

UTAH-400 Digital Routing Switcher



Utah Scientific has been involved in the design and manufacture of routing switchers for audio and video signals for over twenty-five years. Starting with our original AVS-1 router and moving through several generations of routing switcher design to the current UTAH-200 and UTAH-300 series for all signal formats and the UTAH-1500 HD matrix, we have participated in the evolution of the broadcast television industry from analog composite through components and various forms of digital video and audio to today's complex mixed environment of analog and multiple digital signal formats.

Our newest routing switcher, the UTAH-400, was developed to provide a single platform for all digital router applications from very small to extremely large matrix configurations and to handle all digital signal formats.

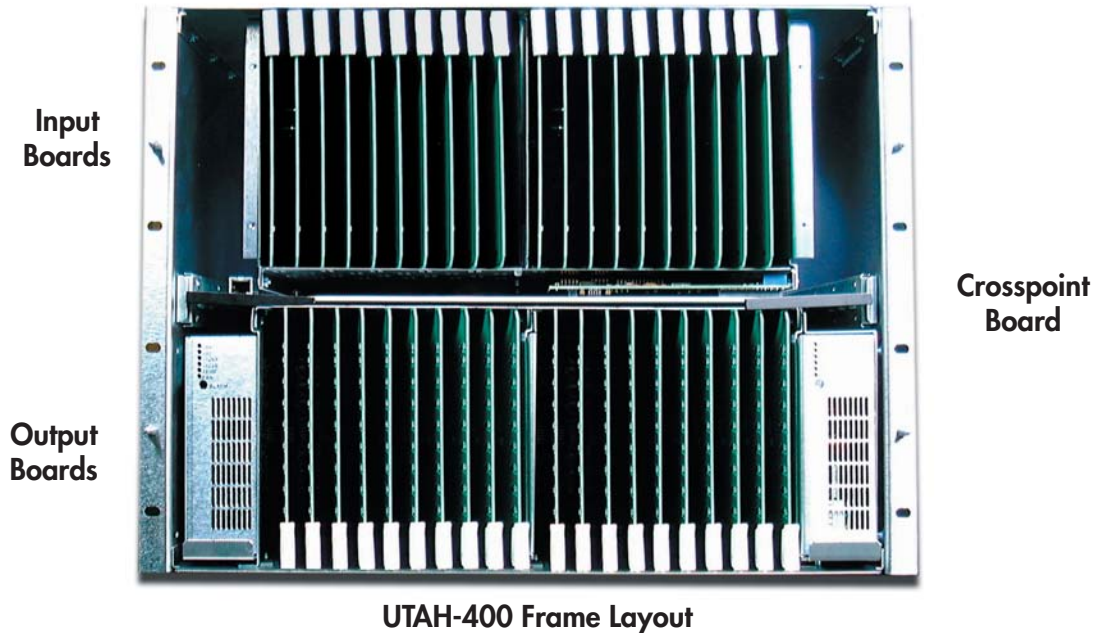
The UTAH-400 offers maximum flexibility in building large switching matrices for Standard Definition, High Definition, or mixed signal environments. Thanks to an innovative matrix architecture, the UTAH-400 is readily scalable from 8x8 to 1152x1152 and beyond using a single family of matrix building blocks. In addition to this flexibility of configuration, the UTAH-400 offers tremendous reductions in the physical space required for larger matrix systems.

The UTAH-400 uses a three-board architecture consisting of an input board, a crosspoint board, and an output board. This approach has been used for many years in a wide variety of systems, including the current UTAH-300 switchers. Most three-board switchers, however, have been designed around a fixed-frame configuration where the system's card cage sets very specific limits on the size and configuration of the matrix. Because of these constraints, fixed-frame designs offer very limited flexibility in terms of matrix expansion or re-configuration.

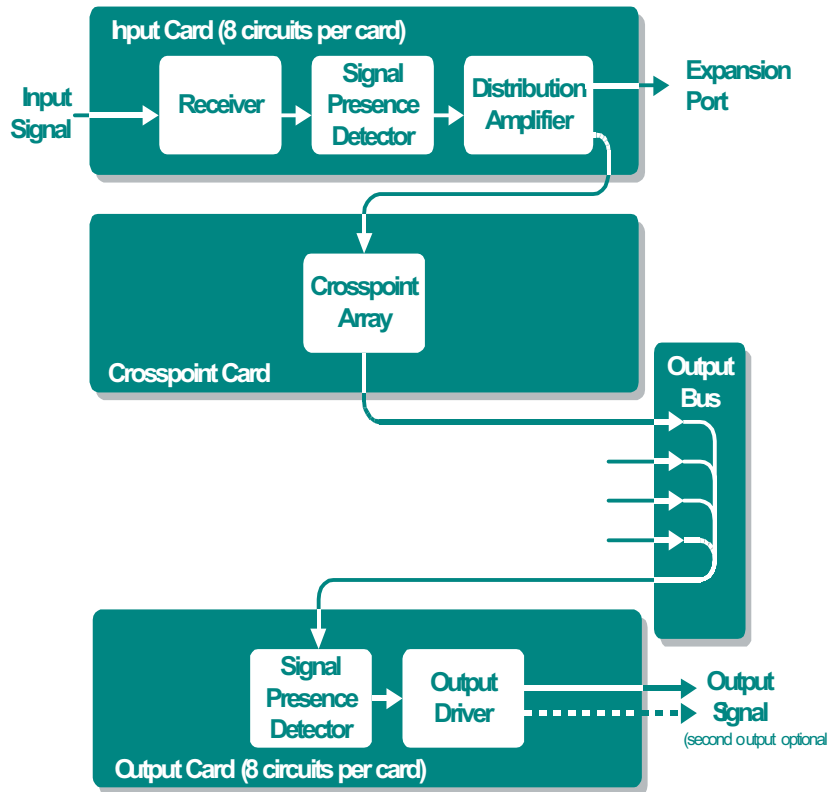


In contrast to these fixed-frame routers, the frame of the Utah-400 contains 36 I/O slots which can be filled with any combination of input and output boards and one crosspoint card slot.

The UTAH-400 frame and signal distribution components are designed for HD signal compatibility, providing full insurance that an SD system can be upgraded to HD operation by simply exchanging the signal I/O modules.



UTAH-400 Block Diagram

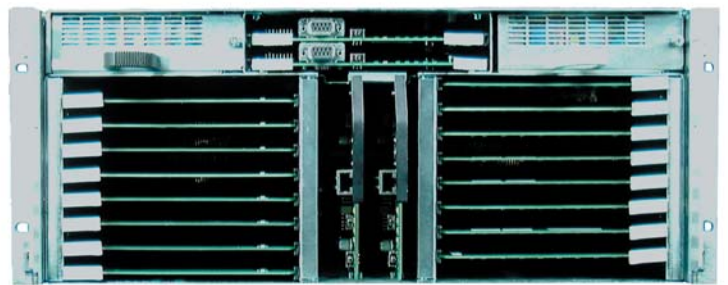
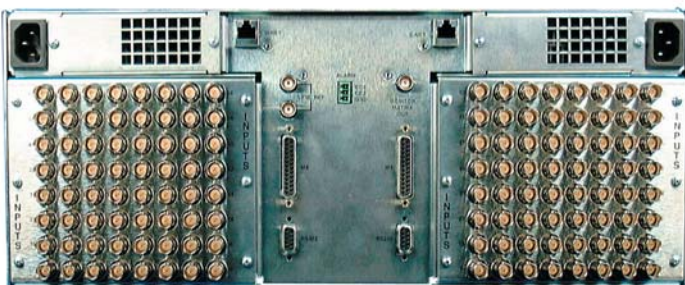


SMALL MATRIX APPLICATIONS

The UTAH-400/64 frame supports matrix sizes up to 64x64 in just 4 Rack Units of space. UTAH-400/64 frames use the same I/O modules as the larger UTAH-400 frames and offer dual power supplies and dual control cards just like the larger frames.

Like the larger frames, the UTAH-400/64 frame can be fitted with an optional Redundant Crosspoint Card that provides full backup against an internal path failure in the matrix.

UTAH-400/64 frames can be controlled by the same control bus connections used by the larger frames. They also offer the option of having internal controller boards for standalone applications.



Typical Matrix Size Configurations

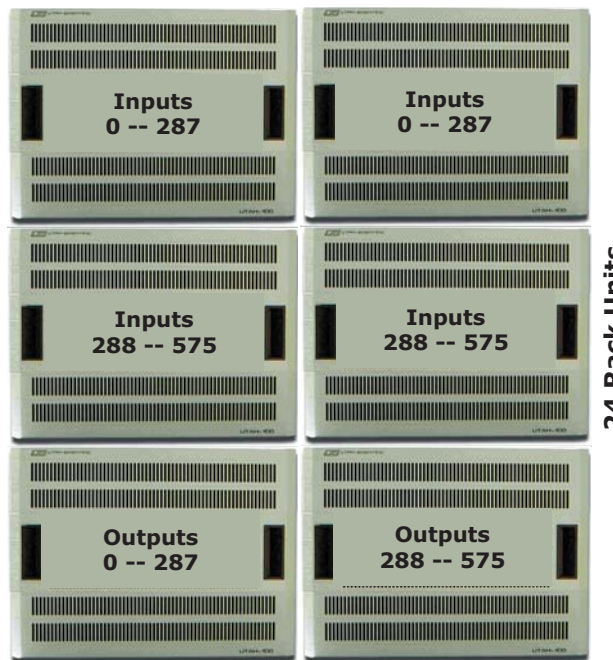
Matrix Size	Number of Frames	Input Boards	Crosspoint Boards	Output Boards
64 x 64	1 (4ru)	8	1 (64x64)	8
144 x 144	1 (8ru)	18	1 (144x144)	18
288 x 288	2 (16ru)	36	1 (288x288)	36
576 x 576	6 (48ru)	144	4 (288x288)	72
1152 x 1152	20 (160ru)	576	16 (288x288)	144

Note:

A matrix of any size may be short-loaded by removing the appropriate I/O cards and crosspoint submodules. Such a matrix would be field-expandable to the full size shown.

MATRIX CONFIGURATIONS

A matrix is built-up from the basic building blocks to accommodate a certain number of inputs and outputs. A single 8 RU frame will house a 144x144 matrix. A maximum of four input frames with 36 input cards in each (8x36=288 inputs per frame) can be bussed to one output frame (288 outputs), making the maximum number of inputs 1152.



Rack Layout for a 576 x 576 Matrix

UTAH-400 FEATURES

SIGNAL PRESENCE DETECTION — The UTAH-400 has signal presence detectors on all inputs and outputs, allowing the matrix to perform a number of unique functions — ranging from simple alarms to automatic restoration of service on critical signal paths.

CROSSPOINT REDUNDANCY OPTIONS — The UTAH-400’s unique architecture allows us to place fully redundant crosspoint assemblies in each matrix block for the ultimate degree of operational reliability.

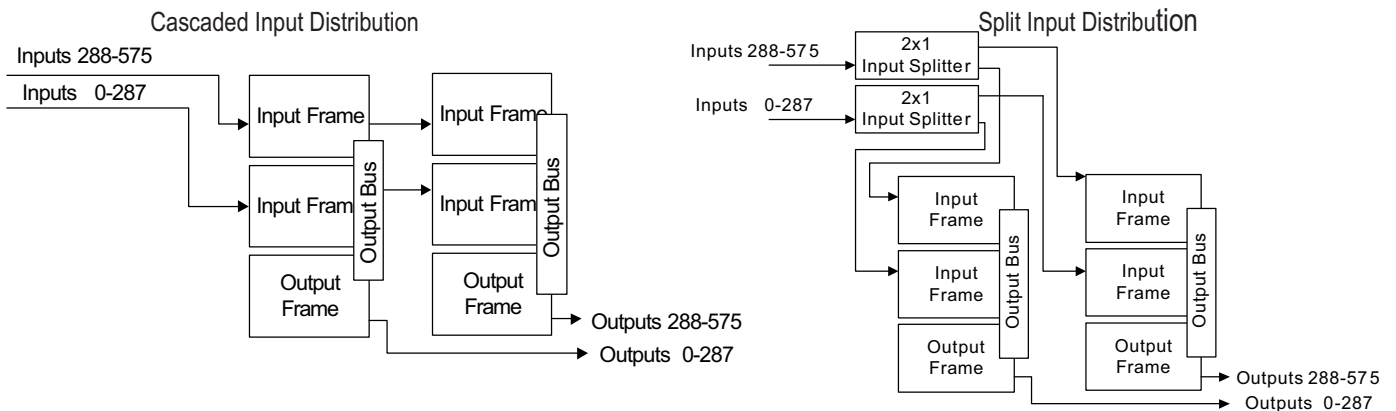
INTERNAL MONITOR MATRIX — Each UTAH-400 Chassis is equipped with an internal monitor matrix for monitoring any of the output busses carried in that chassis. In multi-chassis systems, the monitor bus outputs from each chassis are combined to provide a single monitor bus that can select any output in the system for monitoring.

REDUNDANT POWER SUPPLIES — All UTAH-400 systems are supplied with dual power supplies in each frame. These supplies operate in a fully redundant configuration with complete alarm and monitoring capabilities.

REDUNDANT CONTROL CARDS — To further insure operational reliability, all UTAH-400 systems are supplied with dual control cards in each frame.

LOW POWER CONSUMPTION — The UTAH-400 is designed for extremely low power consumption. While the maximum load for each frame is 350 Watts, most systems will operate significantly below this number. This translates to direct savings on operational expense and increased long-term reliability.

Block Diagram for a 576 x 576 Matrix



For system sizes above 288 outputs, an input / crosspoint card stack is created for each set of 288 outputs. Thus, an 1152x1152 matrix would require four input / crosspoint card stacks, each feeding a block of 288 outputs. Each of these stacks must receive an isolated copy of each input signal. This can be done by using a “cascade” arrangement where a second input card is fed from the expansion port of the first input card, by externally splitting the signals into a copy for each stack, or by a combination of the two methods.

MODULE DESCRIPTIONS

INPUT BOARD

The input board carries eight identical receiver / buffer circuits for bringing the input signals from the rear panel into the matrix and delivering them to the crosspoint board. Each input circuit has a signal presence detector that can send an alarm to the frame's alarm processor when it detects a loss of signal on the input. The Standard Definition version of the Input Board provides automatic equalization for up to 300 meters of type 8281 or equivalent cable at the input. The optional High Definition version of the Input Board offers 100 meters of equalization and can accept digital video signals at any data rate up to 1.5Gbps.

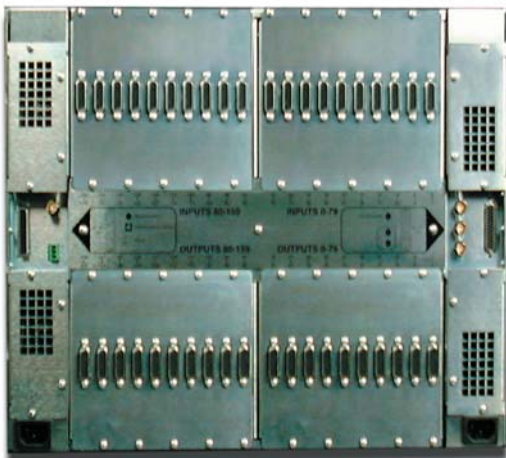
CROSSPOINT BOARD

The crosspoint board receives its inputs from the input cards and applies these signals to the crosspoint array. This array is fitted with the appropriate number of 144x144 sub-modules that can be arranged to make an array of any size from 144x144 to 288x288 on a single crosspoint board. The crosspoint board's control inputs come from the system controller by way of a pair of Utah MX-Bus connectors mounted on the frame's rear panel. The outputs of the crosspoint array are passed onto the Output Boards by the Output Bus.

OUTPUT BOARD

The Output Board carries eight identical driver circuits that buffer the signals from the Output Bus and present them to the connectors at the rear panel of the frame. Each output circuit has a signal presence detector for alarm reporting and automated troubleshooting and a reclocking circuit to ensure maximum signal quality at the output of the matrix.

A single copy of each output is provided as the default configuration with an optional second copy of each output available for monitoring,



Audio Matrix Rear Panel

DIGITAL AUDIO MATRIX

The UTAH-400 digital audio switcher offers a number of innovative functional improvements over existing audio routers, including synchronous / asynchronous operation and the ability to control the configuration of AES/EBU digital audio signals within the router to allow channel swapping and mixing, and other functions that are not normally provided in a digital audio routing switcher.

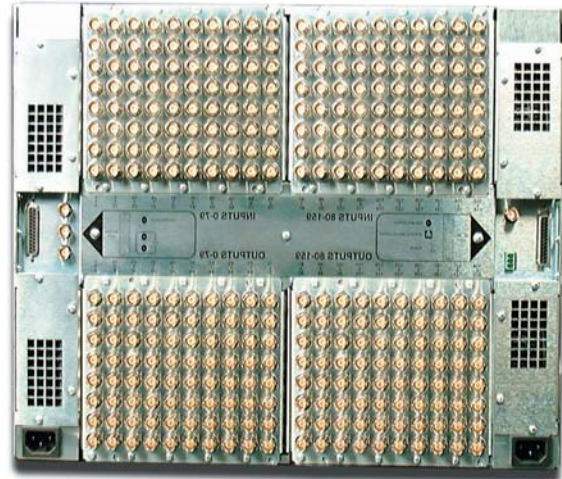
The UTAH-400 AES switcher also offers an option for “soft transitions”, completely eliminating pops and clicks that can accompany the switching of digital audio signals. UTAH-400 AES routers are available with balanced or unbalanced I/O ports. Matching transformers are available as an option.

INTERNAL SIGNAL FORMAT CONVERSION

The UTAH-400's digital I/O cards can be replaced as required with cards that feature on-board Analog-to-Digital or Digital-to-Analog format conversion, giving the UTAH-400 the unique ability to provide analog inputs and/or outputs in blocks of 8 ports per board.

This capability can be used to provide analog monitoring of the signals in the digital router or to provide a simple way to integrate analog source and destination equipment into the digital routing system.

Video Matrix Rear Panel



ADVANCED CONTROL FACILITIES

The UTAH-400 offers a glimpse into the future of routing switcher design with its unique signal presence monitoring capability. By continuously monitoring the presence of digital bit streams at each input and each output, the system can support automatic rerouting, or "protection switching", to restore a signal feed that is interrupted by an internal or external fault. For example, simple logic instructions can be set up to cause the switcher to switch a given output to a secondary input if there is loss of signal on the primary input. Using the same logic facilities, the system can check for signal presence on the active input when it detects loss of signal on an output before sending an alarm to the operator.

By providing full user programmability of this control logic, the UTAH-400 brings us one step closer to the ultimate goal of a fully automatic router that offers the operational simplicity that we have become accustomed to in the data networks that we work with every day.

For more information on the UTAH-400 Routing Switcher family or other Utah Scientific products, contact your Utah representative or visit www.utahscientific.com



Digital Video Matrix

(Conforms to SMPTE 259M, SMPTE 292M)

Data Rates:

SD Boards: 360, 270, 177, 143 Mbps

HD Boards: above rates, plus 1.485 Gbps

Input Return Loss

to 270MHz: 15 dB

to 1.5GHz: 10dB

Automatic Input Equalization (8281 coax)

143,177,270 Mbit/s: 1000 ft

360 Mbit/s: 600 ft

1.485Gbps: 300 ft

Signal Level 800mV p-p $\pm 10\%$

Output Return Loss

to 270MHz 15 dB

to 1.5GHz 10dB

Reclocking: Yes

Analog Video I/O Option

Converter Resolution: 10 Bits

Converter Delay: 1ms

A>D Conversion: 3 line adaptive comb filter

A>D Conversion Delay: 78us

Input and Output Levels:

1V p-p nominal. (100 IRE)

Input and Output Return Loss: >40dB

Differential Gain: 1.5%

Differential Phase: 1.5 degrees

Frequency Response: +/- 0.1dB to 5.5 MHz

Gain Uniformity: +/- 0.5 dB at 500 KHz

Crosstalk: -60dB

Tilt: 0.1%

Signal to Noise Ratio: -58dB

(P-P video vs. RMS noise and hum, 5 MHz b/w)

Digital Audio Matrix

(Conforms to AES3-1992)

Balanced Differential Inputs/Outputs

(75 Ohm Unbalanced I/O option)

Input Impedance: 110 Ohms

Input Level Minimum: 200 mV p-p

Maximum: 7 V p-p

Maximum Common Mode Level: ± 7 V (DC-20 kHz)

Output Impedance: 110 Ohms

Analog Audio I/O Option

Converter Resolution: 24 Bits

(20 or 16 selectable)

Total Harmonic Distortion: 0.1%

(30 Hz to 20 KHz, +24dBm)

Hum and Noise: -85dBm (15 KHz weighting)

Crosstalk: -85 dB (20 KHz, +24dBu)

Gain Uniformity: +/- 0.15dB

Frequency Response: +/- .25dB

(20 Hz to 20 KHz)

Input Impedance: 200K

Output Source Impedance: <50 ohms

Common mode rejection: 70 dB (50/60 Hz)

Power Requirements

PS-400 Redundant Power Supply

(UL-listed and IEC950 approved)

Input: 100-240 VAC, 50/60 Hz

Consumption: 350W Max

Physical

EIA 19" Rack Space requirements:

RF-400 Video or Audio Frame:

8RU (14"/ 356mm)

RF-400RX Redundant Crosspoint Frame:

9RU (15.75"/ 400mm)

RF-400/64 Video or Audio Frame:

4RU (7"/ 174mm)

SC-3: 4RU (7"/178mm)

SC-4: 2RU (3.5"/86mm)

All units are 17"/430mm deep

Shipping Weight (144x144 matrix):

80 pounds

Environmental

Operating Temperature Range: 10-45° C

Relative humidity: 0-90%

(non-condensing)

Notes

Specifications are for 144x144 matrix size

Specifications are subject to change without notice.



New Directions in Digital Switching

4750 Wiley Post Way Suite 150 Salt Lake City, UT 84116

Phone: (801) 575-8801

Fax: (801) 537-3099

Email: sales@utsci.com

www.utahscientific.com