Utah Scientific
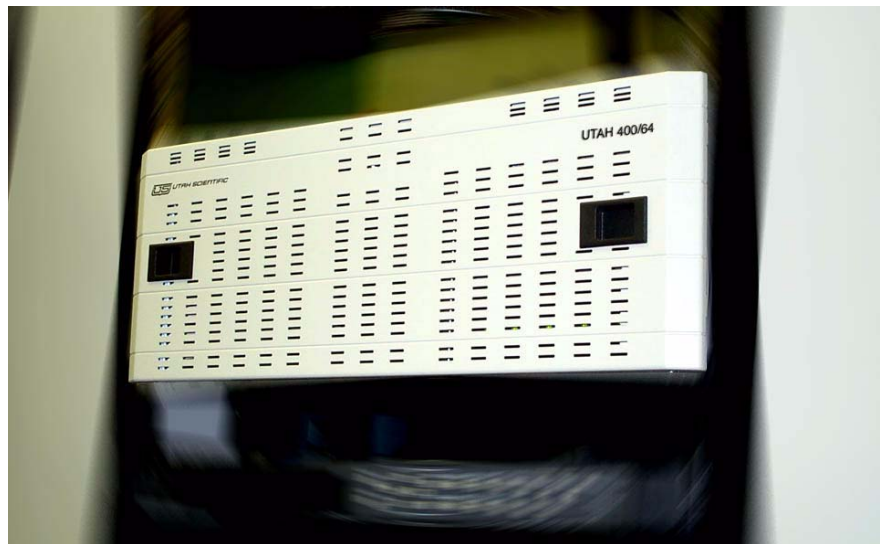
The Utah-400 Digital Routing Switcher

64x64 Systems

System Setup and Operations

The Utah-400/64x64 Digital Routing Switcher Operators' Manual

- Document Number: 82101-0071
- Document Version: 2.2.1
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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).

$$C \epsilon$$

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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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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For the first one (1) year after purchase of the software and the first ten (10) years after the date of purchase of the hardware, Utah Scientific's and its suppliers' entire liability and purchaser's exclusive remedy shall be, at Utah Scientific's option, either:

- 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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CHAPTER 1   *Introduction*

In This Guide

This guide provides instructions on installing, configuring and operating the Utah Scientific, Utah-400 Digital Signal Routing Switcher (64x64 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:

Crosspoint   **Routing Switcher Matrix**
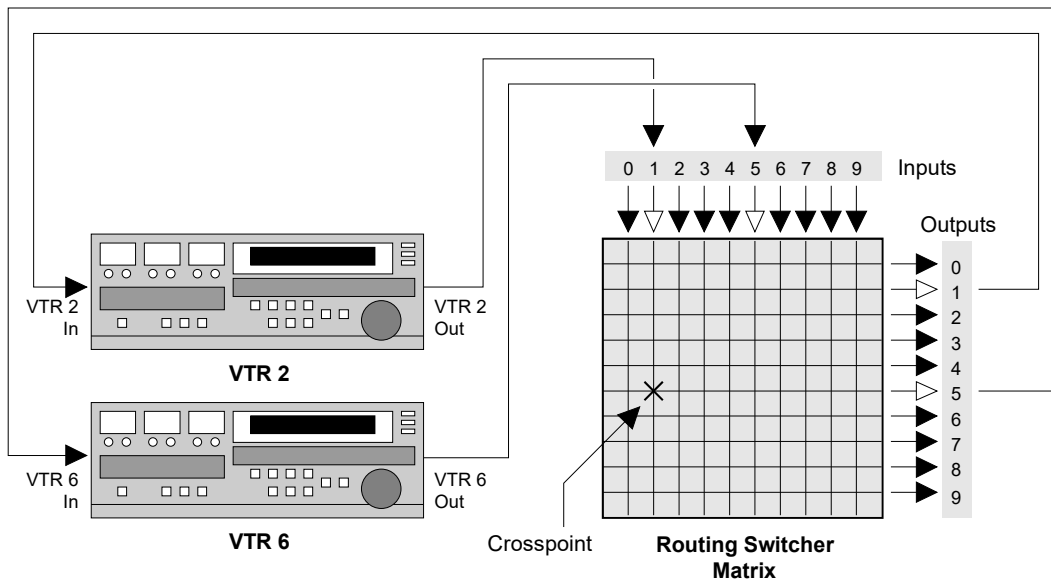
- Each VTR is fully connected to the matrix – all audio/video inputs and outputs.

- 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 crosspoints.

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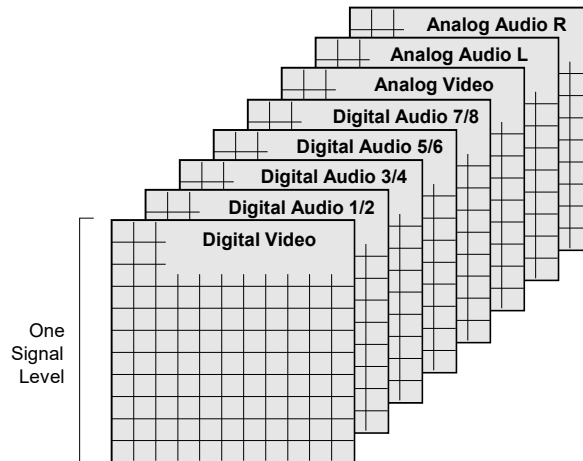
Signal routers are typically much larger than a 10 X 10 matrix, depending on user needs. Each signal level may also have different sizes of matrices and do not all need to be the same size.

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 to the left of the midplane (cross-point) in the chassis; all output boards are installed to the right 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 crosspoint status port – J1.

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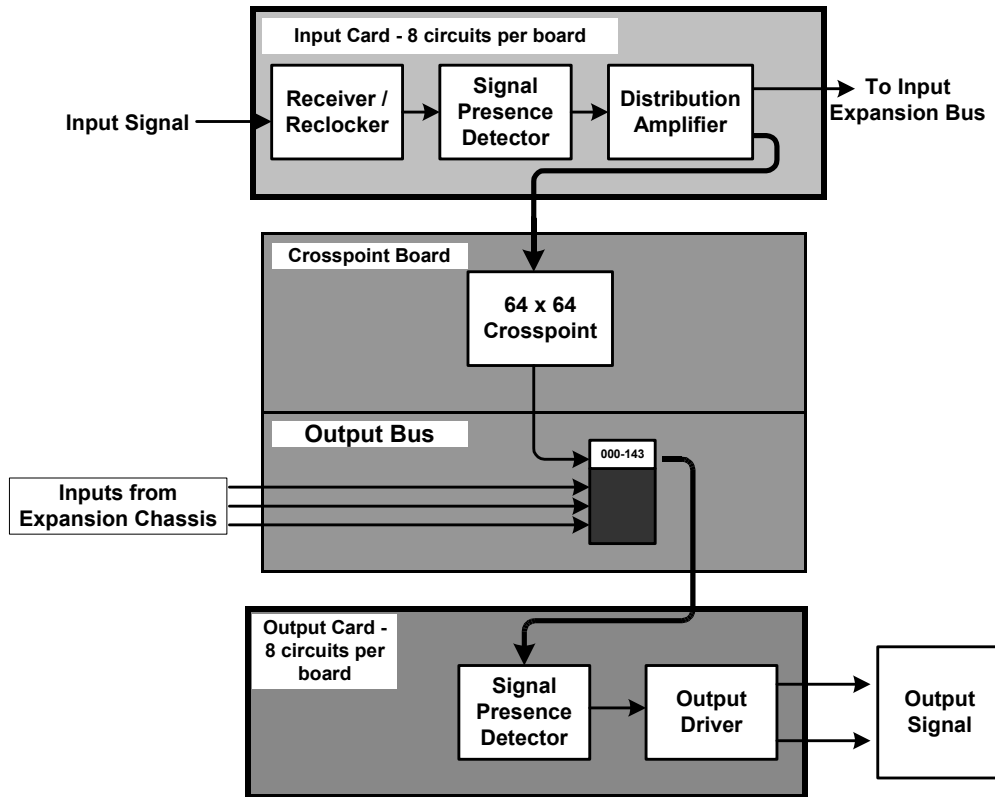
FIGURE 1-1. The Utah-400 Matrix Block Diagram

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 64 X 64 up to 1152 X 1152.
  - Very compact – 64 x 64 = 4 RU; RU; 576 x 576 = 48 RU.
  - Fully redundant Power Supplies and AC sources. (Separate plugs for each chassis supply.)   64x64 HD < 200 watts
  - Low power consumption – 144 x 144 HD = < 300 Watts.
  - Two cooling fans with rear exhaust.
  - Fans replaceable without powering down router.
  - 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
  - Internet
  - RS-232 / RS-422
  - Personal Computer

- 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
    - Fiber cards

- 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 Crosspoint Board.
    - 64 squared matrix.
    - One Monitor Matrix output per crosspoint.
    - Available with redundant control modules.

System Configurations

The chassis configurations for the Utah-400's 64x64 Digital Router involve several variations.

These slots are unoccupied during SC-4 control

Redundant Optional

		SC-400 Controller	**Optional Power Supply**	
	Power Supply			
	56 - 63		63 - 56	
	48 - 55		55 - 48	
	40 - 47	Primary Crosspoint / Redundant Crosspoint Optional	47 - 40	
	32 - 39		39 - 32	
	24 - 31		31 - 24	
	16 - 23		23 - 16	
	8 - 15		15 - 8	
	0 - 7		7 - 0	

Input   Output

Continued

Variations are subject to the customer's requirements, and may include the following:

• 1 or 2 power supplies

• 1 or 2 crosspoint cards

• SC-400 control

• SC-4 external control

Dual Power Supply, SC-400 Control,
Redundant crosspoint cards

Single Power Supply, SC-200 Control,
Redundant crosspoint cards

Single Power Supply, SC-400 Control,
Redundant crosspoint cards

Single Power Supply, SC-400 Control,
Single crosspoint card

FIGURE 1-2. Sample 64x64 Chassis Configurations

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: This Utah-400 router weighs up to sixty pounds with shipping materials and accessories.*

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.
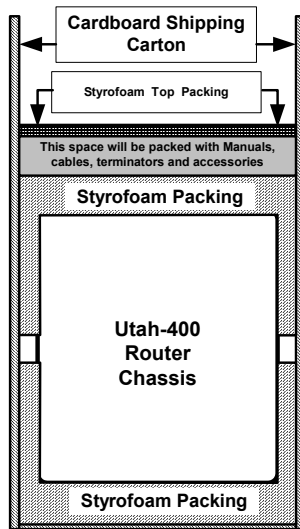
FIGURE 2-1. Utah-400 Packaging

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 an SC-400 is installed.

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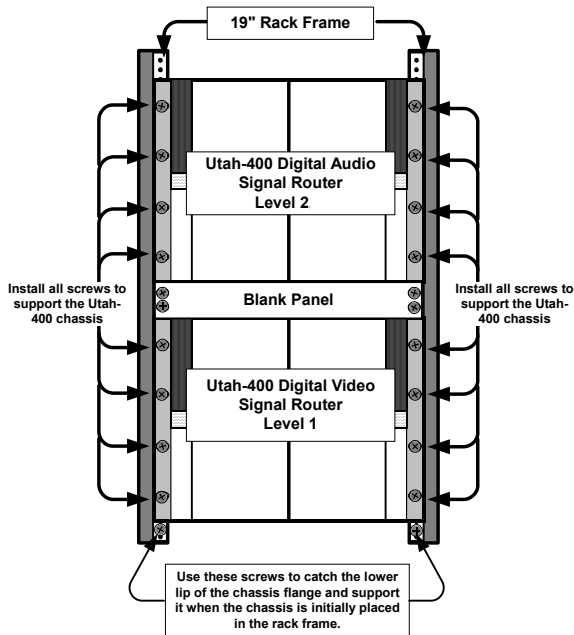
FIGURE 2-2. **Utah-400 Chassis Mounted in 19" Rack Frame**

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

Note: The 64 x 64 chassis (with power supplies and PCB's) weighs close to 50 pounds; Utah Scientific recommends a minimum of two persons, preferably three, 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.
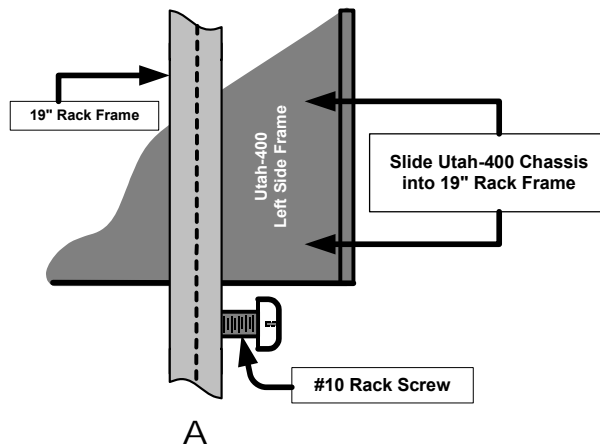
FIGURE 2-3. Sliding the Utah-400 Chassis into Rack Frame
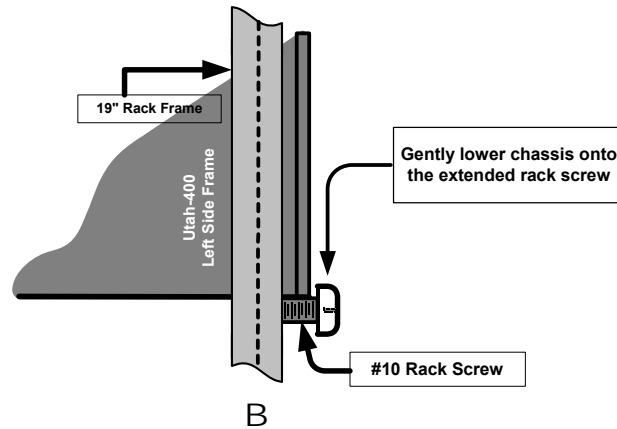
FIGURE 2-4. Lowering the Utah-400 Chassis on the Rack Screw

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 SC-400 controllers. The illustrations on the following page contain the proper connections for either UT-400 with internal SC-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 contains (uses) an internal SC-400.*

The following illustration shows a typical MX-Bus installation.
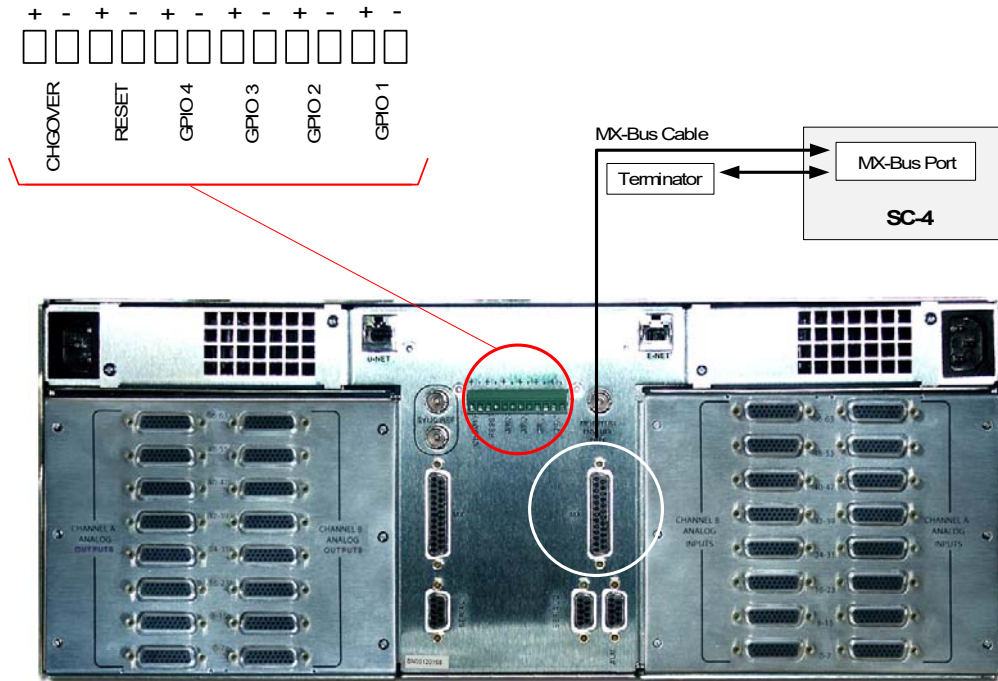
FIGURE 2-5. The MX-Bus Installation to an SC-4 Controller

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. GPIOs 1 - 4 are not currently used.

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

If your UT-400/64 was ordered with internal SC-400 control cards and no other UT-400 frames were ordered with your system, both MX-Bus ports should contain terminators. If your system has internal SC-400 cards and there are multiple UT-400 frames, use the following illustration as a cabling guide.
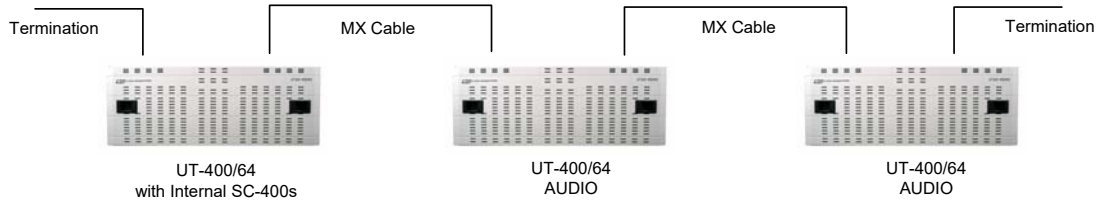
FIGURE 2-6. Basic UT-400/64 cabling

Each 400/64 frame contains two looping reference BNCs. The signal type to be applied to the input is different for audio and video frames.

Audio frames -- with or without internal SC-400 control cards -- 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 SC-400. Video frames containing no internal SC-400 cards require no connection to these BNCs.

Determining and Setting Router Signal Levels

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. Locate the configuration dipswitch on the crosspoint board (below).
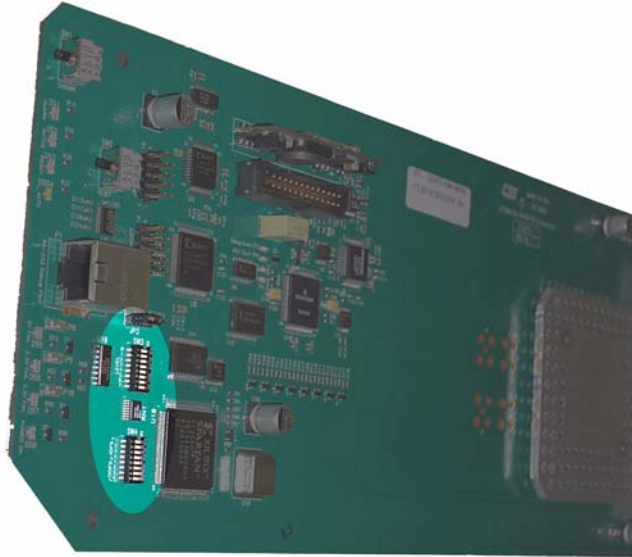
FIGURE 2-7. Crosspoint Carrier Board Dipswitch Location

5. There are two eight-position dipswitches on the Crosspoint Carrier Board. (Labeled as 'Level' and 'Offset'.)

6. Reference Table 2-1 to set the Level dipswitches and Table 2-2 to determine which switches must be changed for the Level desired.

7. Reference Table 2-3 to set the Offset dipswitches per your requirements.

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

IN   OUT

OFFSET

Switch 2 down = Level 3

1 2 3 4 5 6 7 8
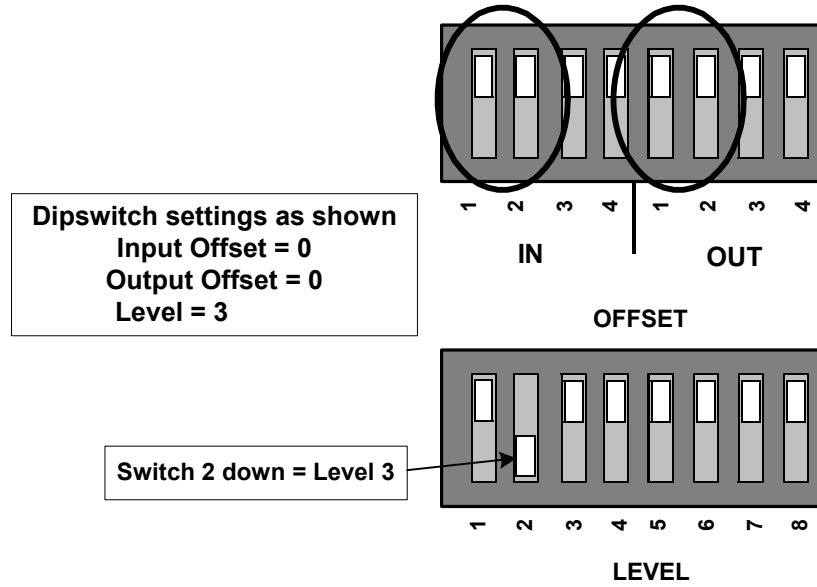
LEVEL

ON = position *toward* the number on the board

FIGURE 2-8. **Utah-400 Configuration Dipswitches as they appear on the Crosspoint Carrier Board**

TABLE 2-1.

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
1	Input/Output Offset 64	Offsets Base input/Output by 64 from 0
2	Input/Output Offset 128	Offsets Base input/Output by 128 from 0
3	Input/Output Offset 192	Offsets Base input/Output by 192 from 0
4	Input/Output Offset 256	Offsets Base input/Output by 256 from 0

TABLE 2-3.

Input/Output Offset		
Switch 1	**Switch 2**	
OFF	OFF	No offset
ON	OFF	Offset by 64
OFF	ON	Offset by 128
ON	ON	Offset by 192

Installing the Video Input and Output Signals

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

Input Signal	Recommended Cable Type	Maximum Cable Length	Termination Method
Digital Video	Belden 8281	300 M. / 1000'	Internal - 75 Ohm
High Definition	Belden 8281	100 M. / 300'	Internal - 75 Ohm
	Belden 1694A	150 M. / 500'	Internal - 75 Ohm

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 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 Input matrix starts with Input 0 at the lower right section of the back-plane.

- The Utah-400 Video Output matrix starts with Output 0 at the lower-left.

- Due to the 75 Ohm internal termination, do not use BNC "T" connectors to loop an input sig-nal. This will result in serious signal degradation.

063	062	061	060	059	058	057	056
055	054	053	052	051	050	049	048
047	046	045	044	043	042	041	040
039	038	037	036	035	034	033	032
031	030	029	028	027	026	025	024
023	022	021	020	019	018	017	016
015	014	013	012	011	010	009	008
007	006	005	004	003	002	001	000
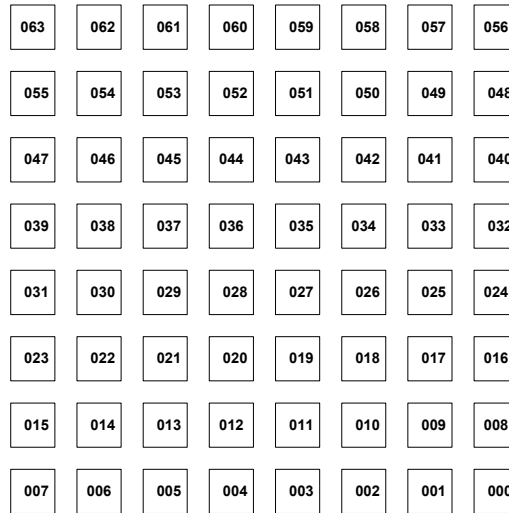
FIGURE 2-9. Unbalanced Digital Audio/Digital Video Input Connector Matrix

056	057	058	059	060	061	062	063
048	049	050	051	052	053	054	055
040	041	042	043	044	045	046	047
032	033	034	035	036	037	038	039
024	025	026	027	028	029	030	031
016	017	018	019	020	021	022	023
008	009	010	011	012	013	014	015
000	001	002	003	004	005	006	007
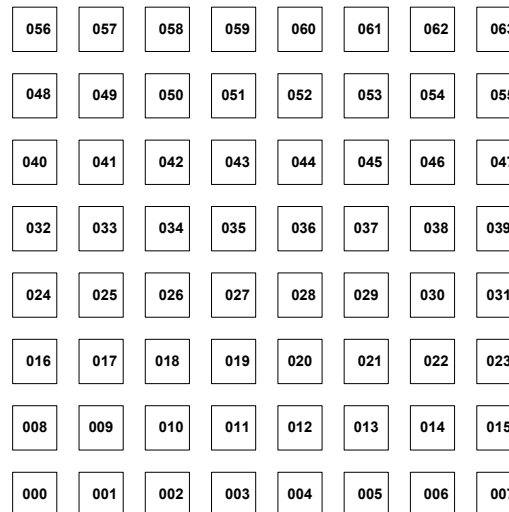
FIGURE 2-10. Unbalanced Digital Audio/Digital Video Output Connector Matrix

Installing the 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 2-13 illustrates an example of a Utah-400 Analog Audio Backplane. Use this figure for Input/Output connector reference.

Table 2-4 shows the connector pin-out for the 26-pin high-density connectors.

Figure 2-14 shows a blown up view of the Male 26-pin high-density connector.

Figure 2-15 shows a blown up view of the Female 26-pin high-density connector.

OUTPUTS 56-63   INPUTS 63-56

OUTPUTS 0-7   INPUTS 7-0
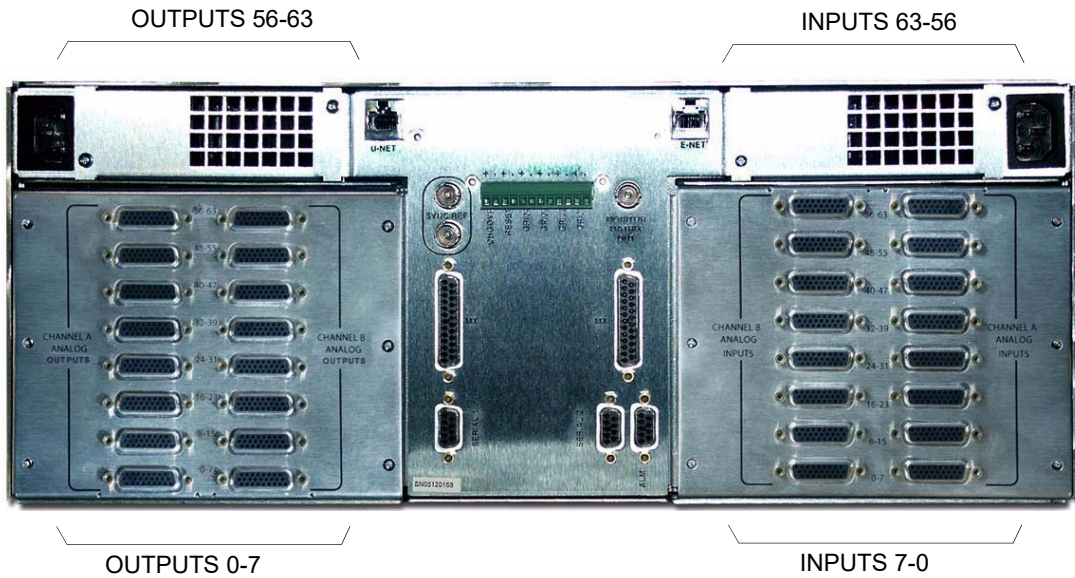
FIGURE 2-11. Utah-400 Analog Audio Backplane

The standard configuration for the Utah-400 Analog Audio Input and Output using DB-26 connectors (illustrated 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:

- 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.
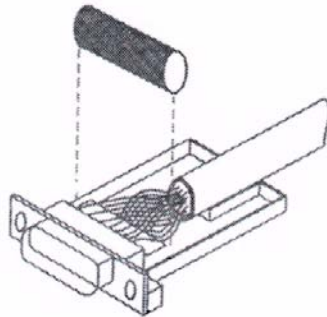
- Provide proper strain relief for the cable ends; use tie-wraps to anchor the cables as they are installed.

- 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 2-4. 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
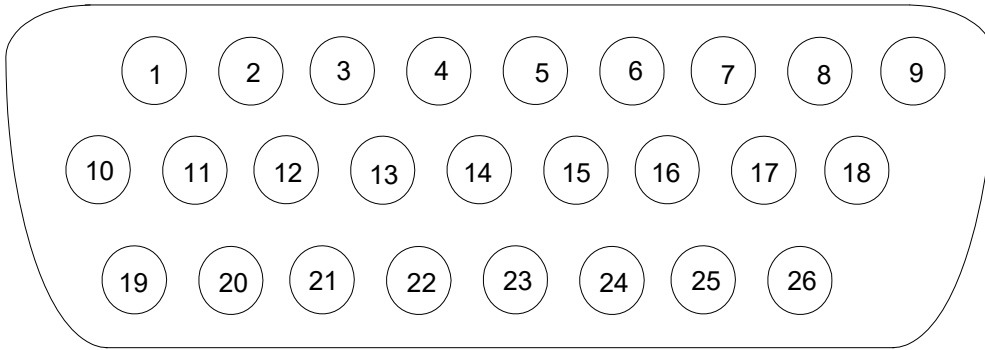
FIGURE 2-12. DB-26 High-Density Male Connector
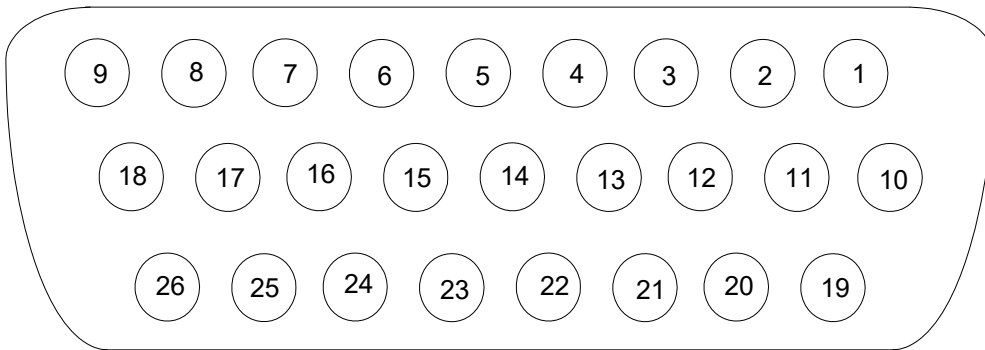
FIGURE 2-13. DB-26 High-Density Female Connector

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.
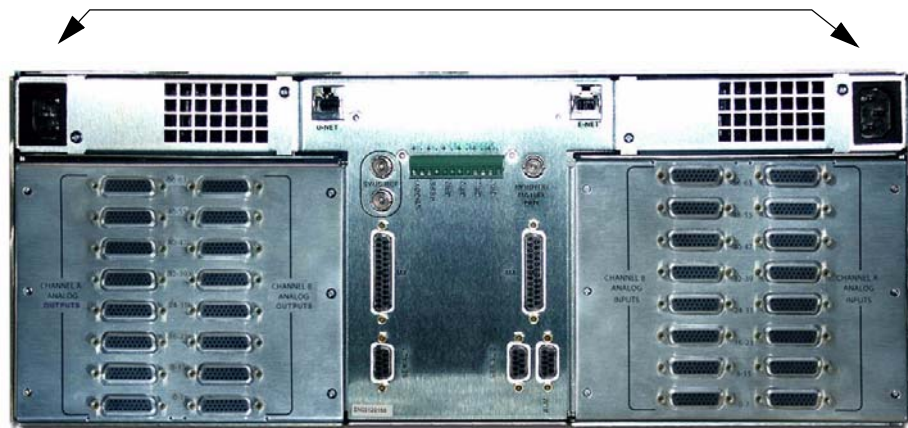- Plug the 3 pronged AC Plug into the desired AC source(s).

FIGURE 2-14. Utah-400 (64x64) Power Connections

DC Connectivity

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.
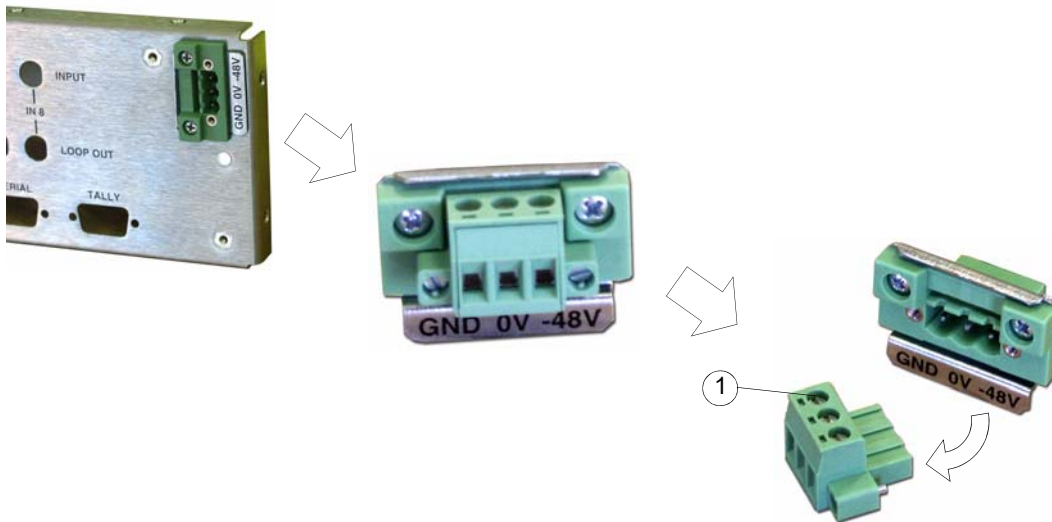
Note that this configuration is a DC isolated connection.

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.

Crosspoint LEDs

If no LED's on the Crosspoint board are on:

The 64x64 system's crosspoint card contains a *soft start circuit* rather than a standard fuse assembly. This non user-serviceable circuit is designed to sense any over current situation along the board and may cause the crosspoint card to reset if an overload is detected. Press the board's reset button if no LEDs are illuminated on the card.

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 does not respond to a reset.

UTAH-64x Read Out / Layout

PS #	CNT		PS #
	CNT		
0F			07
0E			06
0D			05
0C			04
0B			03
0A			02
09			01
08	**P / XPT**	**R / XPT**	00
INPUTS			**OUTPUTS**

IO Card Information =

Cd 00 PN:1015-10A1 IO = 0F00000000 | Cd 01 PN:1019-10A0 IO = 0F00000000 |

Cd 02 PN:1016-10A0 IO = 0F00000000 | Cd 03 PN:1015-10A0 IO = 0F00000000 |

Cd 04 PN:1015-10A0 IO = 0F00000000 | Cd 05 PN:1015-10A0 IO = 0F00000000 |

Cd 06 PN:0966-1003 IO = 0F00000000 | Cd 07 PN:0966-1003 IO = 0F00000000 |

Cd 08 PN:1045-10A0 IO = 0F00000000 | Cd 09 PN:0967-1003 IO = 0F00000000 |

Cd 0A PN:1045-1004 IO = 0F00000000 | Cd 0B PN:2407-1030 IO = 0F00000000 |
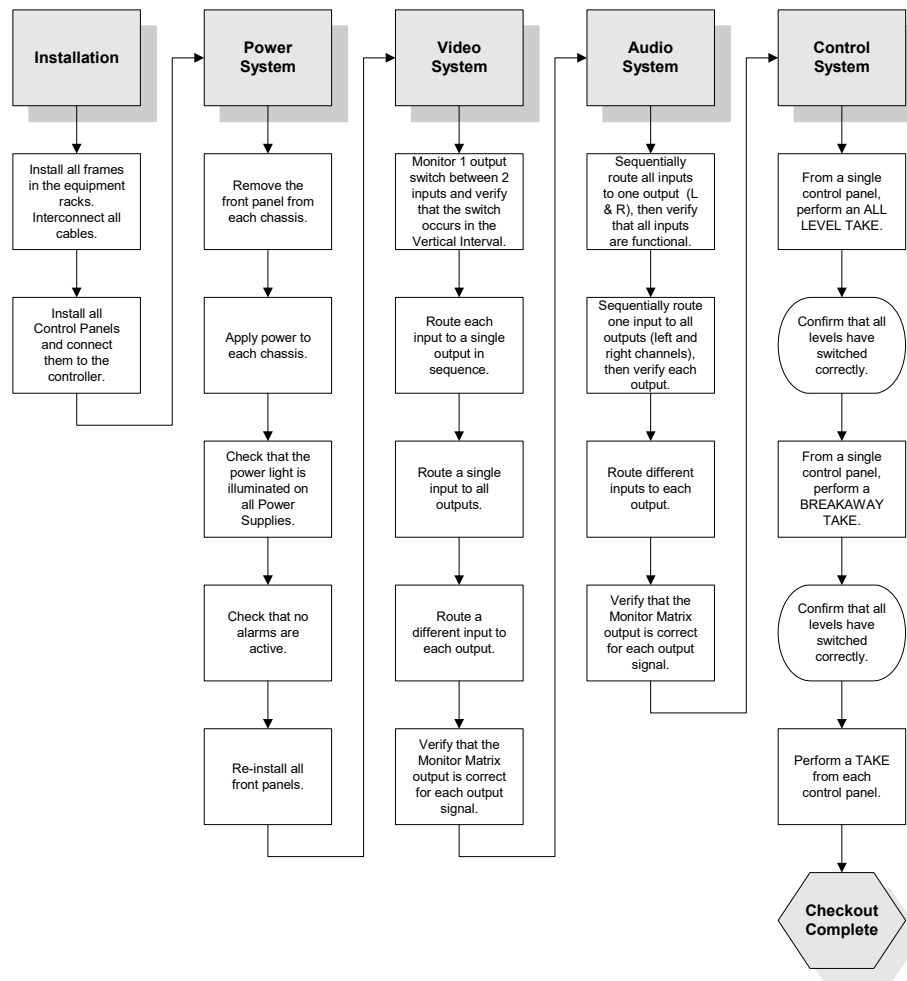
Cd 0C PN:2407-1030 IO = 0F00000000 | Cd 0D PN:0967-1003 IO = 0F00000000 |

Cd 0E PN:0967-1003 IO = 0F00000000 | Cd 0F PN:1016-10A0 IO = 0F00000000 |

Crosspoint = 1072-AA21

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.

• For the System Control column, the SC-3 Control system may require some configuration in order to perform all functions.

Installation	Power System	Video System	Audio System	Control System
Install all frames in the equipment racks. Interconnect all cables.	Remove the front panel from each chassis.	Monitor 1 output switch between 2 inputs and verify that the switch occurs in the Vertical Interval.	Sequentially route all inputs to one output (L & R), then verify that all inputs are functional.	From a single control panel, perform an ALL LEVEL TAKE.
Install all Control Panels and connect them to the controller.	Apply power to each chassis.	Route each input to a single output in sequence.	Sequentially route one input to all outputs (left and right channels), then verify each output.	Confirm that all levels have switched correctly.
	Check that the power light is illuminated on all Power Supplies.	Route a single input to all outputs.	Route different inputs to each output.	From a single control panel, perform a BREAKAWAY TAKE.
	Check that no alarms are active.	Route a different input to each output.	Verify that the Monitor Matrix output is correct for each output signal.	Confirm that all levels have switched correctly.
	Re-install all front panels.	Verify that the Monitor Matrix output is correct for each output signal.		Perform a TAKE from each control panel.
				Checkout Complete

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.
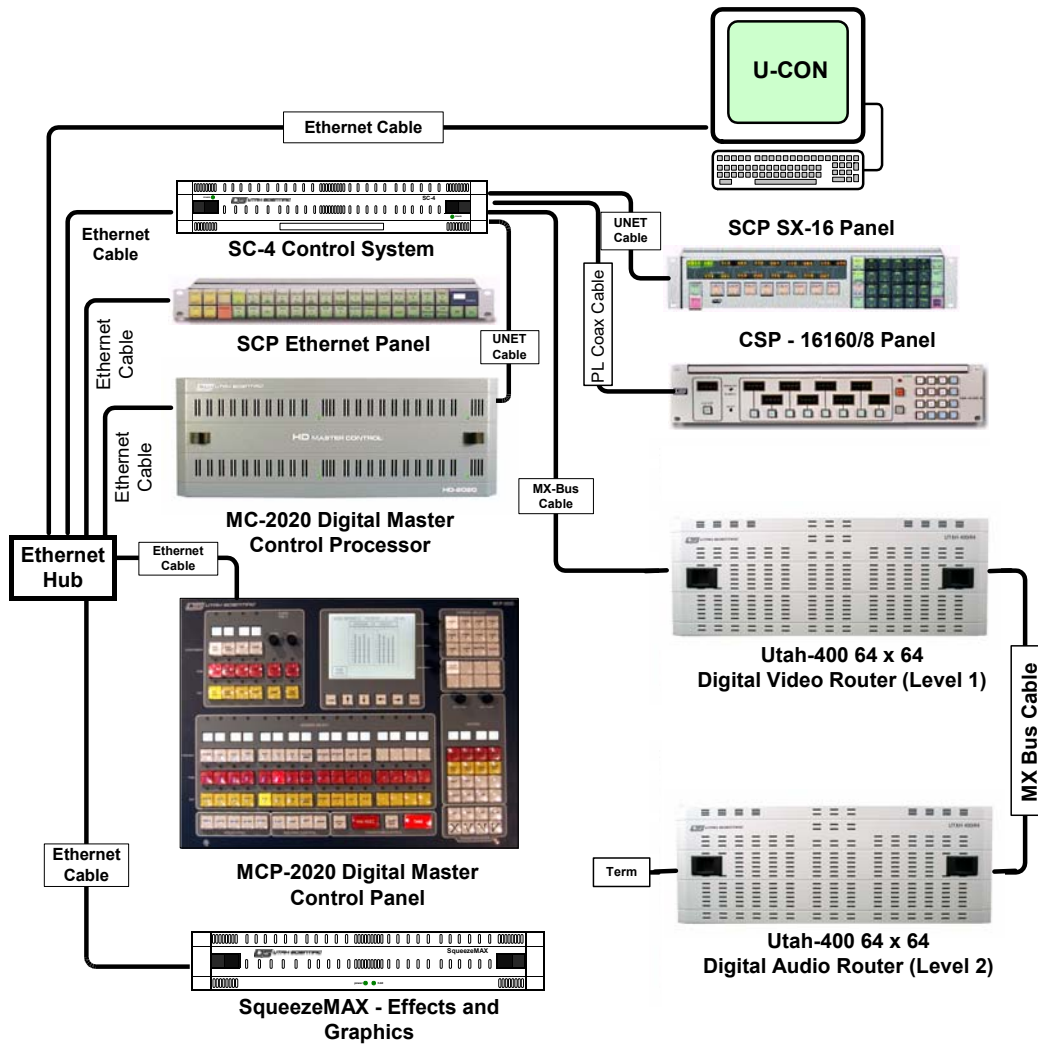

FIGURE 3-1. Utah 400 SC-4 Control
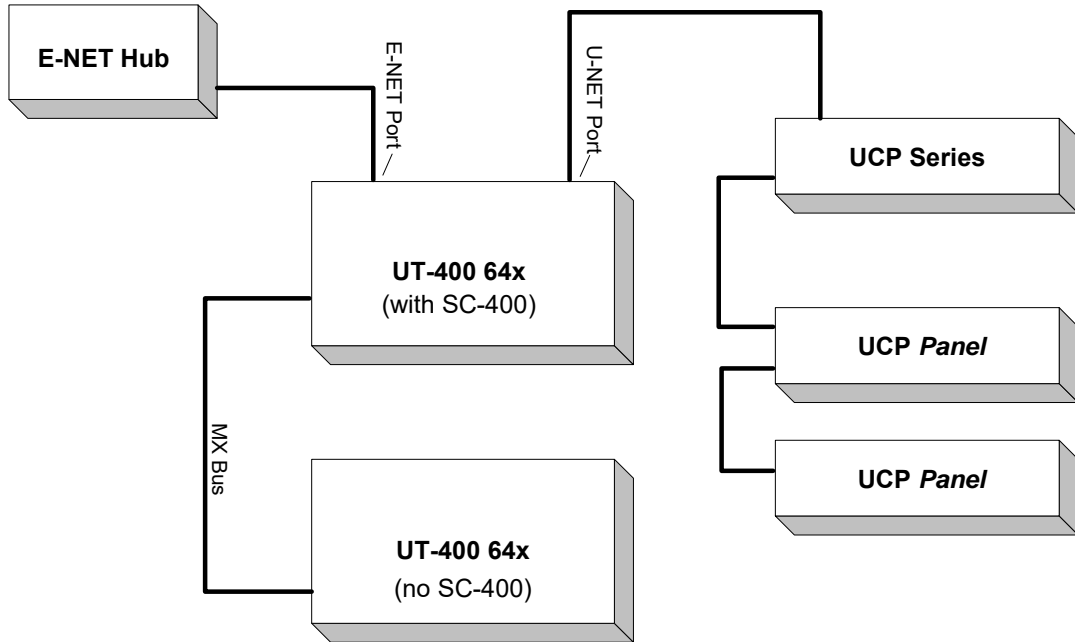
Internal SC-400 Based Connections

Diagram showing:
- **E-NET Hub**
- **UT-400 64x** (with SC-400)
- **UT-400 64x** (no SC-400)
- **UCP Series**
- **UCP *Panel***
- **UCP *Panel***

Connections labeled: E-NET Port, U-NET Port, MX Bus

TABLE 3-1. **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

SC-400 Control Board

The SC-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.

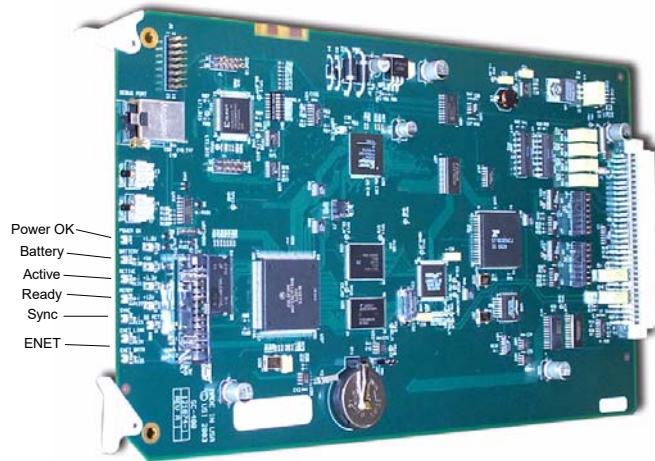Board placement within the
64x64 router

Power OK
Battery
Active
Ready
Sync
ENET

FIGURE 3-2. SC-400 Control Board View

The SC- 400 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.

- Power Ok. All power supplies are functional.

- Power Error indications. Located behind the Power Ok LED, these will illuminate to indicate a problem with a specified power supply. ***Note that when installed in the 400/64 chassis, an illuminated +12V alarm LED is normal.***

- Battery Error. 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.

SC-400 Jumper Settings

- J2 Switch -- Used to clear the RAM

- JP1 -- Serial Port 2

- JP2 -- Serial Port 1

SC-400 Dipswitch Setting

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 toward the silkscreened numbers, or to the *right* as the board is viewed from the front.

Operation

Input and Output Card Removal and Replacement

To correctly remove and replace the individual input and output 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.
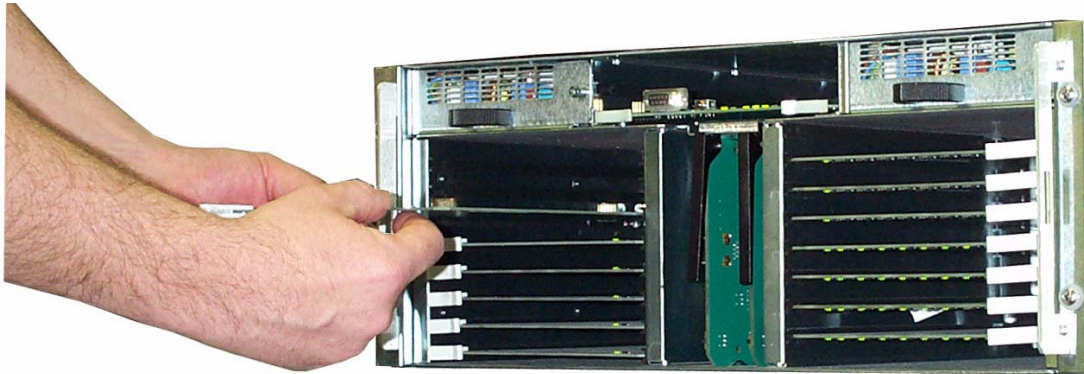
FIGURE 3-3. **Input/Output Board Replacement and Removal**

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

Crosspoint Card Removal and Replacement

The Crosspoint card uses a slightly different version of the locking and unlocking mechanism. The board is removed by gently pulling the ejector tabs outward, and locked into place by pressing the two tabs inward.

FIGURE 3-4. Crosspoint Board Replacement and Removal

Operation

Fan Service

Alarm indicators on the individual boards or front of the unit indicate fan problems. Individual fans can be removed and carefully disconnected using the small screws and mating connectors. Make sure the key is aligned properly when reconnecting.

FIGURE 3-5. Fan device location

Rear Panel Overview

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 on the primary crosspoint. Monitor Matrix data rate is limited to 360Mb per second.

Sync BNCs

Two additional midplane BNC connectors are used for loop through for the AES reference signal -- in the case of an audio router, and NTSC (or PAL) blackburst in a video router.
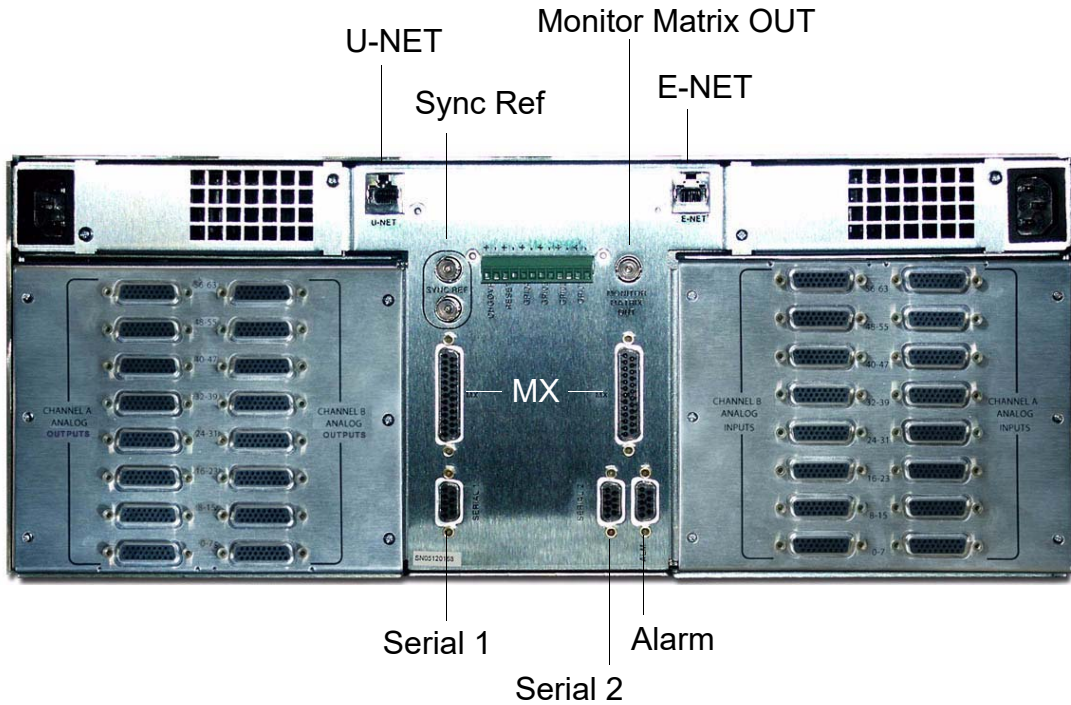
SC-400 - Specific Connections

FIGURE 3-6. **Utah-400 64x rear panel**

U-NET

U-NET is the Utah Scientific network used for all UCP Series control panels. This port is only active if the SC-400 control cards are installed in the frame. In the case of a system controlled by an SC-4, the U-NET panel connection will reside elsewhere. See the System Installation Guide for U-NET cable topologies.

E-NET

This is used to configure the SC-400 through the U-CON software. Applicable to any Ethernet-based control panel.

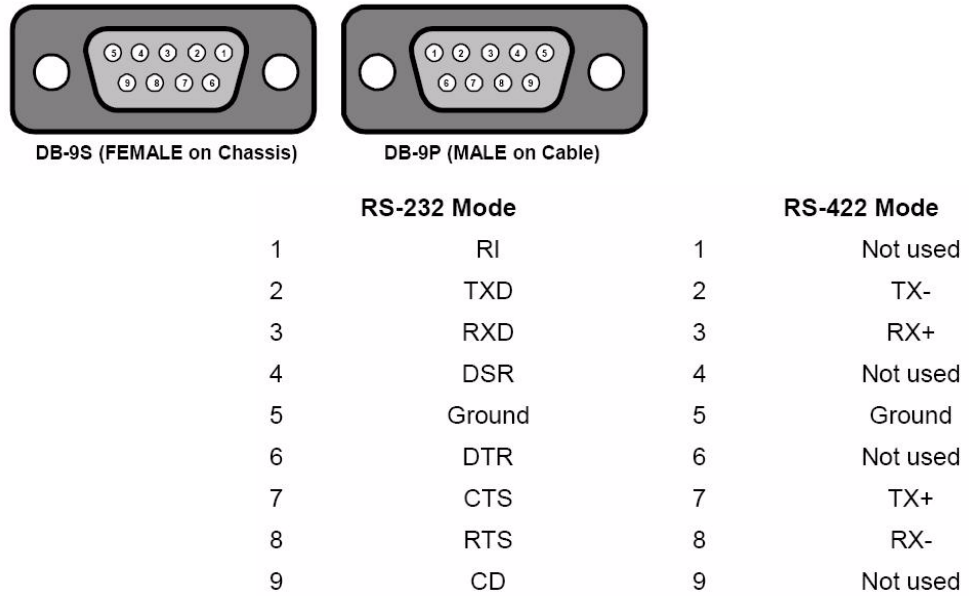## Serial Ports

The Utah-400 64x contains two serial ports.

DB-9S (FEMALE on Chassis)   **DB-9P (MALE on Cable)**

	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 3-7. Pinout detail

Alarm Ports

Connector Pin	Signal
1	ALM0
2	ALM1
3	ALM2
4	ALM3
5	SMPTE0
9	SMPTE1
6, 7, 8	GND

FIGURE 3-8. Alarm Port Pin-Outs for the DB-9 Connector

TABLE 3-2. **SC-400 Serial Port Parameters**

Two Serial Ports and 3rd Party Router Control 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

U-Net Connector
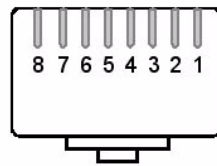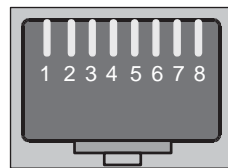
Male on Cable   Female on Chassis
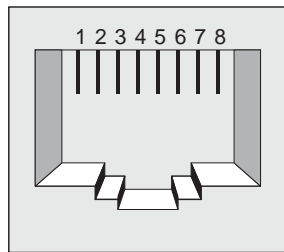
FIGURE 3-9. **Pin-outs for the RJ-45 U-Net connector**

TABLE 3-3. **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

U – NET Cabling

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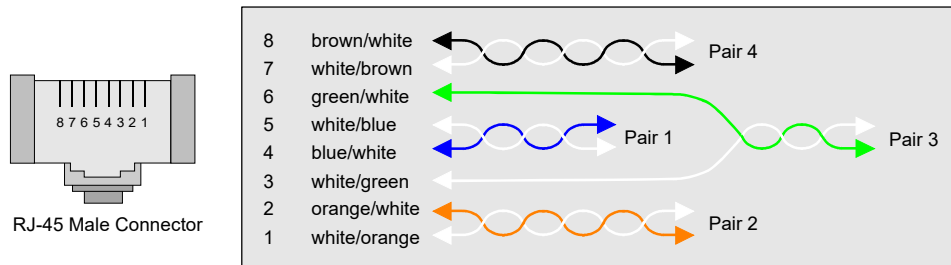

FIGURE 3-10. **RJ-45 (U-Net) Female Connector**

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

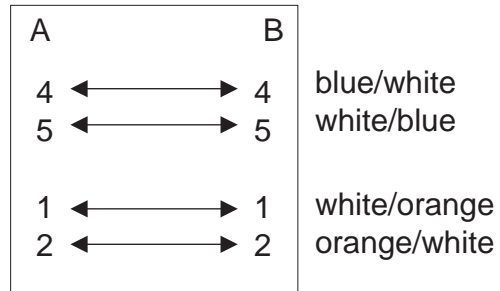**FIGURE 3-11. Standard Ethernet Cable Pairs**

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.

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

```
A              B
4  ◄────────►  4    blue/white
5  ◄────────►  5    white/blue

1  ◄────────►  1    white/orange
2  ◄────────►  2    orange/white
```

FIGURE 3-12. U-Net Cable Pairs and Pin-out

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.

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.
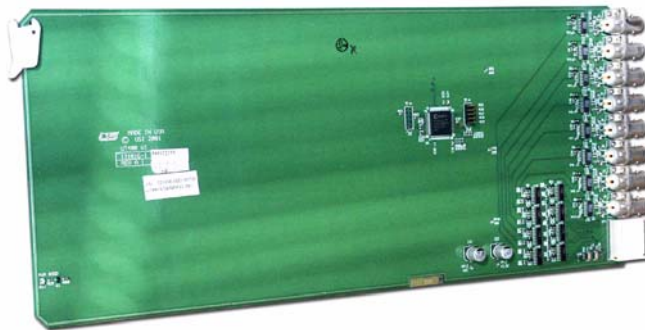
Video Input Boards

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.
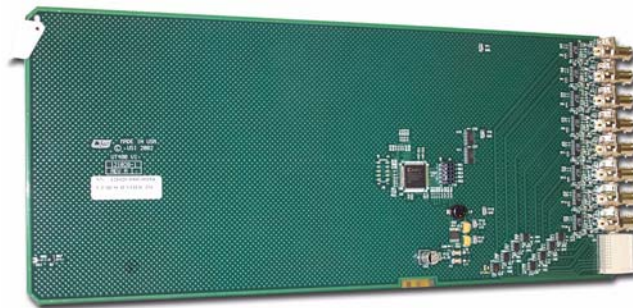

FIGURE 4-1. SD Video Input Board

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).
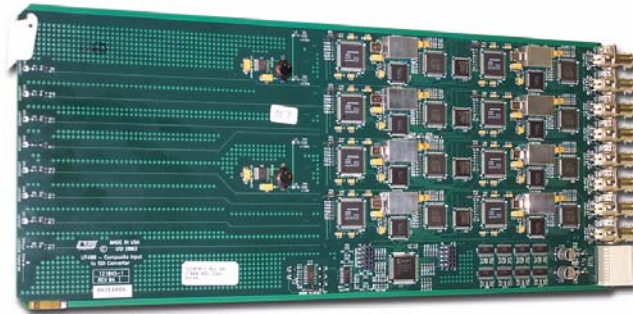

FIGURE 4-3. Analog to Digital Board

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.
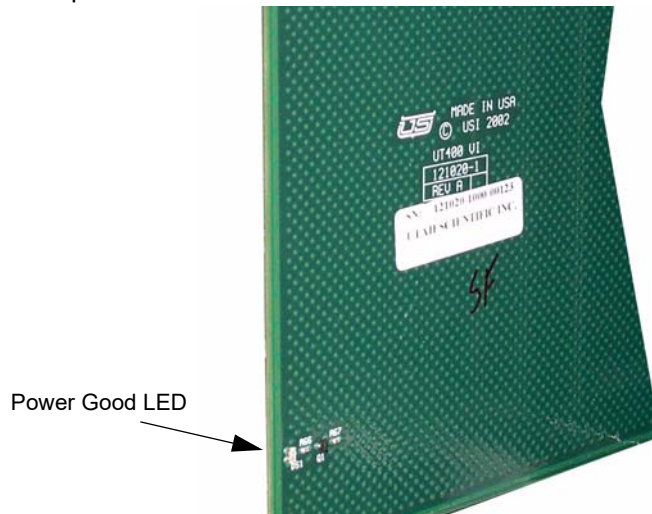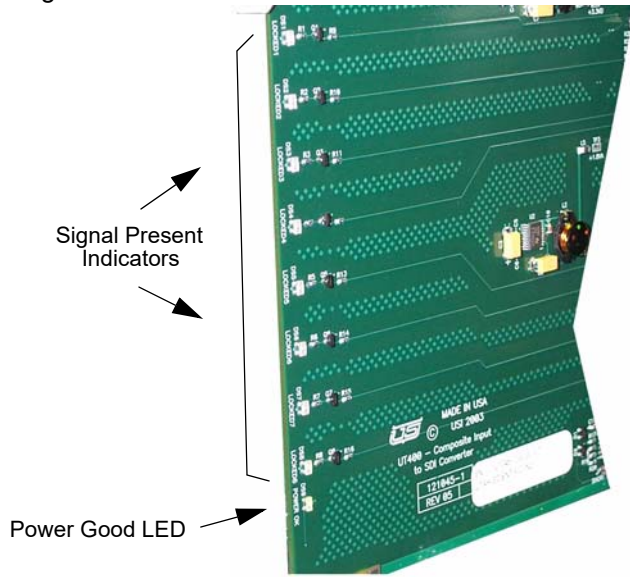

Power Good LED

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.

Signal Present Indicators

Power Good LED

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.
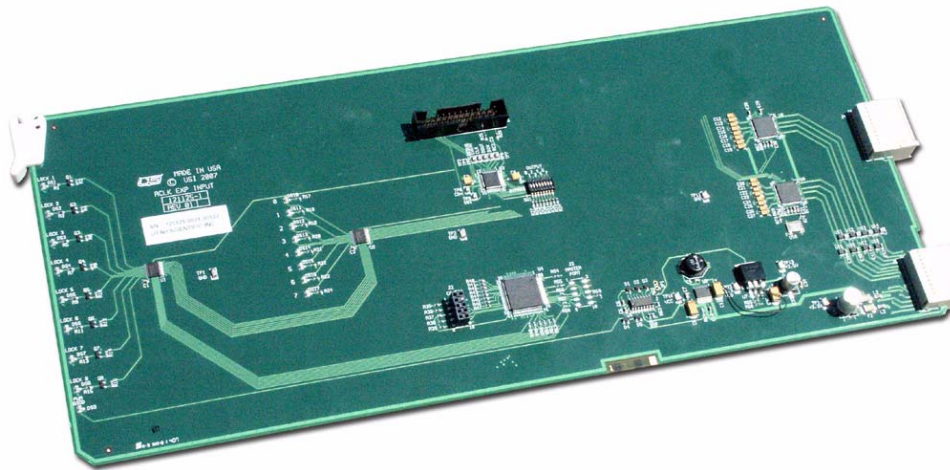

FIGURE 4-6. Reclocking Input Expansion card

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.
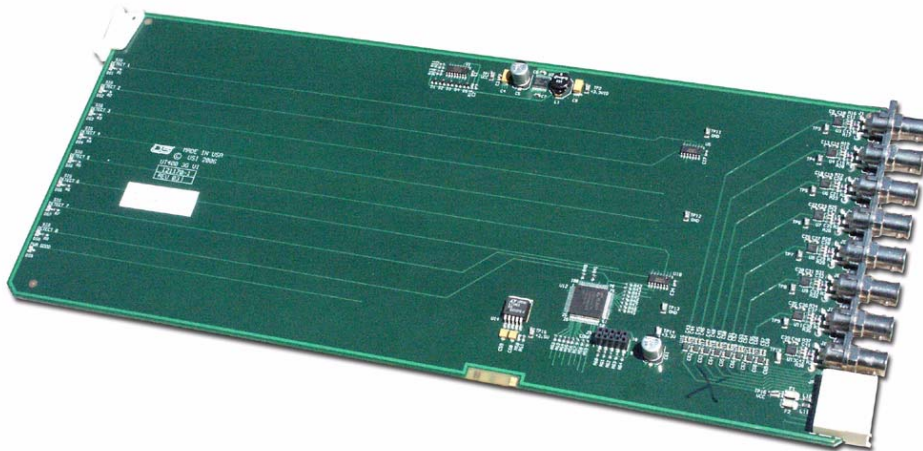
FIGURE 4-7. 3 Gig Input card

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.
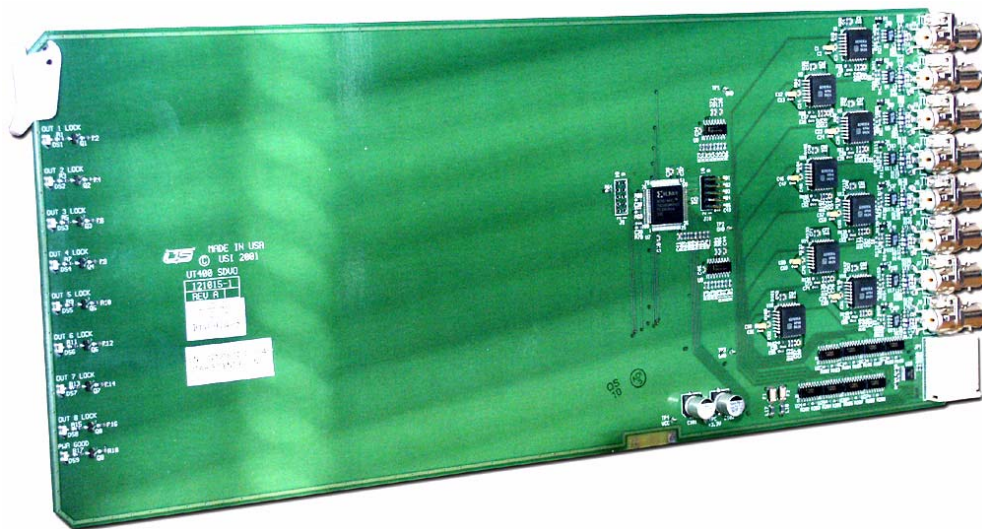

FIGURE 4-8. SD Output Board

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.
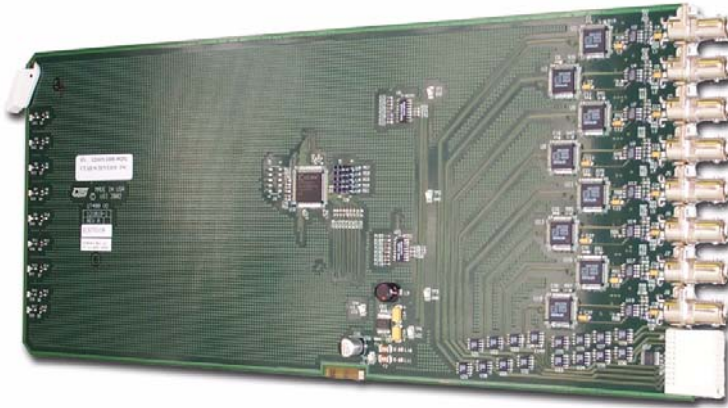

FIGURE 4-9. SD (Multi-Rate) Output Board

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.
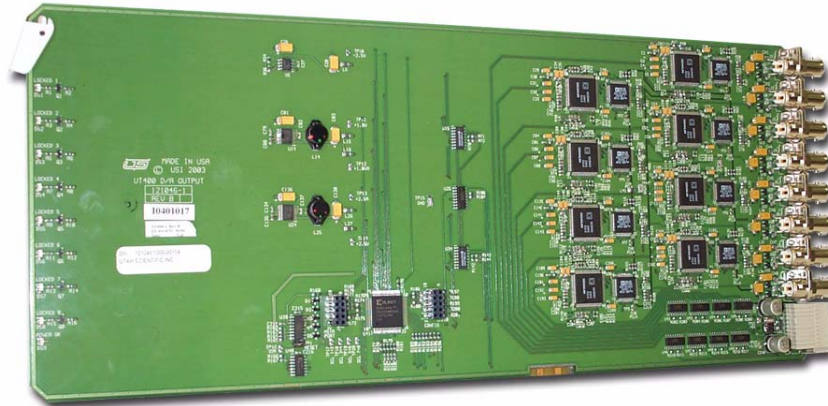
FIGURE 4-10. Multi-Rate Input Board

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.
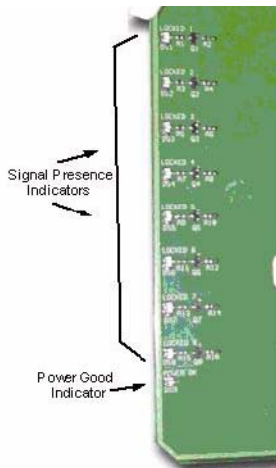
FIGURE 4-12. Digital Video to Analog LED Indicators

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.
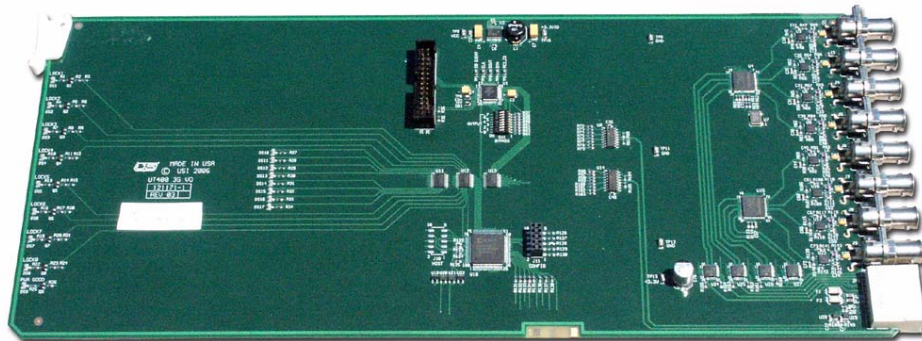

FIGURE 4-13.

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.

Fiber Interface

Utah 400 systems with fiber connectivity will contain dedicated input and output boards for this purpose. Instead of using BNCs for the physical connection, the system utilizes small modules that plug directly into the rear of the UT-400 chassis.
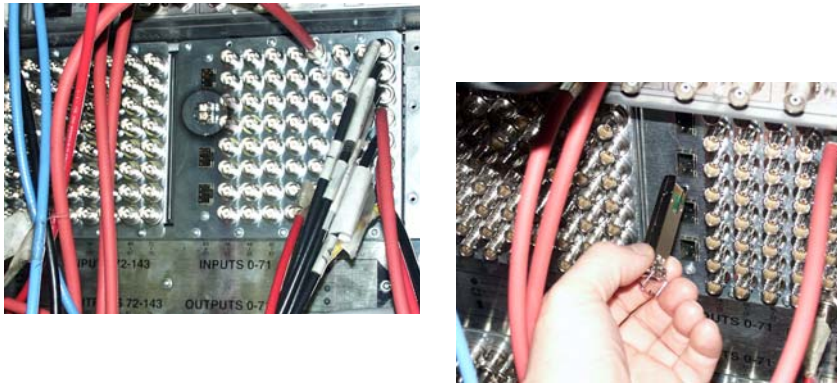
FIGURE 4-14. Module location and removal

The Input and Output board's LEDs are identical in functionality to their Multi-Rate Input and Output counterparts. (For more detail, see Fiber LED Indications - 4-12.)

Input board
Part #121116-1

Output board
Part #121117-1
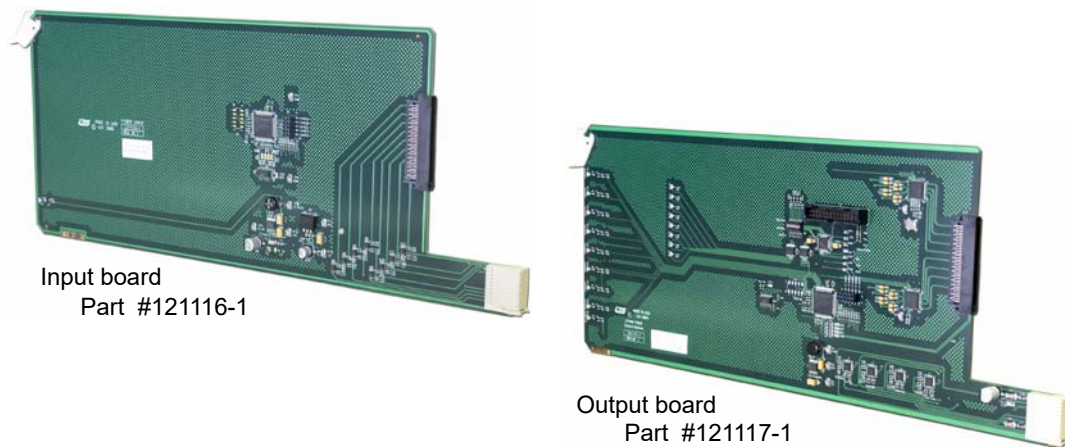
FIGURE 4-15. Input and Output boards

The small modules are responsible for the electrical-optical conversion, and are removable if service is required.

FIGURE 4-16. SP2T - Transmitter module

The SP2R is the receiver module, and is a part of the larger Input card assembly. The SP2T is the transmitter module, and makes up the Output card assembly. These modules are removed and replaced by moving the swinging bale (at the end) out of, and back in to the locked position.

The system's input and output *totals* are typically defined prior to equipment setup and operation. This is based on the number of total fiber inputs.

Specification Detail

- Optical Fiber Output – 1310 nm class 1 laser.

- Optical Output Power - -12dB minimum

- Optical Fiber Type – 9/125 uM Single Mode Fiber

- Connector Type - LC

- Typical Cable Length – 18 Miles SD, 10 Miles HD

- Optical Fiber Input – 1310 nm Class1 laser

- Optical Input Power - -20dB min

- Optical Fiber Type – 9/125 uM Single Mode Fiber

- Connector Type - LC

- Typical Cable Length – 18 Miles SD, 10 Miles HD

Fiber Output LED Indications

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
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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.
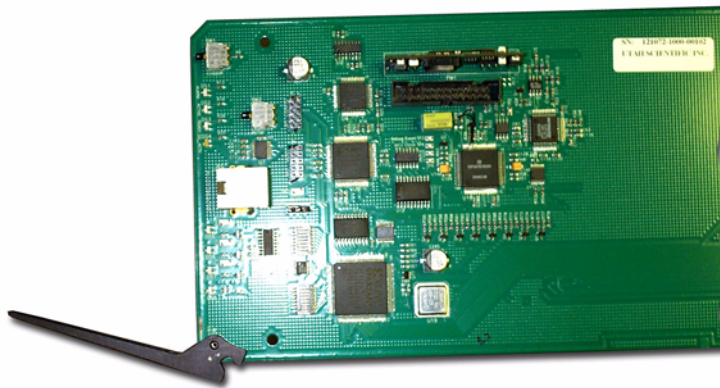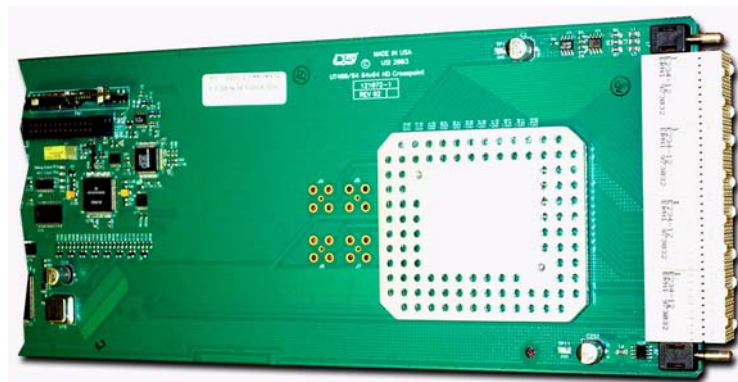
Crosspoint Board

Part number 121072-1, the Video Crosspoint board contains 64 inputs and 64 outputs with a crossbar array in the middle. The Crosspoint board receives signals through the midplane from the 18 input cards, while switching is carried out by a single crosspoint chip located underneath the heat sink. After the signal is switched, it is again routed through the midplane to the output boards.

Left view

Right view

FIGURE 4-17. Crosspoint Board

User Controls

The dip switches located on the crosspoint card are used to set the input and output offset level. This corresponds to the differing audio and video levels as applied to SD video or HD video, which may need to be switched separately. The dip switch settings allow the control of the video router independently of the audio router when necessary. Specific dip switch settings are addressed in the Hardware Installation section – Figure 2.8.

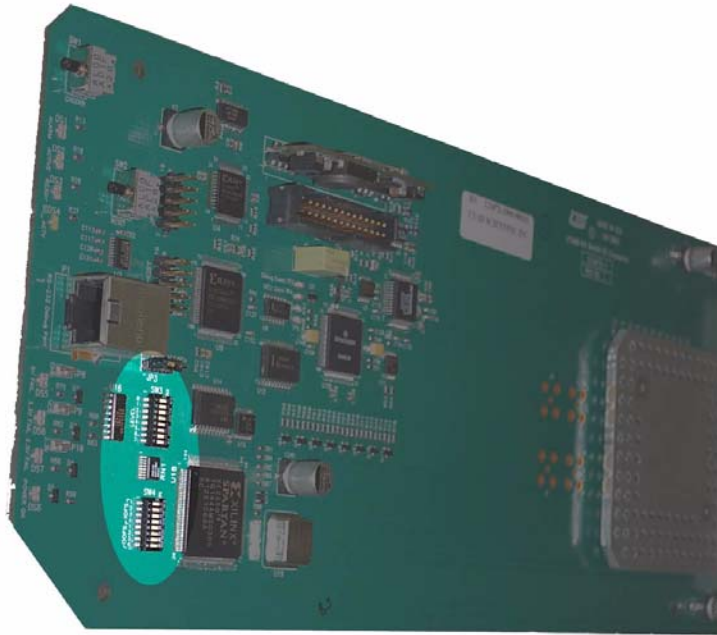**FIGURE 4-18. Crosspoint Dip Switches**

Indicators

Power Ok LED

The green LED is illuminated when all supplies are normal and functioning.

Voltage Failure Mode (3 LEDs)

In this mode, one of the red LEDs will illuminate while the green 'normal' LED turn off.

Scan Data Active (LED)

The yellow LED pulses continuously when conditions are normal. A problem condition exists when the LED is solidly illuminated.

Power Good LED

2.5 V (Voltage Failure)

3.3 V (Voltage Failure)

5 V (Voltage Failure)

Ready
Active
Alarm
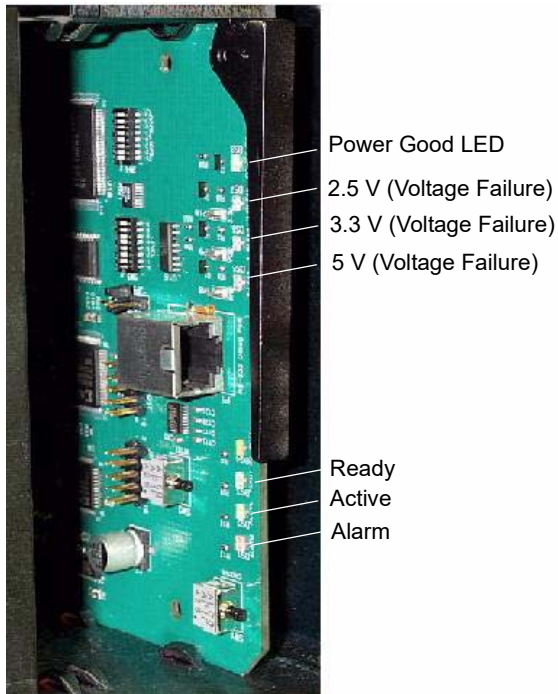
FIGURE 4-19. Crosspoint LEDs

Board Jumpers -- SC-200, SC-3, or SC-4 control

The video crosspoint module contains three jumper blocks, with pins 1 and 2 used to designate SC-200 control, while pins 2 and 3 designate SC-3 or SC-4 control.

FIGURE 4-20. Video crosspoint jumper location -- SC-200, SC-3, or SC-4

Fuses

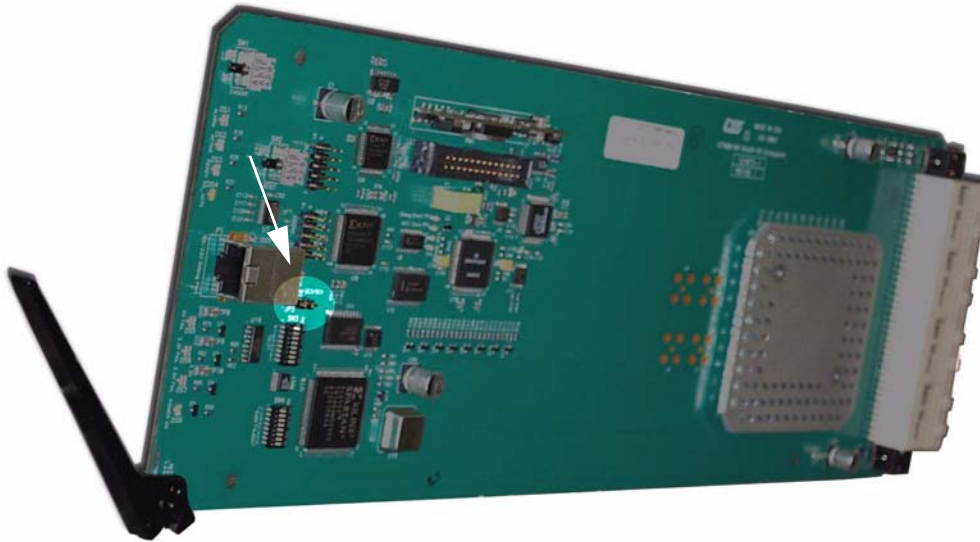The 64x64 system's crosspoint card contains a *soft start circuit* rather than a standard fuse assembly. This non user-serviceable circuit is designed to sense any over current situation along the board and may cause the crosspoint card to reset if an overload is detected. Press the board's reset button if no LEDs are illuminated on the card.

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 does not respond to a reset.

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.
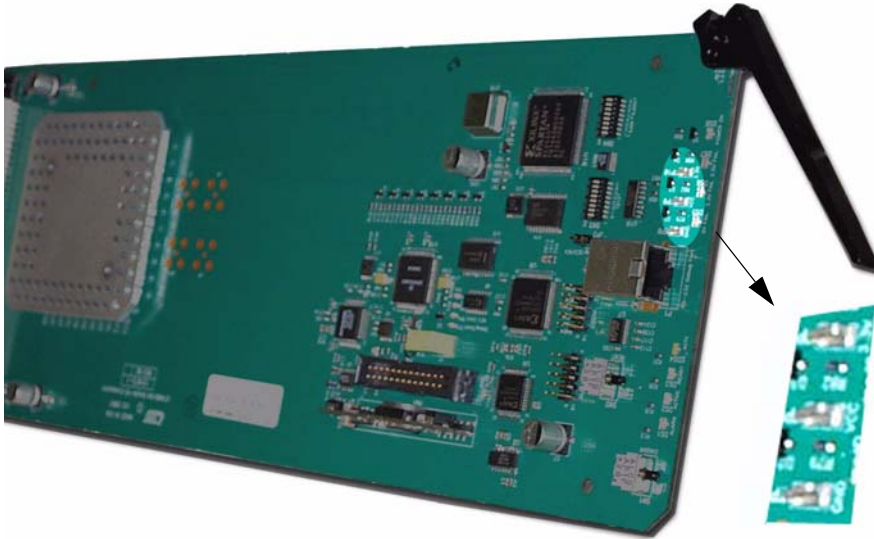
FIGURE 4-21. Crosspoint board test points

Contacts

Ground

+3.3

+5

Audio Chassis - Basic Layout

Chassis Assembly

With the exception of the chassis' internal midplane, the 64x64 Audio chassis is very similar to its video counterpart (using the same types of controllers and power supplies). Unbalanced signals are processed via BNC connections, while balanced signals are handled through D-sub connections (shown below).

FIGURE 4-22. 64x64 Audio backpanel -- BNC and D-sub connections shown

FIGURE 4-23. D-sub assembly

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 4-24. 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.
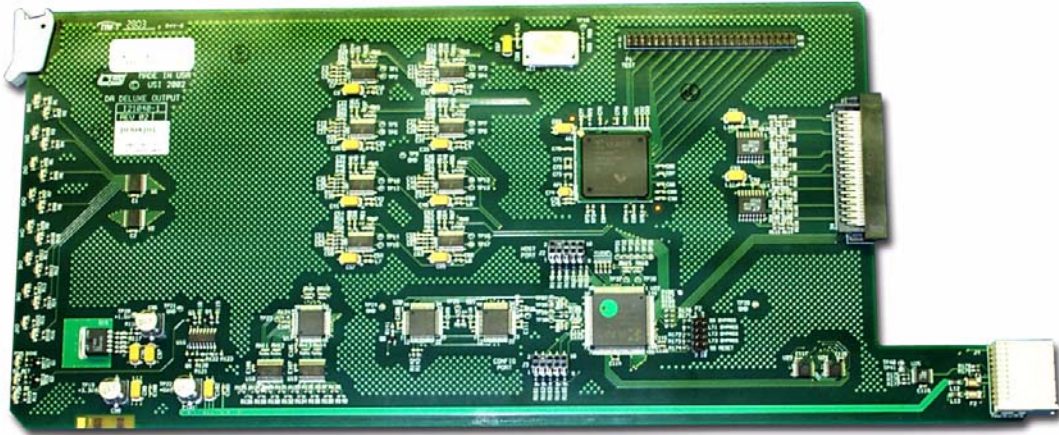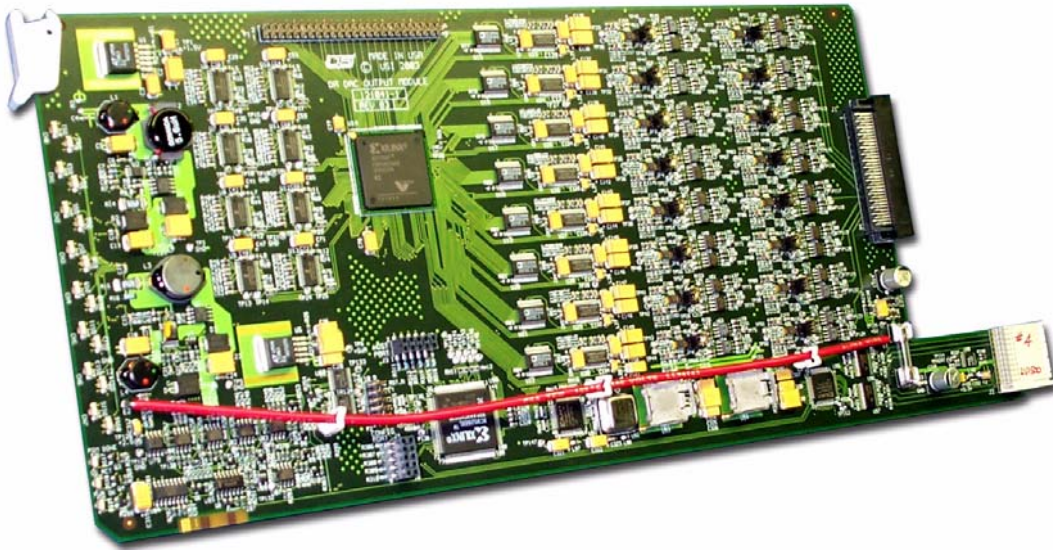

FIGURE 4-25. Target Output Module

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).
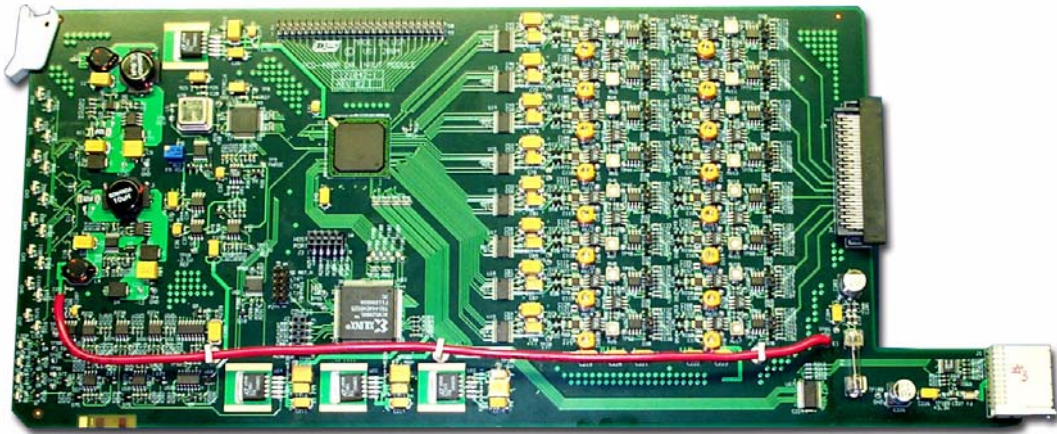

FIGURE 4-26. Target Input Module

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.

Crosspoint Board

The 64x64 audio crosspoint board contains additional status information for power supply monitoring. This board also carries a separate time base sub-module, similar to its larger digital audio router counterpart.
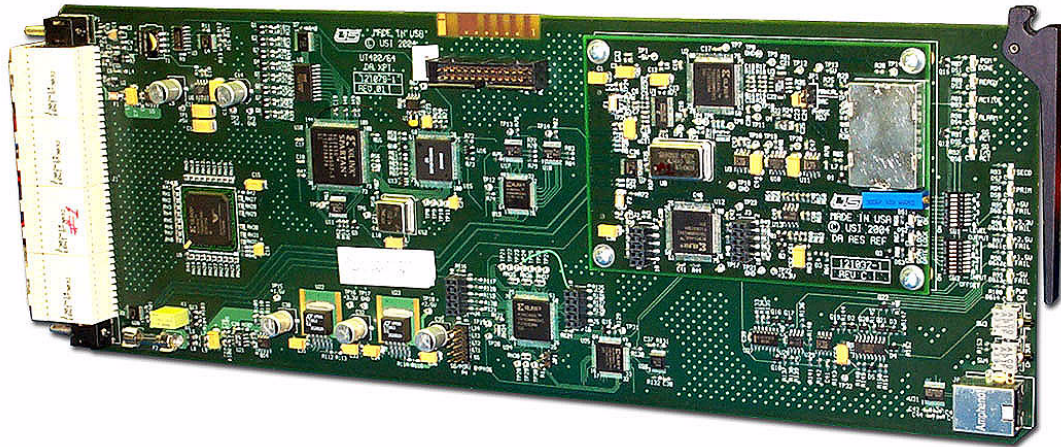

FIGURE 4-27. 64x64 Audio Crosspoint board

Crosspoint Board LED Indications, Resets, and Fuse

FIGURE 4-28. **Crosspoint Board LEDs**

Program Done (Green)

Refers to the MX bus controller. Indicates the load was successful.

Ready (Green)

Responding to the onboard micro-controller. Indicates normal status.

Active (Green)

This chassis supports redundant crosspoint assemblies. Green indicates that current board is active.

Alarm (Red)

Indicates the presence of a controller, power supply or fan error when lit.

SGACT - Scangate Active

The micro-controller is successfully accessing the JTAG portion of the assembly.

SGIO Active - Scangate Input/Output Active

Indicates successful communication between the micro-controller and the various JTAG busses on the various input and output modules.

SECD and PRIM (Secondary and Primary)

Associated with the actual slot the crosspoint assembly is plugged into. Typically the left slot location is the primary, and the right-hand slot location is the secondary. One of the LEDs will respond to the current slot location (primary or secondary).

Power Supply Monitors (Red)

+ 5 and + 3.3 (fail) respond to the two main power supplies within the chassis. +2.5 +1.5 are derived from local voltage regulators, while the -5 indication is derived from the on-board charge pump.

Power OK (Green)

All supplies are normal.

Board Resets

Top button - Re-initializes the crosspoint assembly and resets the onboard micro-controller.

Bottom button - (changeover) Forces a changeover from the active to the stand-by crosspoint card.
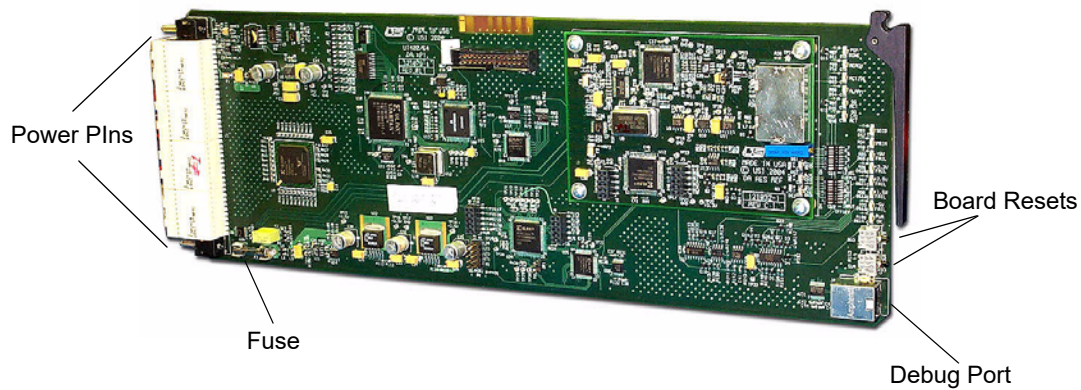
Debug Port

Typically for factory use only.

Fuse

Used for the 3.3 volt supply on the crosspoint assembly. (2 amp)
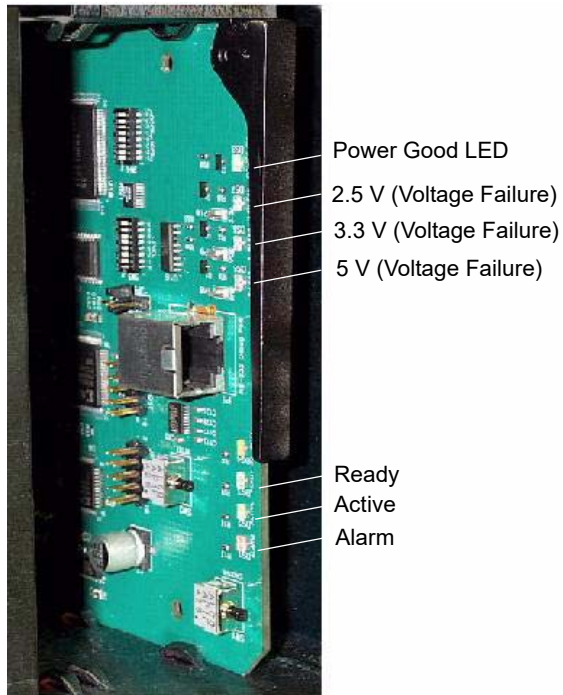
Power Pins

Top - Ground

Bottom - 3.3

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 crosspoint card.

Power Good LED
2.5 V (Voltage Failure)
3.3 V (Voltage Failure)
5 V (Voltage Failure)

Ready
Active
Alarm

FIGURE 4-29. Video Crosspoint Alarm LEDs

Since there are no alarm LED's on the AC Power Supplies in the 64 frame, the Alarm LED on the crosspoint card (Audio or Video) is used to communicate problems with the system, including power supply alarms.

Problems with power supplies anywhere in the system are indicated by a red ALARM LED on the crosspoint card. See page 4-34 for location of the Alarm LED for audio crosspoint cards. To diagnose an alarm condition, the user must either use the RMAN diagnostic software or plug a terminal into the crosspoint card (see appendix B for more information) and perform a status request.

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 switches	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-3 Ports not "Active"			3,4	4,5
Undefined level types in SC-3 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 Trouble-shooting 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?

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 Trouble-shooting 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.

- Either an active LED (DS4) or standby LED (DS5) should be lit on each controller card. If only one controller is present (non redundant system), the active LED (DS4) should be illuminated.

- The heartbeat LED (DS6) indicates that the processor is communicating with the vital parts of the system and is running the application software.

- The MX LEDs indicates communication with the crosspoint matrix. The transmit LED (DS8) will flash whenever communication is being made from the controller to the matrix. The receive LED (DS7) will flash whenever communication is being received by the controller from the matrix.

- U-Net is used for communication between the controller and the control panels. The U-Net data and U-Net transmit enable LEDs (DS9 and DS10) indicate when information is exchanged between the system controller and a control panel.

- If the active LED (DS4) is on and the U-Net transmit enable LED (DS10) is off, this indicates that a controller software upgrade has failed and the controller is waiting for a valid controller software upgrade to be uploaded.

Please note the following additional points regarding the controller:

- If used with an SC-2 or SC-3 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.

- Panels communicate to the controller by 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.

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	300 Watts
Input Fuse Rating	6.3 Amp / 250 Volt – 5 x 20 mm
Voltage	90 – 240 Volts AC, universal power supply
Frequency	50 – 60 Hertz
Redundancy	Dual Redundant power supplies (optional)
DC Output Voltages	
+ 12 Volts DC (VA)	1 Amp
+ 12 Volts DC (VB)	1 Amps
+ 3 Volts DC	35 Amps
+ 5 Volts DC	35 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)

Reference

The table below lists reference specifications

TABLE 2-4. **Reference Specifications**

Parameter	Specification
Audio	One 75 Ohm terminated AES sync

Control

The following table lists control specifications:

TABLE 2-5. **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 2-6. **Alarm Specifications**

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

.
.

Physical

The following table lists physical specifications:

TABLE 2-7. Physical Specifications

Parameter	Specification
Width	EIA – RS-310 – D 92 19" rack mount standard
Height	4 RU, 14 inches, 356 mm
Depth	19 inches, 483 mm maximum
Weight	70 pounds
Mounting	Eight front mount rack ears
System connectors	All connectors rear panel mounted
Cooling	Four Blowers – rear exhaust
Temperature range	10 – 40 Degrees Celsius
Humidity range	0 – 90% non - condensing

Regulatory

The following table lists system regulatory specifications

TABLE 2-8. 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 2-9. 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 SN163A16609X	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

The Debug Port

This Appendix contains the following:

UT-400/64 Firmware

Version 2.00 Release Notes

The difference between FW version 1.08 and 2.00 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 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.

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.

The Debug Cable

The 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.
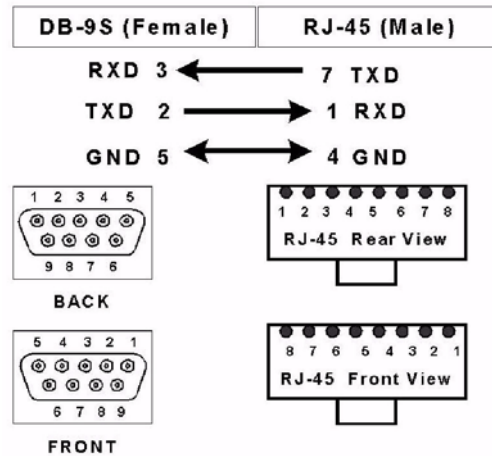

FIGURE B-1. **Debug Port Cable Pinouts**

The terminal settings for the debug port are: **Baud Rate = 38.4 K baud; 8 Data Bits; 1 Stop Bit; No Parity; ASCII Translation and CR = CRLF** (carriage return, line feed).

The Hyper-Terminal will have the same settings as above; but since the Hyper –Terminal does not have a CRLF setting a similar parameter is set by doing the following:

* Click on "Open Port" and set the Baud Rate, Parity, and Stop Bits.
* Select "None" in the Flow Control Box", Click "OK".
* On the Hyper-Terminal window select "File", click on "Properties".
* Click the "Settings Tab" in the Properties Window.
* Click the "**ASCII Setup**" Button.
* In the "ASCII Receiving Block" at the bottom of the window, **checkmark** (enable) the "**Append Line Feed to Incoming Line Ends**" and "**Wrap Lines that Exceed Terminal Width**". These parameters perform the same function as the Terminal's CRLF Setting.

Using the Debug Port

The debug port is the RJ-45 female connector labeled J1, located at the center of the cross-point. 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" FPGA Control board will be read by the Debug Port. By pressing the "Reset" button on the currently active FPGA board, the control should be transferred to the inactive board.

If both FPGA's are to be checked, be sure to press the "Reset" button after reading the first board.

Startup Display

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.

```
*************************************************
            Utah Scientific Inc.
       Utah-400 System Monitor, Rev. X.X
*************************************************
    Set to Primary
```

The display should show the Monitor Revision you currently have in your system. Contact Utah Scientific Technical Services to verify your revision or to upgrade to a higher version, if available.

Main Menu Display

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

After connecting the 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	01 or 61 only
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.
Primary / ID Reg	Indicates FPGA is functioning. 01 = Digital Video 61 = Digital Audio
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 "S" on the keyboard activates this feature. The displayed data is shown below.

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

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
,
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
,
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
,
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
,
FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF
,
```

FIGURE B-2. 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
,
20,21,22,23,24,25,26,27,28,29,2A,2B,2C,2D,2E,2F
,
30,31,32,33,34,35,36,37,38,39,3A,3B,3C,3D,3E,3F
,
40,41,42,43,44,45,46,47,48,49,4A,4B,4C,4D,4E,4F
,
50,51,52,53,54,55,56,57,58,59,5A,5B,5C,5D,5E,5F
,
60,61,62,63,64,65,66,67,68,69,6A,6B,6C,6D,6E,6F
,
70,71,72,73,74,75,76,77,78,79,7A,7B,7C,7D,7E,7F
,
80,81,82,83,84,85,86,87,88,89,8A,8B,8C,8D,8E,8F
,
```

FIGURE B-3. **Crosspoint display - Inputs to Outputs**

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

```
ROUTER STATUS
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
,
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
,
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
,
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
,
00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
,
```

FIGURE B-4. 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, 015, 016,
017, 018, 019, 020, 021, 022, 023, 024, 025, 026, 027, 028, 029, 030, 031, 032,
033, 034, 035, 036, 037, 038, 039, 040, 041, 042, 043, 044, 045, 046, 047, 048,
049, 050, 051, 052, 053, 054, 055, 056, 057, 058, 059, 060, 061, 062, 063, 064,
065, 066, 067, 068, 069, 070, 071, 072, 073, 074, 075, 076, 077, 078, 079, 080,
081, 082, 083, 084, 085, 086, 087, 088, 089, 090, 091, 092, 093, 094, 095, 096,
097, 098, 099, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112,
113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128,
129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 139, 140, 141, 142, 143,
```

FIGURE B-5. 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		2	3	4		5	6	7	8	9
Cd	XX	PN:	XXXX - XX		XX	IO =	00	00	00	00	00

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	IO =	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	IO =	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 B-6. 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 |
Cd 08 PN:2406-1003 IO = FF00000000 | Cd 09 PN:0966-1003 IO =
FF00000000 |
Cd 0A PN:2407-1003 IO = 0000000000 | Cd 0B PN:2407-1003 IO =
0000000000 |
Cd 0C PN:2407-1003 IO = 0000000000 | Cd 0D PN:2407-1003 IO =
0000180000 |
Cd 0E PN: Not Installed           | Cd 0F PN:2406-1003 IO =
FF00000000 |
Cd 10 PN:2406-1003 IO = FF00000000 | Cd 11 PN:0966-1003 IO =
FF00000000 |
Cd 12 PN:2406-1003 IO = FF00000000 | Cd 13 PN: Not Installed
|
Cd 14 PN:2407-1003 IO = 0100000000 | Cd 15 PN:2407-1003 IO =
0000000000 |
Cd 16 PN:2407-1003 IO = 0000000000 | Cd 17 PN:2407-1003 IO =
0000000000 |
Cd 18 PN:2407-1003 IO = 0000000000 | Cd 19 PN:2406-1003 IO =
FF00000000 |
Cd 1A PN:2406-1003 IO = FF00000000 | Cd 1B PN:2406-1003 IO =
FF00000000 |
Cd 1C PN:2406-1003 IO = DF00000000 | Cd 1D PN: Not Installed
|
Cd 1E PN:2407-1003 IO = 0000000000 | Cd 1F PN:2407-1003 IO =
0000000000 |
Cd 20 PN:4128-1001 IO = DF00000000 | Cd 21 PN:4128-1001 IO =
FF00000000 |
Cd 22 PN: Not Installed           | Cd 23 PN:2406-1003 IO =
FF00000000 |
Cd 24 PN:2406-1003 IO = FF00000000 | Cd 25 PN:4121-1001 IO =
8000000000 |
Cd 26 PN:4121-1001 IO = F700000000 | Cd 27 PN: Not Installed
|
Crosspoint = 4120-105A
```

FIGURE B-7. 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.
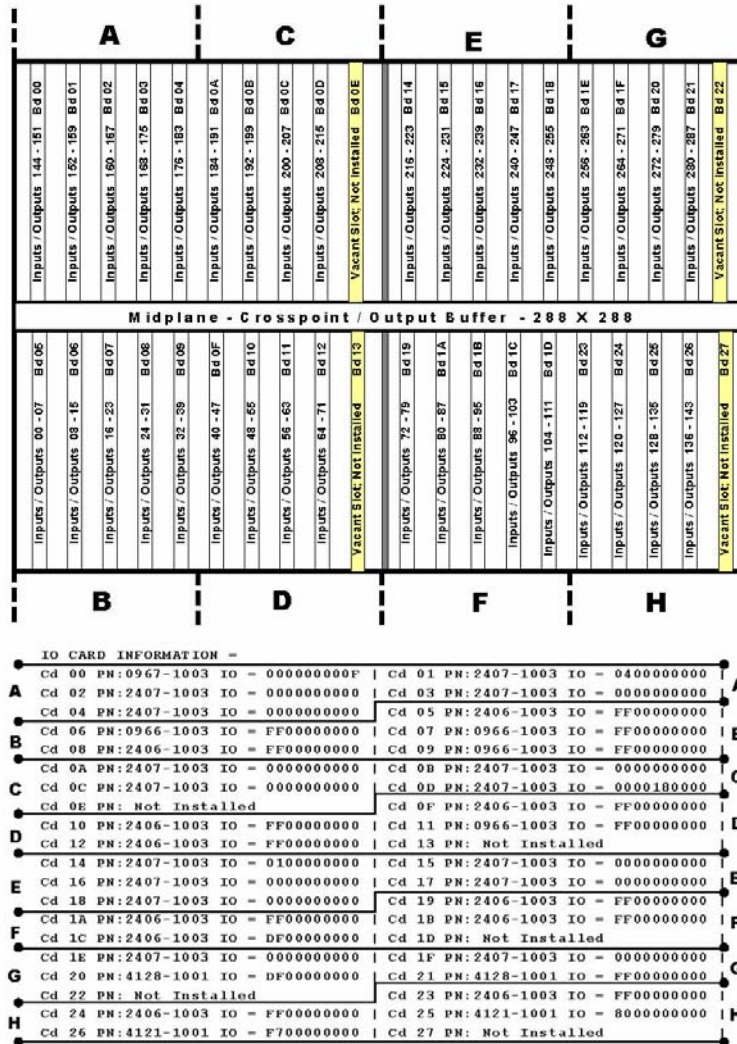
FIGURE B-8. **I/O card information - locator diagram**

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
Crosspoint type = HD/SD XXX x XXX  (AES XXX x XXX)
Slot = Primary
Fan Status =
  Fan 1 OK. |   Fan 2 OK. |   Fan 3 OK. |   Fan 4 OK. |
Local PS Status     =
     5V OK   .     |     3.3V  OK.     |     2.5V  OK.
External PS Status  =
PS1 (RH) Installed -> YES. | Error Code ->  No Error  | TEMP -> 32C
PS2 (LH) Installed -> YES. | Error Code ->  No Error  | TEMP -> 32C
```

- Crosspoint type: Reflects the type of crosspoint card installed in your system and its matrix size – 144 x 144, 288 x 288 or larger.

- Slot: Refers to the FPGA Controller board currently active; primary or redundant.

- Fan Status: All system fans are detected by the FPGA, the status is reported back as "OK" or "Failed".

- Local PS Status: Monitors all voltages on the crosspoint and reports any errors as "Failed".

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.

The Utah-400 Digital Audio Breakout Panel

Scope

This Appendix applies only to the installation of the AES Digital Audio Break Out Panel. The Breakout Panel and Cables are pre-tested at the factory before shipment and do not need any modifications. The customer is responsible for wiring the Sources and Destinations to each panel.

The AES Breakout Panel Kit

Each breakout panel kit ordered from Utah Scientific is shipped with the following items:

- (1) Breakout Panel - Model BDA-400, Part Number 140001-1.

- (9) 3 foot D/D 26 pin high density cables (part number 65366-3).

- (1) field wiring kit, which includes nine tension grip connectors and nine hoods.

Description of the AES Breakout Panel

The AES Breakout Panel is designed to simplify the installation of the Utah-400 Balanced Digital Audio Routing System. The 26 pin high-density connectors are pre-wired to connect directly between the Utah-400 Balanced Digital Audio backplane and the breakout panel. Only a screwdriver is needed for this installation.

The Breakout panels are generic; they may be used for either sources or destinations.

Each panel is silk screened from 0 on the left, to 71 on the right. Each labeled block on the rear of the panel corresponds to the labeled block on the front of the panel.

Installation of the AES Breakout Panel

To install the Breakout Panel:

1. Install the BOP at the desired location on the rack frame. (Within three feet of the Utah-400 Digital Audio Backplane.)
2. Install the D/D 26 pin cables from the Utah-400 input or output 00 - 07 to the BOP back-plane input or output 00 - 07. Continue in the same manner for each input or output for the remaining eight blocks on the breakout panel.
3. Unpack the Field Wiring Kit and connect the required sources or destinations to each of the tension clamp connectors. Refer to Figure D-2, on the following page for wiring each tension clamp connector.
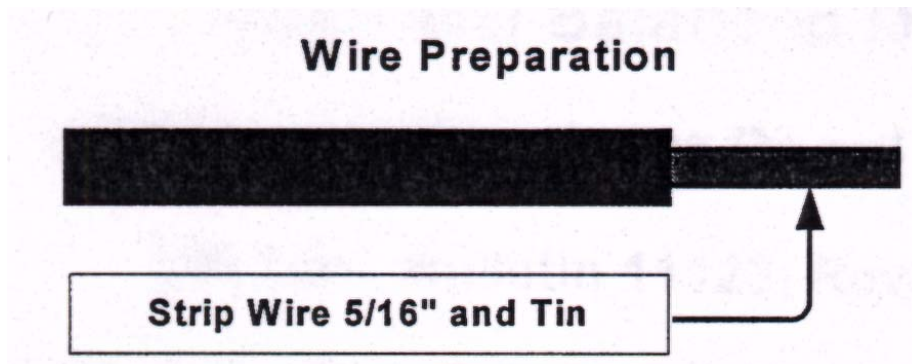
FIGURE C-1. Wire Prep

1. Insert the small screwdriver into the rectangular holes to release the wire clamp.
2. Insert the wire into the round hold above or below the rectangular slot.
3. While holding the wire in the hole, pull out the screwdriver (inserted in Step 1).
4. Tug on the inserted wire to verify that it is properly clamped.
5. Repeat for the entire connector.

Note: Wiring is the same for each sequential block following 0 - 7. Example; 8 - 15, 16 - 23, etc. **Failure to follow these steps will result in loose or no connections, and the wire may fall out of the hole.**

Ridge

When installing wires into the connector, the Ridge should be on TOP, Smooth on the BOTTOM

Wire Tension Clamp Release Slot

Wire Insertion Hole

Smooth

C = Common or Ground
A = Phase A
B = Phase B
0 - 7 = Block Input / Output Number
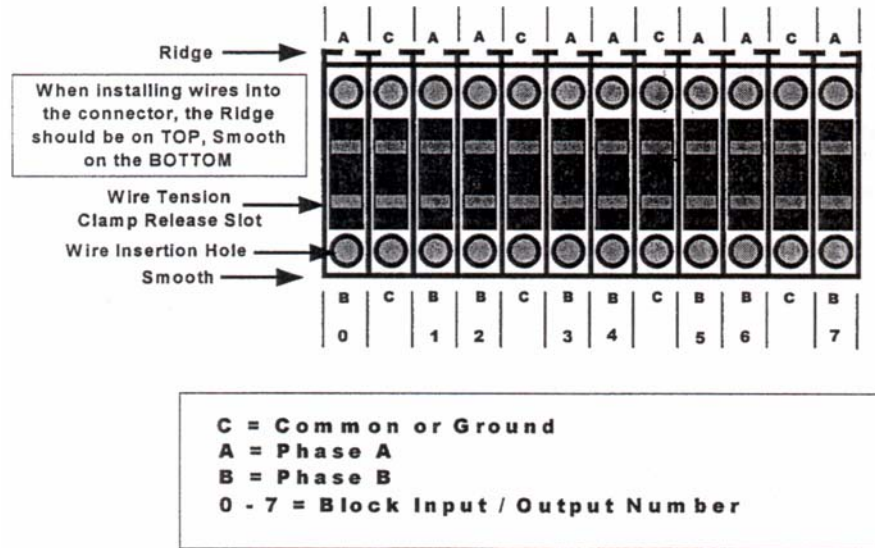
FIGURE C-2. Tension Clamp Connector (viewed from the back)

Label Instructions for the Utah-400 Breakout Panel

Scope

This document applies to the label installation on the Utah-400 Breakout Panel. Labels included in this kit include the 54450-1035 (Input Labels 000 through 287) and 54450-1036 (Output Labels 000 through 287).

Section Two of this document shows the proper wiring techniques to use on the Breakout Panel.

Application

The labels provided for the Utah-400 Breakout Panels are to be applied over the silk-screened blocks (00 – 71) below the front and back connectors on each panel. Each label sheet has two labels for each input / output range (e.g. 000 – 007) for this application.

Each label sheet will consecutively label up to four breakout panels from Inputs 000 through 287 and four breakout panels from Outputs 000 through 287.

If you do not receive enough labels for your particular application, contact Utah Scientifics' Technical Services at 1-800-447-7204 for additional labels.

The illustration below shows the proper application of the labels on the breakout panel.

**Apply New Label over
existing panel silkscreen**

Inputs

000 - 007

0 - 7

Inputs

008 - 015

**Front Section View of the
Utah-400 Breakout Panel**

**Apply New Label over
existing panel silkscreen**

Inputs

008 - 015

8 - 15

Inputs

000 - 007

**Rear Section View of the
Utah-400 Breakout Panel**
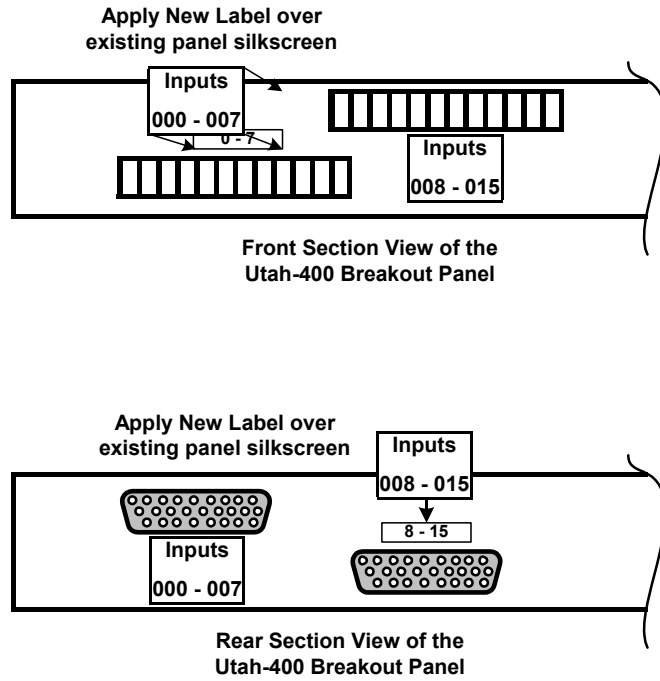
FIGURE C-3. **Breakout Panel Label Application**