Utah Scientific

The Utah-400 Digital Routing Switcher

32x32 Systems

Operator's Manual

The Utah-400/32x32 Digital Routing Switcher Operators' Manual

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This equipment has been tested and found to comply with the limits for a Class A, digital device, pursuant to Part 15, Subpart B of the FCC Rules and the Canadian EMC Requirement (ICES-003). 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 their own expense. Shielded cables must be used to ensure compliance with the FCC Class A limits.

Declaration of Conformity

Utah Scientific, Inc.

4750 Wiley Post Way, Suite 150
Salt Lake City, Utah 84116-2878 U.S.A.

We declare our sole responsibility that the Utah-400 Digital Routing Switcher is in conformance with the following standards:

Emission

- EN55022:1994+A1&A2

Immunity

- EN55024:1998
- EN61000-3-2
- EN61000-3-3

Safety

- IEC 60950-1:2001 /EN 60950-1:2001

Following the provisions of the Directive(s) of the Council of the European Union:

- EMC Directive 89/336/EED
- Low Voltage Electrical Directive 72/23/EEC

Utah Scientific, Inc. hereby declares that the product specified above conforms to the above Directive(s) and Standard(s).

CE

Important Safeguards and Notices

This section provides important safety guidelines for the Operator and Service Personnel. Specific warnings and cautions are found throughout the guide where they apply, but may not appear here. Please read and follow the important safety information, specifically those instructions related to risk of fire, electric shock, or injury to persons.

Safety Symbols

- Hazardous Voltage symbol

- Caution symbol. The product is marked with this symbol when it is necessary to refer to the manual to prevent damage to the product.

Warnings

Please observe the following important warnings:

- Any instructions in this guide that require opening the chassis, changing a power supply, or removing a board, should be performed by qualified personnel only. To reduce the risk of electric shock, do not perform any service unless you are qualified to do so.
- Heed all warnings on the unit and in the operating instructions.
- Do not use this product in or near water. Disconnect AC power before installing any options or servicing the unit unless instructed to do so by this manual.

- This product is grounded through the power cord ground conductor. To avoid electric shock, plug the power cord into a properly wired receptacle before connecting the product inputs or outputs.
- Route power cords and other cables so they won't be damaged.
- The AC receptacle (socket) should be located near the equipment and be easily accessible.
- Disconnect power before cleaning. Do not use any liquid or aerosol cleaner - use only a damp cloth.

- Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed conductors and components while power is on. Do not insert anything into either of the systems two-power supply cavities with power connected.
- Do not wear hand jewelry or watches when troubleshooting high current circuits, such as power supplies. During installation, do not use the door handles or front panels to lift the equipment as they may open abruptly and injure you.
- To avoid fire hazard when replacing fuses, use only the specified correct type, voltage and current rating as referenced in the appropriate parts list for this product. Always refer fuse replacement to qualified service personnel.
- Have qualified personnel perform safety checks after any service.

Cautions

Please observe the following important cautions:

- When installing this equipment do not install power cords to building surfaces. To prevent damage when replacing fuses, locate and correct the problem that caused the fuse to blow, before reconnecting power.
- Use only specified replacement parts

Notices

Please observe the following important notes:

- When the adjacent symbol is indicated on the chassis, please refer to the manual for additional information.
- For the HD-2020 Chassis and Master Control Panel, refer to “Connecting and Disconnecting Power” - Chapter 2 (Hardware Installation).

Company Information

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Warranty Policies

Hardware Warranty

Utah Scientific, Inc. warrants to the original purchaser that the Utah Scientific hardware is free from defects in materials and workmanship and will perform substantially in accordance with the accompanying written materials under normal use and service for a period of ten (10) years from the date of shipment. Any implied warranties on hardware are limited to ten (10) years. Some states/jurisdictions do not allow limitations on duration of an implied warranty, so the above limitation may not apply to certain specific purchasers.

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Utah Scientific warrants that the software will perform substantially in accordance with the accompanying written materials for a period of one (1) year from the date of shipment.

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- Return of the price paid, or
- Repair or replacement of the software or hardware that does not meet the above warranties and is returned to Utah Scientific under the returned materials authorization (RMA) process with freight and forwarding charges paid.

After the initial warranty periods, purchaser's exclusive remedy is the repair or replacement of the hardware upon payment of a fixed fee to cover handling and service costs based on Utah Scientific's then-current price schedule. The above warranties are void if failure of the software or hardware has resulted from an accident, abuse, or misapplication. Any replacement software or hardware will be warranted for the remainder of the original warranty period or thirty (30) days, whichever is longer.

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APPENDIX C *The Router Debug Port*

CHAPTER 1 Introduction

In This Guide

This guide provides instructions on installing, configuring and operating the Utah Scientific, Utah-400 Digital Signal Routing Switcher (32x32 configuration). The following chapters and appendices are included:

- **Chapter 1**

"Introduction" summarizes the guide, describes basic router operation and describes the hardware and software components of the Utah-400 Digital Routing Switcher.

- **Chapter 2**

"Hardware Installation" provides instructions for installing the Utah-400 Digital Routing Switcher in your facility.

- **Chapter 3**

"Configuration and Operation" provides specific information regarding the configurations of this unit, and necessary equipment handling (operation).

- **Chapter 4**

"Utah-400 Router Components" provides basic information about the Input, Output, Crosspoint, Interface board and Power Supplies. Included is general information about LED indicators and alarms present on each board type.

- **Chapter 5**

"Troubleshooting" looks at some of the common hardware and software problems, diagnostics and solutions available to the user on site. Included in this section is information on the various avenues to contact Utah Scientific Technical Services and tips on discussing equipment problems.

- **Appendix A**

"Hardware Specifics" provides technical details of connectors, cabling, and suggestions regarding usage. A Glossary of Terms is also included in this section.

- **Appendix B**

"Specifications" lists all system specifications, including Audio, Video, physical, power, and regulatory.

Conventions

The following conventions are used throughout this guide:

- Connectors and terminators will be indicated by bold, upper case text in Arial Black font. For example:
    - Connect the **MX-Bus** to **J-1**
- **Operator Actions** will be indicated in Helvetica Bold where a board is inserted, removed and/or an action is required in the Troubleshooting or configuration sections of this manual. There will usually be a graphic to accompany the instruction(s). For example:
    - **Insert** the expansion Input board in slot 6.
    - **Switch** the suspected bad input **to a known good input** to verify output "X".
- The use of bullets indicates a random order of operation or to draw the readers attention to specific items.

1. The use of numbers in specific operations or lists indicates a "**recommended order of operation**" to perform specific tasks. Bulleted items may be below numbered items to highlight tasks or indicate the operation(s) may be performed at random.

Abbreviations

The following abbreviations may be used in this guide: See Appendix A for an additional Glossary of Terms and further definitions.

TABLE 1. Common Abbreviations and Mnemonics

Abbreviation	Description
ATR	Audio Tape Recorder
AES	Audio Engineering Society
CPU	Central Processing Unit
DTR	Digital Tape Recorder
EBU	European Broadcast Union
ENET	Ethernet
HDTV	High Definition Television
I/O	Input / Output
IP	Internet Protocol
JPEG	Joint Photographic Experts Group
M-JPEG	Motion – JPEG
MPEG	Motion Picture Experts Group
MX-Bus	Utah Router Control Comm. Bus
RMS	Router Management System
RU	Rack Unit
SDI	Serial Digital Interface
U-Net	Utah Control Panel Comm. Network
UTP	Unshielded Twisted Pair
VTR	Video Tape Recorder

Terms

The following terms are used throughout the documentation in this guide:

- "**Operator**" and "**User**" refer to the person using or operating the Utah-400 Digital Router System.
- "**System**" refers to the entire interconnected Utah-400 System including control panels, routers, software, and chassis.
- "**Mainframe**" refers to the Utah-400 chassis plus redundancy.
- "**Input**" refers to and audio or video signal source that is connected to the Utah-400 main frame.
    - One video input represents one High Definition or Serial Digital Interface video output signal.
    - One audio input represents a single monophonic track from an analog audio source.
    - One digital audio input represents two tracks (left and right channel) from a digital audio source.
- "**Source**" refers to an audio or video device whose output signals are connected to the Utah-400 mainframe inputs. Examples of audio / video sources are ATR's, VTR's, DTR's, cameras, video / audio routers, audio mixers, graphics systems, and satellite feeds.
- "**Output**" refers to the Utah-400 audio or video signals from the Utah-400 "Outputs", which are connected to the 'destination device'. This term also includes the physical output connectors on the frame.
- "**Destination**" refers to the device, which is receiving the Utah-400 output signal. This could include VTRs, monitors, satellite feeds, or video / audio routers.
- "**Signal Level**" refers to the logical level of the audio / video routers in relation to the entire connected system(s). Typically, the Utah-400 occupies levels above 1, with master control occupying the lowest logical level.
- "**Hot Swappable**" " refers to a printed circuit board, which can be removed or replaced with system power "on".
- "**Control Panel**" refers to the physical human interface used to control the various systems in use.
- "**Display**" is the 'LCD Display' on the panels in use.

- "**Monitor**" refers to the monitor attached to the monitor matrix port of a video or audio router system.
- "**High Definition**" " refers to all 780p and 1080i formats – as per CEMA definition. The typical high definition data rate is 1.485 Giga Byte and a 16:9 Aspect Ratio Picture characterizes this technology.
- "**Serial Digital**" Interface (SDI)" refers to the serial digital video signal operating at 125 to 270 MB. Utah Scientific data rates for the serial digital router are 143, 177, 270,360 and 540 MB.

Routing Switcher Basics

A routing switcher is a specialized form of broadcast equipment that allows the user to connect large numbers of source and destination devices together electronically – without patching or running cables across floors and without significant signal loss.

The routing switcher solves connectivity problems and increases signal qualities in a wide variety of applications. The technologies of routing switchers now include the standard analogue, digital video, digital audio, and increasingly the high definition formats.

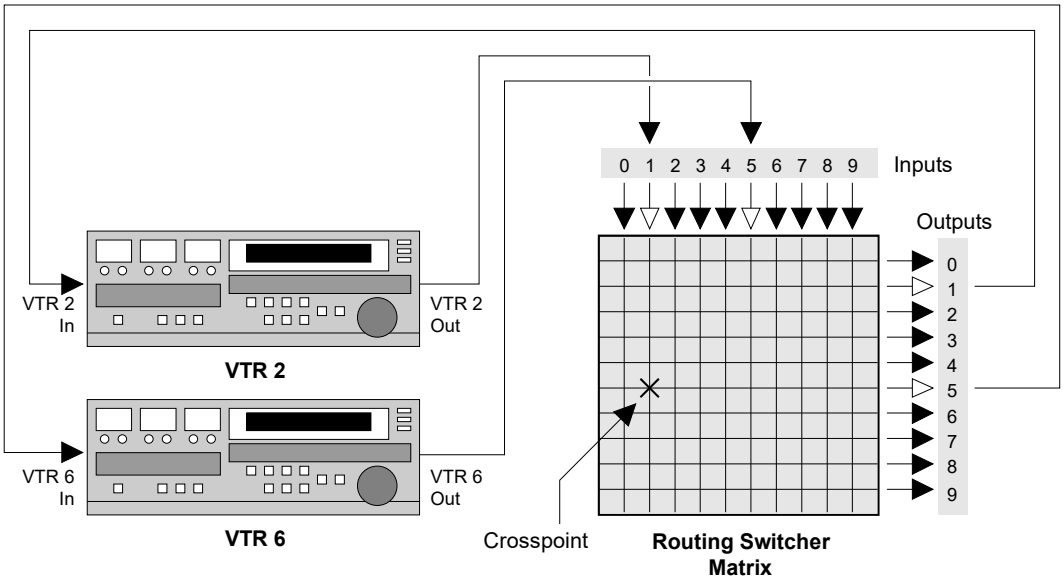
The routing switcher provides the user with the following advantages:

- Many signal levels (determined by the matrix size) may be switched simultaneously.
    - A simple route connects (switches) one signal level from one source (for example a VTR) to one destination (a monitor).
        - A complex route would connect multiple signal levels from one source to multiple destinations, including tie lines. For example, a satellite feed to a group of VTRs and monitors.
- Audio and video signal levels can be switched in groups (all follow takes) or individually (breakaway takes). Any input can be switched to any output, limited only by the matrix size.
- The Routing Switcher may be controlled manually via control panels, or with computer controlled automation.

Switching Matrix

A switching matrix is the internal array of inputs, crosspoints and outputs that allow a routing switcher to perform the task of routing signals from sources to destinations. The figure below illustrates a simple 10 X 10 switching matrix – with 10 Inputs and 10 Outputs.

Note the following points regarding the illustration:



- Each VTR is fully connected to the matrix – all audio/video inputs and outputs.
- A cross-point (represented by an **X**) is the internal electronic connection of the input to the output – either audio or video.
- When the cross-point is turned "**ON**" the connection is made between the source and destination. The action of turning the cross-point on is known as making a "**Take**".
- When an entire audio/video array is connected in this manner, from all of the devices in your facility, you have full routing flexibility.
- Without re-cabling or re-patching, a device can play back one moment (as a source) and record the next moment (as a destination).

Signal Levels

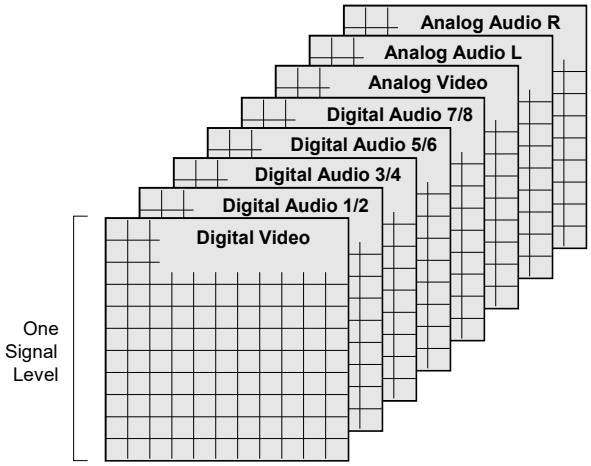
A "signal level" represents one of many specific types of audio or video elements that a routing switcher is capable of handling. The typical signals capable of being switched are:

- Analog Video
- Analog Audio (stereo with left and right channels).
- Digital Video
- Digital Audio (dual channel – stereo pair)
- High Definition Video.

Some systems may be configured with one signal level, while others may be configured with multiple signal levels.

While the diagram in the previous section shows only one signal level, a multi-signal level system is capable of routing any combination up to 32 levels – each with its own matrix and cross-points.

The figure below illustrates ***eight signal levels*** in a 10 X 10 matrix system.



Signal routers are typically much larger than a 10 X 10 matrix, depending on user needs. Each signal level may also have different sizes of matrices and do not all need to be the same size.

The Utah-400 Routing Matrix

The Utah-400's unique matrix technology allows for a greater flexibility of input and output combinations available to the user. Each input or output board contains eight signal paths so the user can expand in groups of eight up to the maximum capacity of the router.

The crosspoint board and its flexible design characterize the Utah-400 system. All crosspoint switching is input coincident, consistent with previous Utah Scientific technologies.

Chassis demographics require all input board to be installed at the top of the chassis mid-plane; all output boards are installed at the bottom of the midplane in the chassis.

Features of this technology include signal presence indicators on both the input and output boards. The status of the router input and output states can be continuously monitored via the SCX-400 status port – P2 (black RJ-45, debug connector).

Refer to the Utah-400 Matrix Block Diagram for the following signal routing description.

The input signal is received on the input board at the Receiver/Re-clocker circuit. A valid input will illuminate the Signal Presence Detector LED and also status the crosspoint board.

From this point the signal is routed to the crosspoint, where the operator has made a "Take", selecting the routing path of this input to its output.

The output from the crosspoint is directed to its proper path on the output bus and the appropriate output board slot. When the output board detects a valid output signal, it will illuminate the appropriate Signal Presence LED. From this point the output signal is sent to its output driver and its destination.

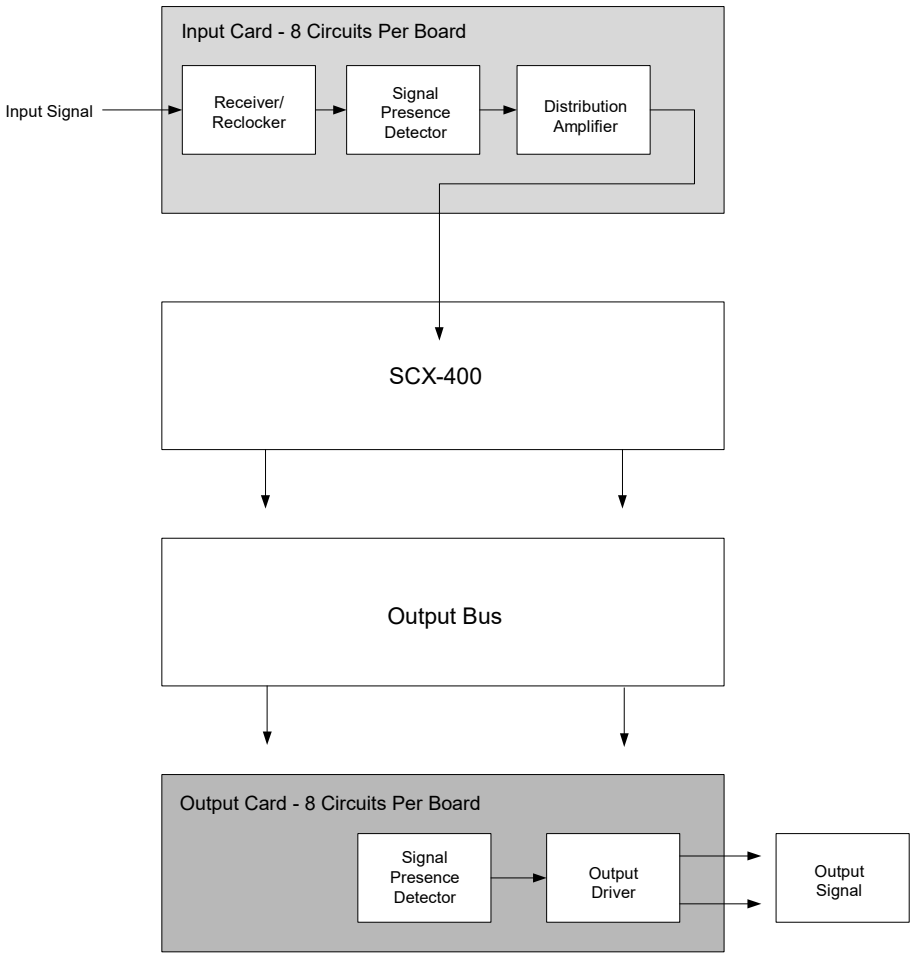


FIGURE 1-1. The Utah-400 Matrix Block Diagram

Introducing the Utah-400 Digital Routing Switcher

Utah Scientifics' **Utah-400 Digital Routing System** incorporates the latest technology and is designed to meet the most demanding user needs in the router switching market.

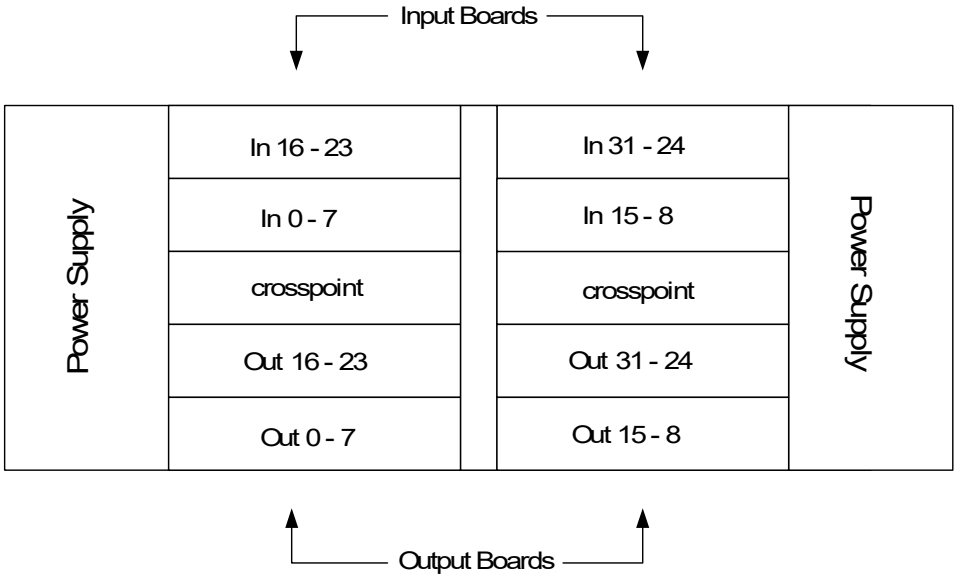
The Utah-400 offers the following features:

- Digital Audio and Video switching matrices from 32 X 32 up to 1152 X 1152.
    - Very compact – 32 x 32 = 2 RU; RU; 576 x 576 = 48 RU.
    - Fully redundant Power Supplies and AC sources. (Separate plugs for each chassis supply.)
    - Two cooling fans with side exhaust.
    - Low density Input/Output Blocks: 8 channel Input / Output boards.
    - Flexible Input/Output combinations for each chassis.
    - Input and output signal presence indicators
    - All circuit boards insert and extract from the front of the router, less downtime when troubleshooting problems.
- Compatible with existing control systems.
    - Uses the existing Utah Scientific MX-Bus Router Interface.
    - UNET
    - RS-232 / RS-422
- Error Indicators include voltage, fan and temperature.
- Redundancy used to avoid a single point failure where possible.
- Non-Intrusive diagnostics and status reports when interfacing with a personal computer.

- Utah –400 Digital Video Systems:
    - Will accommodate SD and HD video in the same chassis.
    - HD boards designed to handle SD
    - Data Rates:
        - SD Re-clocking Rates include 143, 177, 270, 360, and 540 MBPS.
        - HD Re-clocking Rates include the SD rates above plus 1.485 GBPS.
    - ADC and DAC
- Utah-400 Digital Audio Systems:
    - Will accommodate synchronous and asynchronous digital audio inputs.
    - Balanced and Unbalanced Inputs and Outputs can be installed the same chassis.
    - Direct or transformer coupling for input and output boards available.
    - Conforms to AES3-1992 Specification; 48 kHz, 24 bit.
    - ADC and DAC
    - Deluxe Output card
- The Utah-400 SCX-400 Board.
    - 32 squared matrix.
    - One Monitor Matrix output per crosspoint.
    - Selectable controller or Router modes.
    - Available as redundant modules.

System Configurations

The chassis configurations for the Utah-400's 32x32 Digital Router involve several variations.



CHAPTER 2

Hardware Installation

In This Chapter

This chapter provides instructions for installing your Utah-400 router in your facility. The following topics are covered:

Caution: *To avoid damage to the system,* ***do not connect AC power until the hardware is fully installed.***

Unpacking and Inspection

When you receive your Utah-400 system, inspect each shipping carton for signs of damage. Contact your dealer and shipper immediately if you suspect any damage has occurred during shipping. Check the contents of each carton against your Utah Scientific order and verify them against the shipping manifest. If any items are missing, contact your dealer or Utah Scientific immediately.

Save the shipping box and material for future use, in case the unit may have to be shipped back to Utah Scientific.

Caution: The Utah-400 router weighs approximately thirty pounds; with shipping materials and accessories the box weight may equal more than fifty pounds.

Each router is wrapped in anti-static plastic prior to boxing up. Figure 2-1 shows the typical packaging of a single Utah-400 router.

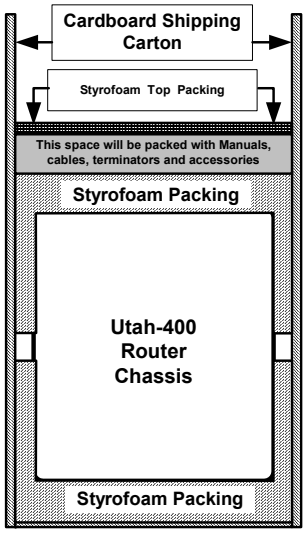


FIGURE 2-1. Utah-400 Packaging

Recommended unpacking method:

1. With carton setting upright, open the top.
2. Remove the Styrofoam packing material in the top of the box.
3. Remove the accessories.

4. Remove the Styrofoam Packing from the top of the Utah-400.
5. Grasp the sides of the Utah-400 and gently pull it up and out of the bottom Styrofoam packing material and box.
6. Place the Utah-400 on a stable bench or cart.
7. With the Utah-400 sitting on a bench or cart, remove the anti-static wrap covering the router and save for future use.
8. Move the router to the installation site.

Installing Physical Equipment

Installation of your Utah-400 Video and/or Audio router may require some or all of the following steps:

1. Mounting equipment in rack frames.
2. Installing MX-Bus cables.
3. Connecting the AES Reference.
4. Determining and Setting the Router Signal Level(s).
5. Installing Audio/Video signal cables.
6. Connecting power.
7. Hardware checkout.

Note: The video sync is only used when the SCX-400 is in Controller mode.

Mounting Equipment in Rack Frames

Installing the Utah-400 Digital Routing Switcher

Use the following steps to install the Utah-400 Systems into the rack frames:

1. Determine the vertical layout of your frames before you begin the installation. Please note:
   - You may wish to place blank panels between the systems to increase ventilation and make cabling easier.
   - You may wish to install the systems in a way to reflect the priority of audio and video signal levels.

- **For example**: If digital video is signal level 1, digital audio is signal level 2 and 3, the digital video may occupy a lower position in the rack frame.

Note: See Figure 2-2 for an example rack frame layout.

2. Once your layout is determined, remove the front cover from the Utah-400 and set it aside.

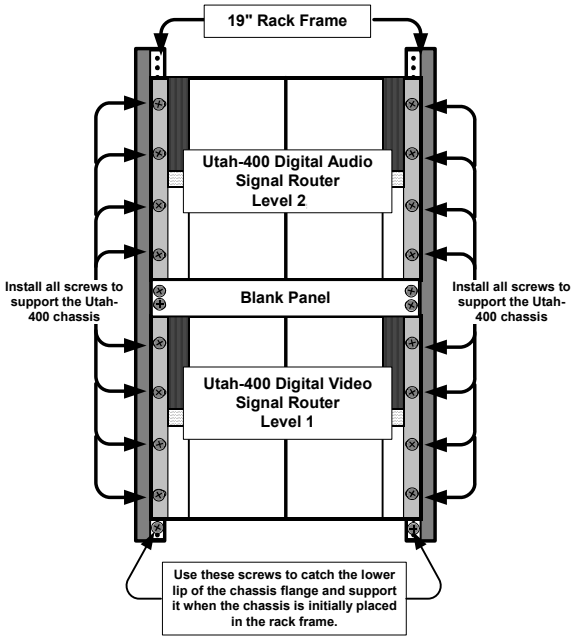


FIGURE 2-2. Utah-400 Chassis Mounted in 19" Rack Frame

3. Install the Utah-400 chassis' in the 19" rack frame.

Note: The 32x32 chassis (with power supplies and PCB's) is relatively heavy, and Utah Scientific recommends a minimum of two persons to install the chassis in the rack frame. Install all mounting screws in the front of the chassis; the entire weight of the router and cables are supported by the chassis side-frames.

a. Determine the height to mount the Utah-400 in the rack frame.

b. Install two rack screws into the empty rack frame below the height determined in step a, above. These screws will be used to support the weight of the chassis when it is moved into the rack frame. See Figure 2-3, Section A.

c. With two persons, pick the chassis up from the shipping carton at the left and right side frames.

d. Move the chassis to the 19" rack frame and carefully slide it into the rack frame, hooking the flange of the chassis above the rack screws installed in step b., above. See Figure 2-3, Section B.

Note: An alternative method is to support the Utah-400 Chassis with a shelf or similar support and align the mounting holes accordingly.

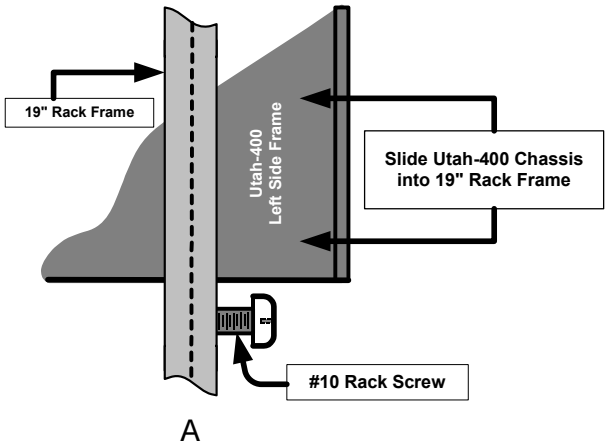
e. With the chassis resting on the lower rack screws, carefully lift the left side frame, align the lowest chassis frame mounting hole with a rack frame threaded hole and start rack screw. Repeat for the right hand side frame.

f. Once the lower chassis rack screws are in place, snug both sides up, but do not tighten.

g. Align remaining six mounting holes, install remaining six rack screws through mounting holes and then snug them down.

h. Finally, tighten all eight rack screws installed in the chassis mounting holes.

4. Replace all front covers when the installation is complete.



A

FIGURE 2-3. Sliding the Utah-400 Chassis into Rack Frame

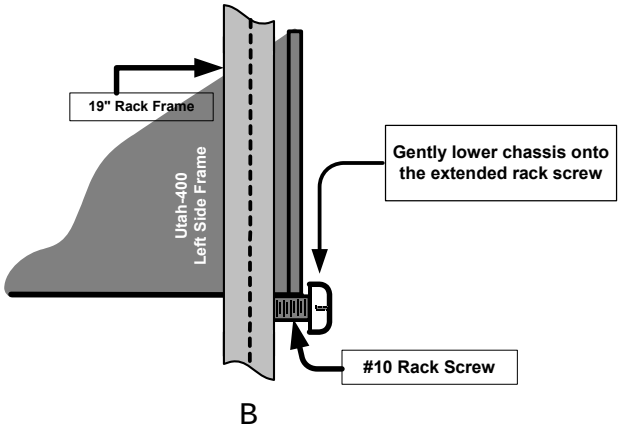


FIGURE 2-4. Lowering the Utah-400 Chassis on the Rack Screw

Installing the MX-Bus Cables

The MX-Bus is the actual control bus that connects the UT-400 router hardware to the SC-4 or other controllers. The illustrations on the following page contain the proper connections for either a UT-400 with internal SCX-400 control, or a UT-400 with external SC-4 control

In either case, the proper levels and offsets must be set on the Utah-400 routing system(s) so they will operate on the proper signal levels.

The MX-Bus is a daisy chain configuration, must not exceed 300 feet (91.4 meters) in length; and must be terminated at both ends of the daisy chain.

Your Utah-400 router is shipped standard with:

- One MX-Bus Cable – 10 ft. (USI Part Number: 80229-10). Other lengths are available and may be ordered through Utah Scientific sales at 1–800–453–8782.

Interconnecting the SC-4 and Utah-400 Frames

The MX-Bus interconnection to the Utah-400 typically starts at the SC-4 control system and is terminated at the last physical Utah-400 chassis. The actual physical arrangement depends on the site placement of the various physical components. *No connection to an SC-4 is needed if your system uses the internal SCX-400 in 'control' mode.*

The following illustration shows a typical MX-Bus installation.

A Simple MX-Bus Configuration

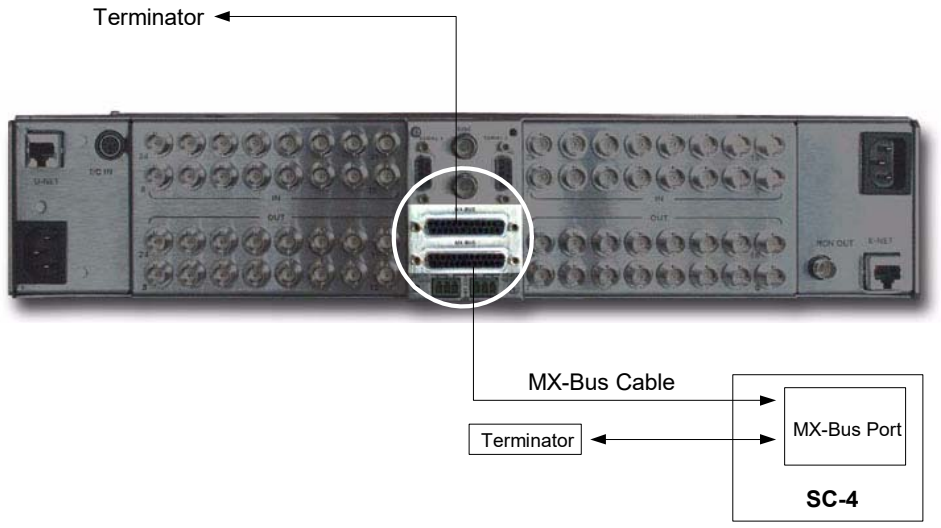


FIGURE 2-5. The MX-Bus Installation to an SC-4 Controller

If your UT-400/32 was ordered stand-alone and no other UT-400 frames were ordered with your system, both MX-Bus ports should contain terminators. If your system is using the internal SCX-400 cards and there are multiple UT-400 frames, use the following illustration as a cabling guide.

FIGURE 2-6. Basic UT-400/32 cabling

Reference

Each UT-400/32 frame contains two looping reference BNCs. The signal type to be applied to the input is different for audio and video frames.

Audio frames require an AES-3 reference signal for synchronous operation. This signal can be a standard AES-3 source that is timed with the rest of the sources.

Video frames with internal control cards require analog NTSC, PAL, or Tri-level black burst signals. This signal must be terminated in 75 Ohms, and is used as the vertical interval switching reference for the SCX-400. Video frames not using the internal SCX-400 in controller mode require no connection to these BNCs.

SCX-400 (video) and System Configuration

The SCX-400 must be configured correctly for proper system operation. Its setup will include determining whether it will be a Controller or Router.

In the Router mode the SCX-400 functions as a video crosspoint card and all control system ports are disabled. When set as a controller, the SCX-400 will serve as a system controller and a crosspoint card combined. In this mode all control ports are functional. Aspects of the SCX-400 setup include defining the router level, input-output offset and the XP-RST mode.

Determining and Setting Router Level, Mode, and Offsets

Signal levels are preset at the factory and tested during manufacturing, determined by customer input and requirements. The installation of your new Utah-400 Router should not require any signal level changes to operate after the new installation.

By definition, a signal level represents distinct elements of the broadcast system. These individual elements include, but are not limited to, High Definition Video, SDI Video, Digital Audio, Analog Video, Analog Audio and Data Routers. For additional information relating to signal levels, refer to the Introduction, Page 1-7.

Should you ever need to change the signal level of your router it is useful to determine:

- What new signal level is required.
- If other signal levels will have to be modified to accommodate the new signal level.
- Additional encoding requirements necessitated by the change.

To change the Utah-400 Router Signal Level:

Note: The Utah-400 crosspoint board must be powered down or reset for it to recognize any configuration changes made to the dipswitches. If the router has on-air signals present do not attempt a reconfiguration until it can be completed during the off-air time slots.

1. If the Utah-400 is not powered down, disconnect it from the power source.
2. Remove the front cover from the Utah-400.
3. Pull the Crosspoint slightly out of the router using the board ejectors (top board).

4. If this is a video system, locate the configuration dipswitch on the SCX video crosspoint board (below).

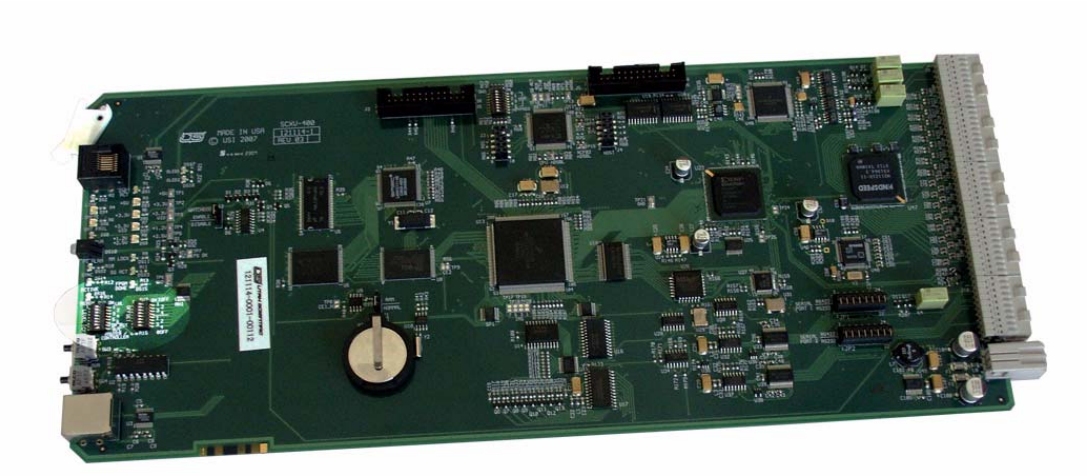


FIGURE 2-7. Crosspoint Board Dipswitch Location

- There are two eight-position dipswitches on the SCX-400.
- Please see Table 2.1, “Switch Settings,” to set the Level dipswitches and to determine which switches must be changed for the Level desired.
- Reference Tables 2.2 and 2.3 to set the Offset dipswitches per your requirements.
- CFG switches 7 and 8 are used to configure your system per your needs.
  - R/C is set to C “on” when the card is configured as a controller and crosspoint.
  - R/C is set to R “off” when the card is configured as a router crosspoint *only*.

Note: The following two items apply when this card is used as the Controller.

- XP_RST in the “on” position will reset the crosspoints following the controller reset. (Crosspoints will need to be refreshed before connections are available.)
- XP_RST in the “off” position will cause the crosspoint reset *not* to follow the controller reset. (Crosspoint connections will not be lost.)

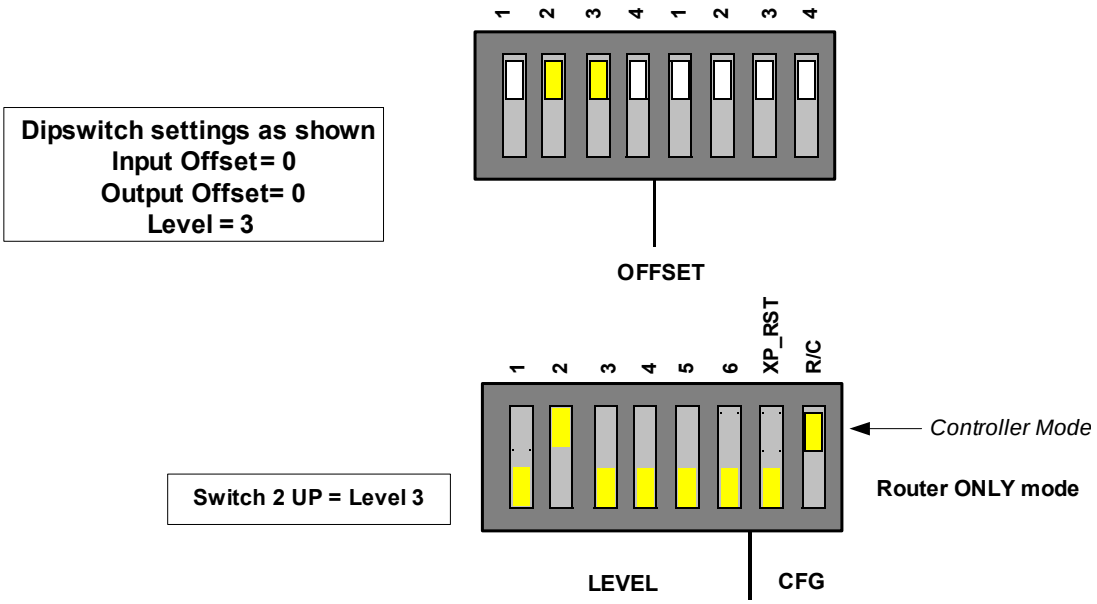


FIGURE 2-8. Utah-400 Configuration Dipswitches as they appear on the SCX-400

5. If this is an audio system, locate the configuration dipswitches on the crosspoint card (following illustration).

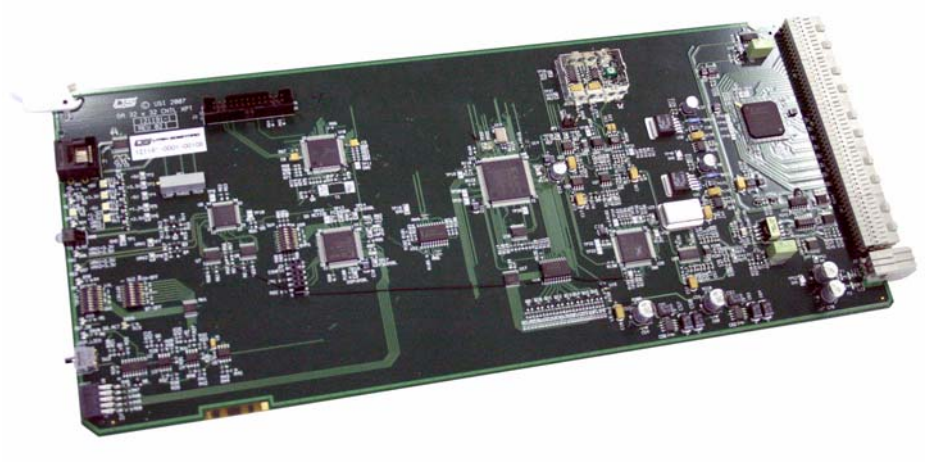


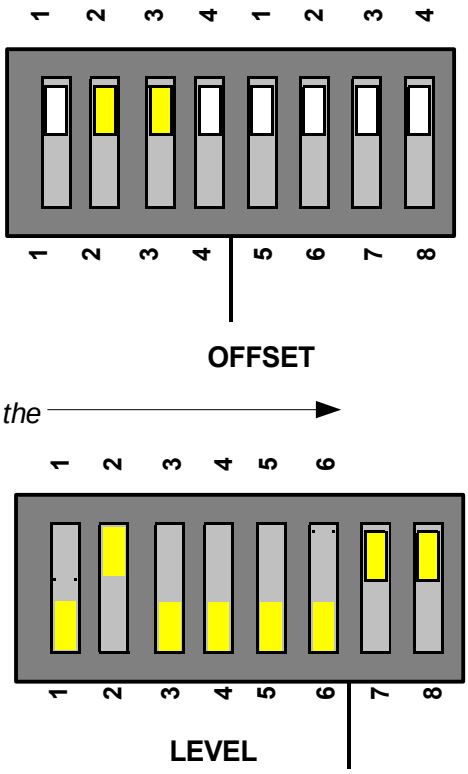
FIGURE 2-9. Audio Crosspoint

- There are two eight-position dipswitches on the DA-32 crosspoint.
- Please see Table 2.1, “Switch Settings,” to set the Level dipswitches and to determine which switches must be changed for the Level desired.
- Reference Tables 2.2 and 2.3 to set the offset dipswitches per your requirements.

Left PS	Input 16-23 Input 0-7	Input 24-31 Input 8-15	Right PS
	Pri-Xpoint	Sec-Xpoint	
	Output 16-23 Output 0-7	Output 24-31 Output 8-15	

- Reference Table 2.3, “Input/Output Offset,” to set the Offset dipswitches per your requirements.

Dipswitch settings as shown
Input Offset = 0
Output Offset = 0
Level = 3



Switch 2 UP = Level 3

ON = position *toward* the number on the board

FIGURE 2-10. Utah-400 Configuration Dipswitches as they appear on the DA-32 crosspoint

TABLE 2.1 Switch Settings

Switch 1	Switch 2	Switch 3	Switch 4	
OFF	OFF	OFF	OFF	Level 1
ON	OFF	OFF	OFF	Level 2
OFF	ON	OFF	OFF	Level 3
ON	ON	OFF	OFF	Level 4
OFF	OFF	ON	OFF	Level 5
ON	OFF	ON	OFF	Level 6
OFF	ON	ON	OFF	Level 7
ON	ON	ON	OFF	Level 8
OFF	OFF	OFF	ON	Level 9
ON	OFF	OFF	ON	Level 10
OFF	ON	OFF	ON	Level 11
ON	ON	OFF	ON	Level 12
OFF	OFF	ON	ON	Level 13
ON	OFF	ON	ON	Level 14
OFF	ON	ON	ON	Level 15
ON	ON	ON	ON	Level 16

TABLE 2.2 Utah-400 Offset Dipswitch Settings

Input/Output Offset Switch Setting	Function	Description
0	Input/Output Offset 0	Offsets Base input/Output by 0 from 0
1	Input/Output Offset 32	Offsets Base input/Output by 32 from 0
2	Input/Output Offset 64	Offsets Base input/Output by 64 from 0
3	Input/Output Offset 96	Offsets Base input/Output by 96 from 0
4	Input/Output Offset 128	Offsets Base input/Output by 128 from 0
5	Input/Output Offset 160	Offsets Base input/Output by 160 from 0
6	Input/Output Offset 192	Offsets Base input/Output by 192 from 0
7	Input/Output Offset 224	Offsets Base input/Output by 224 from 0
8	Input/Output Offset 256	Offsets Base input/Output by 256 from 0

Input/Output Offset Switch Setting	Function	Description
9	Input/Output Offset 288	Offsets Base input/Output by 288 from 0
10	Input/Output Offset 320	Offsets Base input/Output by 320 from 0
11	Input/Output Offset 352	Offsets Base input/Output by 352 from 0
12	Input/Output Offset 384	Offsets Base input/Output by 384 from 0
13	Input/Output Offset 416	Offsets Base input/Output by 416 from 0
14	Input/Output Offset 448	Offsets Base input/Output by 448 from 0
15	Input/Output Offset 480	Offsets Base input/Output by 480 from 0

TABLE 2.3 Input/Output Offset

Input/Output Offset				
Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	
OFF	**OFF**	**OFF**	**OFF**	**No offset**
ON	**OFF**	**OFF**	**OFF**	**Offset by 32**
OFF	**ON**	**OFF**	**OFF**	**Offset by 64**
ON	**ON**	**OFF**	**OFF**	**Offset by 96**

Installing the Video and Unbalanced Audio Input and Output Cables

This section provides guidelines for installing the Utah-400 Video and Unbalanced Digital Audio Inputs and Outputs on the backplane connectors. Serial Digital Video, Unbalanced Digital Audio, and High Definition cable specifications are listed below.

Input Signal	Recommended Cable Type	Maximum Cable Length	Termination Method
Digital Video & Unbalanced Digital Audio	Belden 8281	300 M. / 1000’	Internal - 75 Ohm

Input Signal	Recommended Cable Type	Maximum Cable Length	Termination Method
High Definition	Belden 8281	100 M. / 300’	Internal - 75 Ohm
	Belden 1694A	150 M. / 500’	Internal - 75 Ohm

3 Gig Input Card - Cable Information

TABLE 2.4

SD-SDI SMPTE259	350 Meters of 1694 Cable
HD-SDI SMPTE-292	140 Meters of 1694 Cable (-2 version) 200 meters (-1 version)
3G SDI SMPTE 424	120 Meters of 1694 Cable

The following recommendations are made regarding cable connections:

- Ensure the router frames are installed securely in the equipment racks.
- Due to the compactness of the Utah-400 Video Backplane BNC', it may be useful to have a connector chart next to the backplane.
- The use of a BNC insertion / extraction tool is recommended.
- Label the Input and Output cables coming into the backplane – for example:
- VTR1 – Video Out or Out 0 – VTR1.
- All Utah-400 Video and unbalanced digital audio BNC's use 75-Ohm single ended connectors.
- Avoid stress on the lower backplane BNC connections by providing proper strain relief on all cables.
- The Utah-400 Video and unbalanced digital audio Input matrix starts with Input 0 at the lower right section (bottom half) of the backplane. (rear view)
- The Utah-400 Video and unbalanced digital audio Output matrix starts with Output 0 at the lower-right section (top half of the backplane). (rear view)
- Due to the 75 Ohm internal termination, do not use BNC "T" connectors to loop an input signal. This will result in serious signal degradation.

Figure 2-11, “Utah-400 32x32 Video Backplane,” shows the entire Utah-400 32x32 Matrix Backplane.

Figure 2-12, “Video and Unbalanced Audio Input Connector Matrix,” shows the Input Backplane connector matrix, use this matrix to connect the input cables to the chassis.

Figure 2-13, “Video and Audio Unbalanced Output Connector Matrix,” shows the Output Backplane connector matrix, use this matrix to connect the output cables to the chassis.

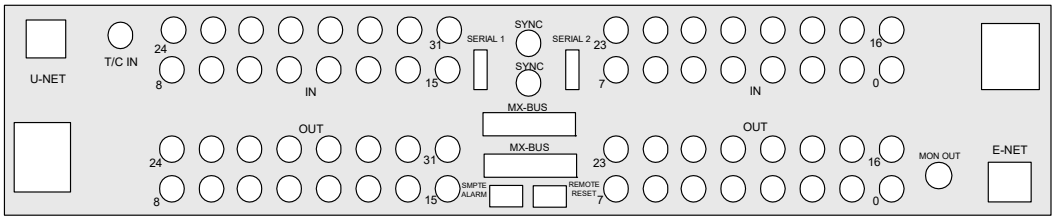


FIGURE 2-11. Utah-400 32x32 Video Backplane

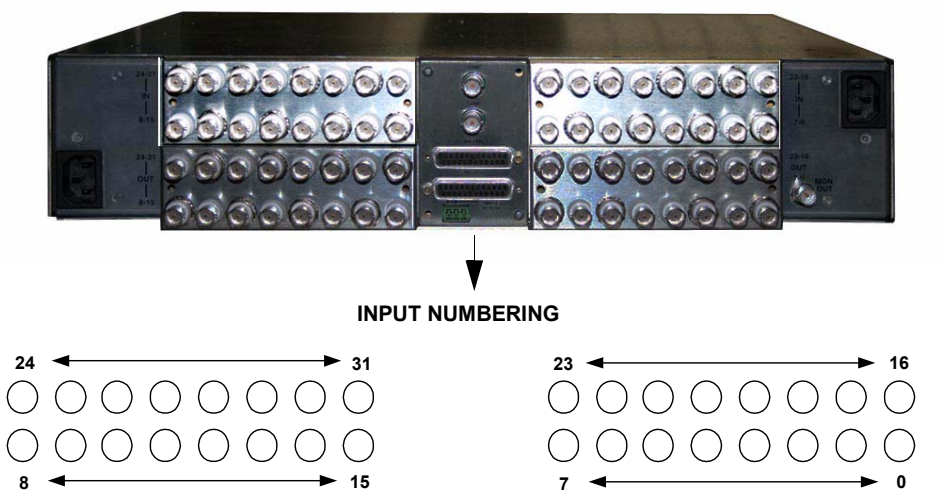


FIGURE 2-12. Video and Unbalanced Audio Input Connector Matrix

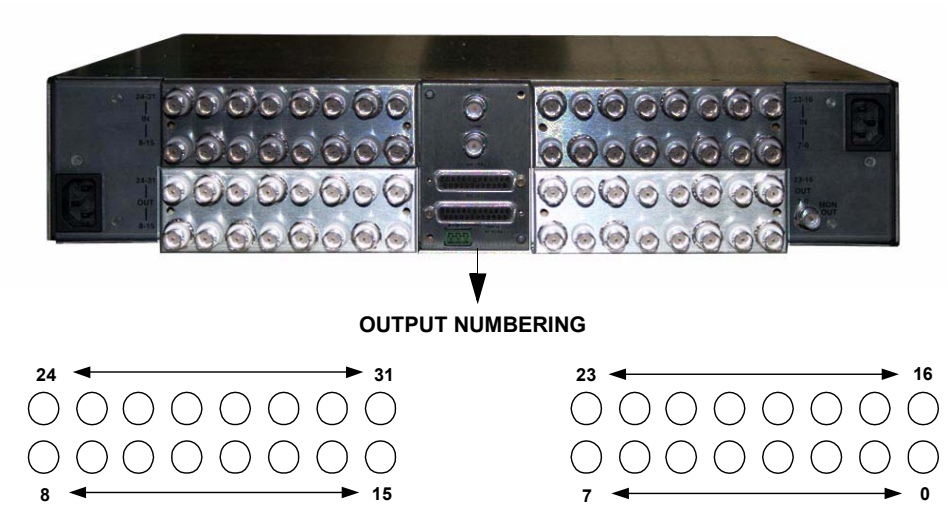


FIGURE 2-13. Video and Audio Unbalanced Output Connector Matrix

Installing the Balanced Digital Audio/Analog Audio Input and Output Cables

The following recommendations are suggested for installing the Analog Audio Inputs and Outputs.

- Ensure the Utah-400 Chassis are installed securely to the equipment rack.
- Label all cables going to the Inputs and Outputs, for example:
    - **Inputs 0-7: VTR1 – 0, VTR2 – 1, SAT –4 …**
    - **Cable-1; Inputs 0-7, see Chart 1….**
- Pre-wired cables are available from Utah Scientific.
- D-connector to terminal block. Breakout panels are available from USI. (BDA-400)
- Inputs and Outputs can be connected directly to the backplane using 26 pin high-density "D" connectors and back shells. (Supplied with the system) Contact Utah Scientific sales for more information.
- Additional strain relief should be provided for each "D" connector, in addition to the connector screws.

Refer to Appendix A – "Hardware Specifics" for wiring charts and a list of audio connector suppliers.

Figure 2-14, “Utah-400 Digital Audio Rear Panel,” , illustrates an example of a Utah-400 Digital Audio Backplane. Use this figure for Input/Output connector reference.

Figure 2-15, “Utah-400 Analog Audio Rear Panel,” , illustrates an example of a Utah-400 Analog Audio Backplane. Use this figure for Input/Output connector reference.

Table 2.5 shows the connector pin-out for the 26-pin high-density connectors.

Figure 2-16, “DB-26 High-Density Male Connector,” , shows a blown up view of the Male 26-pin high-density connector.

Figure 2-17, “DB-26 High-Density Female Connector,” , shows a blown up view of the Female 26-pin high-density connector.

FIGURE 2-14. Utah-400 Digital Audio Rear Panel

FIGURE 2-15. Utah-400 Analog Audio Rear Panel

The standard configuration for the Utah-400 Audio Input and Output connectors (illustrations above).

The high-density DB-26 connector used on the backplane has the same wiring format for the input and outputs. Table 2-4 is a generic table and applies equally to the input and output wiring. Although any wiring scheme may be used, Utah Scientific makes the following recommendations:

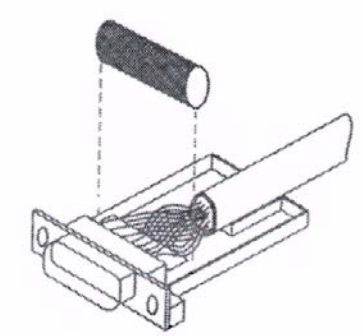
See Page 2-13 for Unbalanced Digital Audio Cable Specifications.

- Use a high quality shielded cable for the Digital Audio. See the chart below.

Recommended Cable	Maximum Cable Length	Physical Characteristics	Shielding
Belden 9992 (or better)	100 M. / 300’	9 pair / 24 AWG / Stranded	Individual Shields and Drain wires
Belden 6387 (or better)	100 M. / 300’	9 pair / 24 AWG / Stranded	Individual Shields and Drain wires
Belden 1800A (or better)	100 M. / 300’	1 pair / 24 AWG / Stranded	Shield with Drain Wire

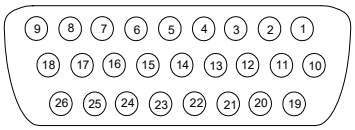
Note: The cable shield should be grounded on the chassis end only; this prevents ground loops from occurring.

- Use shrink tubing around the end of the wires and cups on the 26-pin high-density male connector when assembling. This process helps prevent any shorting between adjacent wires.
- Tie all grounds together inside the connector shell. Use an EMI Gasket for this application.

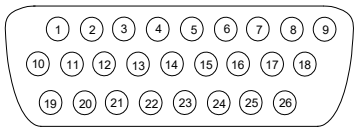


- Provide proper strain relief for the cable ends; use tie-wraps to anchor the cables as they are installed.
- Avoid running Digital Audio cables across or adjacent to AC power sources where possible.
- Do not bundle wires close to chassis backplane, this increases connector stresses.

TABLE 2.5 Utah-400 Balanced Digital Audio/Analog Audio (Pinout Connections)



DB-26S (Female)



DB-26S (Male)

Pair	Pin Number	Signal	Drain Wire (GND)
1	1	Input/Output 0 +	19
	11	Input/Output 0 -	
2	2	Input/Output 1 +	20
	12	Input/Output 1 -	
3	3	Input/Output 2 +	21
	13	Input/Output 2 -	
4	4	Input/Output 3 +	22
	14	Input/Output 3 -	
5	5	Input/Output 4 +	23
	15	Input/Output 4 -	
6	6	Input/Output 5 +	24
	16	Input/Output 5 -	
7	7	Input/Output 6 +	25
	17	Input/Output 6 -	
8	8	Input/Output 7 +	26
	18	Input/Output 7 -	
N/A	9 - 10	Isolated Chassis Ground	N/A

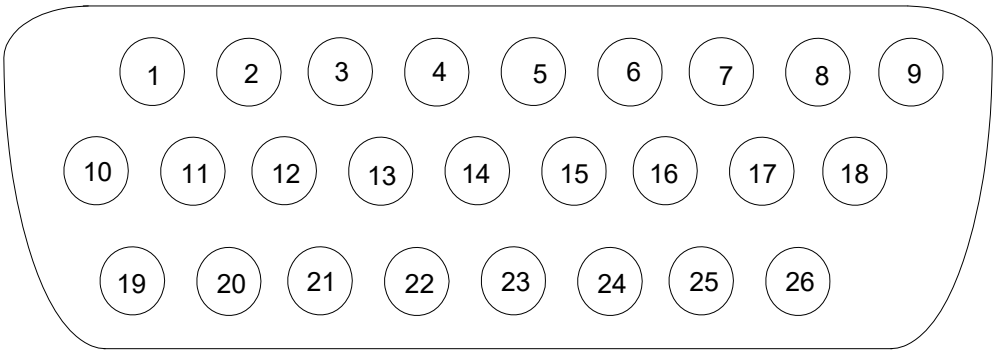


FIGURE 2-16. DB-26 High-Density Male Connector

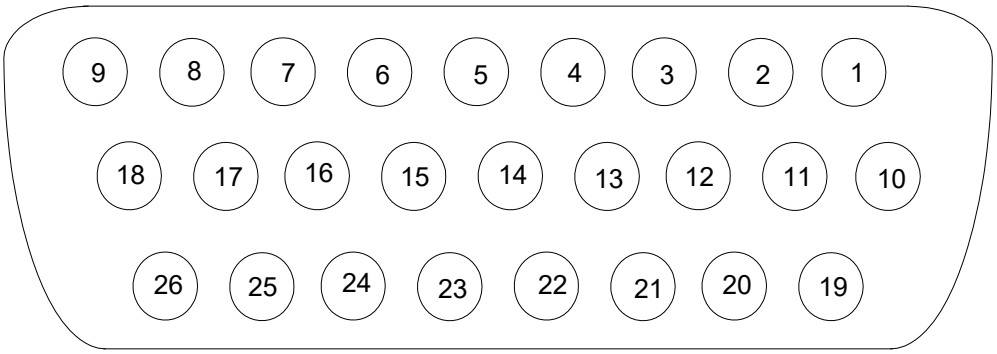


FIGURE 2-17. DB-26 High-Density Female Connector

Connecting and Disconnecting Power

AC Connection

The Utah-400 Audio and Video Routing Systems are designed for continuous power; there is no AC Power Switch on the router.

Important:The AC power cord is the only method which chassis power can be connected or disconnected. In case of an emergency, the user should have quick access to the AC plug.

Power redundancy is built into the Utah-400 Audio and Video Routing Systems. The power cords plug into the upper right and left hand sides of the chassis. Either AC source can power the routing system independently, provided redundant power supplies are ordered with the system.

This provides the flexibility to connect one AC Source to the standard utility source; with the second AC Source being connected to a non-interruptable system, such as a backup generator system.

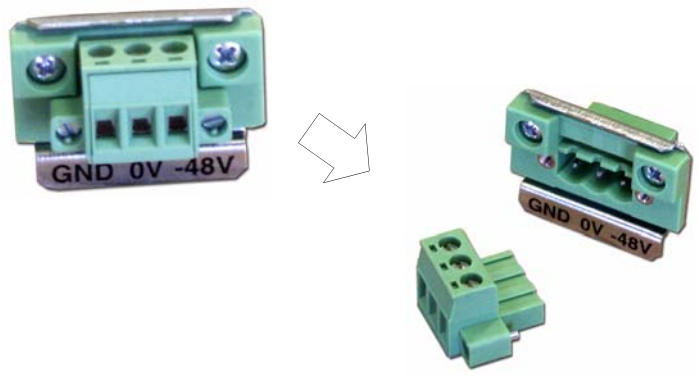
- On the back of the chassis locate the left and right AC NEMA connector.
- Plug the NEMA end of the power cord into the chassis NEMA socket.
- Plug the 3 pronged AC Plug into the desired AC source(s).

FIGURE 2-18. Utah-400 (32x32) Power Connections

DC Connectivity (not in current panel version)

The DC input at the rear of the chassis is noticeably different than its AC counterpart. The connection consists of three separate terminals:

- Ground - Frame or chassis grounding point
- 0V - Most positive leg of -48V DC connection.
- -48V - Most negative leg of -48V DC connection.



Note: This configuration is a DC isolated connection.

The terminal strip is a small bracket containing three screws (see 1). Loosen the screws to remove the terminal from the back. This will expose the strip of wire (aprox. 1/4 of an inch).

Proper wire insertion into the removable terminal block

- Turn the screws counter clockwise to allow wire insertion (3 screws on block top).
- Strip 1/4” of the insulation from the new wires.
- Insert wire, then turn screw clockwise to tighten

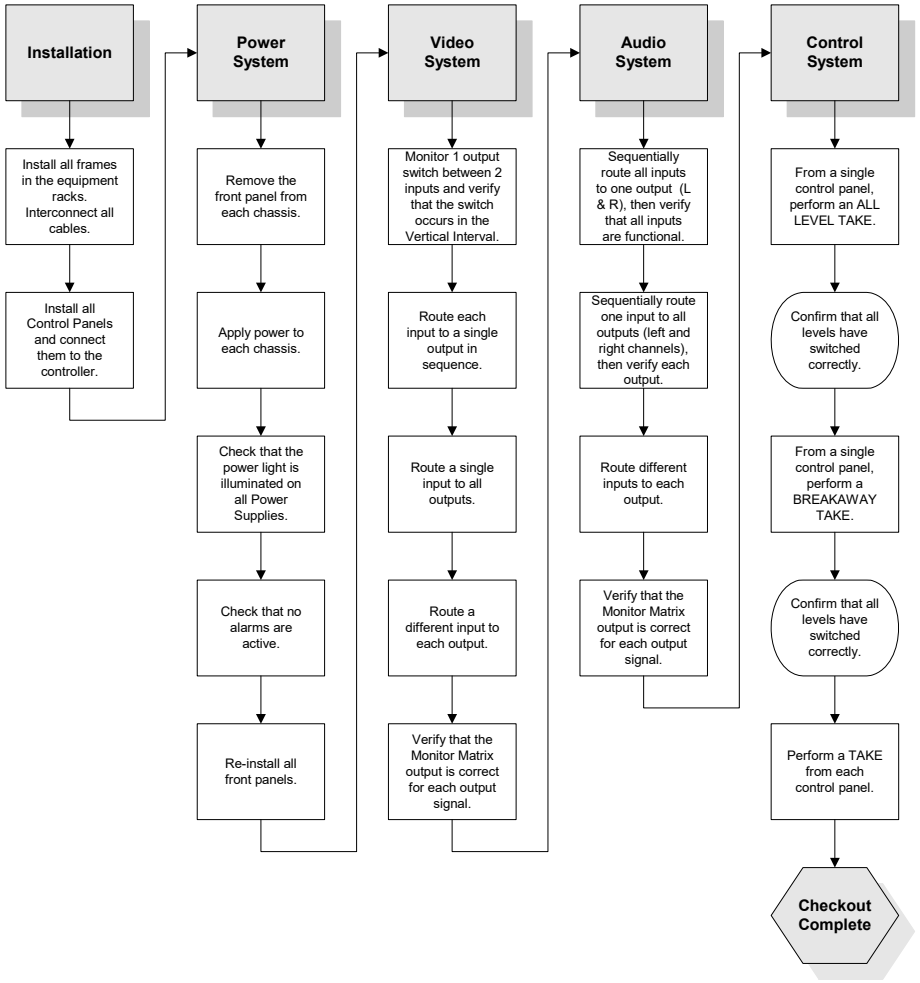
Use 12 AWG wire (maximum)

The maximum current required for the branch circuit feeding the UT-400 144 and UT-400 288 is 10 Amps.

Hardware Checkout

Use the following flow chart to check out your Utah-400 System. Note the following important points:

- For the Video and Audio System columns may be switched numerically if encoding is not required.
- The Control system may require some configuration in order to perform all functions.



CHAPTER 3

Control System Interconnection

This chapter provides an explanation for specific Utah-400 configurations, and basic instruction for the handling and operation of your Utah-400 system.

This Chapter contains the following:

SC-4 Based Connections

The SC-4 lies at the heart of the station control system, effectively managing the routing switchers and acting as an interface with other control and switching systems.

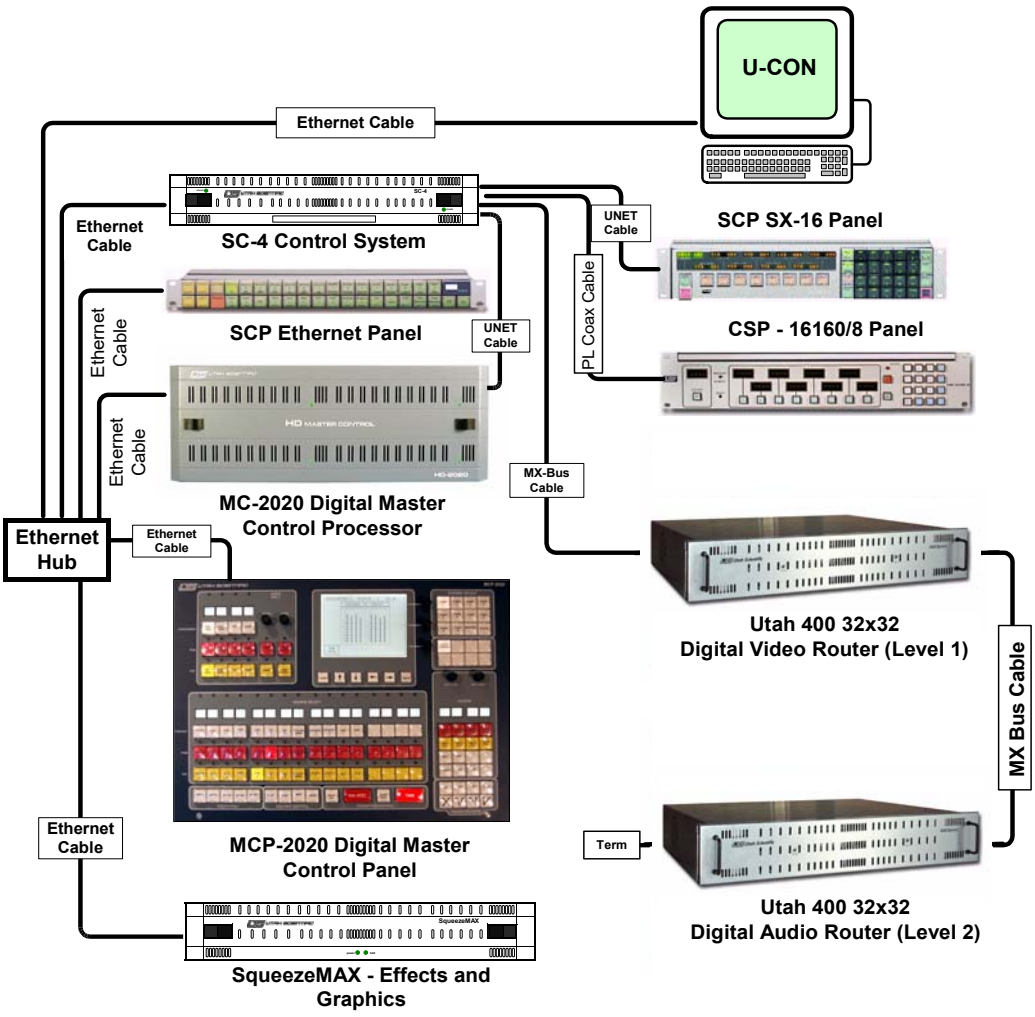
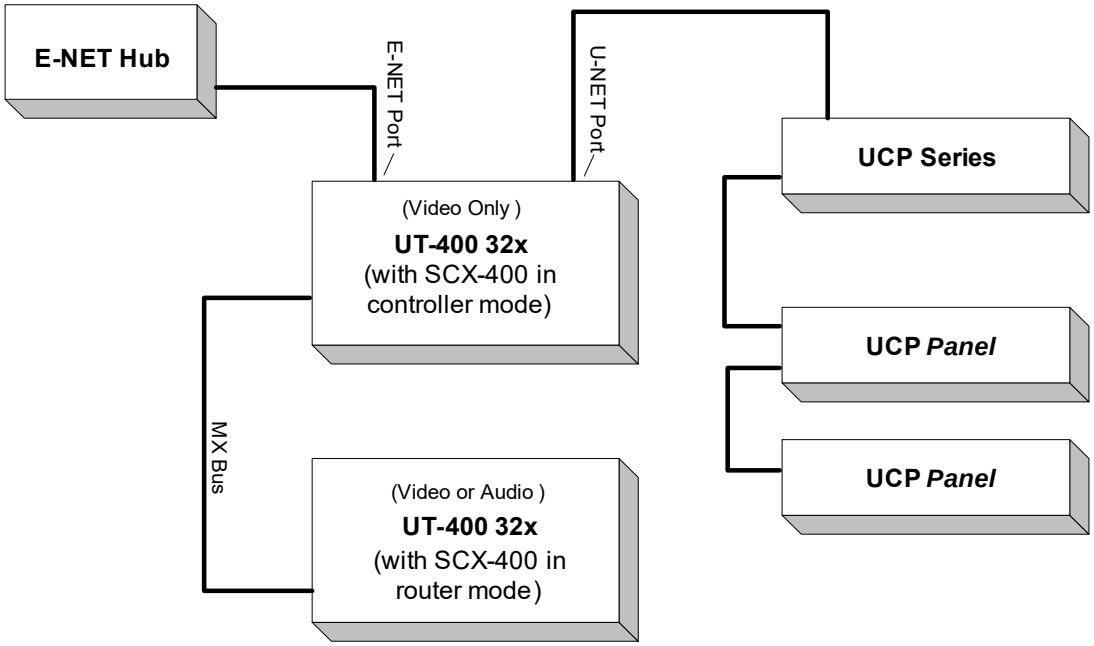


FIGURE 3-1. Utah 400 SC-4 Control

Internal SCX-400 Connections (Video)



Note: The video system can be a controller or router, but an audio system can be a router only. There is no controller circuitry in the audio chassis.

Rear Panel Overview (Video)

MX Bus (control bus)

All routing switcher chassis in the system must be interconnected with the MX Bus cable, with the two free ends terminated. In the case of a stand-alone system, both connectors must be terminated.

Monitor Matrix BNC

This allows the user to switch up an additional output that can look at the output of any other output modules present in the system. Monitor Matrix is only functional in the primary crosspoint's slot, when active in the primary slot.

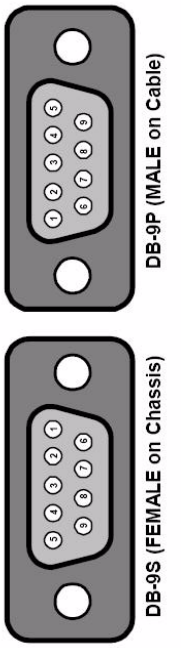
Sync BNCs

When operating in the Controller mode, you will need to attach NTSC (or PAL) blackburst in a video router. *(Terminate the loop-thru port to 75 ohms.)*

FIGURE 3-2. Utah-400 32x rear panel

Serial Ports (Only used in Controller mode)

The Utah-400/32 (Video) 1-2 contains two serial ports.



	RS-232 Mode		RS-422 Mode
1	RI	1	Not used
2	TXD	2	TX-
3	RXD	3	RX+
4	DSR	4	Not used
5	Ground	5	Ground
6	DTR	6	Not used
7	CTS	7	TX+
8	RTS	8	RX-
9	CD	9	Not used

FIGURE 3-3. Pinout detail

Note: Set serial port modes on the SCX-400 by strapping JP1 and 2 to RS-232 or RS-422.

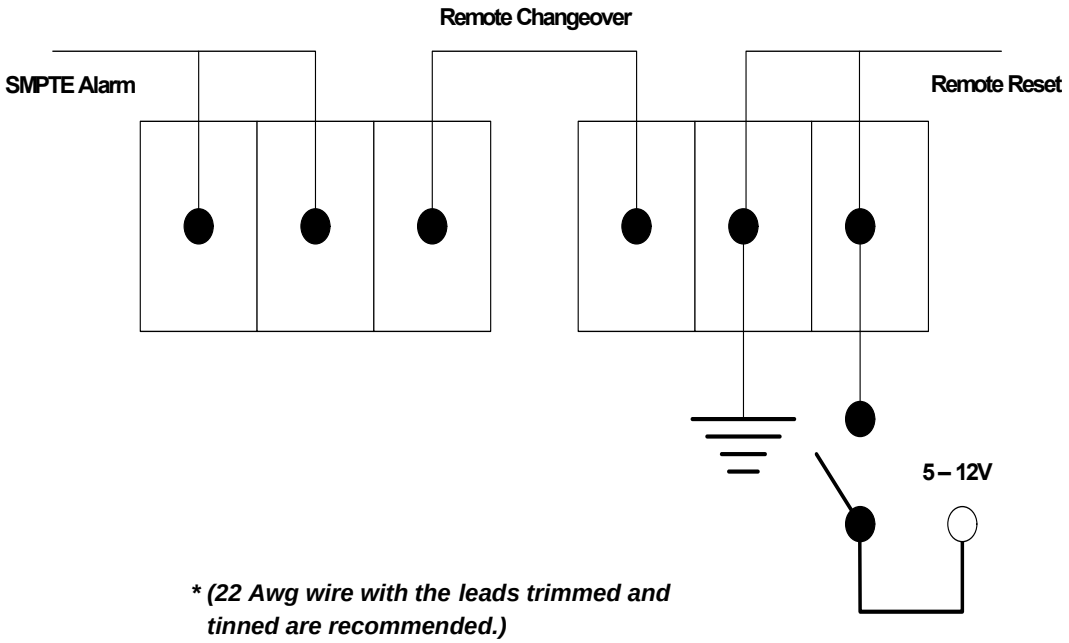
TABLE 3-1. SCX-400 Serial Port Parameters

Two Serial Ports	
Parameter	Value
Baud	1200
	2400
	4800
	9600
	19,200
	38400
Data Bits	7 or 8
Stop Bits	1 or 2
Parity	Even or None

Ports: SMPTE Alarm, Remote Changeover, and Remote Reset

SMPTE Alarm - Contact Closure (illustrated below) for alarm indications.

Remote Reset/Current Triggered Opto - A current across the pins will cause the controller to Reset.



**** (22 Awg wire with the leads trimmed and tinned are recommended.)***

Recommended current drive circuit

The Remote Reset and Changeover are activated when the + and - pins (for each) are *shorted* together. Remote Reset will reset the cards within the system[1], while Remote Changeover switches control from the active to the standby control card.

1. Caution - this will result in a system reset.

U-Net (Only used in controller mode)

U-NET is the Utah Scientific network used for all UCP Series control panels. *See the System Installation Guide for U-NET cable topologies.* Up to 32 control panels can be connected together in a daisy-chain topology. The maximum cable length (for the entire chain) is 1000 feet.

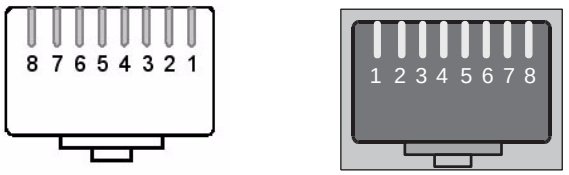


FIGURE 3-4. Pin-outs for the RJ-45 U-Net connector

TABLE 3-2. U-Net Connector Pin-outs

Pin #	Signal	Pin #	Signal
1	TE +	5	DAT +
2	TE -	6	Ground*
3	Ground*	7	Ground*
4	DAT -	8	Ground*

**** Grounds are tied together***

This section provides information and specifications for U-Net cabling. The figure below illustrates an RJ-45 jack and its associated pins.

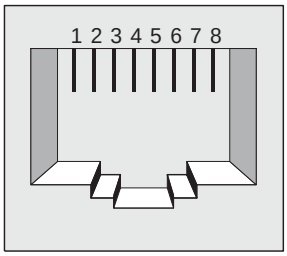


FIGURE 3-5. RJ-45 (U-Net) Female Connector

The U-Net cable utilizes pairs 1 and 2, as shown below. The pin-out is also shown.

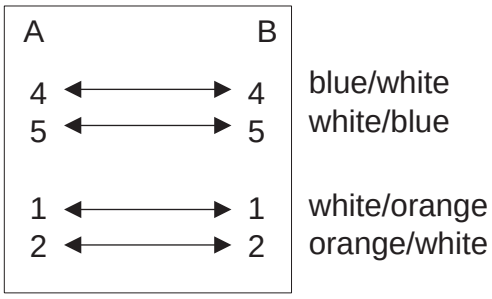


FIGURE 3-6. U-Net Cable Pairs and Pin-out

Ethernet (Only used in Controller mode)

The figure below shows the standard wiring diagram for a standard “straight-through” Ethernet cable.

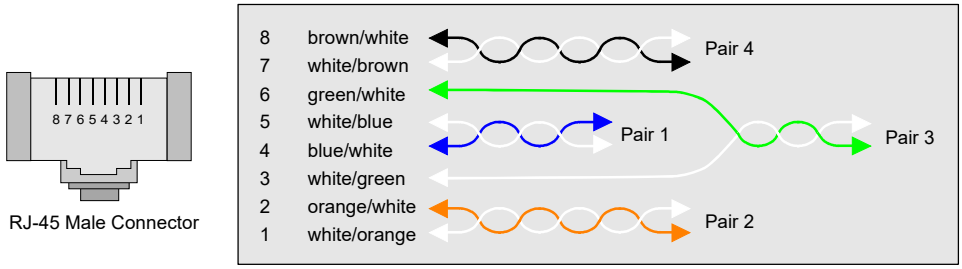


FIGURE 3-7. Standard Ethernet Cable Pairs

This is used with the UCP-Series control panels to configure the SCX-400 through the U-CON software. *See the System Installation Guide for E-NET cable topologies.*

Important: It is imperative that wires in each of the pairs (1 and 2) remain in that pair in order to retain the balance properties of the cable.

- Pair 2, which resides on pins 1 and 2 of the RJ-45 jack, should occupy the white/orange and orange/white wires of the cable.
- Pair 1, which resides on pins 4 and 5, should occupy the white/blue and blue/white wires.

Category 5 UTP cable is the recommended grade of cable to use. All wires must be connected at both ends of the cable. Failure to adhere to these guidelines could result in faulty U-Net connections and/or communications.

NOTE: Even though the cable for Ethernet and U-Net are the same, the actual pairs that are utilized for communications are different.

Time Code (only used in controller mode)

The time code input is used only in the Controller mode, and is utilized for system logging and timing references.

The following table contains the time code connector pin-outs.

6 Pin CirDin Connector Viewed from the Front of the Connector.

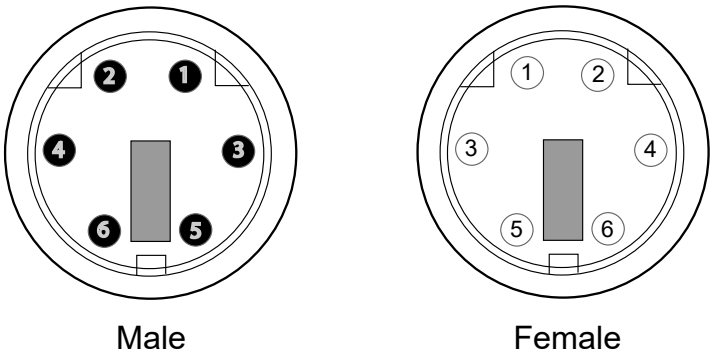


Table 0-1. Time Code Pin-outs

Pin #	Signal
1	Ground*
2	Ground*
3	Ground
4	Time Code In -
5	Ground
6	Time Code In +

TABLE 3-3. **SC-4 Configuration for the Utah-400 and MC/MCP-2020**

SC-4 System Cable / Termination Table			
Part Name	**Part Number**	**Description**	**Comments**
UNET Terminator	65324-04	8 RJ-45	Supplied by USI
MX-Bus Terminator	70797-1	DB-25P Module	Supplied by USI
MX-Bus Cable	80229-010	Parallel / DB-25P	Supplied by USI
UNET Cable	N/A	UTP/RJ-45	Not Supplied
Ethernet Cable	N/A	UTP/RJ-45	Not Supplied
Party Line Coax Cable	N/A	**Belden RG-59/U; 9209 or 8281**	Not Supplied

Rear Panel Overview (Audio)

MX Bus (control bus)

All routing switcher chassis in the system must be interconnected with the MX Bus cable, with the two free ends terminated. In the case of a stand-alone system, both connectors must be terminated.

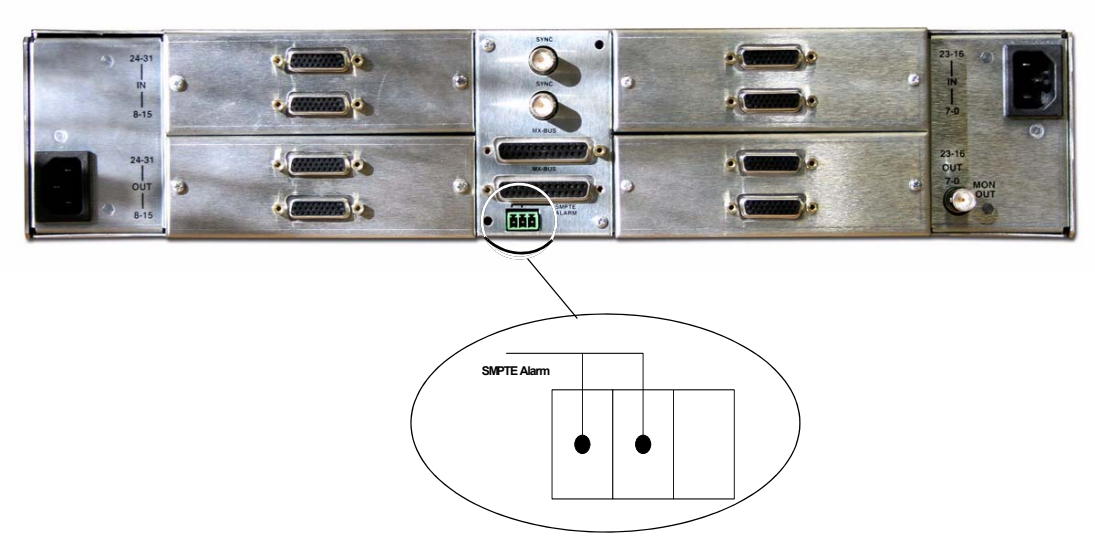
Monitor Matrix BNC

This allows the user to switch up an additional output that can look at the output of any other output modules present in the system. Monitor Matrix is only functional in the primary crosspoint's slot.

Sync BNCs

Two additional midplane BNC connectors are used for loop through for the AES reference signal -- in the case of an audio router.

Attach a DARS sync if your facility is 100% synchronous. Sync should not be applied if any sources are non-synchronous.



SMPTE Alarm - Contact Closure (illustrated below) for alarm indications.

FIGURE 3-8. Rear Panel - audio

CHAPTER 4

Utah-400 Components

In This Chapter

This chapter contains descriptions of each video and audio board type contained within the Utah-400; including Input, Output, Crosspoint and Interface (midplane) cards, and Power Supplies. Information regarding LED indications and alarms is also provided.

Video Boards

Video Input Boards

SD Video Input

Part number 121016-1, the SD Video Input board contains 8 circuits that allow video to be received within the system. This card performs cable equalization prior to passing the signal input along to the crosspoints. This card is also limited to lower data rate Serial Digital Inputs.

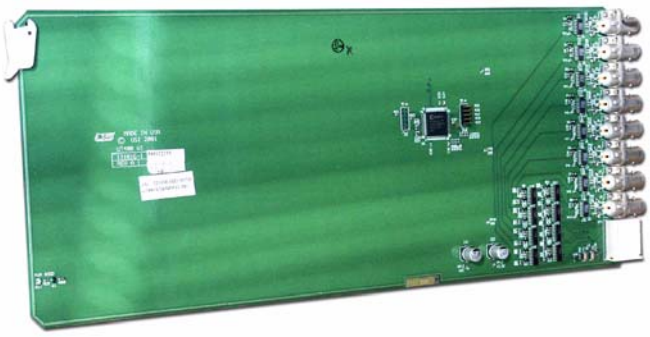


FIGURE 4-1. SD Video Input Board

Multi-Rate Input

Part number 121020-1, the Multi-Rate Input board is designed for High Definition Inputs, as well as Serial Digital Inputs.

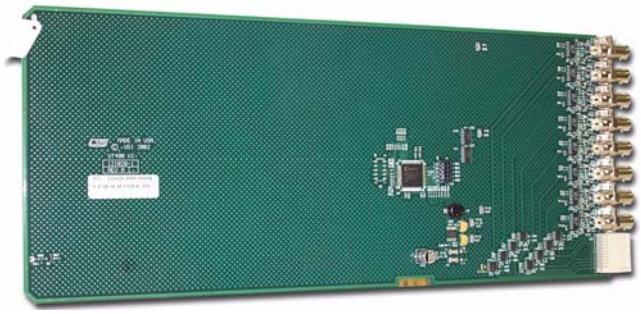


FIGURE 4-2. Multi-Rate Input Board

Analog to Digital

Part number 121045-1, the Analog to Digital board allows the input of analog video signals, then takes these signals and converts them to digital before presenting them to the Crosspoint card(s).

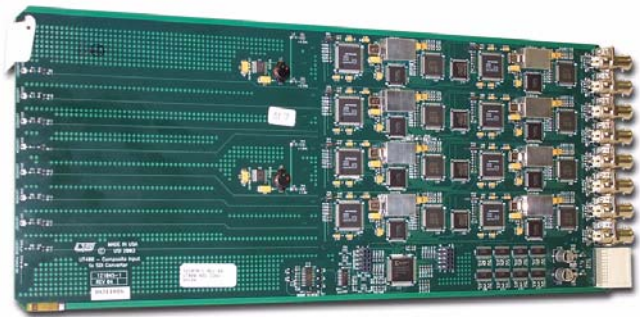


FIGURE 4-3. Analog to Digital Board

LED Indications

The SD Video Input and Multi-Rate Input cards only contain a ‘Power Good’ indication. This LED responds to the Utah-400’s two power supplies and illuminates if power is okay, and is not lit when power is absent.

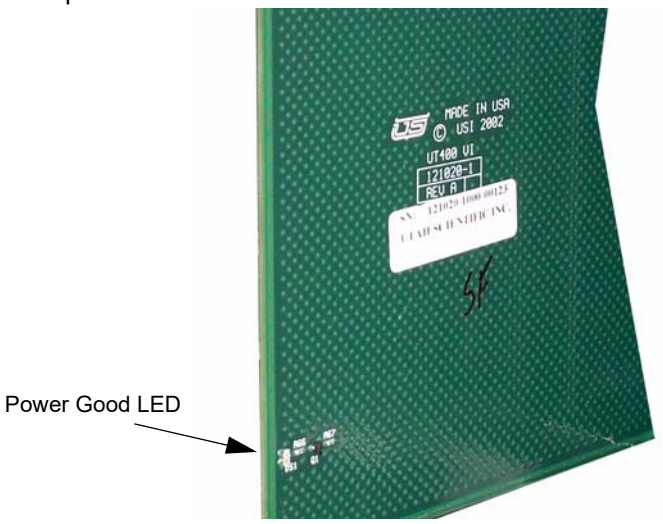


FIGURE 4-4. Power Good LED

The Analog to Digital board contains the same Power Good indication as above, and also contains an LED for each input signal – green if the signal is present, and not illuminated to indicate signal absence.

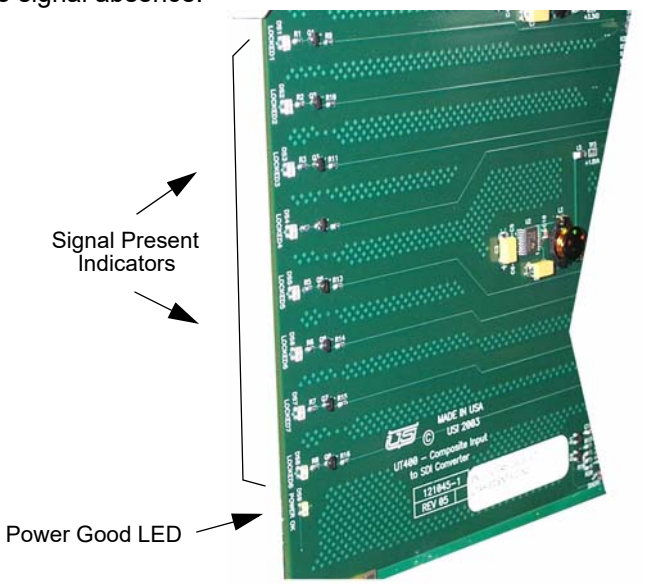


FIGURE 4-5. Analog to Digital card LEDs

Reclocking Input Expansion Card

Part #121125-1, the Reclocking Input Expansion card is used only in the output expansion stacks of the UTAH-400 1152x1152 series of routers. Instead of accepting serial digital or analog signals from rear panel mounted BNC connectors, [they] accept signals from the first output stack (0-287 outputs) through a custom 8-way interconnect cable. The card can process SD-SDI or HD-SDI signals, or analog signals that have been converted to SD-SDI in the first frame.

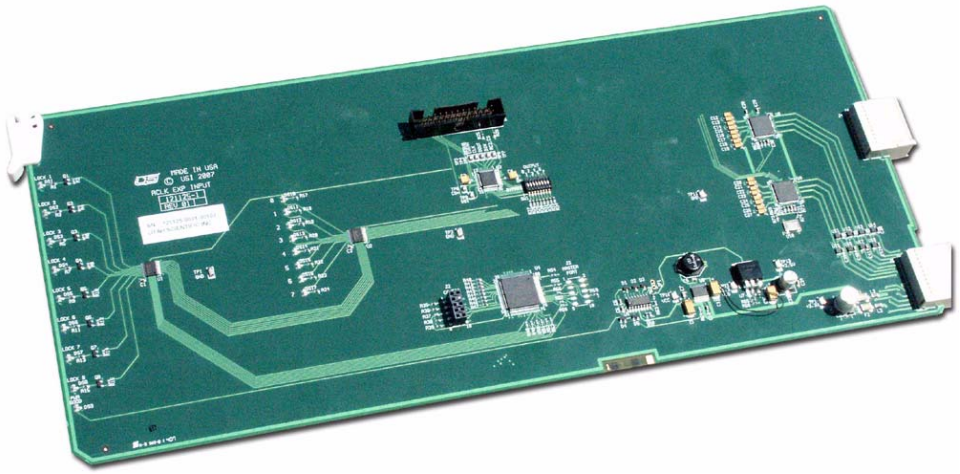


FIGURE 4-6. Reclocking Input Expansion card

Features

This card handles 8 channels of video; it receives, equalizes, and reclocks the video signals coming from the first frame, then distributes them to both the local frame's crosspoint and the midplane expansion output connector. This allows for a connection to another UTAH-400 output chassis stack. The card also has the ability to disable reclocking on individual inputs if desired, and contains an array of status LED's to indicate whether or not it has locked to a signal, and if so, that signal's rate.

Controls

The single control point on this card is dipswitch SW1, the bypass control. By moving one of the individual switches to the 'ON' position, the reclocker for that input is defeated. The dipswitch labeled 0 is for the lowest numbered input on the card, while 7 corresponds to the highest.

Indicators

There are 17 LED's located on the card, 8 correspond to the input signal lock status, 8 correspond to a rate indication, and one is a board power good indicator. DS9 is the power good indicator, and when lit, board power supplies are OK. If not lit, one or more of the supplies on the board have failed.

DS1-8 are locked indicators for the 8 inputs on the board. DS1 corresponds to the lowest input number, while DS8 corresponds to the highest. ON indicates that this particular input is present and is being reclocked. A dark LED means the signal is not present. Please note that if the reclocker is bypassed, the corresponding LED will be dark.

DS10-17 - (text to follow)

Specifications

Power Consumption - 4.25W

Reclocker Rates - SMPTE-259CD and SMPTE 292. The card must be manually bypassed for any other rates.

UTAH-400 3G Input Card

Part #121170-1 the UTAH-400 3G Input card contains 8 inputs that accept SDI signals. There are two versions of this card; identified by a -1 or a -2 in the serial number. The -2 version is capable of receiving all SDI signals up to the SMPTE-424 1080P standard. The -1 version contains a maximum data rate of HD-SDI, the SMPTE-292 standard.

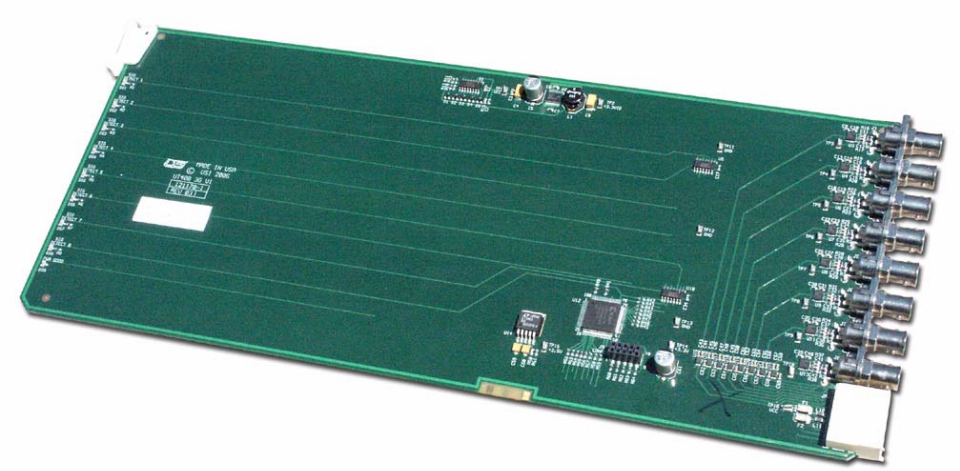


FIGURE 4-7. 3 Gig Input card

Features

The card handles 8 channels of video; receiving and equalizing the video signals coming from the 8 rear panel mounted BNC connectors, then distributing them to both the local crosspoint (in the frame) and to the midplane expansion output connector, allowing for connections to an additional UTAH-400 output chassis stack. The card also contains an array of status LED's to indicate if it has acquired the carrier of a SDI signal.

Controls

None

Indicators

There are 9 LED's located on the card; 8 used for input signal carrier status, and one used for the 'power good' indication.

DS9 is the power good indicator, and when lit, all board power supplies are OK. When not lit, one of more of the supplies on the board have failed.

DS1-8 are carrier indicators for the 8 inputs on the board. DS1 corresponds to the lowest input number, while DS8 corresponds to the highest. ON indicates that this particular input is present. A *dark* LED means the signal is not present.

Specifications

Power Consumption - 3W

Cable EQ CApability

TABLE 1.

SD-SDI SMPTE259	350 Meters of 1694 Cable
HD-SDI SMPTE-292	140 Meters of 1694 Cable (-2 version) 200 meters (-1 version)
3G SDI SMPTE 424	120 Meters of 1694 Cable

Video Output Boards

The Utah-400's Video Output cards receive signals from the Crosspoint card, where user specified switching takes place. All three card types (below) perform a signal presence detection, while the SD and HD Output cards contain a re-clocking stage.

SD-Output

Part number 121015-1, this card is used only for data rates that are within the standard definition range – up to approximately 540MHz per second. The SD output card is capable of passing 5 specific SMPTE data rates, with any other signal muted. This card will not pass non-standard video signals.

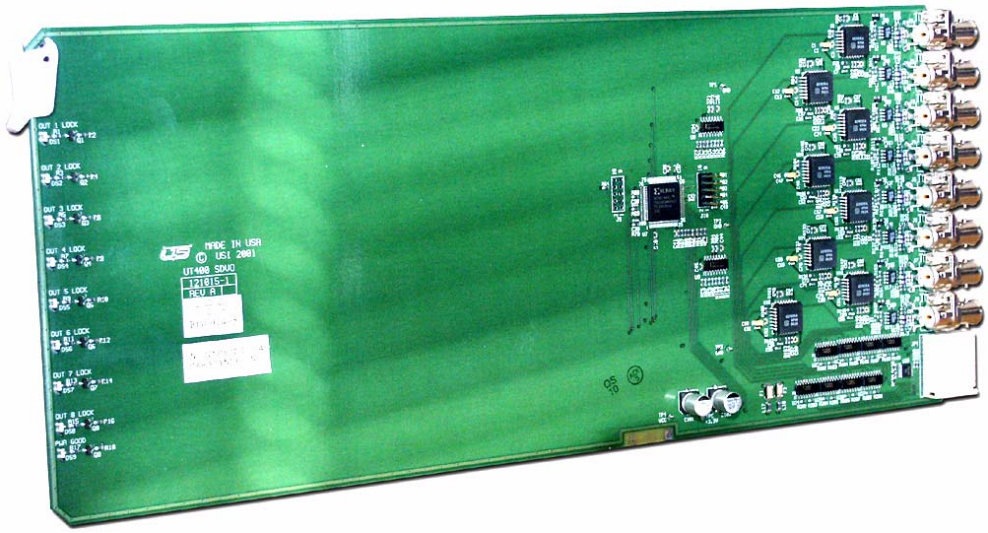


FIGURE 4-8. SD Output Board

HD-Output (Multi-Rate output card)

Part number 121019-1, the HD-Output card is capable of re-clocking at all SD and high-definition frequencies. Though non-standard video signals will not be re-clocked by this card, these signal types will be passed without muting.

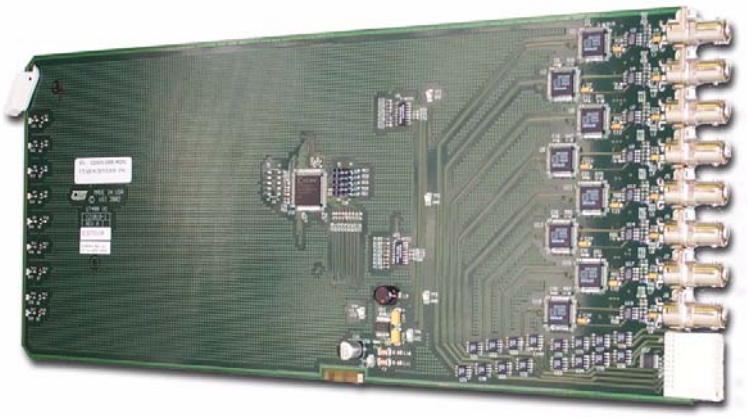


FIGURE 4-9. SD (Multi-Rate) Output Board

Digital Video to Analog Converter Output card

Part number 121046-1, the Digital Video to Analog Converter card takes a standard 270 Megabit serial digital signal, then converts it to analog video before presenting it to the output.

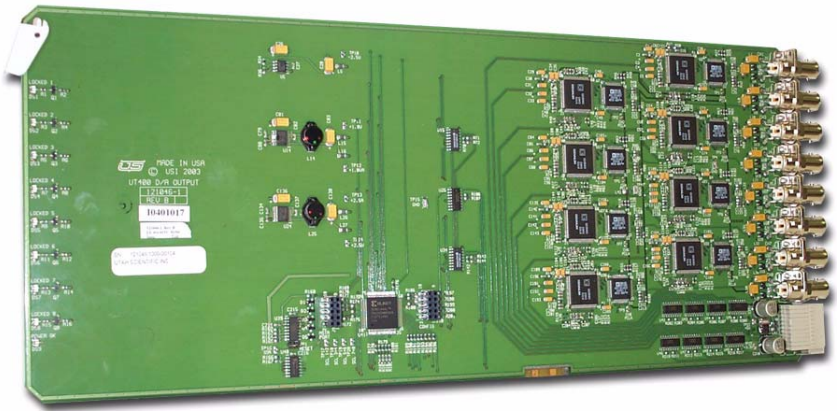


FIGURE 4-10. Multi-Rate Input Board

LED Indications

The SD Video Output and HD (Multi-Rate Output) cards only contain a 'Power Good' indication. This LED responds to the Utah-400's two power supplies and illuminates if power is okay, and is not lit when power is absent.

FIGURE 4-11. SD and HD Output Power Good LED

The Digital to Analog card contains the same Power Good indication as above, and also contains an LED for each input signal – green if the signal is present, and not illuminated to indicate signal absence.

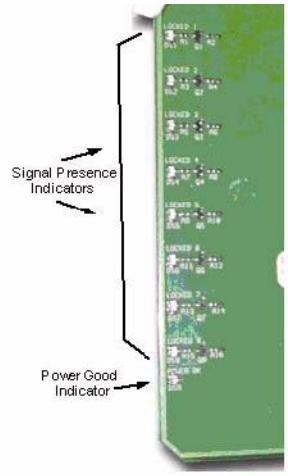


FIGURE 4-12. Digital Video to Analog LED Indicators

Multi-Rate Output Board

Overview

The Multi-Rate output card is capable of passing signals from between 3 Mb/Sec. to 1.5Gb per second. This card contains all of the features of earlier UT400 output cards at a lower cost and power consumption, with also some enhanced diagnostic and control facilities. This card occupies a single 8-output slot in a UT-400 64, 144, or 288 system.

Status Description

There are three sets of diagnostic LED's on the Multi-Rate Output card.

- First, DS9 (Power OK) is a very simple indication that both on-board power supplies are running.
- Second, DS1-DS8 are indications that the re-clocker chip has an active lock on the signal a particular channel is passing. These LED's will be off when either there is no signal passing through a given output or that channel has been manually bypassed.
- Thirdly, DS17-DS10 represent a status array that indicates what data rate the re-clocker (if locked) is actually locked to.
    - DS15-DS17 represent a three bit indication of the output number. The following table indicates the state of these LED's for the various outputs.

Output	DS15	DS16	DS17
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

DS10-DS12 represent a 3-bit data rate indication

Rate	DS10	DS11	DS12
None	OFF	OFF	OFF
270 Mb/S	OFF	ON	OFF
360 Mb/S	OFF	ON	ON
540 Mb/S	ON	OFF	OFF
1.5 Gb/S	ON	OFF	ON

These LEDs change at about a 1 second rate, giving you status of all of the re-clockers in about seven seconds.

If the onboard MPU cannot access the re-clocker chips to control them, DS10-DS17 will be set in a ‘55’ pattern to indicate a communication problem.

Control Description

The Multi-Rate card has a single dipswitch, SW1, which enables or disables each of the 8 reclockers. When the dipswitch for a given output is set to the ‘Reclock’ position, the re-clocker will continually hunt for one of the following rates -- 270 Mb/Sec. (SMPTE 259M), 360 Mb/Sec. (SMPTE 259 Wide Screen), 540 Mb/Sec. (SMPTE 344) or 1.485 Gb/Sec. (SMPTE292). When it finds one of these data rates, it will lock to it and re-time the data to reduce jitter. If it loses lock, it will continue the process of hunting for the next data rate.

If the switch is set to ‘Bypass’, the re-clocker will not re-time the data, it will simply pass it from it’s input to it’s output. This is the preferred setting for any rate other than one of the ones listed above.

UTAH-400 3G Output Board

Part # 121171-1, the eight output, 3G Output Board can reside in any model of UTAH-400 router and is capable of reclocking and transmitting SDI signals. It comes in two different versions; the 121171-2, which covers data rates from SMTE-259, 292, and 424, and the 121171-1 version that covers data rates for SMPTE 259 and 292. The version of the card is determined by the -1 or -2 on the serial number sticker.

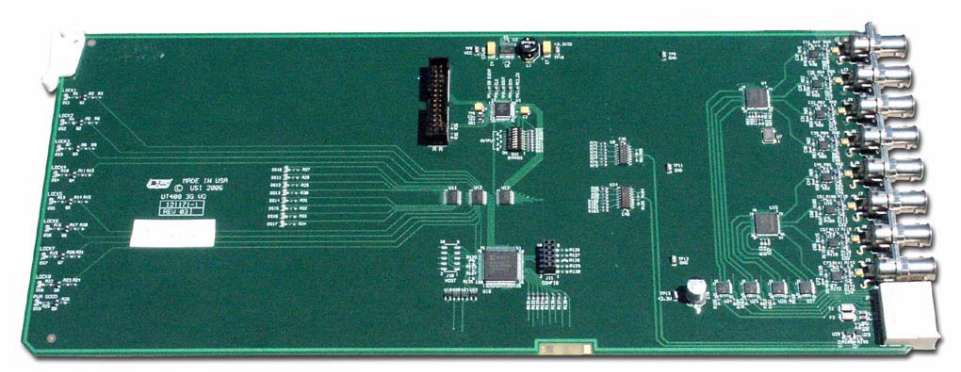


FIGURE 4-13.

Features

Handling eight channels of video, the card receives, equalizes, and reclocks the video signals coming from the local crosspoint card. These signals are then directed to a monitor matrix via the rear panel mounted BNC's. The card has the ability to disable reclocking on individual outputs if desired, and also contains an array of status LED's to indicate a signal lock, and if present, that signal's rate.

Controls

The single control point on this card is dipswitch SW1, the bypass control. By moving one of the individual switches to the 'ON' position, the reclocker for that input is defeated. The dipswitch labeled 0 corresponds to the lowest numbered input on the card, while 7 corresponds to the highest.

Indicators

There are 17 LEDs located on the card; 8 are designated to input lock status, 8 are designated for a rate indication, and 1 is a board power good indicator.

DS9 is the power good indicator. When lit, board power supplies on the board are OK. If this indicator is not lit, one or more of the supplies on the board have failed.

DS1-8 are locked indicators for the 8 outputs on the board. DS1 corresponds to the lowest output number, while DS8 corresponds to the highest. ON indicates that this particular output is present and is being reclocked. A dark LED means the signal is not present. Please note that if the reclocker is bypassed, the corresponding LED will be dark.

DS10-17 (information to follow)

Specifications

Power Consumption - 6.5W

Reclocker Rates - SMPTE-259CD, SMPTE 292 and SMPTE-424 (-1 Version Only). Card must be manually bypassed for any other rates.

SCX-400 (Video) - Crosspoint and Controller

Part number 121114-1, the SCX-400 board is a video crosspoint and a system controller combined. Depending on the application, this board can be configured as a controller and router, or router only. There are 32 inputs that are received from four input cards that are switched through a single crosspoint IC. The crosspoint will then switch the appropriate inputs to the 32 outputs located on the four output cards.

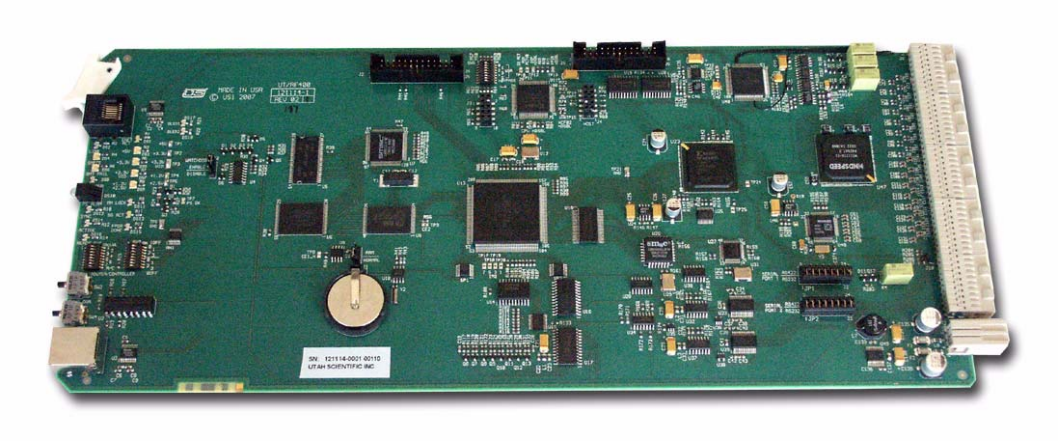


FIGURE 4-14. Crosspoint Board

Board Jumpers -- Board Reset/Changeover

Reset - This re initializes the board. (The XP_RST switch will determine if the crosspoint follows this reset).

Changeover - This forces a changeover from the active to the standby card.

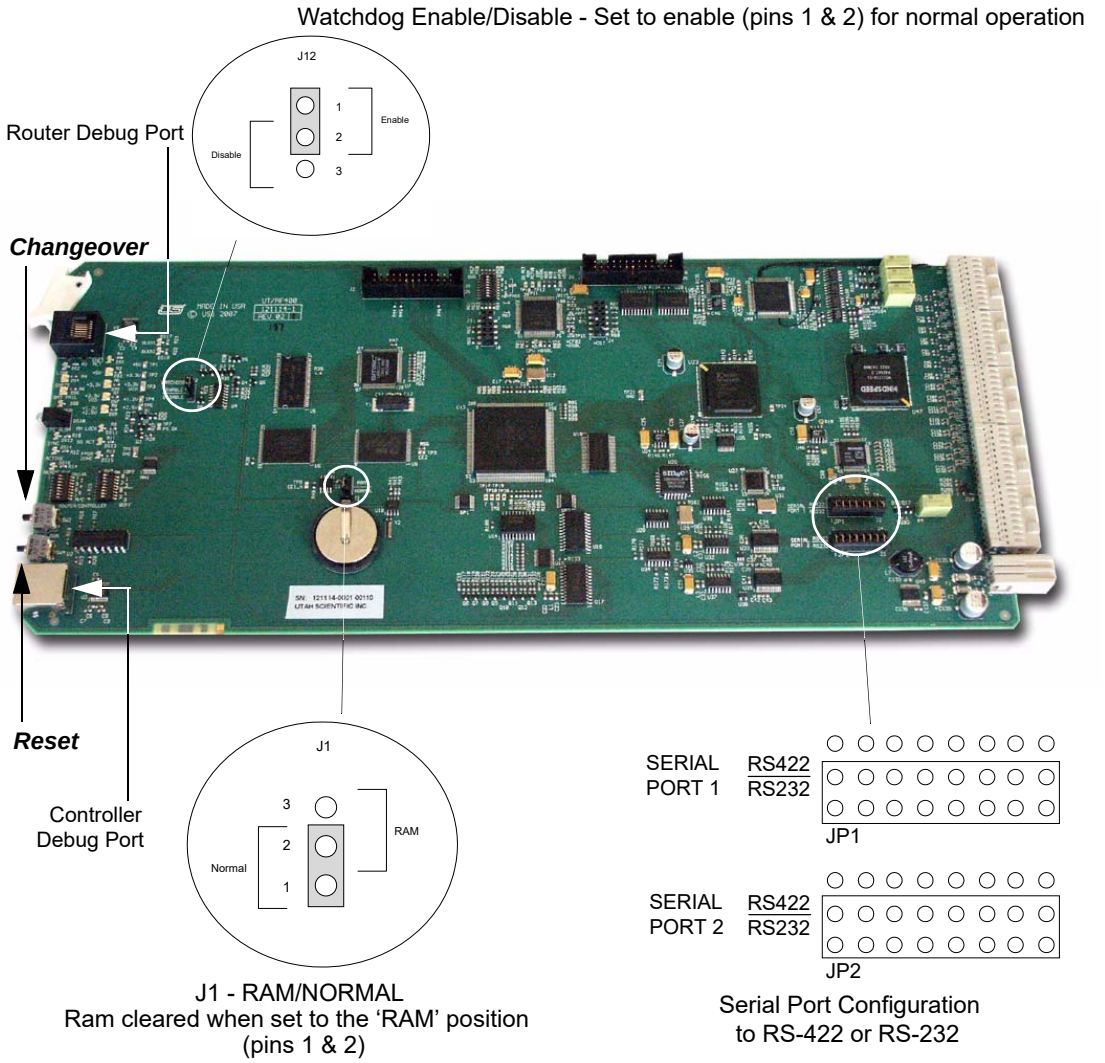


FIGURE 4-15. SCX-400 Jumper Locations

Fuses

The 32x32 system's crosspoint card contains two *resettable* fuses. These fuses will open if an over current situation occurs on the 3.3V or 5V board voltages. These fuses will close to normal operation once the overcurrent situation is resolved.

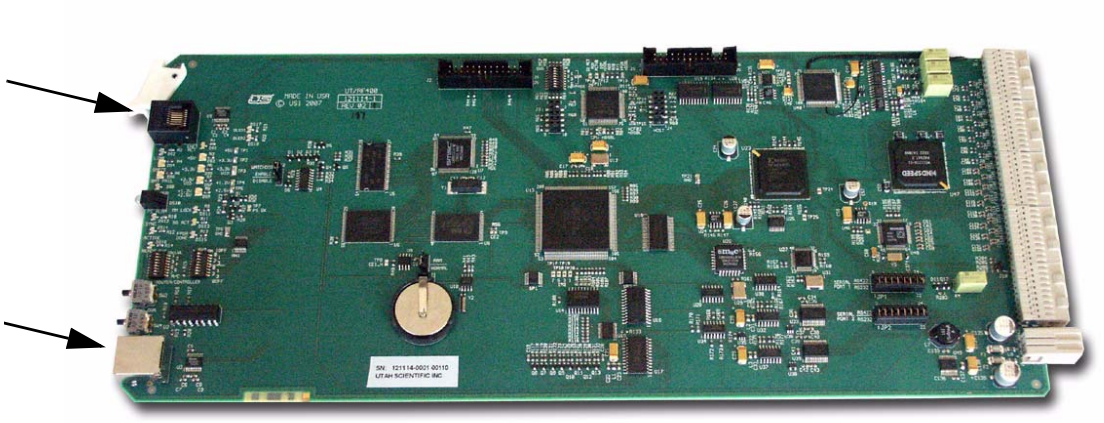
All other voltages on the board are derived from the 3.3V and 5V voltages.

Crosspoint failure independent of any other board failure is very uncommon, and is often the result of a problem elsewhere. Please contact Customer Service in the event the crosspoint card experiences a failure.

Debug Connectors

Controller Debug Port - (Silver RJ-45) - RS-232 serial interface to the controller portion of the board. (SC/MC RJ-45/DB95 Adapter - USI# 140100-2) - Baudrate = 19.2K, Data = 8 bit, parity = None, Stop = 1 bit, Flow = None

Router Debug Port - (Black RJ-45) - RS-232 serial interface to the router portion of the board. (UT400 RJ-45/DB9S Adapter - USI# 1400000-8) - Baudrate = 38.4K, Data = 8 bit, Parity = None, Stop = 1 bit, Flow = None



Test points (front of Crosspoint card)

In rare cases, engineering personnel may (when receiving certain voltage alarms) clip onto these points with a volt meter & make certain deductions regarding system voltages.

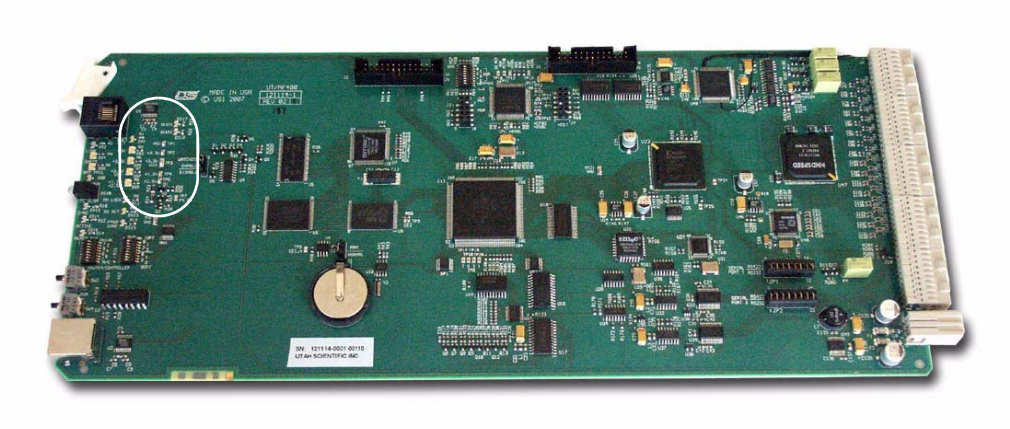


FIGURE 4-16. Audio Crosspoint board test points

Contacts

+ 5V

+ 3.3V

+3.3V VID

+ 1.2V

+ 2.5V

GND

Control Board

The SCX-400 is a limited feature version of the SC-4 System Controller. When installed within a UT-400 frame, it becomes a stand-alone router with control capability.

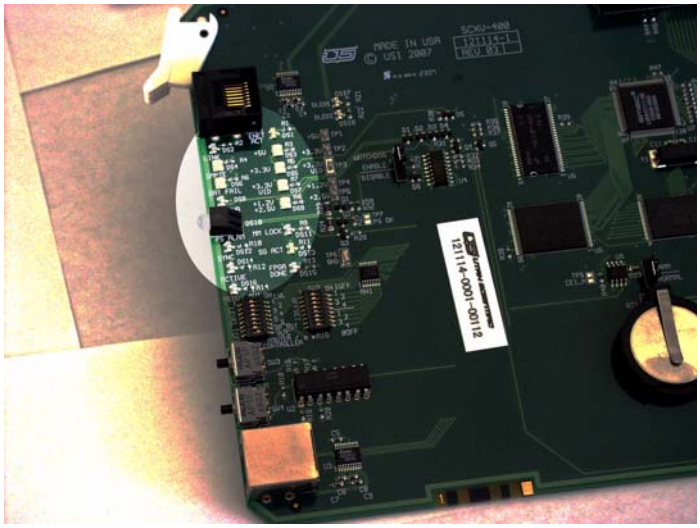


FIGURE 4-17. FIGURE 4-17. SCX-400 Control Board View

LED Indications

- The ‘Ready’ LED indicates whether or not the cards are in sync and communicating with one other.
- Active, which indicates the ‘controlling’ card when the board is part of a redundant pair. The LED is green (ready) when the card is in default status. The current default card will give up control to its alternate when the changeover button is pressed.
- Board Power - All onboard power supplies are functional (illuminates green).
- Power Error indications - These will illuminate to indicate a problem with a specified power supply. Note: The illumination of these LEDs will turn off the board power LED.
- PS Alarm - This indicates the condition of the chassis power supplies. (Green = normal function, Red = fan, temp, or voltage failure.
- SMPTE - will illuminate when there is a SMPTE alarm condition.

- Battery Fail - Will illuminate when the battery is low.
- Sync LED -- Will illuminate when a composite signal is in place -- allowing vertical interval switching.
- Ethernet link -- Illuminates when the ethernet port is in use.
- Ethernet Active - blinks on and off to indicate ethernet activity on the port.
- SG Active - Indicates activity on the scangate bus.
- FPGA Done - FPGA programmed correctly.
- MM Lock - Monitor Matrix signal detected.

SC-400 Jumper Settings

- J1 Switch -- Used to clear the RAM
- JP1 -- Serial Port 1 -- RS-232/422
- JP2 -- Serial Port 2 -- RS-232/422

SCX-400 Scangate Dipswitch Setting (SW5)

User Switch 0

When set, the system will initiate a software load, though the Linux application itself will not start. This is typically used for factory troubleshooting.

User Switch 1

User switch 1 determines which of the two memory banks is in use. A change to either memory partition (0 or 1) will not affect the other. The actual switch position determines which memory partition is in use.

User Switch 5

Used to start the Linux operating system, but not the actual application.

User Switches 2 - 4

Undefined at this time.

Bypass Switch

Also used for factory troubleshooting. The default configuration is all switches positioned away from the silkscreened numbers, or to the *left* as the board is viewed from the front.

For additional detail, please see”Board Jumpers - Board Reset/Changeover” on page 4-21.

User Controls

The dip switches located on the SCX-400 card are used to set the Level, Mode, and Offsets. Specific dip switch settings are addressed in the Hardware Installation section; see *Section 2, Figure 2-8*.

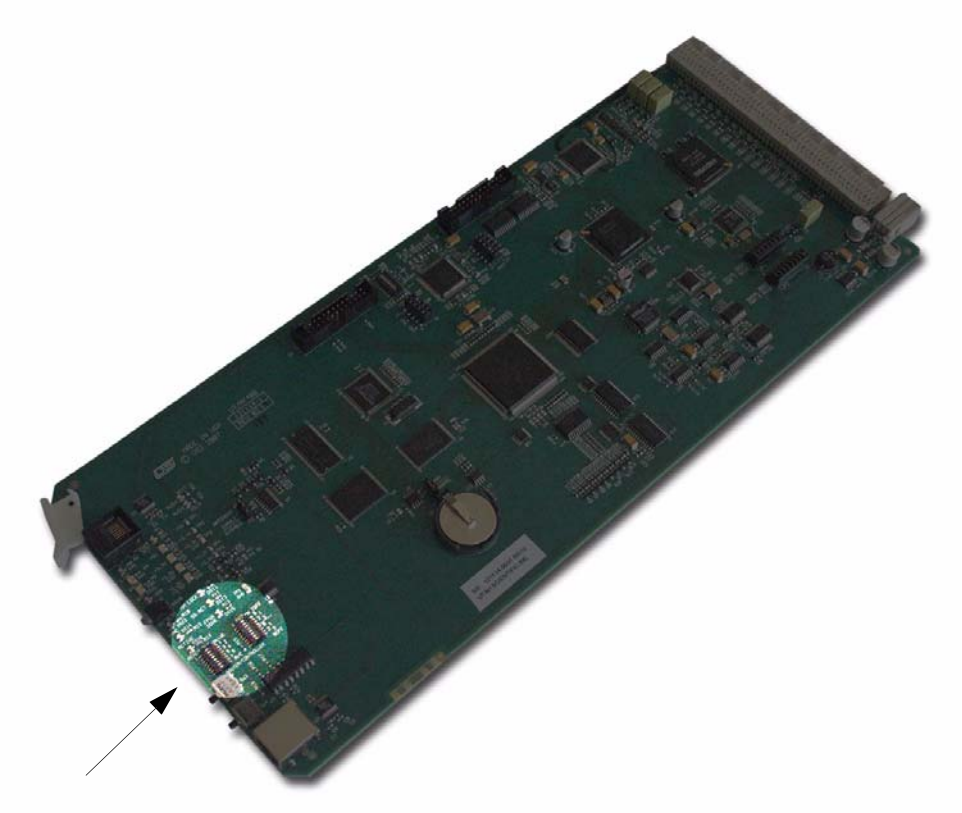


FIGURE 4-18. Crosspoint Dip Switches

Power Supply

The Utah-400's power supply(s) is standard, with AC input, alarm monitoring circuitry, and DC output going to the system.

LED Indications

Power supply alarms are indicated on the SCX-400 card and each power supply.

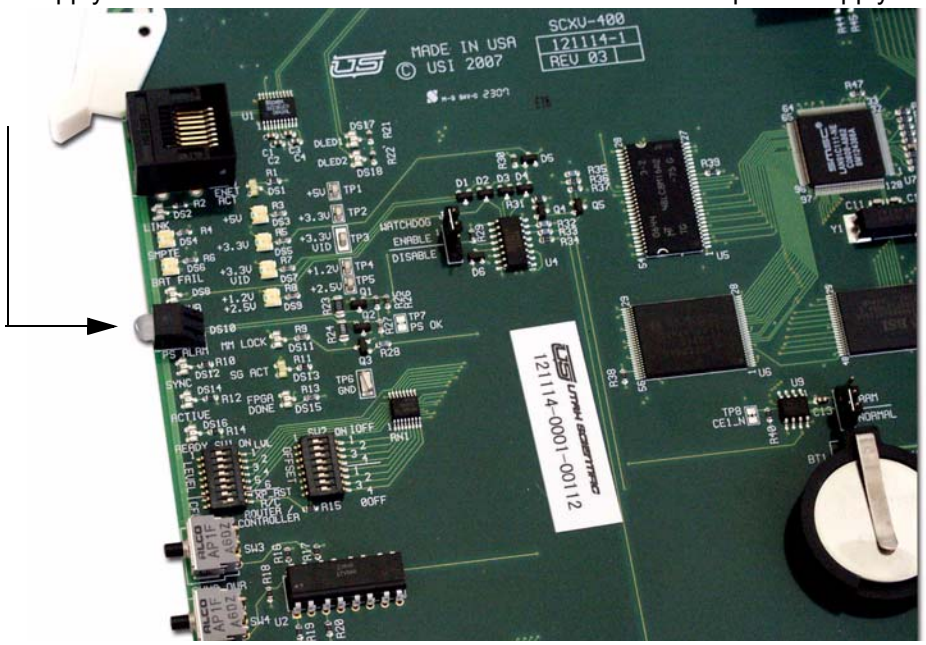


FIGURE 4-19. Power Supply indications

RF400 Pass-Thru Video Xpoint (121111-1)

The Pass-Thru Xpoint has been designed to loop the input signals (0-31) to the output signals (0-31). There are several applications that can utilize this pass thru functionality but in most cases it is used with an MC400 master control. In this scenario the MC400 will sit in an output slot and receive signals from its corresponding input card thru the Pass-Thru Xpoint. There can be as many as four MC400 boards per UT4-32x32 chassis. Details on the MC400 can be found in the "MC-400 Operations Guide".

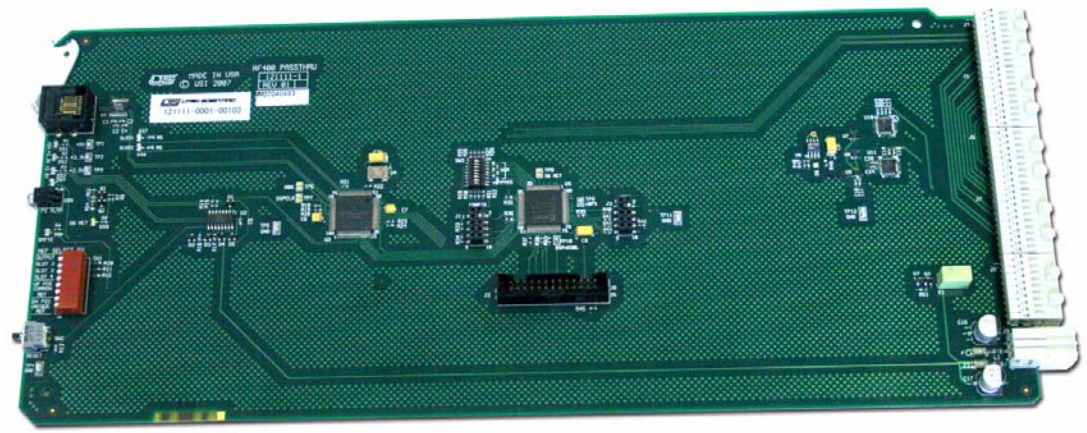


FIGURE 4-20. RF400 Pass Thru

The MC400 board uses input six as the sync reference. In applications where more than one MC400 is used in the chassis, the Pass-Thru Xpoint can be configured to use the sync reference from the first input card and pass it directly to each MC400. The Pass-Thru Xpoint has a dipswitch located at the front edge of the board that is labeled "REF SELECT SW".

"SLOT 2, 3, 4" switches in the up position correspond to using the common reference from the first input card.

"SLOT 2, 3, 4" switches in the down position correspond to using their own unique reference (input 6 on their input card).

Pass-Thru Xpoint Front Edge Details:

RJ45 (P1) - RS232 serial interface (UT400 RJ-45/DB9S Adapter - USI# 1400000-8). - Baudrate = 38.4k, Data = 8 bit, Parity = None, Stop = 1 bit, Flow = None

Power Error indications - These will illuminate to indicate a problem with a specified power supply. Note: The illumination of these LEDs will turn off the board power LED.

Test Points - +5V, +3.3V, +2.5V

Board Power - All onboard power supplies are functional (illuminates green).

PS ALARM = - This indicates the condition of the chassis power supplies. (Green = normal function, Red= fan, temp, or voltage failure)

SG Active - Indicates activity on the scangate bus.

SMPTE - will illuminate when there is a SMPTE alarm condition.

RESET - Initializes the board.

Audio Boards

Deluxe Output Module

The target circuit module, USI 121040-1, is an alternate output module for the Utah-400 digital audio router with capability to modify the payloads of the eight AES-formatted digital audio signals that it conveys.

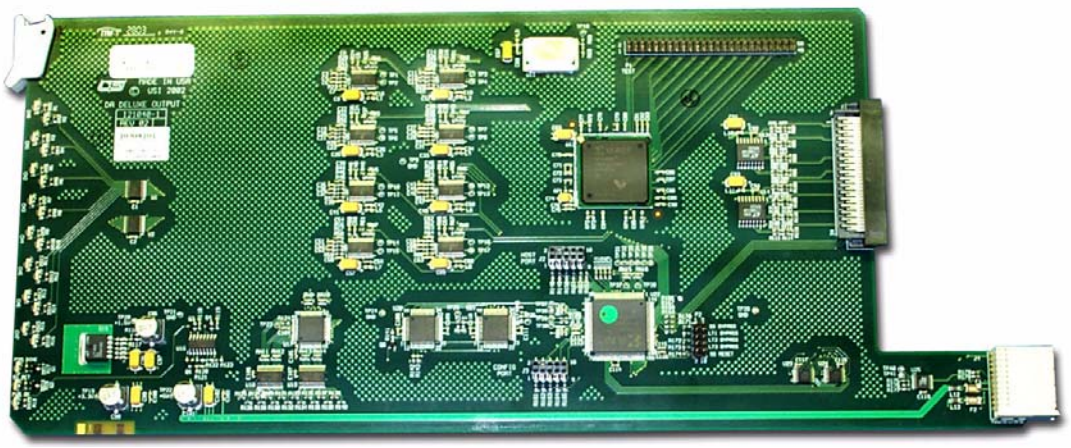


FIGURE 4-21. Target Output Module

These capabilities include the following:

- Execution of a V-fade that ensures clickless synchronous switching of outputs by first fading-down the previous source from full to zero amplitude, performing a synchronous source switch, then fading-up the new source from zero to full amplitude.
- Execution of analog-like channel data manipulations:
    - Channel swap
    - Channel 1 to both output channels
    - Channel 2 to both output channels
    - Selective polarity (phase) inversion of channels
    - Selective muting of channels
    - Summation of channels to monaural ([L+R], –[L+R])

  - Summation of channels to difference signals ([L–R], [R–L])

- Adjustment of output word lengths to 16, 20, or 24 bits at user discretion.
- Addition of dither to output signals at user discretion.

These capabilities are accessed by control and status monitoring via embedded JTAG control structures included in the Utah-400 router platform.[1]

Further, these operations are performed in concert with the channel status (C-bit) indications at the inputs, and the channel status outputs are set appropriately, according to parameters from inputs and commanded functions.

This module also includes the provisions present on the standard output module (USI 121027-1), i.e. signal presence detection, protection input switching capability, and monitor matrix functionality.

In order to properly perform its intended function, the V-fade facility is expected to operate on signal sources that are synchronous to the router's DARS (digital audio reference signal). If either (or both) the pre- or post-switch sources are asynchronous, the hardware will still execute the commanded V-fade operation, but at the switching point, it will have to acquire the frequency and phase of the new signal, outputting an improper discontinuous AES signal while it does so. Since there can be no possible guarantees of the responses of downstream equipment, this mode of operation is not recommended and should be avoided.

All other signal manipulations are suitable for both synchronous and asynchronous AES sources.

This module is substituted for the standard output module in a Utah-400 chassis, on an as-needed basis; to bring these enhanced features to those specific system outputs.

1. The described control and status at the router's JTAG bus is contained within the first layer of control. The second layer is located at the MX Bus (partially implemented at this writing). The third layer is contained within the system controller software (mostly not implemented at this writing). The fourth layer is control panel functionality (not implemented at this writing.)

DAC Output Module

The target circuit module, USI 121041-1, is an alternate output module for the Utah-400 digital audio router that delivers analog output signals. Like the 121040-1 deluxe output module, it has the capability to modify the characteristics of the eight AES-formatted digital audio input signals that it converts.

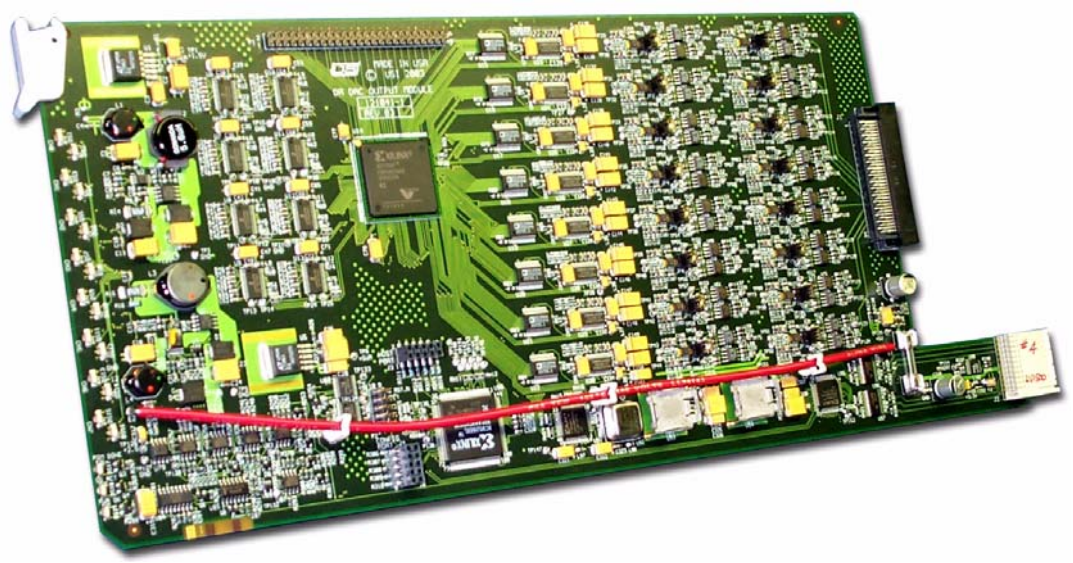


FIGURE 4-22. Target Output Module

These capabilities include the following:

- Execution of a V-fade that ensures clickless synchronous switching of output.
- Execution of analog channel data manipulations within each AES signal pair:
- Automatic adjustment to input word lengths of 16 to 24 bits.
- Addition of dither to output signals at user discretion.

These capabilities are accessed by control and status monitoring via embedded JTAG control structures included in the Utah-400 router platform.[2]

Further, these operations are performed in concert with the channel status (C-bit) indications at the AES inputs, with outputs set appropriately, according to parameters from inputs and commanded functions.

This module also includes the provisions present on the standard output module (USI 121027-1), i.e. AES signal presence detection, protection input switching capability, and monitor matrix functionality. In addition, payload audio signal presence detection is provided at a threshold of -48 dBfs for both embedded channels for signal integrity monitoring.

The module's digital monitor matrix output is derived from digital domain signal processing data at a point just before application to the channel's sample-rate and digital-to-analog converters. C-bits at the monitor matrix output are transmitted according to the indications at the selected input, with modifications consistent with commanded signal processing functions.

In order to properly perform its intended function, the V-fade facility is expected to operate with signal sources that are synchronous to the router's DARS (digital audio reference signal). If either (or both) the pre- or post-switch sources are asynchronous, the hardware will still execute the commanded V-fade operation, but at the switching point, it will have to acquire the frequency and phase of the new signal, extending the muting interval while it does so.

Signal processing on each AES channel includes a sample rate converter (SRC) just before that channel's digital-to-analog converter (DAC). This is done to capitalize on the jitter attenuation capability of the SRC, maximizing the resultant signal-to-noise ratio and minimizing the distortion of converted signals, independent of their specific sample rates. The DACs are always operated at 48 kHz sample-rate, as derived from a local master clock and the SRCs.

To support multi-channel operation, the SRCs can be operated with matched group delay. (The default condition, when the SRCs are operated independently, is an uncertainty of up to several milliseconds.) This is accomplished by identifying all AES signals that are part of the multi-channel (matched-phase) group. These signals must be synchronous with one another and connected to a single DAC output module. A control bit is set to identify each AES signal pair that is to be part of the group. Within the designated group, one AES signal is indicated as "phase master". The phase master conveys sample-rate conversion data to all other AES channels in the group, i.e. the slaves, locking their conversion processes together for proper multi-channel performance with uniform group delay. The phase master is designated with a control word applied through the embedded JTAG control structure.

2. The described control and status at the router's JTAG bus is contained within the first layer of control. The second layer is located at the MX Bus (partially implemented at this writing). The third layer is contained within the system controller software (mostly not implemented at this writing). The fourth layer is control panel functionality (not implemented at this writing.)

This module is substituted for the standard output module in a Utah-400 chassis, on an as-needed basis; to bring the above enhanced features and analog functionality to those specific system outputs. Since it derives two-channel analog outputs from each AES input signal, this module requires a special output adaptor fitted with two balanced audio connectors.

ADC Input Module

The Target Input module, USI 121042-1, is an alternate input module for the Utah-400 digital audio router with capability to accept eight two-channel analog input pairs, formatting them into eight AES digital audio signals for application to the routing matrix. This module is substituted for standard input modules on an as-needed basis (as constrained by options for deployment of analog I/O adaptor subassemblies and power).

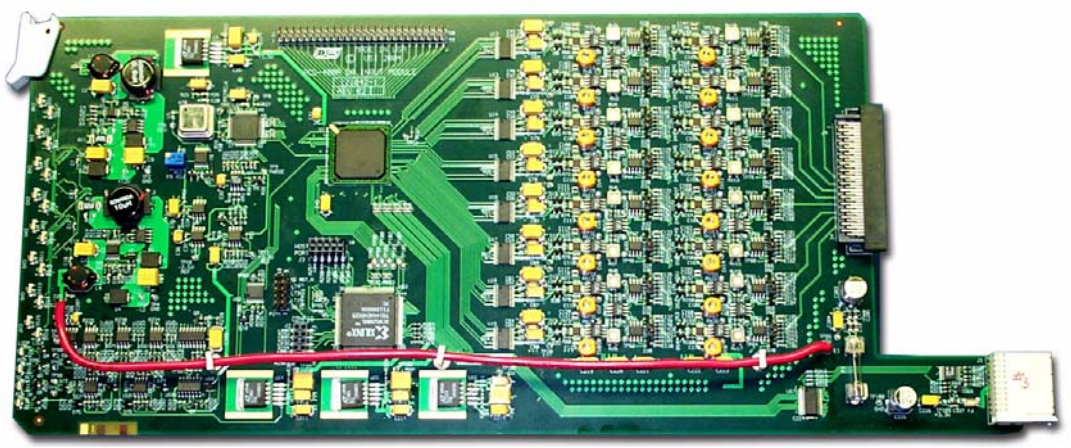


FIGURE 4-23. Target Input Module

The following feature set is embodied in this module:

- Audio sample word-length adjustable to 16, 18, 20, or 24 bits, by AES channel-pair, at user discretion.
- Automatic non-subtractive dither, with triangular PDF, applied to signals configured at reduced word-lengths.
- Analog input signal presence detection at –48 dBfs (28 to 30 dB below operating level) with 5-second moving detection window, provision to detect individual channel signal activity
- Selectable input muting, for each individual analog input channel.

- High-impedance bridging inputs with strap-selectable 600 Ohm termination.
- Configurable “encoded channel mode” (including multi-channel modes) for C-bit indications in the AES-formatted output signals.
- Error indications for signal overload (clipping), for each individual analog input channel.

Converted signals are synchronous to the system DARS. If the DARS is unavailable or invalid, a fallback crystal oscillator provides an asynchronous master clock rendering a 48 kHz sample rate. This module also includes the standard (for Utah-400) feature of auxiliary LVDS outputs for expansion and protection applications. Control and status reporting is accomplished via a ScanGate Type-4 chip communicating over the system’s JTAG bus. Some of the module’s extended features are accessed via virtual TAPs contained in its signal-processing hardware and connected to local TAPs of the ScanGate Type-4 device.

Audio Crosspoint Board

The DA-32 XP is an audio crosspoint board that receives 32 inputs from four input cards. The card will then switch the appropriate inputs to the 32 outputs located on the four output cards.

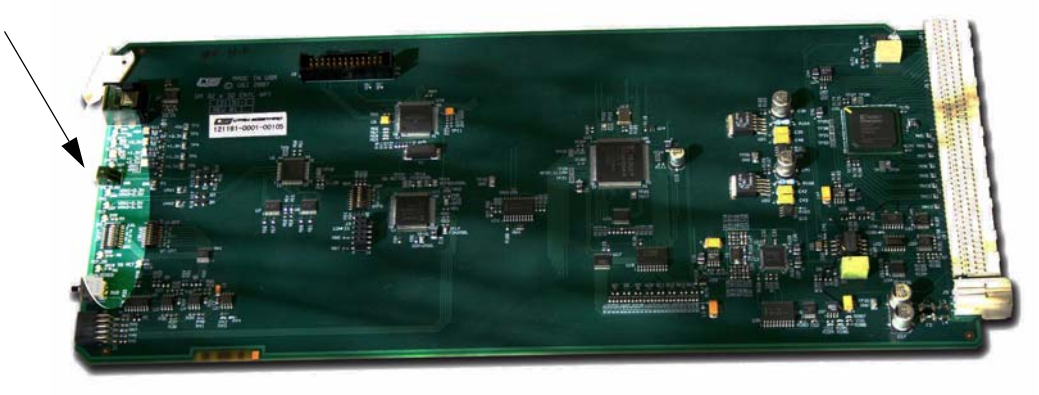


FIGURE 4-24. 32x32 Audio Crosspoint board

Reset = Initializes the board.

Debug = RS232 serial interface (UT400 RJ-45/DB9S adapter - USI #1400000-8) - Baudrate = 38.4K, Data = 8 bit, Parity = None, Stop = 1 bit, Flow = None

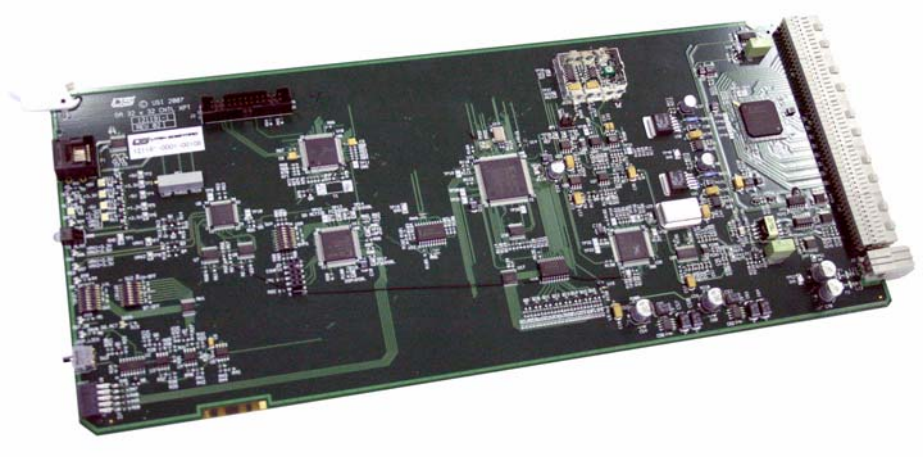
Fuse = The 32x32 system's crosspoint card contains two *resettable* fuses. These fuses will open if an over current situation occurs on the 3.3V or 5V board voltages. These fuses will close to normal operation once the overcurrent situation is resolved.

All other voltages on the board are derived from the 3.3V and 5V voltages.

Crosspoint failure independent of any other board failure is very uncommon, and is often the result of a problem elsewhere. Please contact Customer Service in the event the crosspoint card experiences a failure.

Jumpers - JP1 = 1-2 (manual)

The Audio Crosspoint LED Indications



- Active, which indicates the ‘controlling’ card when the board is part of a redundant pair. The LED is green (ready) when the card is in default status. The current default card will give up control to its alternate when the **changeover** button is pressed.
- Board Power - All onboard power supplies are functional (illuminates green).
- Power Error indications - These will illuminate to indicate a problem with a specified power supply. ***Note: The illumination of these LEDs will turn off the board power LED.***
- PS Alarm - This indicates the condition of the chassis power supplies. (Green = normal function, Red = fan, temp, or voltage failure.
- SMPTE - will illuminate when there is a SMPTE alarm condition.
- PRI - will illuminate when in the primary slot.
- Red - will illuminate when in the secondary slot.

- Red_ACT
    - Flashing indicates the redundant board is ready.
    - On indicates no redundancy.
    - Off indicates redundancy is not ready.
- Ref OK -- Will illuminate when a valid DARS signal is in place -- allowing timed switching.
- Loop Lock - Will illuminate when the PLL is running properly.
- SG Active - Indicates activity on the scangate bus.
- MM Detect - Monitor Matrix signal detected.

Test points (front of Crosspoint card)

In rare cases, engineering personnel may (when receiving certain voltage alarms) clip onto these points with a volt meter & make certain deductions regarding system voltages.

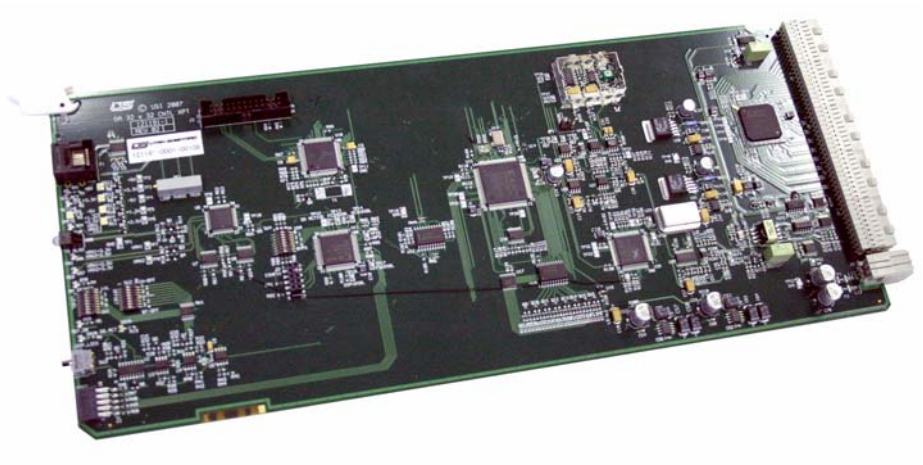


FIGURE 4-25. Audio Crosspoint board test points

Contacts

+ 5V

+ 3.3V

-5V

+ 1.2V

+ 2.5V

GND

VRX1 = 3.3V - Primary Slot / 2.5V Secondary Slot

VRX2 = 2.5V - Primary Slot / 3.3V Secondary Slot

Input, Output, and Crosspoint Card Replacement

To correctly remove and replace the individual cards, always make sure the guides are located (inside the chassis) and the card slides all the way in before the ejector is locked in place. The card ejectors are pressed inward and down from the card when locking, and pulled outward from the card when removing.

FIGURE 4-26. Input/Output Board Replacement and Removal

Note that all cards are situated at opposite sides, up and down on either side of the chassis, with the left cards facing up and the right cards facing down.

All boards within the Utah-400 system are hot-plug capable.

Router Overview

Left PS	Input 16-23 (Parts side up)	Input 24-31 (Parts side down)	Right PS
	Input 0-7 (Parts side up)	Input 8-15 (Parts side down)	
	Pri-Xpoint (Parts side up)	Sec-Xpoint (Parts side down)	
	Output 16-23 (Parts side up)	Output 24-31 (Parts side down)	
	Output 0-7 (Parts side up)	Output 8-15 (Parts side down)	

Fan Service

Alarm indicators on the individual boards or front of the unit indicate fan problems. The Utah-400 32x32 chassis fans are located on the power supplies. Fan replacement will involve a complete power supply replacement.

FIGURE 4-27. Fan device location

CHAPTER 5 *Troubleshooting*

Note: Parts of this section were derived from the Utah-200 Manual; some areas may not apply directly to the Utah-400 but will be corrected in the next version of this manual.

In This Chapter

This chapter is designed to help the user diagnose problems on the Utah-400 Routers to the subsystem level. There are no repairable boards in the Utah-400 system, contact Utah Scientific Technical Services at 800-447-7204 regarding any problems you may be having. Should any printed circuit boards need repair, Technical Services can advise you on shipping and on the repair process.

Subsystem Level Troubleshooting

A routing system is typically comprised of several subsystems:

- Video System
- Control System
- Power System

Fault finding is simplified by first isolating the problem to one of these subsystems. For example, if the audio-system is functioning normally, but there are problems with video, the problem is probably confined to the video system.

Note: With the exception of a system using Digital Video with embedded audio, audio signals are switched through a different matrix than the video signals.

Main Troubleshooting Chart

The following table provides an indication of what subsystems should be reviewed for common problems.

Please note:

- The numbers shown in the four Subsystem Table Reference columns indicate specific troubleshooting problems that are found in the four individual Subsystem Tables.
- For example: a 1 listed under the Video column refers to problem number 1 in the "Video Subsystem Table" on the following page. Here you will find a list of specific checks that will assist in troubleshooting the problem.

TABLE 5-1. Main Troubleshooting Table

	Subsystem Table Reference			
Problem	**Video**	**Audio**	**Power**	**Control**
No Video or Audio outputs	1	1	1,2	1
Video and Audio outputs are present but neither can be switched	2,3	2,3		1,2,6
No Video output, Audio functions normally	1,2,3		1	2
No Audio output, Video functions normally		1,2,3	2	2
Video switches normally but audio does not switch		2,3		2
Audio switches normally but the video does not switch	2,3			2
Flash on video when switching	4			
Cannot access expansion inputs or outputs of video level	5			
Audio signal level incorrect		4		
Video signal level incorrect	7			
Video signal anomaly	5,6,8			
Video monitor matrix not functional	9			
Audio monitor matrix not functional		5		
Control panel does not function				1,2,3
Control via serial port not functional				4
Ethernet control port not functional				5
Alarm port active			3	6
SC Ports not "Active"			3,4	4,5
Undefined level types in SC Controller				1,2,4

Video Subsystem Troubleshooting Table

Use the following table to troubleshoot specific video subsystem problems. The numbers in the left-hand column indicate specific references from the Video column in the **Main Troubleshooting Table**.

TABLE 5-2. Video Subsystem Troubleshooting Table

Problem		Check
1	No video output	• Control cable connected, or internal controller functional? • Different input works on output bus? • Other outputs functional?
2	Unable to select a specific input	• Control panel programming correct? • Output signal level locked or protected?
3	Unable to select any input	• Control cable connected? • Control panel defective? • Controller failure?
4	Video flash when switching between inputs	• Input sources timed correctly? • Input reference signal present and timed? • Input reference correct standard? • Correct video standard jumper set on controller board?
5	Inputs / Outputs inaccessible	• Expansion matrix crosspoint cards present?
6	Sync missing on video output (analog)	• Sync present on selected input? • Normal DC level on input?
7	Video output level incorrect	• Input level correct • Output terminated at destination (analog)? • Input/output compensation jumpers correctly set?
8	Sparkles on video output (digital)	• Input signal amplitude too low? • Cable length > 300 meters on input?
9	Monitor Matrix not functional	• Selected correctly on control panel?
10	Control Ports Not Functioning	• SCX configured as a controller?
11	Router not switching with an external controller	• SCX configured as a router?

Power Subsystem Troubleshooting Table

Use the following table to troubleshoot specific power subsystem problems. The numbers in the left-hand column indicate specific references from the Power column in the **Main Troubleshooting Table**.

TABLE 5-3. Power Subsystem Troubleshooting Table

Problem		Check
1	No video output	• Power applied to video frame? • Warning indicators on the front of each power supply? • Control cable between chassis connected?
2	No audio output	• Power applied to audio frame? • Warning indicators on the front of each power supply? • Control cable between chassis connected?
3	Alarm active	• Voltage alarm active (LED on)? • Fan alarm active (LED on)? • Temperature alarm active (LED on)?
4	Controller power	• Power applied to controller frame?

Power Supply Alarms

Power supply alarms are indicated by red LEDs on the front of each power supply module. They consist of voltage, fan, and temperature alarms.

- The voltage alarm indicates that one of the supply voltages is either too high or too low.
- The fan alarm indicates that the fan has stalled.
- The temperature alarm indicates that the temperature is elevated in the power supply. This may be caused by dirt or dust blocking the airway, a defective cooling fan, or by operation in extreme temperatures.

Note: Optional redundant power supplies may be fitted to most UTAH-400 systems. In this configuration, the failure of a power supply should not affect normal system operations, but users would be unaware of the power supply failure. Thus, it is highly advisable to utilize the SMPTE alarm output provided at the rear of the chassis.

Control Subsystem Troubleshooting Table

Use the following table to troubleshoot specific control subsystem problems. The numbers in the left-hand column indicate specific references from the Control column in the **Main Troubleshooting Table**.

TABLE 5-4. Control Subsystem Troubleshooting Table

	Problem	Check
1	No control of any level	• Internal controller operating? (see below) • External controller connected? • Control panels connected? (see below) • MX bus terminated? (see below) • U-Net terminated? (see below) • Completed controller software upgrade?
2	No control of individual signal level or levels	• MX bus cable connected? (see below) • MX bus correctly terminated? (see below) • Is non functional signal level address set correctly? (see • below). • Control panel programmed correctly? (see "Operations") • Output locked or protected on that level? (see “Operations”)
3	Control panel not functional	• Panel address set to unique number? • Completed panel software upgrade?
4	Serial control port not functional	• Communications baud rate incorrect? • Serial control Protocol incorrect? • Serial control cable wired correctly?
5	Ethernet port not functional	• Ethernet option fitted? • Connected to PC directly by null cable? • Connected to network via gateway?
6	Alarm active	• Active CPU indicator extinguished? (SC-3) • Heartbeat indicator extinguished? (SC-3) • MX activity light does not flash? (SC-3)

System Controller Alarms

System controller alarms are indicated by LEDs on the front of each controller card.

For SCX-400 LED information, please see Section 4, “The SCX-400 LED Indications”.

Please note the following additional points regarding the controller:

- If used with an SC-2, SC-3, or SC-4 system controller consult the appropriate controller manual for details about the controller card.
- The total MX bus cable length must be less than 300 feet and must be terminated at the last chassis.

Control Panel Troubleshooting

If your control panel does not control any of the matrix, check that power is applied to the panel.

U-NET

- Panels can communicate with the controller via a special network known as U-NET. Panels are connected together daisy chain style to the controller. Removing a panel physically from the network will break the chain and disconnect panels downstream from the controller.
- U-Net uses unshielded twisted pair cable. It requires two twisted pairs terminated in an RJ 45 connector. The maximum length of any segment is 1000 feet and must be terminated at the last control panel in each segment. Refer to the Appendix C "U-Net Cabling" for details.
- The panel may be communicating to the controller correctly, but the required signal level matrix may not be responding. Check the Dipswitch setting on the rear panel of the non-functional router level.

  Confirm that the control panel address is a unique number. Each panel address is set by a rear panel Dipswitch and must be a unique address. This control panel address is read when the control panel is powered up.

Ethernet

- Panels can communicate with the controller via an Ethernet network. Panels are connected together through a multi-port repeater (Hub).
- All connections are point to point links with a twisted pair cable that is terminated (in RJ-45 connectors.)
- The panel may be communicating to the controller correctly, but the required signal level matrix may not be responding. Check the Dipswitch setting on the rear panel of the non-functional router level.

APPENDIX A Specifications

In this Appendix

This appendix provides detailed lists of all system audio, video, control, physical, power and regulatory specifications.

Power

The following table lists power specifications:

Input Power and DC Power Specifications

TABLE 2-1.

Parameter	Specification
AC Supply	
Input Power Consumption	100 Watts
Voltage	90 – 240 Volts AC, universal power supply
Frequency	50 – 60 Hertz
Redundancy	Dual Redundant power supplies (optional)
DC Output Voltages	
+ 12 Volts DC	1.5 Amps
- 12 Volts DC	1.5 Amps
+ 3.3 Volts DC	16 Amps
+ 5 Volts DC	14 Amps

Digital Video

The following table lists the system digital video specifications.

TABLE 2-2. Digital Video Specifications

Parameter	Specification
Jitter and all other specifications	Conforms to SMPTE 259M; 292M
Data Rates	143, 177, 270, 360 and 540 Mbps With SD Re-clocking
Input Return Loss	>15 dB, 6 MHz. – 360 MHz*
Output Return Loss	>15 dB, 6 MHz. – 360 MHz*
Input Equalization up to 360 Mbps	1000 ft. for 8281 cable
Signal Level	800 mV ± 10%
Output Re-clock	

* >10db for cards operating at 1.5Gb to 3Gb/Sec

High Definition SDI Video

The following table lists the high definition specifications:

TABLE 2-3. High Definition SDI Video Specifications

Parameter	Specification
Video Standard	10 Bit SDV, Conforms to SMPTE 292M
Data Rate:	1.4835 Gbps / 1.485 Gbps
Input Return Loss:	>15 dB; 5 MHz. – 1.485 Gbps
Output Return Loss:	>15 dB, 5 MHz. – 1.485 Gbps
Automatic input equalization:	>150 Meters with 1694A coaxial cable
Output Re-Clocking:	Jitter, < 0.2 UIpp (average)

Digital Audio

The following table lists system digital audio specifications

TABLE A-1. Digital Audio Specifications

TABLE 2.

Parameter	Specification
Digital Audio Processing	48 kHz. 16 - 24 Bit, AES / EBU; AES-3
Input Impedance - Balanced	110¾ ±20%. 100 KHz. to 6.144 MHz
Input Level minimum:	200 mVPP. w/> 50% Eye Pattern Opening
Modes of Operation	Synchronous and Asynchronous
Input Level maximum:	7 VPP
Common Mode Range:	± 7V (DC + Peak Signal)
Common Mode Rejection:	Per AES-3, Section 6.3.5 (1997)
Output Impedance - Balanced	110¾ ±20%, 100 kHz. to 6.144 MHz
Output Amplitude:	2.0 VPP into 110?, minimum
Nominal Rise / Fall Times:	25 nano seconds
Common Mode Rejection:	>30 dB, DC to 6 MHz
Sample Rate:	48 kHz
Intrinsic Jitter:	< 0.025 UI Peak, w/700 Hz. HPFApplies to discreet AES outputs
Output Phasingwith respect to DARS Input:	± 2.5% (± 9º) of Frame Interval.Applies to discreet AES outputs

Reference

The table below lists reference specifications

TABLE 2-3. Reference Specifications

Parameter	Specification
Audio	One 75 Ohm terminated AES sync
Video	NTSC (or PAL) blackburst or HD Trilevel Sync (1Vpp nominal)

Control

The following table lists control specifications:

TABLE 2-4. Control Specifications

Parameter	Specification
Control	MX-Bus Daisy Chain - Terminated
Audio	One AES Audio Sync
SMPTE Alarm	One output

Alarms

The following table lists alarm specifications:

TABLE 2-5. Alarm Specifications

Parameter	Specification
Primary alarm	ANSI / SMPTE 269M fault reporting(Relay closure)
Connector Type	Phoenix Male Barrier Strip – 3 pin (share with Remote CO)
Functions	• Power • Temperature • Fans • System Board Failure
Maximum current	20 milli-Amp

.

.

Physical

The following table lists physical specifications:

TABLE 2-6. Physical Specifications

Parameter	Specification
Width	EIA – RS-310 – D 92 19” rack mount standard
Height	2 RU, 3.5 inches, 89 mm
Depth	18 inches, 457 mm maximum
Weight	30 pounds
Mounting	Two front mount rack ears
System connectors	All connectors rear panel mounted
Cooling	Two fans – side exhaust
Temperature range	10 – 40 Degrees Celsius
Humidity range	0 – 90% non - condensing

Regulatory

The following table lists system regulatory specifications

TABLE 2-7. Regulatory Specifications

Parameter	Specification
EMC	EN50 081-1 (EN50 022 Class A)
Susceptibility	EN50 082 (IEC 801-3, IEC 801-4)
Safety	EN60 950, UL 1950, CSA 022.2 No. 234
Shock / Vibration	MIL Std. 810E, Method 514.4(cargo truck 500 / 500 miles)

Connector Suppliers and USI Part Numbers

The following table lists connector supplies and Utah Scientific Part Numbers where applicable: Not all connectors are used on the Utah-400 but are supplied as a courtesy.

TABLE 2-8. Connector Suppliers

Manufacturer Part Description	**Part Number**	**USI Part No.**	**Contact**
Advanced Connectek USA Inc. • DB-26B – Male connector, crimp	DH-26PK-SFG-T	41226-2026	714 – 573-1920
Conec Corp. • DB-26B – Male connector, solder cup	CDS26LFHD SN163A1660 9X	41226-3026	Ontario, Canada905 – 790-2200American Conec Corp.102 Pleasant Wood Ct.Morrisville, NC 27560(919) 460-8800
Amp • BNC Male connector • RJ-45 Male connector • DB-9B Male connector	225395-2 5-569278-2 747904-2	41215-0001 41211-0011 41223-1009	AMP Inc.Harrisburg, PA 17105(800) 522 – 6752
Phyco • 6 pin CirDin	A-9001-069	41329-1006	Kimball Electronics1600 Royal St.; GO-149Jasper, IN 47549(800) 634-9497

APPENDIX B

The Controller Debug Port (SCX-400 Video Board)

This Appendix contains the following:

The Controller Debug Cable

The Controller Debug Cable is a full duplex serial cable, consisting of an RJ-45 Connector on one end and DB-9S (female) connector at the other end. Refer to the figure below if you wish to build your own cable for the debug port.

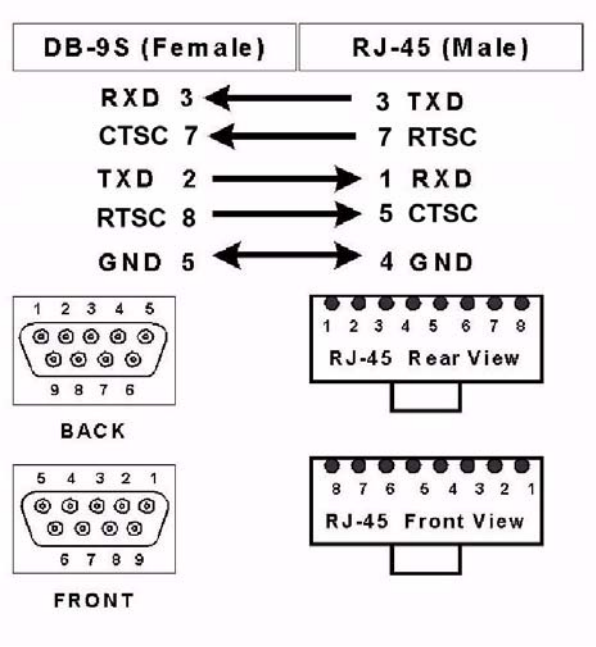


FIGURE B-1. Debug Port Cable Pinouts

The Controller Debug Port has two primary functions:

1. To aid the user in system diagnostics or when diagnosing problems with Technical Services.
2. When performing software upgrades as recommended by Utah Scientific.

The Controller Debug Port can be connected to a PC using the adapter plug (Part # 140100-2, DB-9S to RJ-45) provided by Utah Scientific and a straight through CAT-5 cable (furnished by the user).

The controller debug port will communicate with any terminal program although Hyper-terminal and Tera-Term Pro are two of the programs that work well.

The set up for your terminal emulator should be:

1. 19200 Baud,
2. 8 Data Bits,
3. No Parity,
4. 1 Stop Bit,
5. No flow control.

Controller Operations

The Debug Port

Introduction

The controller debug port is the major source of operational information and control. While configuration info is downloaded to the controller via UCON, some operational information is still best determined by a direct connection to the debug port.

Physical Connection

Supplied with your system is an adapter intended to plug on to the serial port of any standard PC. This adapter is USI PN 140100-2. It has a male 9 pin D connector on one end and a female RJ-45 connector on the other. The user supplies a straight thru CAT 5 cable between the adapter and the debug port on the controller (see figure 3-1 in this manual for location).

Terminal Emulation software setup

Any terminal emulation program such as windows Hyper terminal is useful for debug port operation. Utah Scientific recommends TeraTerm, a freeware terminal emulation software package available on the internet. Serial Port parameters necessary to communicate to the controller are as follows:

TABLE B-1.

Baud Rate	19.2K
Data Bits	8
Stop Bits	1
Parity	NONE
Hardware Handshaking	NONE

General Status

Once you are connected to the controller, pressing the return key should return a prompt of "/ >". From this prompt various operations can be performed.

The most valuable data is gathered after a system reset. This is the point where the controller 'finds' all connected routers and control panels. The best method for determining what the controller discovers is to connect the debug port to the left controller and then press and release the reset buttons (See figure 3-1) simultaneously. After several screens of data that deal with the bootup process, you will see messages such as the following:

MX H/W found: input 0, output 0, level 0, id 0x40

configServer: register PL panel 3, name CSP-500, model CSP-16160

MX H/W messages indicate that the SC4 has found and MX-Bus based router at the specified address. The ID number varies with different address types.

configServer messages indicate panel types and address found.

Specific Operations

Reading system setup information

The chassis command is used to read and/or set the chassis IP address(s), system name and other parameters. It's usage is detailed below.

chassis

Synopsis: chassis [OPTIONS] [FILE]

This program allows the user to interact with the chassis identification ROM located in the local chassis. Not all new USI products support this feature. If you aren't sure or are getting unexpected results, please check the appendix and verify the operation is supported on the platform you are working with.

Options:

- -h – displays the help information
- -d – activates debug mode which displays low level interactions with the device hardware.
- -r – read and display data contained in the local chassis config ROM.
- -init – write a set of default values into the chassis config ROM

- -ip1 <xxx.xxx.xxx.xxx> – sets the IP address for network interface 1 to the specified value.
- -ip1 <xxx.xxx.xxx.xxx> network <xxx.xxx.xxx.xxx> optionally sets subnet mask
- -ip2 <xxx.xxx.xxx.xxx> – sets the IP address for network interface 2 to the specified value.
    - Please note not all devices support a 2nd network interface.
- ip2 <xxx.xxx.xxx.xxx> netmask <xxx.xxx.xxx.xxx> - optionally sets subnet mask
- -cust <customer name> - Sets the customer name to the text specified. Typically this will be the call letters of the station using the device.
- -chid <chassis ID> - This sets the chassis ID to the text specified. Typically this will be a description of the physical device location. Ex: MCP-CR01-KUSI
- -unet <xxx> - set the unet node for this device to that specified.
- mask1 <xxx.xxx.xxx.xxx> - sets subnet mask for network interface 1 to...
- mask2 <xxx.xxx.xxx.xxx> - sets subnet mask for network interface 2 to...

Shutting down the SC4 application

The sc4down command will turn off the SC4 application. This command might be used prior to reprogramming the controller's main image.

sc4down

Synopsis: sc4down

This command sends a signal to all active controller processes and tells them to shutdown. This replaces the need to perform a <ps> command followed by a kill –INT <pid> command which is the method for stopping the current SC-4 software from running. A message will tell the user whether the shutdown has been successful or not.

Resetting the SC4

sc4reset

Synopsis: sc4reset

This command resets the controller board being accessed. When this action is performed on an active board in a redundant system, control will switch over to the other board.

Gathering data from the onboard log

logdump

Synopsis: logdump [OPTIONS]

This command displays log entries from NVRAM. If no option is specified then ALL log entries will be dumped to the screen. Optionally, a number can follow the command, which specifies that only that number of final entries will be displayed. The log can only handle a certain number of entries. Older entries will be lost as the log overflows saving only the most recent events.

Example:logdump 10 - dumps the last ten log messages to the screen

Viewing / Setting Configuration parameters

sc4config is used to display and in some cases modify the custom configuration parameters of the controller. Various options are detailed below.

sc4config

sc4config display – displays all config tables

sc4config sim – Turns on simulation for all router levels. Append a level number to simulate that level

sc4config nosim – Turns off simulation for all router levels. Append a level number to unsimulate that level

sc4config mx – Displays MX Bus configuration

sc4config pl – Displays Party Line Configuration

sc4config routers – Displays router configuration

sc4config levels – Displays level mapping

sc4config srcs – Displays source table

sc4config dsts – Displays destination table

sc4config serial – Displays serial port parameters

sc4config misc – Displays miscellanous parameters

sc4config dstattrs – Displays router attribute status

tiedump

Displays the tieline status

tiedump clear – clears out the tieline status (crosspoints are not affected.) This will free all tie lines.

lockdump

This displays the output lock status.

lockdump – displays lock status.

lockdump clear – removes all locks.

router

This utility provides certain router status functionality such as setting, viewing, and saving status.

- **router xy** - This connects each source to its corresponding destination; i.e., 0-0, 1-1, etc. This is best used with the controller default configuration.
- **router source** <srcnum> - This routes the source value specified as srcnum to all outputs. This is best used with the controller default configuration.
- **router killstatus** - This clears all router and tieline status (except for attributes) but leaves the controller configuration intact.

The router utility can also save the router status to a file that can be subsequently loaded. This functionality is best used with the *rtrsave* and *rtrload* scripts, found in the SCX installation directory; i.e., C:\usi\<cust> - scx401\updates.

Simply double-click the *rtrsave.ba*t file after running the NFS server, then enter the PC IP address and the controller IP address as prompted. You will also be prompted to enter a file-name where the current router status will be stored. You may then enter a list of destinations whose status you want to Sav. (Leave this blank to default to all destinations.)

The destination list should look something like this:

1-5,7,11,300-350 (no spaces)

Other destinations will not have their status saved in the file, so a load operation using that file will not affect them. Double-click the *rtrload.bat* file to load one of the saved files. The router connections will be restored to the saved status.

APPENDIX C

The Router Debug Port

This Appendix contains the following:

Using the Router Debug Port (Black RJ-45 connector)

The router debug port is the [black] RJ-45 female connector located at the left side of the crosspoint.[1] Its capabilities include:

- System **Power Up** Display
- **Main Menu** Display.
- Verifying the **FPGA Memory Status**.
- Verifying the **Software Version**.
- Checking the **Router Crosspoint Status** to verify switching.
- Checking the **I / O Card Information**.
- Checking the **Hardware Status**.

Only the “Active” crosspoint will have the update information to be read by the router debug port. By pressing the “Change Over” button on the currently active SCX-400 (video), or by pressing the reset button on the currently active DA-32 XP, the control will be transferred to the inactive board.

1. This is labeled P2 for the SCX-400 (video) and labeled P1 for the DA-32 XP.

Startup Display (Video)

If the debug port and terminal is connected to the Utah-400 system during the power up sequence, the following display will appear on the terminal. The display below is a portion of the ADC setup information, and is generally for factory use only.

```
**************************************************
     lash Set...
     00000000FF
     XPT Enabled
**************************************************
```

Audio - If the debug port and terminal is connected to the UT-400 system during the power-up sequence, the following display will appear on the terminal.

```
**********************************************************
                  Utah Scientific Inc.
  Utah-400 32R Audio System Monitor - V1.01w
**********************************************************
```

Main Menu Display

The main menu displays the selections possible on the Router Debug port.

After connecting the router debug port to the crosspoint board, activate the Main Menu by pressing <Enter> or <Return> on the terminal or computer. The display will be as shown below and is self explanatory:

Menu-
M = FPGA Memory Status
V = Version
R = Router Crosspoint Status
I = IO Card Information
S = Hardware Status

FPGA Memory Status

Typing an upper or lower case “M” on the keyboard activates this feature. This display function enables the user to examine the crosspoint status as reported by the FPGA Controller. The status display and explanation is shown below.

FPGA MEMORY STATUS	**Min / Max Values**
Level Switch = 00	Range = 00 to 1F
Offset Switch = 00	Range = 00 to FF
MX Active? -> YES.	Yes / No
Monitor Matrix = FF	Range = 00 to 1F
Primary / ID Reg = 01	
FPGA Rev = X.XX	Reflects Current Version

Parameter	Description
Level Switch	Reflects the Router Level that is selected when the dipswitch is turned “Off” (toward the silkscreen number) on the crosspoint board.
Offset Switch	Reflects any router offsets selected.
MX Active	Indicates the MX Bus is active. If there is a “**No**” showing in this block, the MX Cable may be disconnected or the MX Bus daisy chain may not be terminated.
Monitor Matrix	Reflects the Monitor Output currently switched up. FFh = Default. Mon. Mtx. not switched up.
FPGA Revision	Subject to change.

Verifying the Software Version

This feature is the same as the Start Up Display with the exception of the “Set to Primary” message. Typing an upper or lower case “V” on the keyboard activates this feature. The displayed data is shown below.

Video

****
Utah Scientific Inc.
Utah-400/32 System Monitor, Rev. X.X
****

Audio

```
**********************************************************
                    Utah Scientific Inc.
          Utah-400 32R Audio System Monitor - V1.01w
**********************************************************
```

Checking the Router Crosspoint Status

To activate this feature press an upper or lower case “R” on the keyboard. This feature displays all of the crosspoints and indicates which crosspoints are switched up. The table displayed is arranged in blocks of 16.

When the router is initially powered up the display will be all FF’s. This screen displays the Inputs that are switched up to the respective output in the crosspoint matrix. To check if an Input / Output has been switched up, first switch up the Input / Output and then press “R” again to refresh the screen. The display should reflect the Input / Output change to the router matrix.

Thus, if Input 00 is switched up to all outputs, after pressing “R” the crosspoint status block will show all 00’s.

An example of the screens is shown below:

Crosspoint display after router is powered up (Hexadecimal):

```
ROUTER STATUS
FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF
,
FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF
```

FIGURE C-1. Crosspoint display (hex)

Crosspoint display with Inputs switched to Outputs diagonally (Hexadecimal):

```
ROUTER STATUS
00,01,02,03,04,05,06,07,08,09,0A,0B,0C,0D,0E,0F
,
10,11,12,13,14,15,16,17,18,19,1A,1B,1C,1D,1E,1F
```

FIGURE C-2. Crosspoint display - Inputs to Outputs

Crosspoint display with Input 00 switched up to all outputs (Hexadecimal):

00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00,
00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00,

FIGURE C-3. Crosspoint display - input 00 switched to outputs

Crosspoint display shown as a decimal matrix:

(This is shown for reference only; the terminal display will always be in the Hexadecimal format)

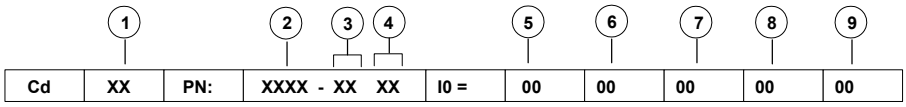
000, 001, 002, 003, 004, 005, 006, 007, 008, 009, 010, 011, 012, 013, 014, 015,
016, 017, 018, 019, 020, 021, 022, 023, 024, 025, 026, 027, 028, 0293, 030, 031,

FIGURE C-4. Crosspoint display as decimal matrix

Checking Input / Output Card Information

Typing the upper or lower case “I” activates this feature. This display provides up to date information on the types of Input and Output boards in the system, the revision of each board and the Monitor Matrix Output that is switched up.

The display format (per line) is shown below:



1. **Chassis location of Card: Range - 00h to 27h**
2. **Four Digit Part Number of Card**
3. **Card Dash Number**
4. **Card Revision Number**
5. **Signal Presence Indicator**
6. **Card Specific Range = 00h to FFh**
7. **Card Specific Range - 00h to FFh**
8. **Card Specific Range - 00h to FFh**
9. **Monitor Matrix Output Reported; (Indicated on Output boards only) 08h = Out 0, Monitor Matrix Enabled; 0Fh = Out 7 on; Default = 8Fh; Off = 00h**

Cd	00	PN:	1026 - 10A0	I0 =	01	00	10	00	0F

Typical Data represented by a Digital Audio Input Board: *Card Slot 00, Board Part Number = 1026, Dash Number = 10, Revision A, IO Data = Input 00 contains* ***signal present****.*

Cd	05	PN:	1027 - 1001	I0 =	01	04	00	00	00

Typical Data represented by a Digital Audio Output Board: *Card Slot 05, Board Part Number = 1027, Dash Number = 10, Revision 01, IO Data = Output 00 contains* ***signal present****.*

5 **Signal Presence Indicator: The byte of information contains a single bit that indicates presence (1) or not (0) for each input or output on the card.**

Input / Output	0	1	2	3	4	5	6	7
Value	01	02	04	08	10	20	40	80

FIGURE C-5. Display format - I/O card info

Note: These values Add if more than 1 I/O contains a signal. (FF = All Signals Active)

IO Information – full display

The complete terminal display of IO Information is shown below. This is how this screen should appear, dependent on the size of your system. A smaller system will have a larger portion of the screen showing boards “Not Installed”. Note: on the bottom of the display, data on the system crosspoint is reflected. This data is also available in the Hardware Status feature.

```
IO CARD INFORMATION =
Cd 00 PN:0967-1003 IO = 000000000F | Cd 01 PN:2407-1003 IO =
0400000000 |
Cd 02 PN:2407-1003 IO = 0000000000 | Cd 03 PN:2407-1003 IO =
0000000000 |
Cd 04 PN:2407-1003 IO = 0000000000 | Cd 05 PN:2406-1003 IO =
FF00000000 |
Cd 06 PN:0966-1003 IO = FF00000000 | Cd 07 PN:0966-1003 IO =
FF00000000 |
```

FIGURE C-6. I/O info - Full display

IO Card Information – Locator Diagram

The following diagram gives an illustration of how the IO Information display actually relates to the physical chassis. This is a useful tool for locating suspect Inputs or Outputs or just for changing or Input or Output boards to your system.

<table>
<tr><td rowspan="2">B</td><td>In 16 - 23 Cd. 6</td><td rowspan="5"></td><td>In 31 - 24 Cd. 7</td><td rowspan="2">B</td></tr>
<tr><td>In 0 - 7 Cd. 4</td><td>In 15 - 8 Cd. 5</td></tr>
<tr><td></td><td>Crosspoint</td><td>Crosspoint (option)</td><td></td></tr>
<tr><td rowspan="2">A</td><td>Out 16 - 23 Cd. 2</td><td>Out 31 - 24 Cd. 3</td><td rowspan="2">A</td></tr>
<tr><td>Out 0 - 7 Cd. 0</td><td>Out 15 - 8 Cd. 1</td></tr>
</table>

FIGURE C-7. I/O locator diagram

```
Cd 00 PN : 1041-0101 IO = 00100000008  |  Cd 01 PN: Not Installed
Cd 02 PN : 1040-0102 IO = 00100000000  |  Cd 03 PN: Not Installed
Cd 04 PN : 1026-0101 IO = 00001000000  |  Cd 05 PN: Not Installed
Cd 06 PN : Not Installed               |  Cd 07 PN: Not Installed
Xpt  =  1191-0100
```

FIGURE C-8. I/O Card Information - AUDIO

Hardware Status Display

By pressing the lower or upper case “S” the Hardware Status is displayed on the screen. This display gives a snapshot of the current condition of the major system components being monitored in the router.

The display will be similar to what is shown below. A brief description of the data is explained below.

```
HARDWARE STATUS
 UT400/32   XPT
 Slot  =  Primary
 Active?   Yes
 Local PS Status   =   Local PS OK (Audio system list the crosspoint voltages)
 External PS Status   =
 PS1  (RH)   Installed  -> YES.  |  Error Code  -> No Error   |   TEMP  ->  32C
 PS2  (LH)   Installed  -> YES.  |  Error Code  -> No Error   |   TEMP  ->  32C
```

- Slot: Refers to the location of the crosspoint; primary or redundant.
- Active refers to the state of the crosspoint; yes or no.
- Error Register, Board Pres Regs, and Primary /ID Reg are for Factory Use.

- Local PS Status: Monitors all voltages on the crosspoint and reports any errors as “**FAIL**”.
- External PS Status: Reflects the status of the power supplies installed in the system and reports any errors. The temperature of each power supply is also monitored in Celsius. If a power supply is not installed, there is a “No” following the arrow. A fan failure will display an actual “Fan Error”.

UT-400/32 ADC Setup Details (Video)

This solely deals with the 121045-1 Analog to Digital Conversion cards.

A function and associated menu items was added that allows a selectable reset of the converter chips on these cards when the transition from an unlocked state to a locked state. This was put in place due to an issue with the ADC chips that prevented them from successfully locking to a source after having been fed non-standard video for a period of time. This typically manifests itself on inputs fed by satellite or microwave receivers that transition from a de-tuned mode (where unwanted video is put out) to a tuned mode where real video is generated.

Menu Items

To enable this feature on a given block of 8 inputs, a series of commands must be entered.

“CNTRL + D” (Hold down the CONTROL key and press D). This enables the debug mode.

Use upper case U and D keys to direct the software to the card you wish to enable this function on. After each entry, the card that the software is ‘pointed’ to is reported. (The Utah-400 32x32 should only point to the input cards - CD 04-CD07.)

The number 6 is then entered to enable or disable the function on this card.

When the ‘6’ key is pressed, the system will report a string of bits that represent whether or not the function is enabled for each card slot. This data takes the form of 40 bits, represented in 5 bytes of hex data. A 1 in a bit position indicates that the function is enabled for that card. In the Utah-400 32x32, the leftmost digit is the only data that should change. That digit will be a value of 0 - F where 0 = all disabled and F = all enabled. (e.g., 2 = CD 05 enabled, 3 = CD 04 and CD 05 enabled, etc.)

Status

Whenever this auto-reset function is performed by the software, a report is issued to the debug port of the router. It takes the form of an ‘*’ followed by two numbers -- the hexadecimal address of the card, and the number, 0 0 7, of the input that was reset.