Quartz

Topaz

Routing

System Manual

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MADE IN ENGLAND

Safety

WARNING: Dangerously high voltages are present inside this equipment.

WARNING: To reduce the risk of fire or electrical shock, do not expose this appliance to rain or moisture.

WARNING: This equipment uses power/mains connectors fitted with earth pins. It is most important as a matter of personal safety that the equipment is properly earthed.

CAUTION: This equipment may have more than one power supply cord. To reduce the risk of electric shock, disconnect all power supply cords before servicing.

CAUTION: These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified personnel.

CAUTION: To reduce the risk of electric shock, plug each power supply cord into separate branch circuits employing separate service grounds.

NEVER use flammable or combustible chemicals for cleaning components.

NEVER operate this product with any covers removed.

NEVER wet the inside of this product with any liquid.

NEVER bypass any fuse or replace any fuse with a value or type other than those specified.

NEVER operate this product in an explosive atmosphere.

NEVER block the airflow through ventilation slots.

NEVER expose this product to extremely low or high temperatures.

This product complies with the requirements of the product family standards for video, audio, audio-visual entertainment, and lighting control apparatus for professional use as mentioned below.

CE	EN60950	Safety
	EN55103-1: 1996	Emission
	EN55103-2: 1996	Immunity

Quartz Electronics Ltd

FC

Tested to comply with FCC Standards

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1) This device may cause harmful interference, and
2) This device must accept any interference received, including interference that may cause undesired operation.

For Home or Office Use

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Contents

INSTALLATION

This section describes how to install the system with the minimum of fuss and time. The system has been designed with the aim of being simple to install; we trust that you will agree.

UNPACKING

Remove the equipment carefully from the boxes and check against the Packing List supplied with each unit. This shows what items have been shipped against your order and includes all options. Any error should be reported to your supplier immediately. After you have unpacked the equipment please save all the packing material as this could be useful in the future if the unit needs to be returned for maintenance.

Check each item supplied for transit damage. Any damage should be reported in detail to your supplier. You must state the serial number of the unit (to be found on the rear or side of each unit).

Check that power cords supplied are suitable for your country and that the equipment is compatible with your mains (line) voltage. Note that remote panels are mains powered and must also be checked.

PHYSICAL INSTALLATION

ROUTER FRAMES

All units are designed for mounting in standard 19" equipment racks. The depth of all the frames is 130mm plus connectors, except the Analog Video, which is 275mm. In addition allowance must be made for the high numbers of cables to be installed at the rear of the frame.

Power dissipation in all units is low and cooling is achieved by natural convection.

REMOTE PANELS

The Q-Link remote panels are 130mm deep plus cables. All remote panels are designed to fit into standard 19" equipment racks and can be mounted at any angle.

ELECTRICAL CONNECTIONS

The view of the rear panel shows the connections.

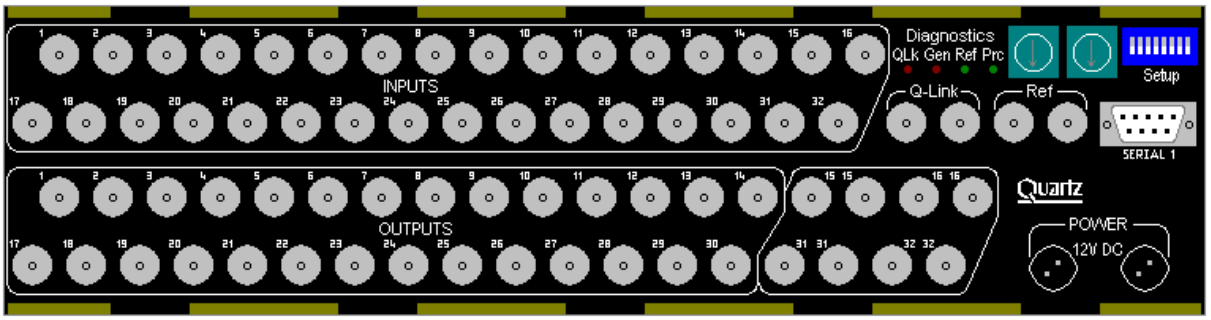


Figure 1: Rear View of Topaz QT-SD-3232 Router

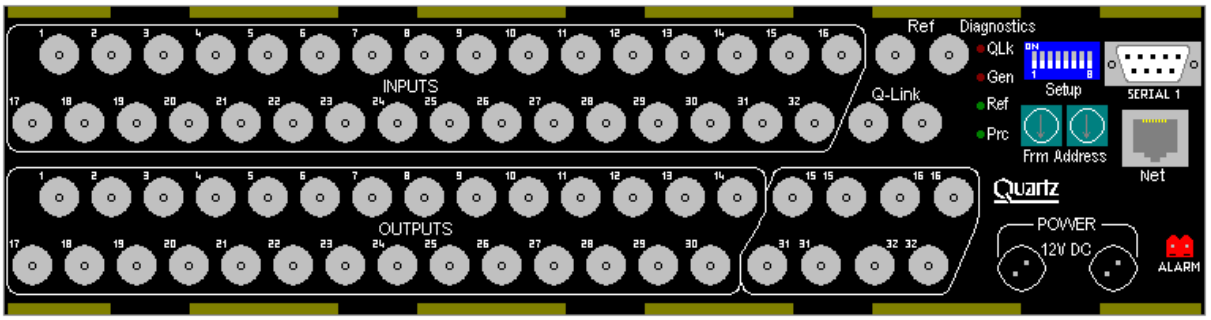


Figure 2: Rear View of Topaz QT-HD-3232 Router

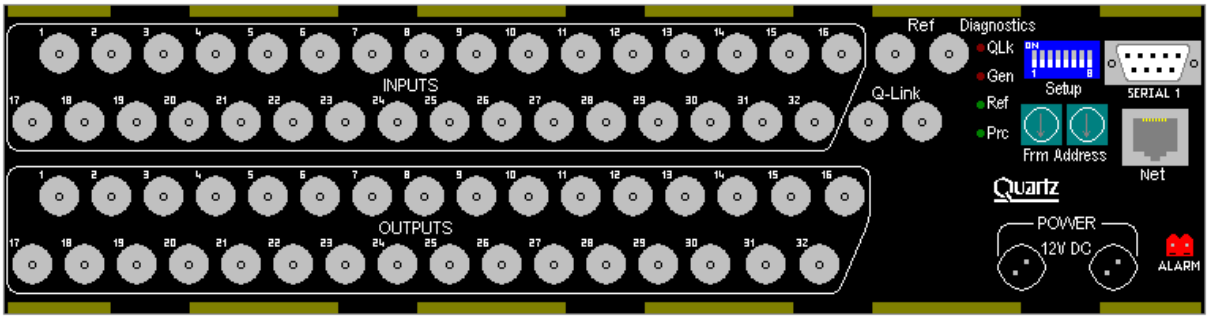


Figure 3: Rear View of Topaz QT-AV-3232 Router

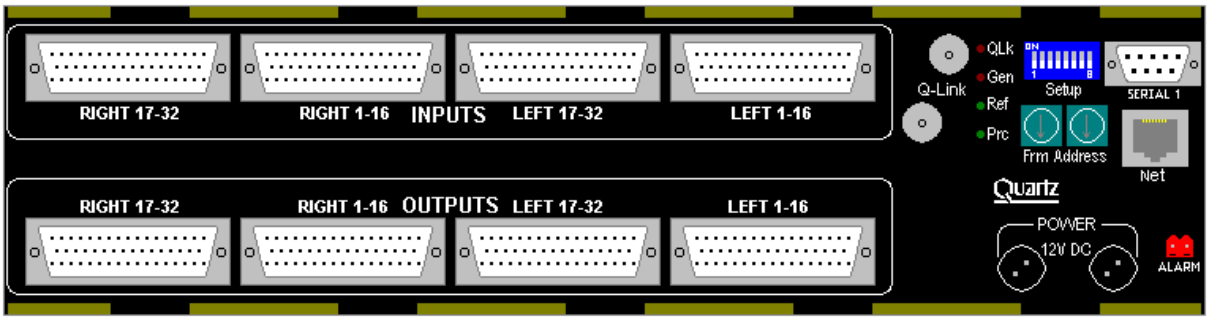


Figure 4: Rear View of Topaz QT-AA-3232 Router

VIDEO INPUTS AND OUTPUTS

These connections are made using standard 75Ω video coaxial cables. A high quality cable such as PSF1/2 (TF3255) or PSF1/3 (TF3304) or equivalents should be used for optimum performance. It is both important and good practice that cables are properly supported and not hanging on the connectors as this can put unnecessary stresses on the connectors and possibly reduce their working life.

On Topaz routers of 16x16 and 32x16, outputs 1-14 are single outputs and 15 and 16 are dual outputs. On 32x32 routers, outputs 1-14 and 17-30 are single outputs and 15, 16, 31, and 32 are dual outputs.

VIDEO SYNC

Standard Definition, High Definition, and Analog Video routers have a separate looping Ref input that takes any standard analogue video signal with standard sync. In addition High Definition routers will also accept a tri-level sync.

If no reference signal is connected then the unit will make crosspoint changes at a rate of about 40Hz.

AUDIO INPUTS AND OUTPUTS

Unbalanced AES digital audio should be routed using the Topaz Analog Video router.

The connections of the analog audio signals to the equipment are made using 50 way multi-way connectors. One connector is used for each block of 16 audio channels.

The matching cable connectors are all PLUG types. They are not supplied as standard because many customers prefer to buy their connectors in bulk and prepare the cables in advance of the equipment being shipped.

Each connector has three pins for each signal: signal hot (+), signal cold (-) and screen. Figure below shows how the cables are wired into the mating plugs. It is good analogue audio practice to earth the cable screens at one end only, as hum can sometimes be introduced owing to earth potential differences. However with digital audio it is better to ground at both ends. For digital audio it is important to use data cable with 110Ω characteristic impedance rather than audio cable. For error free transmission care should be taken to ensure the cable losses are acceptable over the intended length.

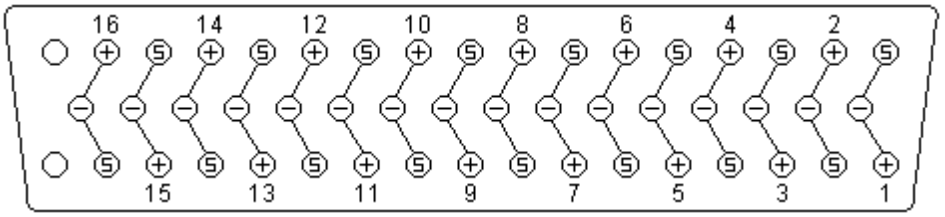


Figure 5: Audio Connector Wiring

REMOTE CONTROL - USING Q-LINK

All Topaz routers can be connected to other Quartz standard routers and standard remote control panels by a single coaxial link called Q-link. This link uses standard 75Ω video cable daisy-chained from frame to frame and from panel to panel over a maximum cable length of 500m. Each end of the link must be terminated in 75Ω. **The installer must fit a 75W terminator at each end of the cable.** A pair of looping connectors is fitted on each unit.

This daisy-chain method ensures the best transmission quality of the control signals down the cable. Short cuts that might save cable, such as running stubs to some panels, are not recommended as this may under certain circumstances cause data errors.

The system can support up to 32 devices. Each unit being connected to the Q-link has its own address switch, which is set up as part of the system configuration.

ETHERNET PORT

This is not currently supported.

The Ethernet port will support TCP/IP protocol and be used for the following functions:

- Setup download from WinSetup using TCP/IP protocol
- Router Control using TCP/IP protocol
- Telnet
- SNMP

RS232/422 SERIAL PORT

The D9 connector on the rear of the router is always functional. The router has three rear panel DIP switches to set some of the serial port modes:

DIP Switch	Function
SW-1	Down/Off = Use WinSetup parameters to set baud rate etc. Up/On = Force Quartz standard protocol and baud rate.
SW-2	Down/Off = Remote control protocol mode. Up/On = Diagnostics mode.
SW-7	Down/Off = RS-422. Up/On = RS-232.

The router has been built to minimise RF emissions. It is important you use tin and dimple D-type connectors with metal shells connected to the screen of external cables in order to achieve low RF emissions from this equipment. The shells are fixed by screw locks with 4-40 UNC threads.

The Computer Interface connector on the equipment is a D-Type 9 socket using the pin connections shown below. The wiring of the connectors is different for RS232 and RS422.

NOTE: The pin connections on the Topaz for RS-422 are NOT the same as the standard Quartz RS-422 pin connections.

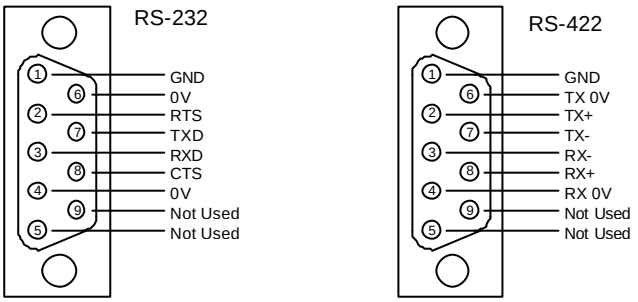


Figure 6: RS232/422 Connecting to the Router

The RS232 PC interface Cable

The cable between the PC and the router only needs to use TX, RX, and GND as shown below.

The cable between a PC with a D-Type 9 way connector and the router:

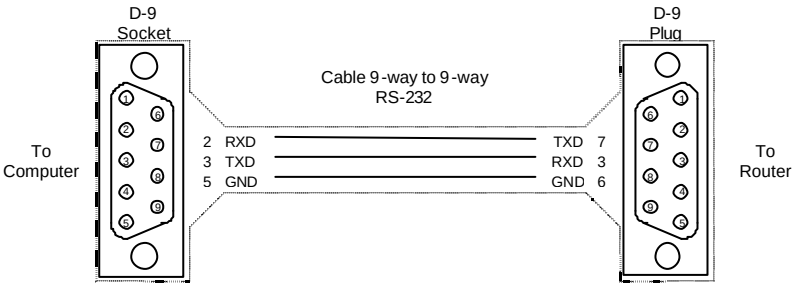


Figure 7: RS232/422 Connecting to the Computer

POWER

The Topaz range uses a common external PSU 'brick' that is auto-ranging and converts nominal 115V or 230V AC mains voltages to safe 12V DC. This then connects to the Topaz router where any internally required voltages are generated. The external PSU has an IEC inlet and approx 1.7m of DC lead terminated in a two-pin bayonet style connector

IEC connectors have an earth pin and as matter of safety this earth pin must be connected to a solid ground to ensure a proper earth connection.

In the UK equipment is supplied with a power cord already fitted with a 3 pin mains plug. Should the lead be re-wired then please make connections using the colour code below:

Brown	Live (Line or Phase)
Blue	Neutral (Return)
Green/Yellow	Earth (Ground)

There is no power switch on the unit so it is essential that the power cord is removed before commencing to service the unit.

All topaz router PSU's are auto-ranging and no adjustments are required.

CONFIGURING THE FRAMES

All of the Topaz routers have a rear panel DIP switch and rotary address switches to allow basic operating modes to be controlled and the Q-Link address to be set.

DIP SWITCHES

This is a small 8-way switch block. The switches should be moved with a small screwdriver or pen.

DIP Switch	Function
SW1-1	Up/On = Force protocol, Down/Off = Use WinSetup
SW1-2	Up/On = Diagnostics mode Down/Off = Protocol mode
SW1-3	Up/On = Q-Link Slave. Down/Off = Q-Link Master.
SW1-4	Up/On = 1 PSU in use. Down/Off = 2 PSU in use, alarm if one fails.
SW1-5	Up/On = Field rate switching. Down/Off = Frame rate switching
SW1-6	Up/On = 625 Line switching standard (line 6/319). Down/Off= 525 Line switching standard (line 10/273).
SW1-7	Up/On = RS232. Down/Off = RS422
SW1-8	Up/On = Self Test Off. Down/Off = Self Test On

Note on Topaz SD SW1-4 has a different function:

SW1-4	Up/On = Use last crosspoint settings at power up. Down/Off = Force all outputs to specified input.

Q-LINK ADDRESS SWITCHES

The rotary hex switches are used to set the unique address of the router. The purpose of the switch setting is to ensure that each router has a different code. This distinguishes different routers and panels in a multi-frame system so each is identified uniquely and updated with the correct settings.

A small screwdriver is needed to fit the slot and make the selection. Rotate the switch, which has 16 positions from 0 through 9, then A to F (hexadecimal notation). The two switches together support the address range from 00 to 3F.

TV LINE SWITCHING

Standard Definition Router

Switching always complies with the SMPTE RP-168 standard (525 = line 10/273, 625 = line 6/319). It is also possible to choose whether to permit switching on every TV field or only on the first field of each picture, important in some editing applications, using SW1-8.

Function	SW1-6
625	Up/On
525	Down/Off

Function	SW1-5
Field mode	Up/On
Frame mode	Down/Off

High Definition Router

Switching always complies with the SMPTE RP-168 standard.

Function	SW1-6
Tri-level sync	Up
525/625 sync	Down

Function	SW1-7
625 mode	Up
525 mode	Down

Note that SW1-7 is only used when in 525/625 sync mode.

Function	SW1-8
Frame mode	Up
Field mode	Down

Analogue Video Router

Switching always complies with the SMPTE RP-168 standard (525 = line 10/273, 625 = line 6/319). It is also possible to choose whether to permit switching on every TV field or only on the first field of each picture, important in some editing applications, using SW1-8.

Function	SW1-6
625	Up/On
525	Down/Off

Function	SW1-5
Field mode	Up/On
Frame mode	Down/Off

GENERAL DESCRIPTION

INTRODUCTION

The Topaz range are small routing switchers ideal for simple switching applications. The Topaz routers are available in a range of sizes and cover most signal formats.

Each router format: high definition (HD), standard definition (SD), analog video (AV), and analog audio (AA), is a stand-alone unit. They use external power 'bricks' and two such units can be used to provide a redundant PSU solution. A controller is built in to each router. Options include the redundant PSU and rear mount PSU carrier trays.

Products currently available

QT-SD-1616	Standard Definition, 16x16, 2U
QT-SD-3216	Standard Definition, 32x16, 2U
QT-SD-3232	Standard Definition, 32x32, 2U
QT-HD-1616	High or Standard Definition, 16x16, 2U
QT-HD-3232	High or Standard Definition, 32x32, 2U
QT-AA-1616	Analog Audio, 16x16, 2U
QT-AA-3232	Analog Audio, 32x32, 2U
QT-AV-1616	Analog Video, 16x16, 2U
QT-AV-3232	Analog Video, 32x32, 2U

Options

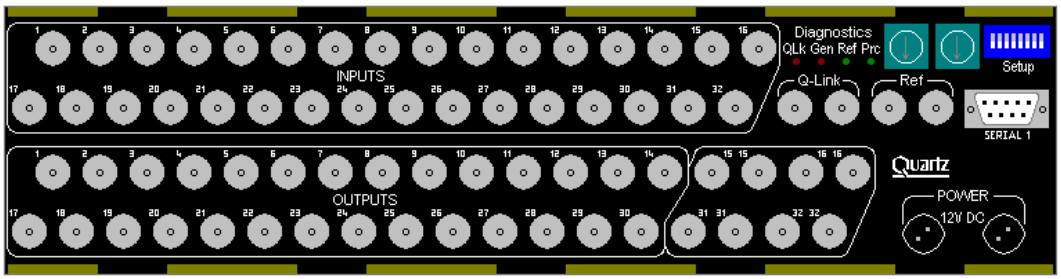
QT-PS	Additional PSU for backup or as a spare
QT-TR	PSU mounting tray, main/right-hand, fitted to rear of QT router
QT-TL	PSU mounting tray, backup/left-hand, fitted to rear of QT router

Units may be stacked together to form multi-level (video plus audio) routers. A local control panel may be attached in place of the blank front panel, usually as a factory installed option.

The internal controller supports Q-Link and is compatible with any other Quartz router or any of the standard Quartz remote control panels.

Routers are configured using the WinSetup program but a default configuration will have been factory installed.

STANDARD DEFINITION VIDEO (SD)



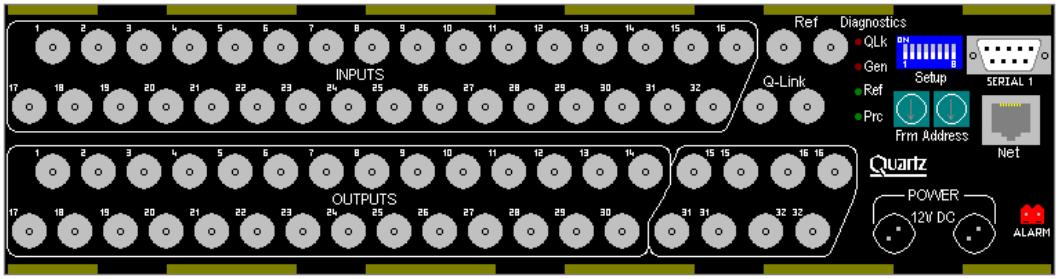
The matrix is capable of handling signals in the following formats:

270Mb/s	D1 component
270Mb/s	ASI MPEG Compressed Video
143Mb/s	D2 NTSC composite
177Mb/s	D2 PAL composite
360Mb/s	future wide screen applications

The serial video inputs are terminated in 75Ω and fed to an input receiver circuit that provides equalisation for losses to serial video signals, mainly at high frequencies, that have travelled down long cables. This equalisation varies automatically to suit the length and type of video cable used. The crosspoint array switches the signal, which then passes to the output amplifiers that are designed to drive 75Ω video cables. Outputs 15, 16, 31, and 32 have twin feeds and all other outputs have just one feed of the signal.

Vertical interval switching is referenced to the Sync Input and complies with SMPTE RP-168.

HIGH DEFINITION VIDEO (HD)



The matrix is capable of handling signals in the following formats:

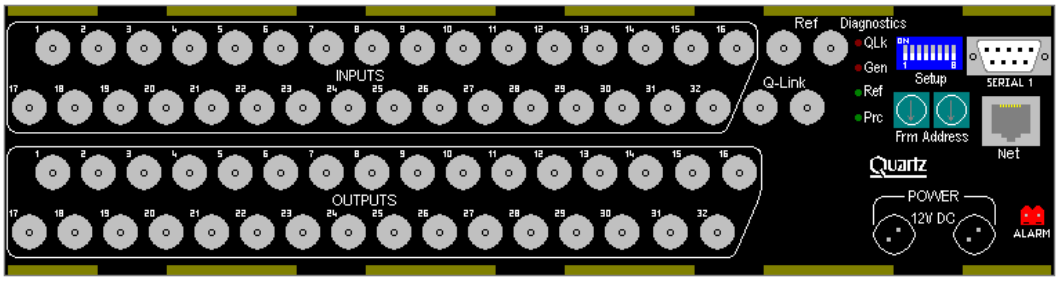
1.485Gb/s	HD 60Hz Frame Rate
1.485/1.001Gb/s	HD 59.94Hz Frame Rate
270Mb/s	D1 component
270Mb/s	ASI MPEG Compressed Video
143Mb/s	D2 NTSC composite
177Mb/s	D2 PAL composite
360Mb/s	future wide screen applications

The serial video inputs are terminated in 75Ω and fed to an input receiver circuit that provides equalisation for losses, mainly at high frequencies, to serial video signals that have travelled down long cables. This equalisation varies automatically to suit the length and type of video cable used. The output stage re-clocks the signal from the crosspoint so that the correct pulse widths and timings are regenerated. It automatically selects the correct sample rates from those mentioned above. The output amplifiers are designed to drive 75Ω video cables. Output 1 has twin feeds but the second output has just one feed of the signal.

Vertical interval switching is referenced to the Sync Input, which can be either HD tri-level sync or standard sync (complies with SMPTE RP-168).

ANALOGUE VIDEO (AV)

Available Q3 2004.



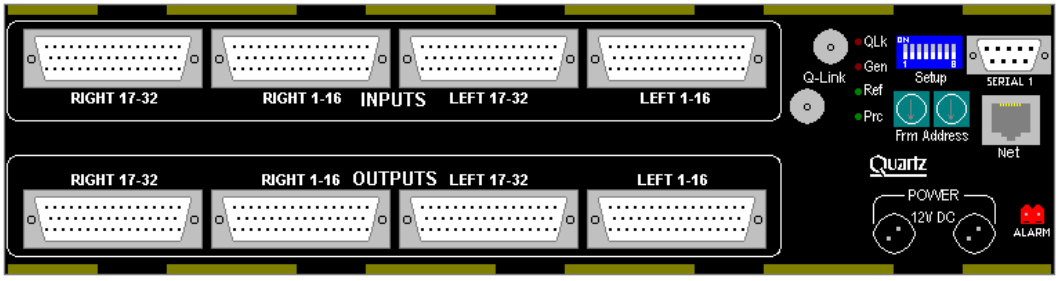
The video inputs are terminated in 75Ω and dc coupled, enabling it to handle composite or component signals. The output amplifiers are adjustment-free with a bandwidth to over 100MHz.

Vertical interval switching is referenced to the Sync Input and complies with SMPTE RP-168.

This product can also route AES unbalanced audio signals.

ANALOGUE AUDIO (AA)

Available Q3 2004.



The inputs are electronically balanced to provide a high common mode rejection over a wide frequency range. The input connectors are two D50 multi-way types and outputs are a single D15. The output stages are balanced and the insertion gain so accurately maintained that no adjustment is required. A jumper link for each output is provided to correct the gain when driving into 600Ω loads. If it is necessary to drive unbalanced loads then just one of the output lines and 0V are used, resulting in a 6dB drop in level.

AES/EBU DIGITAL AUDIO (DA)

BALANCED (D50)

Not available yet.

This unit supports the standard 110Ω AES3-1992 interface.

The audio inputs and outputs are transformer coupled and the connectors are a D50 multi-way type for inputs and a D15 for the outputs.

UN-BALANCED (BNC)

For applications using the SMPTE 276M 75Ω AES3-ID coaxial interface a standard video router can be used. Contact the factory for more details about this application.

POWER SYSTEM

The Topaz range uses a common external PSU 'brick' that is auto-ranging and converts nominal 115V or 230V AC mains voltages to safe 12V DC. This then connects to the Topaz router where any internally required voltages are generated. The external PSU has an IEC inlet and approx 1.7m of DC lead terminated in a two-pin bayonet style connector.

CONTROL SYSTEM

INTRODUCTION

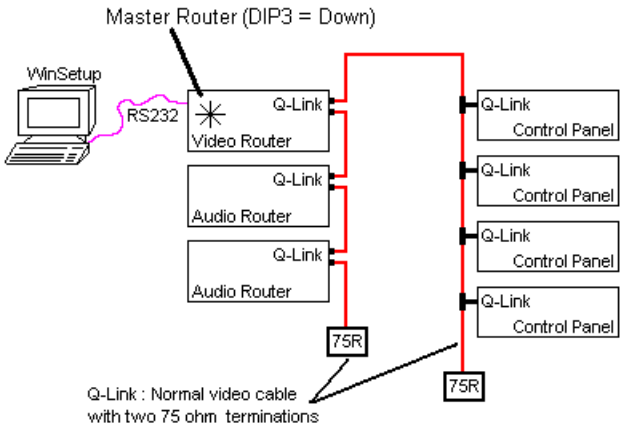
The Topaz internal controller module supports the full range of control features of the larger Quartz routers, resulting in the following major benefits:

1. Any standard Quartz remote panel can be connected to the router.
2. It is possible to connect this router into a larger Quartz routing system so that, for instance, it could provide output monitoring for another much larger router.
3. Several Topaz routers can be stacked, e.g. three routers to handle component analogue video signals.
4. Up to three routers can be cascaded to provide a router of up to 64x16 for monitoring applications.
5. Support for an RS232/422 port, enabling the router to be controlled from another piece of equipment.
6. Crosspoint status is maintained while the unit is powered down.

Topaz routers are reconfigured using the Quartz WinSetup Windows software package.

THE Q-LINK SYSTEM

Q-link is used to interconnect the panels and router frames using a single coaxial cable, making it very easy to install. A total run of over 500 metres of standard video cable can be used between panels and the frames.



The Q-link is daisy-chained from one panel to the next and between router frames. **The link must be terminated with 75W at both ends**, standard video practice.

The WinSetup configuration lists the devices to be connected to the Q-Link. Two hex switches at the rear of each unit set the Q-Link address and this must match the address specified in WinSetup. Up to 32 devices can be supported.

ETHERNET PORT

This is not currently supported.

The Ethernet port will support TCP/IP protocol and be used for the following functions:

- Setup download from WinSetup using TCP/IP protocol
- Router Control using TCP/IP protocol
- Telnet
- SNMP

SERIAL PORT

The serial port is used to connect to computers or other third party equipment. This feature is always available but is controlled by the rear panel DIP switch.

LOCAL CONTROL PANEL

Option not currently available.

REMOTE CONTROL PANELS

Any of the Quartz Q-Link remote panels may be connected to the Topaz. Their operation is determined by the configuration of the master unit in the system. Refer to Quartz manual MANUAL-05 for details of the Q-Link control panels and their operation.

SPECIFICATIONS

SERIAL VIDEO

VIDEO INPUTS

Signal level	800mV p-p nominal
Impedance	75Ω terminating
Return Loss to 5-270MHz	15dB, 17dB typical

VIDEO OUTPUTS

Impedance	75Ω
Return Loss to 5-270MHz	15dB, 17dB typical
dc on output	0+/-0.5V

SIGNAL PATH

Rise/Fall Times	0.6-0.9ns
Cable Equalisation at 270MHz	
Belden 8281, BBC PSF1/2	300M min, 350M typical
BBC PSF1/3	200M min, 250M typical
Path length	9ns, spread 1ns
Line Switching (to SMPTE RP-168)	line 6/319 (625)
	line 10/273 (525)

HIGH DEFINITION VIDEO

VIDEO INPUTS

Signal level	800mV p-p nominal
Impedance	75Ω terminating
Return Loss to 5-1485MHz	15dB

VIDEO OUTPUTS

Impedance	75Ω
Return Loss to 5-1485MHz	15dB
dc on output	0+/-0.5V

SIGNAL PATH

Rise/Fall Times	0.2-0.4ns
Cable Equalisation at 1485MHz	
Belden 8281, BBC PSF1/2	95M
Belden 1694	140M
Path length	5ns
Line Switching (to SMPTE RP-168)	HD = Tri-level
	625 = line 6/319
	525 = line 10/273

ANALOGUE VIDEO

VIDEO INPUTS

Signal level	1V p-p nominal, +6dB max.
Impedance	75Ω terminating
Return Loss to 5.5 MHz	40dB

VIDEO OUTPUTS

Impedance	75Ω
Return Loss to 5.5 MHz	40dB
dc on output	+/-50mV

SIGNAL PATH

Insertion gain	+/-0.1dB
HF response	+/-0.2dB, to 5.5MHz
	-3dB, to 100MHz
Diff Gain and Phase	0.15%, 0.15° (10-90% APL)
Timing spread at 4.43MHz	+/-1° at any output
Crosstalk at 4.43MHz	-57dB
Noise to 5.5MHz	-70dB rms.
Vertical Interval Switching	Input 1

ANALOGUE AUDIO

AUDIO INPUTS

Signal level	0dBu nominal, +20dBu max.
Impedance	20KΩ

AUDIO OUTPUTS

Impedance	40Ω balanced
dc on output	+/-50mV

SIGNAL PATH

Insertion gain	+/-0.1dB
Frequency Response	
20Hz to 20KHz	+/-0.25dB
to 150KHz	-3dB
Total Harmonic Distortion	0.05%, 0.03% typical
-10dBu to +20dBu and 20Hz to 20KHz	
Crosstalk	-85dB 20Hz to 20KHz
Noise	-90dB rms.
	20Hz to 20KHz unweighted

COMMON FEATURES

Standard Control

Q-Link

Q-link to remote panels	75Ω video cable, 500M max.

Serial

Computer RS232/422	D9 female

POWER	90-264v 50/60Hz auto-ranging
	30 watts

PHYSICAL

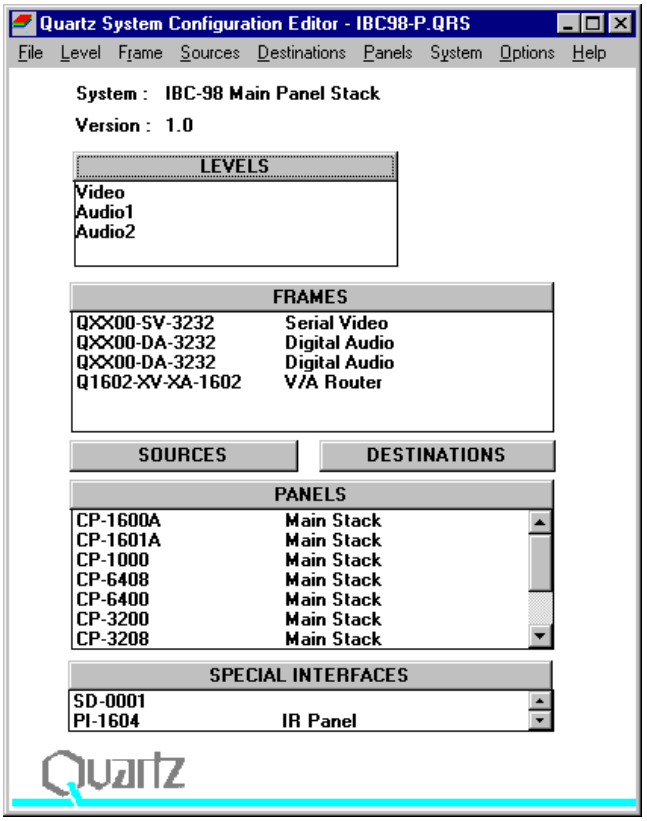
Height	2U, 88mm
Width	rack mount
Depth of router	130mm
Audio Connectors	2 x D50 female inputs
	2 x D50 female outputs
Temperature, operating	0-40°C
Ventilation	natural convection

CONFIGURING THE SYSTEM: WINSETUP

The WinSetup program is used to configure most of the routing functions, including control panel operation. It allows such things as the number of signal levels to be defined, which routing frames and panels are connected to the system, what the names are for the inputs and outputs.

WinSetup is supplied with a comprehensive help system that can be accessed by pressing **F1** (function key F1) from any screen (dialog). The help system can also be entered from the *Help, Index* menu. The following notes are a very brief guide to WinSetup intended to get you started.

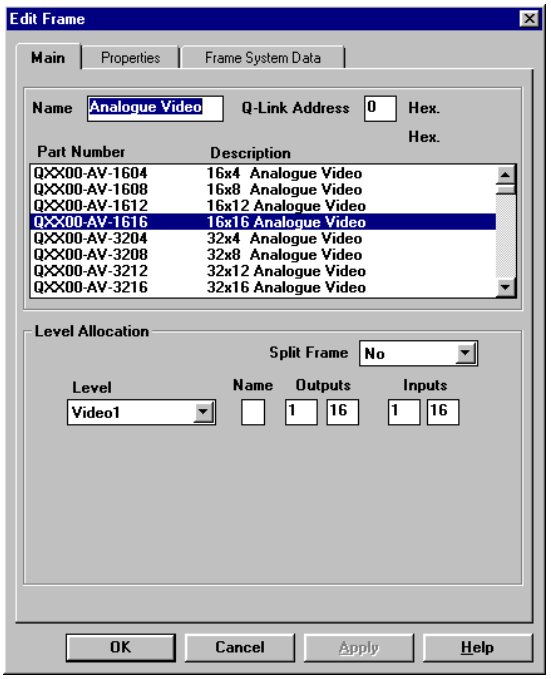
The following dialog is the WinSetup main screen. Any part of the system can be configured from the menu at the top of the screen. The grey bars above each main section and the lines items within the main sections can both be used for quick access to specific items.



If you are generating a system configuration from new then some of the menu's and functions are greyed out (not available). This is deliberate to 'lead you through' the functions that need to be set up. Carry out the following functions to configure your system.

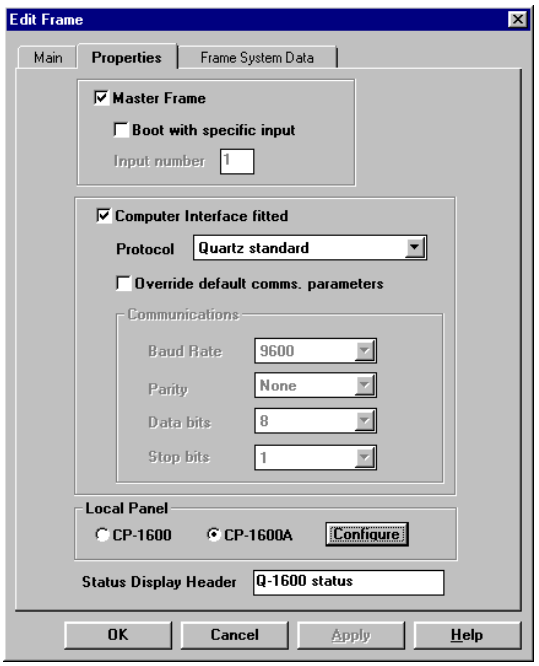
(1) Levels: Enter the level names for each of the signal levels you want to control. The example above shows a typical small system with video and stereo audio. Do not tick the Complex box at this stage.

(2) Frames: Enter the frames dialog and use the new button. This will show all Quartz routers listed by part number. Select the part number that matches the part number on the routers serial number label. If you cannot find an exact match then use one of the generic part numbers like Qxx00-SV-3232 for a Q3200-SV-3232 or a Q6400-SV-3232.

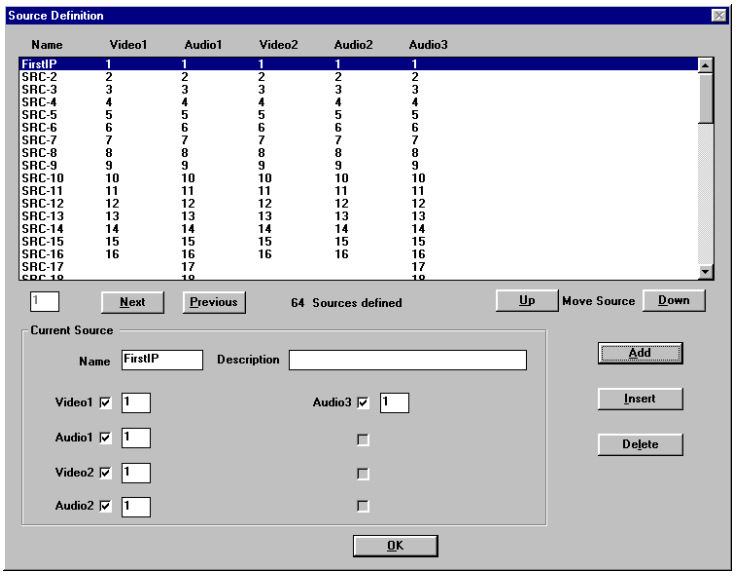


Router frames have to be 'attached' to the router level that they are to follow, and this is set in the level allocation section in the lower half of the screen.

Now use the properties tab to set the routers internal control functions. Note that this dialog is not essential for system operation, but if filled in helps to document how the system is to be used.



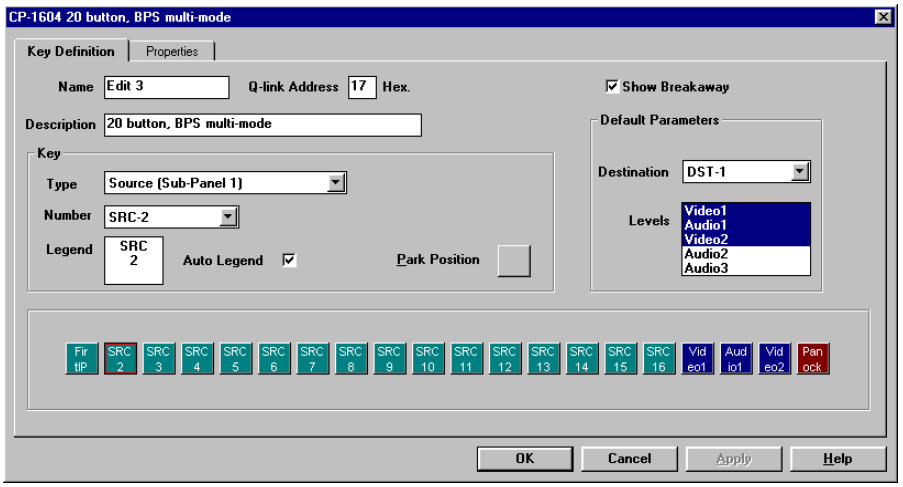
(3) Sources: Enter the sources dialog and use the add button to fill the name table with SRC-1 to SRC-x. The names can be edited later when a few panels are configured and working.



If you want the edit a name now then select one row from the list of names in the upper part of the screen, the details appear in the lower part of the screen. From here you can edit the name and decide which signal levels that name will control when selected on a control panel.

(4) Destinations: Enter the destination dialog and set up the destination names in the same way as used for the source names.

(5) Panels : Enter the panels dialog and use the new button. This will show all Quartz panels listed by part number. Select the part number that matches the part number on the panels serial number label. A new dialog will appear showing a graphic of the panel.



Each button can be programmed by selecting the button and then editing the functions in the Key section of the dialog. Each panel should also be given a name for later identification, EDIT 3 in this example. The Q-Link address will be allocated automatically by the program but can be edited if required. The default parameters control how the panel will function at power up, in this example the panel will always control DST-1 to start with. Now add any further panels that the system will need.

(5) Download: Use the System menu, Download-to-Router, to transfer the setup data to the router, having first set the correct COM port and baud rate (normally 38400). Remember to save the setup as it can **NOT** be retrieved from the router.

CONTROL PANEL OPERATION

The whole range of standard Q-Link panels are described in a separate manual MANUAL-05.