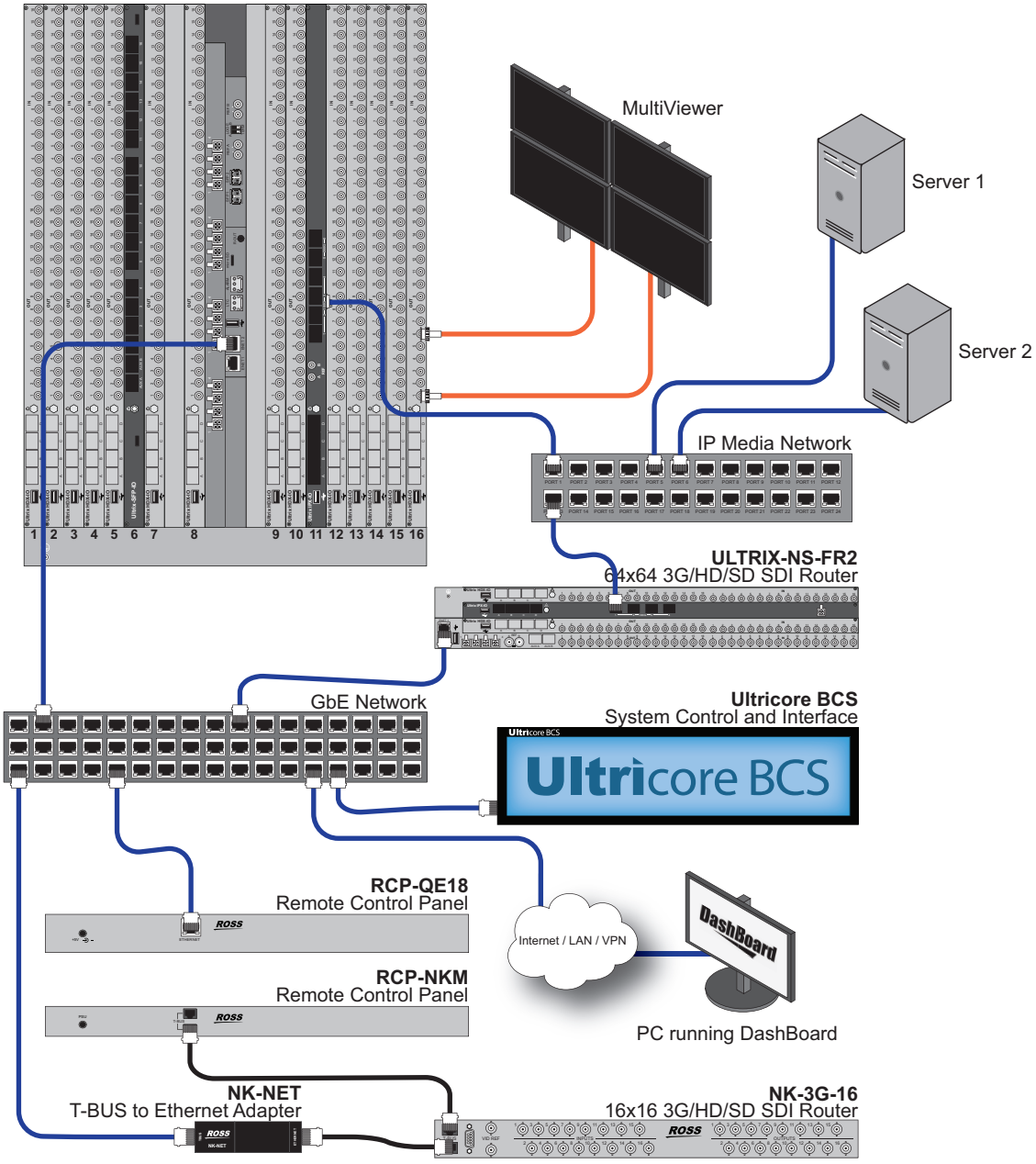


Figure 18 Example of a Routing System with Ross NK Devices and an ULTRIX-FR12

Cabling Designations

This chapter outlines the default cabling designations for each type of I/O blade that the ULTRIX-FR12 supports.

For More Information on...

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

ULTRIX-HDX-IO Blade

This section outlines the implemented cabling designations for an ULTRIX-HDX-IO blade.

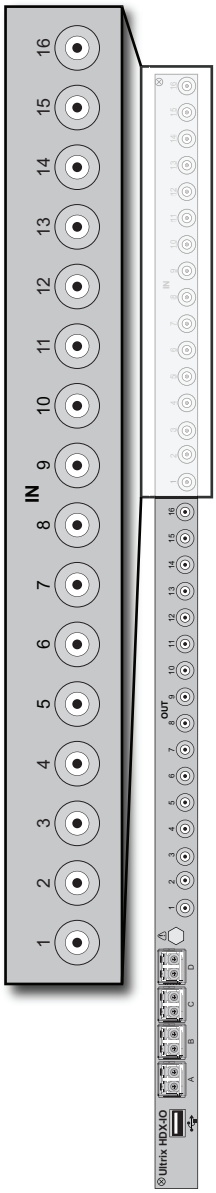


Figure 19 SDI Inputs

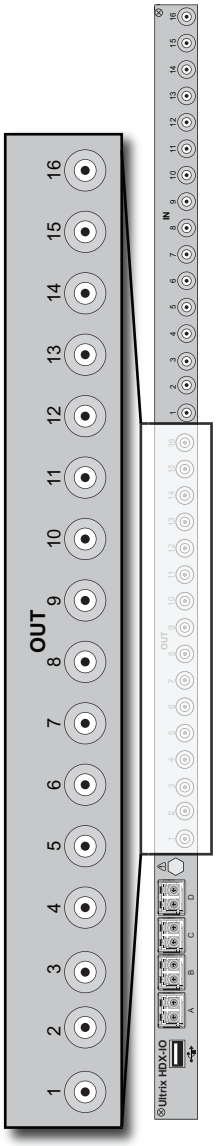


Figure 20 SDI Outputs

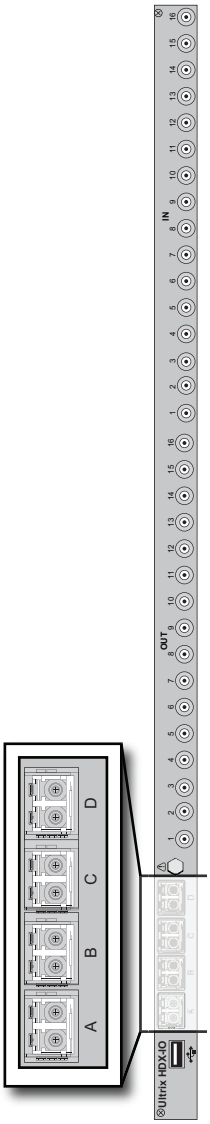


Figure 21 AUX Ports

✶ AUX D is only required for the UltriStream licensed feature. Refer to the ***Ultrix User Guide*** for details.

ULTRIX-HDBNC-IO Blade

This section outlines the default cabling designations for an ULTRIX-HDBNC-IO blade.

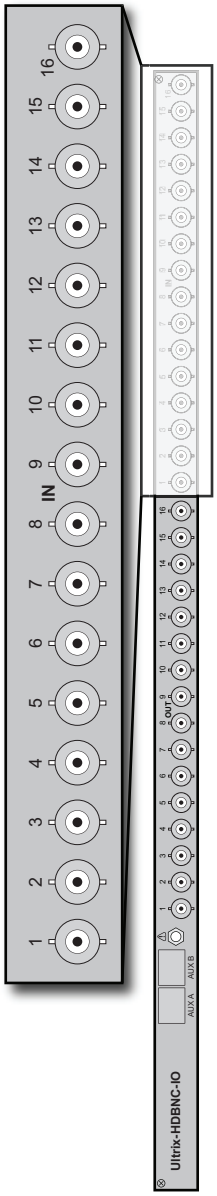


Figure 22 SDI Inputs

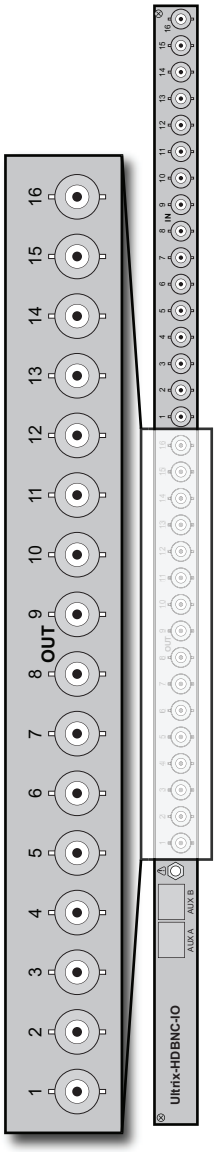


Figure 23 SDI Outputs

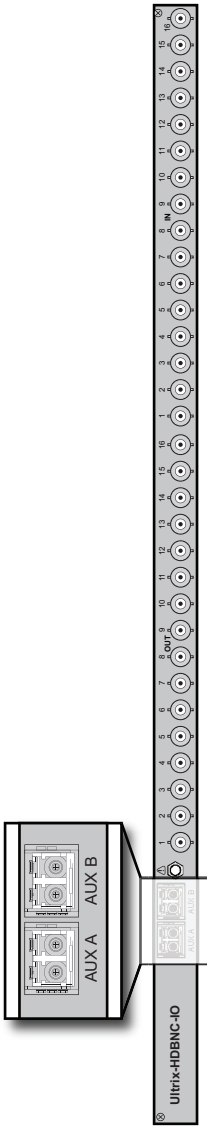


Figure 24 AUX Ports

The Source connections on the ULTRIX-HDBNC-IO blade are located on the top of each blade. The HD-BNCs are numbered starting at IN 1. (**Figure 22**) Destination connections on the ULTRIX-HDBNC-IO blade are located on the bottom of each blade. The HD-BNCs are numbered starting at OUT 1. (**Figure 23**)

ULTRIX-IP-IO Blade

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

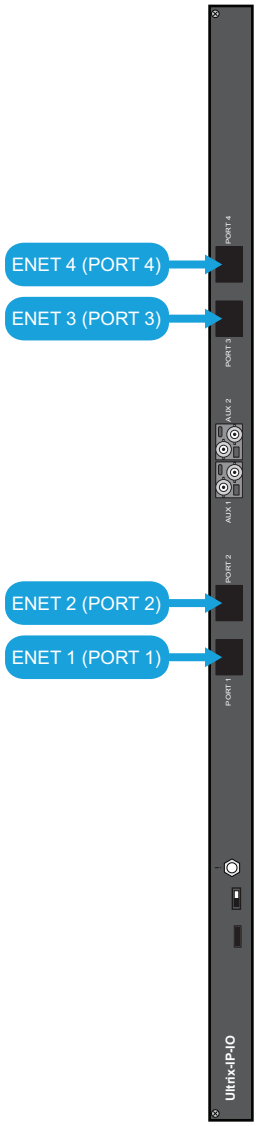


Figure 25 IP Ports

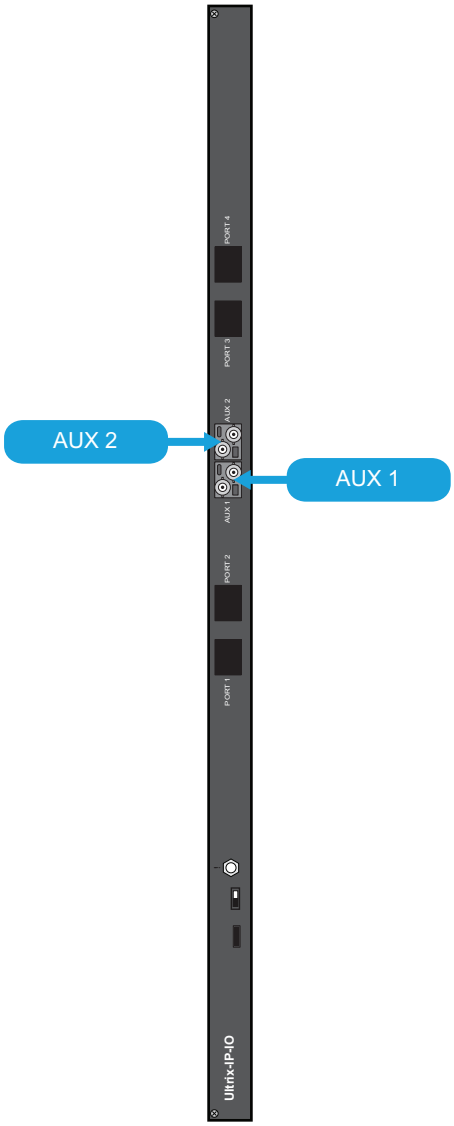


Figure 26 AUX Ports

ULTRIX-IPX-IO Blade

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-IP-IO offers scalability and high total bandwidth, making it suitable for a range of IP applications.

Features

- Video streams per blade:
  - › UHD: 8+8 redundant[1]
  - › 3G/HD: 16+16 redundant

1. Due to software limitations.

- 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)[1]
  - Provisioning and monitoring via DashBoard and/or our published JSON API

Hardware

The Ultrix v5.3.0 software currently supports:

- The 100Gb QSFP28 transceiver modules based on 4x25Gb NRZ optical lanes, requiring no FEC or RS(528,514) KR4 FEC, or based on 1x100Gb PAM4 optical lane, either requiring no FEC or providing built-in RS(544,514) KP4 FEC.
- The 4x25Gb NRZ QSFP28 transceiver modules, available for both multi-mode or single-mode fibers, are identifiable by 100GBASE-SR4, 100GBASE-SWDM4, 100GBASE-PSM4, 100GBASE-CWDM4, 100GBASE-4WDM-10/20/40, and 100GBASE-CLR4.
- The 1x100Gb PAM4 QSFP28 transceiver modules, available for single-mode fibers, are identifiable by 100GBASE-DR, 100GBASE-FR, 100GBASE-LR, compliant with the 100G Lambda MSA, including built-in RS(544,514) KP4 FEC.

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

Cabling

This section outlines the default cabling designations for an ULTRIX-IPX-IO blade.

QSFP28 Ports

The ULTRIX-IP-IO blade includes four QSFP28 ports (1-4). (**Figure 27**) 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))

AUX Ports

The AUX A and AUX B ports can only be used for Ultriscape Head outputs.(**Figure 28**)

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

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

PSU Port

The power supply connector requires a 15VDC connection to an external power supply. (**Figure 29**) Refer to the Ross Configuration Tool on our website for the power requirements of your configuration.

USB Port

The USB Type B port is used for recovery only. (**Figure 30**)

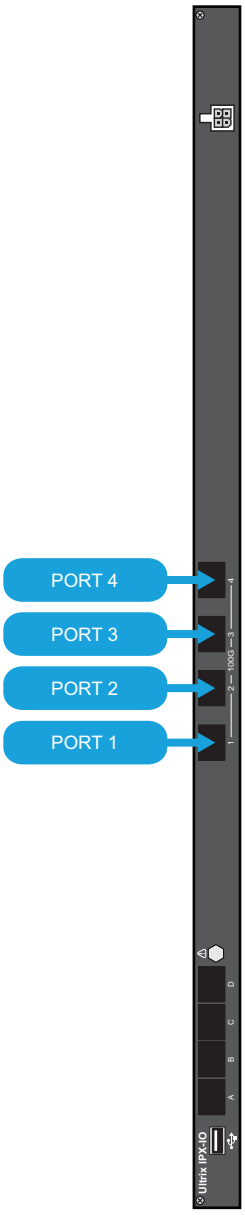


Figure 27 QSFP28 Ports

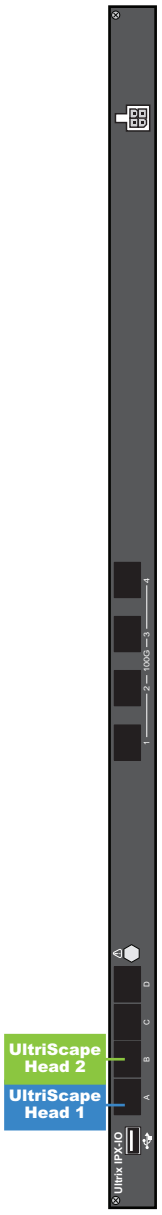


Figure 28 AUX Ports

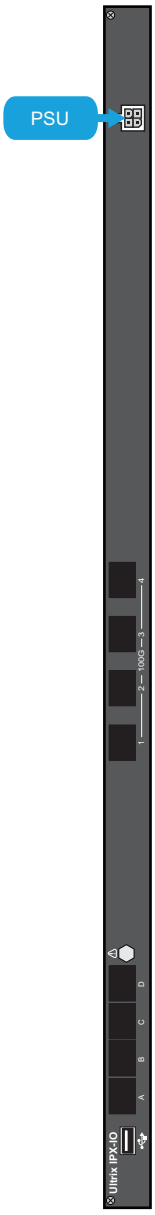


Figure 29 PSU Port

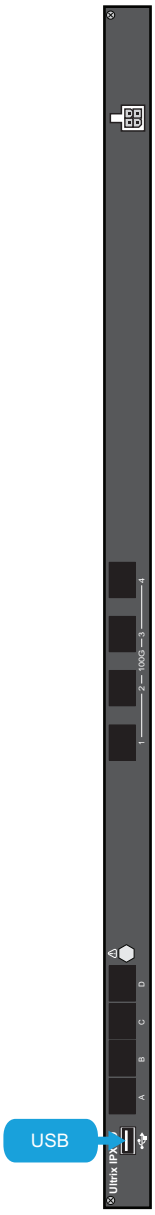


Figure 30 USB Port

ULTRIX-SFP-IO Blade

The ULTRIX-SFP-IO blade provides up to 16 ports that can be populated with supported SFP+ modules. This section outlines the default cabling designations for an ULTRIX-SFP-IO blade.

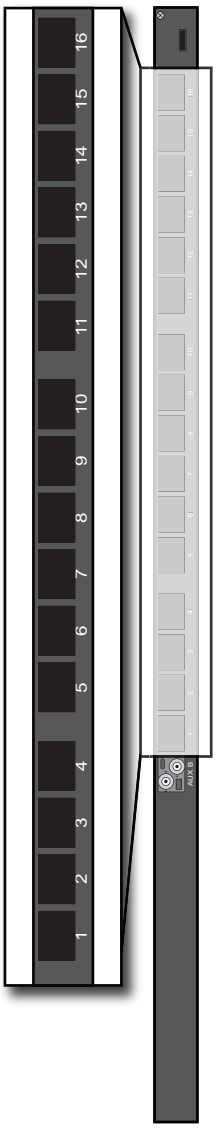


Figure 31 SFP Ports

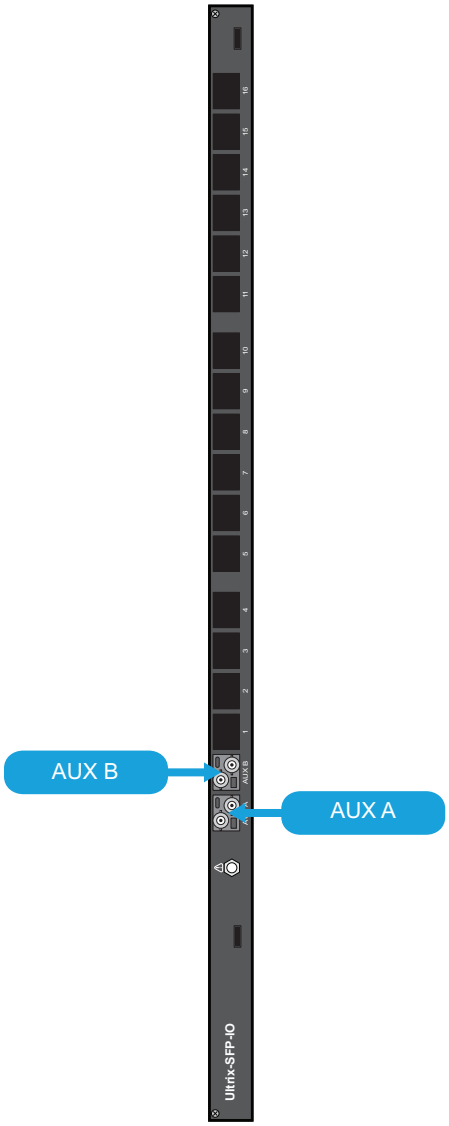


Figure 32 AUX Ports

Technical Specifications

This chapter provides technical information for ULTRIX-FR12. Note that specifications are subject to change without notice.

Physical Dimensions

Table 10 Technical Specifications — Physical Dimensions

Item	Specification
Width	18.90″ (48cm)
Depth	15.91″ (40.41cm)
Height	21.0″ (53.34cm)
Weight (approx.)	122lbs (55.34kg)

Inventory

Table 11 Technical Specifications — Inventory

Item	Specification
Video Matrix Size (max.)	288
Fixed I/O Slots	0
Optional I/O Slots	16 (288 x 288)
Audio	
Audio Matrix Size (max.)[a]	4608 x 4608
Audio Matrix Size (with Optional MADI SFPs)	6144 x 6144
MultiViewer	
Ultriscape Licenses per slot	3
Maximum Multiviewer Heads per System	48
UHD	
UltriSpeed Licenses per frame	1

a. Assumes a chassis fully populated with SDI inputs.

Supported FSCS Video Formats for Conversion

Table 12 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 12 Reference Formats — FSCS Video

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[c]	
23.98Hz	1080p 23.98Hz
24Hz	1080p 24Hz

Table 12 Reference Formats — FSCS Video

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	
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 13 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	PSF	24	✓	✓	✓	
1080	PSF	23.98	✓	✓	✓	
1080	PSF	30	✓	✓	✓	
1080	PSF	29.97	✓	✓	✓	
1080	PSF	25	✓	✓	✓	
1080	P	24	✓	✓	✓	
1080	P	23.98	✓	✓	✓	
3G (HD)						
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	✓	✓	✓	
6G (UHD)						

Table 13 Technical Specifications — Supported Formats

Resolution (lines)	Interlace / Progressive	Frame Rate (Hz)	SDI Routing	UltriMix	Ultriscape	Gearbox
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).

Maximum Power Ratings

✶ Refer to the Ultrix Configuration Tool for details on the required number of Ultripower Power Supply units for the ULTRIX-FR12.

Table 14 outlines the maximum power ratings for fully loaded ULTRIX-FR12.

Table 14 Technical Specifications — Maximum Power Ratings

Item	Specifications
ULTRIX-FR12 with 16 ULTRIX-HDX-IO blades	Typical: 2000W Max: 2500W
ULTRIX-FR12 with 16 ULTRIX-IP-IO blades	Typical: 1890W Max: 2400W
ULTRIX-FR12 with 16 ULTRIX-SFP-IO blades	Typical: 1700W Max: 2200W

Inputs

Table 15 Technical Specifications — 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 15 Technical Specifications — Inputs

Item	Specification
Equalization (typical)	UHD: 50m (160ft) HD, 3G: 200m (650ft) SD: 400m (1300ft)
SFP AUX Connector	Refer to "**Supported SFP Modules**" for a list of AUX options. Refer to the ***Ultrix SFP Modules Guide*** for more information on these options.

Outputs

Table 16 Technical Specifications — 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 the ***Ultrix SFP Modules Guide***.

Embedded Audio

Table 17 Technical Specifications — Audio Inputs

Item	Specification
Audio Channels per SDI I/O	16
Audio Channels per MADI I/O	Selectable 56 or 64

Environmental

Table 18 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 19 Technical Specifications — MicroSD Card

Item	Specifications
Types Supported	Contact Ross Technical Support
Operating Systems Supported	

Ultriscape Output Specifications

Table 20 Supported Video Formats

Format
Ultriscape Output
1080i 50Hz
1080i 59.94Hz
1080p 50Hz
1080p 59.94Hz

Ethernet Port Connectors

Each ULTRIX-FR12 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-FR12 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 21 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-FR12 rear panel can be populated with specific classes of small form-factor pluggable (SFP) modules. Refer to the ***Ultrix SFP Modules Guide*** for more information on the SFP models and their specifications.

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zlib

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

Glossary

The following terms are used throughout this guide:

Connection Point — setting to define a communication connection between an ULTRIX-FR12 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 router that is assigned as an Ultriscape (Multiviewer) output.

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

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

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

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

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

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

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

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

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

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

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

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

UltriClean — clean switch functionality of the ULTRIX-FR12 routers.

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

UltriMix — SDI embedded audio manipulation sub-system of the ULTRIX-FR12 routers.

Ultriscape — licensed Multiviewer option for ULTRIX-FR12 routers.

UltriSpeed — licensed 12Gbps SDI video option.

UltriSync — a per input licensed frame synchronizer.