QUARTZ

Q256-SV

ROUTING SWITCHER

SYSTEM MANUAL

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MADE IN ENGLAND

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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

EN504192 2005
Waste electrical products should not be disposed of with household waste. Contact your Local Authority for recycling advice

Quartz Electronics Ltd FCC For Home or Office Use	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.

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Introduction

Thank you for selecting Quartz products for use in your video/audio system. The Q256-SV family of products offers outstanding quality and value, and will provide a long and cost effective working life with the minimum of maintenance. In order to offer the best in customer support, Quartz supplies the Q256-SV series of products with a full two-year manufacturing warranty.

This guide is intended as a reference to the use of the Q256-SV SDI routing switcher, and should contain all the information you will want to know about using these products. In the event of further product information or assistance being required, please contact Quartz or your local Quartz distributor.

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There are many other products in the Quartz range in router sizes from 8x2 up to 128x128, not including the Q256 range, in all signal formats including HD, SDI, AES, analog video and analog audio. We can also supply a range of data, tally, and relay routers.

General Description

The two building blocks of the Q256-SV are 8U and 16U rack frames. The 8U rack frame is capable of a serial digital video matrix of 128x128. The 8U rack frame can be expanded above 128x128 after installation by adding further 8U or 16U frames, contact the Quartz sales office for further advice.

The Q256-SV 16U rack frame that is capable of a serial digital video matrix of 256x256. The Q256 can be expanded above 256x256 after installation by adding further 8U or 16U frames, contact the Quartz sales office for further advice.

Both products are available in sizes from 32x32 and are expandable in blocks of 32 inputs or outputs. By using four Q256-SV 16U chassis, it is possible to build a compact 512x512 routing switcher in just 64U of rack space. This expansion is carried out without the need for separate distribution amplifiers and switches for cascading outputs.

Both products can be fitted with optional in-built signal monitoring, redundant control, and power supply.

Both products can also be equipped with High Definition (HD) input and output fins.

Applications

The Q256-SV routing switchers are designed for use in large SDI installations where a flexible expandable routing switcher is required. The Quartz router control system also allows control from multiple devices simultaneously, allowing replacement of smaller separate routing switchers.

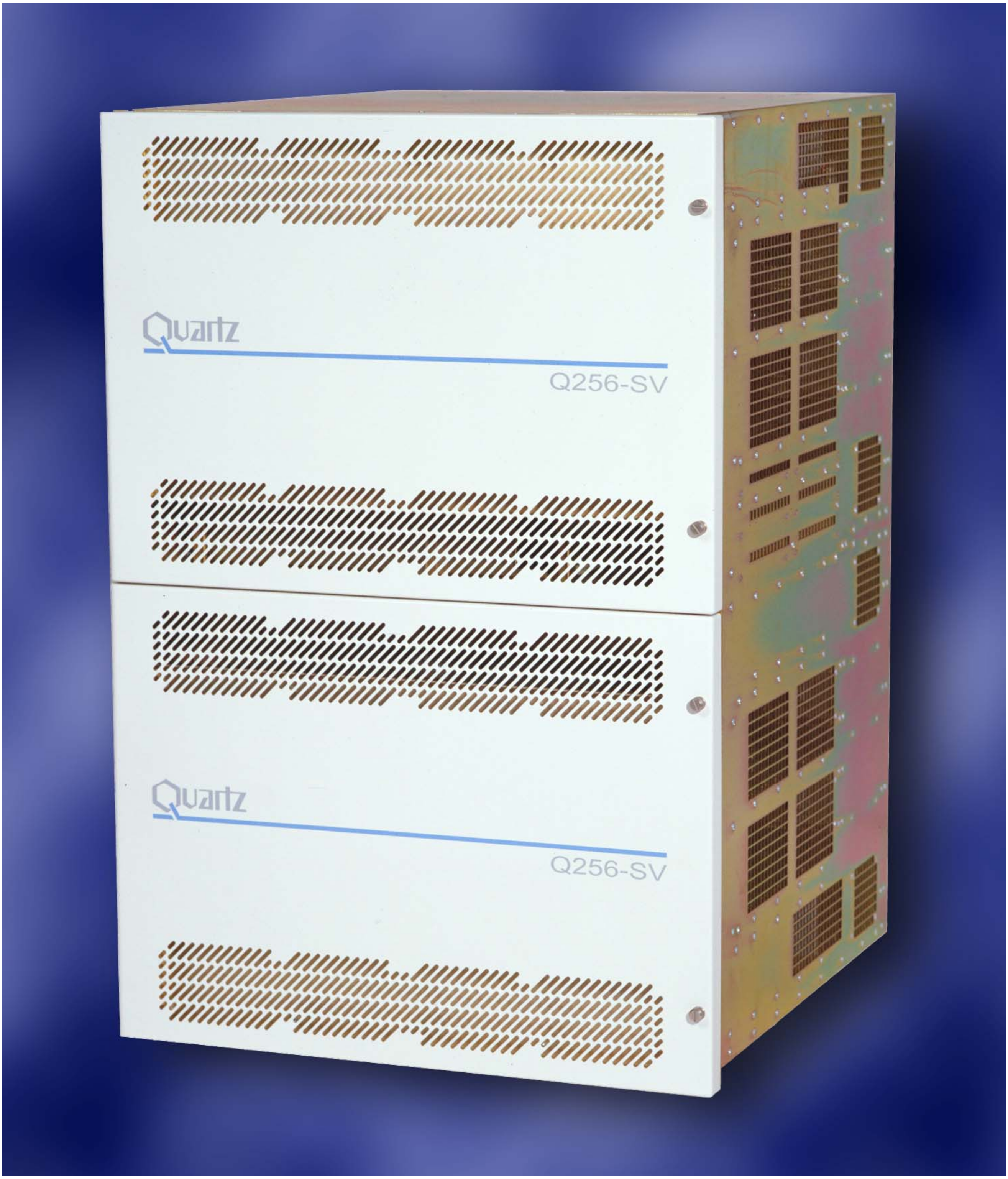
By replacing the standard SD input and output fins with their high definition (HD) equivalents the router can be supplied as a HD router or upgraded in the field in stages from SD to HD. The maximum HD in an 8U chassis is 64x64 and the maximum HD in a 16U chassis is 128x128. The 16U - 128^2 option must be spread equally across the two halves of the frame (i.e. 64 in the top half and 64 in the bottom half).

Key Features

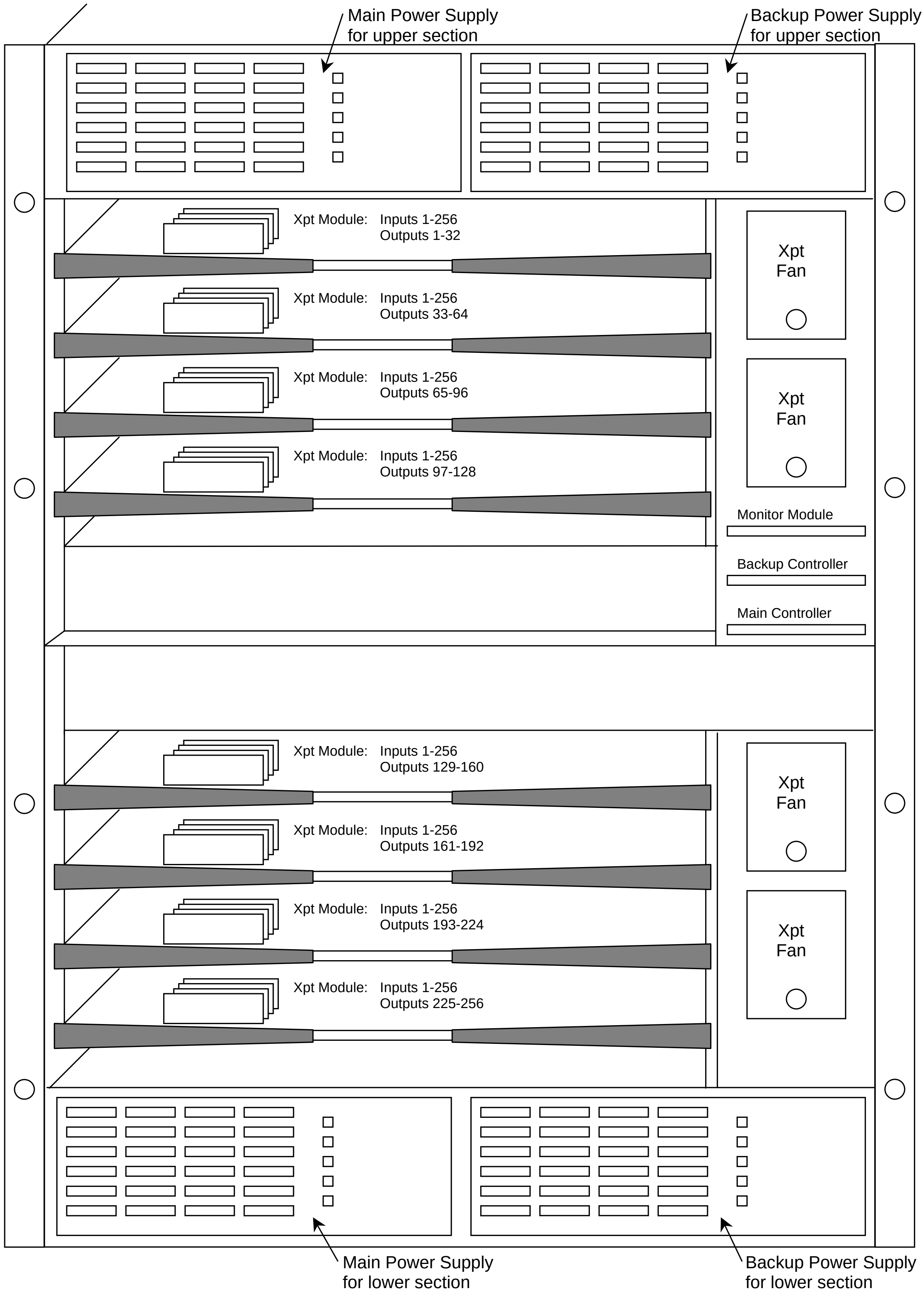
- 128x128 SDI router in 8U.
- 256x256 SDI router in 16U.
- Expandable in blocks of 32 inputs or outputs.
- Digital composite and digital component in the same chassis.
- 360Mbit compatible.
- Flexible control system, can work stand-alone or with the Quartz System Controller, SC-1000
- System-wide environmental monitoring.
- Optional input and output signal monitoring with full EDH check.
- Modular architecture for large sizes.
- Compact design.
- Field expandable.
- Field software and firmware updates.
- Remote monitoring over Ethernet.
- Optional built-in diagnostics.
- Optional power supply redundancy.
- Optional control card redundancy.
- Automatic input equalization.
- Output clock regeneration.
- High Definition (HD) options available up to 128x128.

HD Options	
Chassis	Max
8U	64^2
16U	128^2 *must be equally spread across top 8U frame and the bottom 8U frame

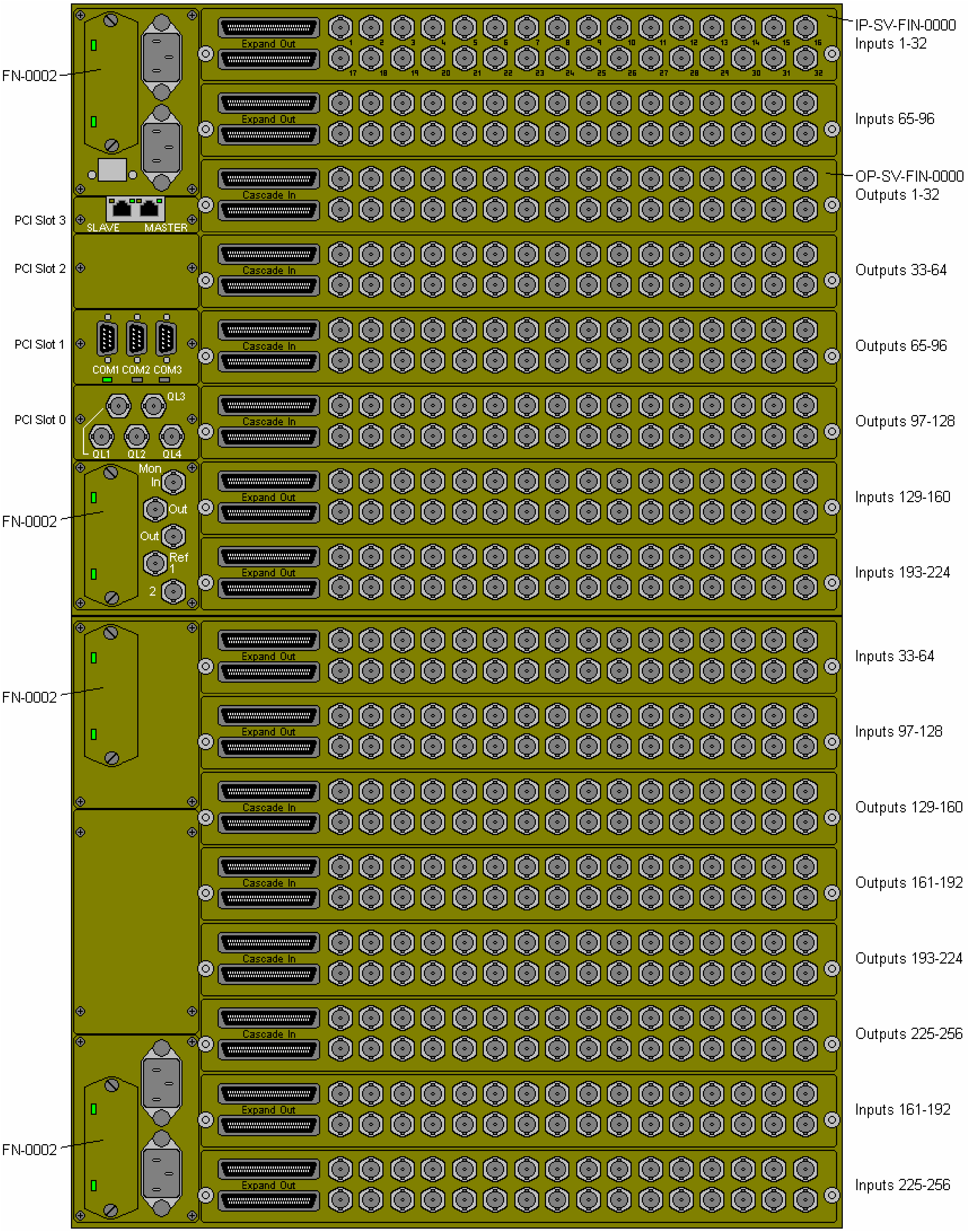
Front View



Front View, Doors Removed



Rear View



Standard input Fin numbering plan.

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Installation

Unpacking the Q256-SV

When fitting the router in a rack frame, be sure to provide support rails beneath it. DO NOT mount the rack by the `ears' only.

Ensure that all cards are located in their guides and pushed fully home.

WARNING: A fully loaded Q256-SV 8U rack weighs 46 kg; one person should not attempt to lift the router.

WARNING: A fully loaded Q256 16U rack weighs 94 kg; one person should not attempt to lift the router. This size chassis **MUST** be adequately supported on a rack shelf unit and not allowed to 'hang' on the rack ears only.

WARNING: Do NOT run a Q256-SV router with side vents blocked.

Operating Conditions & Cooling

When installing the router ensure an adequate airflow can be maintained. In common with other high-speed, high-density electronic units, the Q256 generates a lot of heat. A fully loaded 16U chassis produces 1.6KW of heat and the only way to dissipate this is by drawing cool air in and expelling hot air.

The router draws most of its air through the right hand side and expels it from the left hand side. Some air is also drawn from the front to cool the power supply. The air passing through the Q256 is heated by 18ºC. It is vital that the air vents remain clear of obstructions and that adequate ducting is provided to prevent hot exhaust air from adjacent units, particularly other Q256 chassis, entering the air intakes of the Q256.

The ambient operating temperature maintained should be between 0 and 30 degrees centigrade.

Power Supplies

A thermal circuit breaker is built in to each PSU On/Off switch to protect the power supply and associated mains cabling and therefore no external main fuse is fitted to this product. Each supply has it's own independent IEC inlet.

Should a power supply unit fail, redundancy diodes isolate the defective unit, allowing uninterrupted operation of the router if redundant units are fitted.

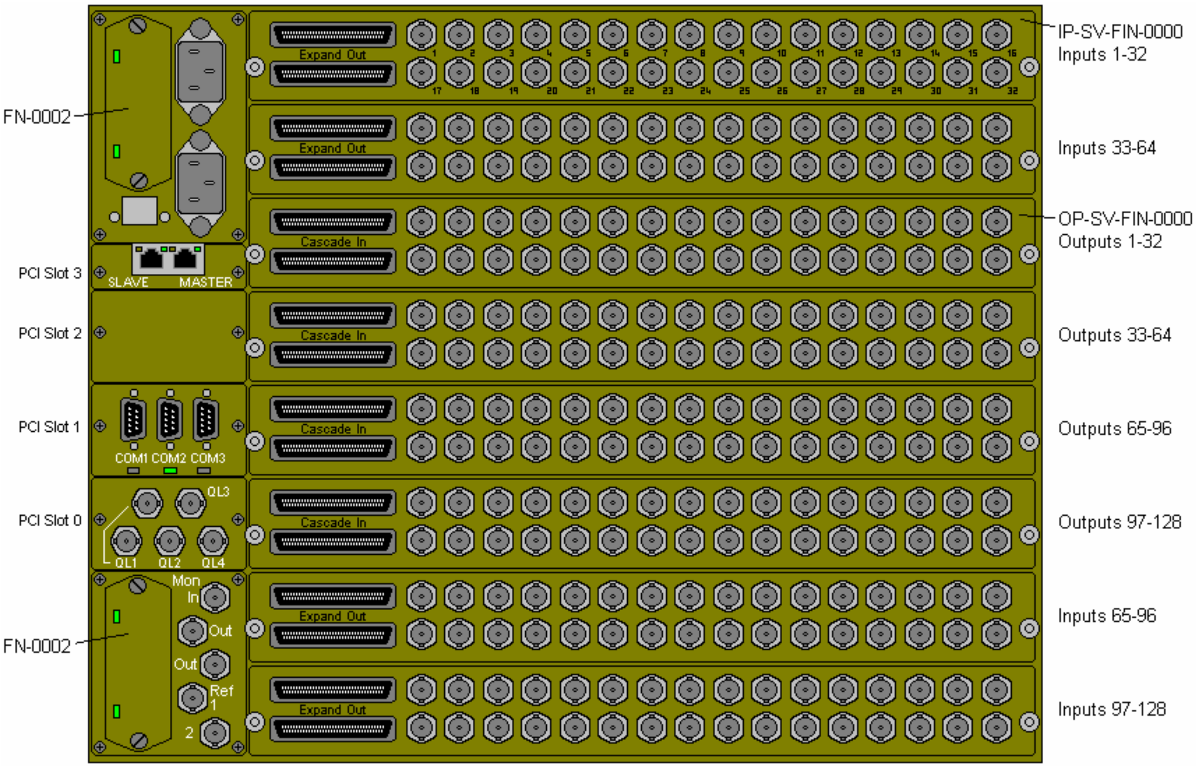
WARNING: As with most power supplies, dangerous voltages exist within these modules, therefore:

Do NOTattempt to repair these units.

WARNING: The high currents that the power supplies can deliver may result in long term contact damage if the supplies are 'hot' plugged, therefore:

Do NOT remove or insert a power supply with its power on. Use the units' front panel circuit breaker to power it down first.

Video Connections
The Q256-SV router is available in an 8U or 16U configuration. The 8U chassis is shown below.

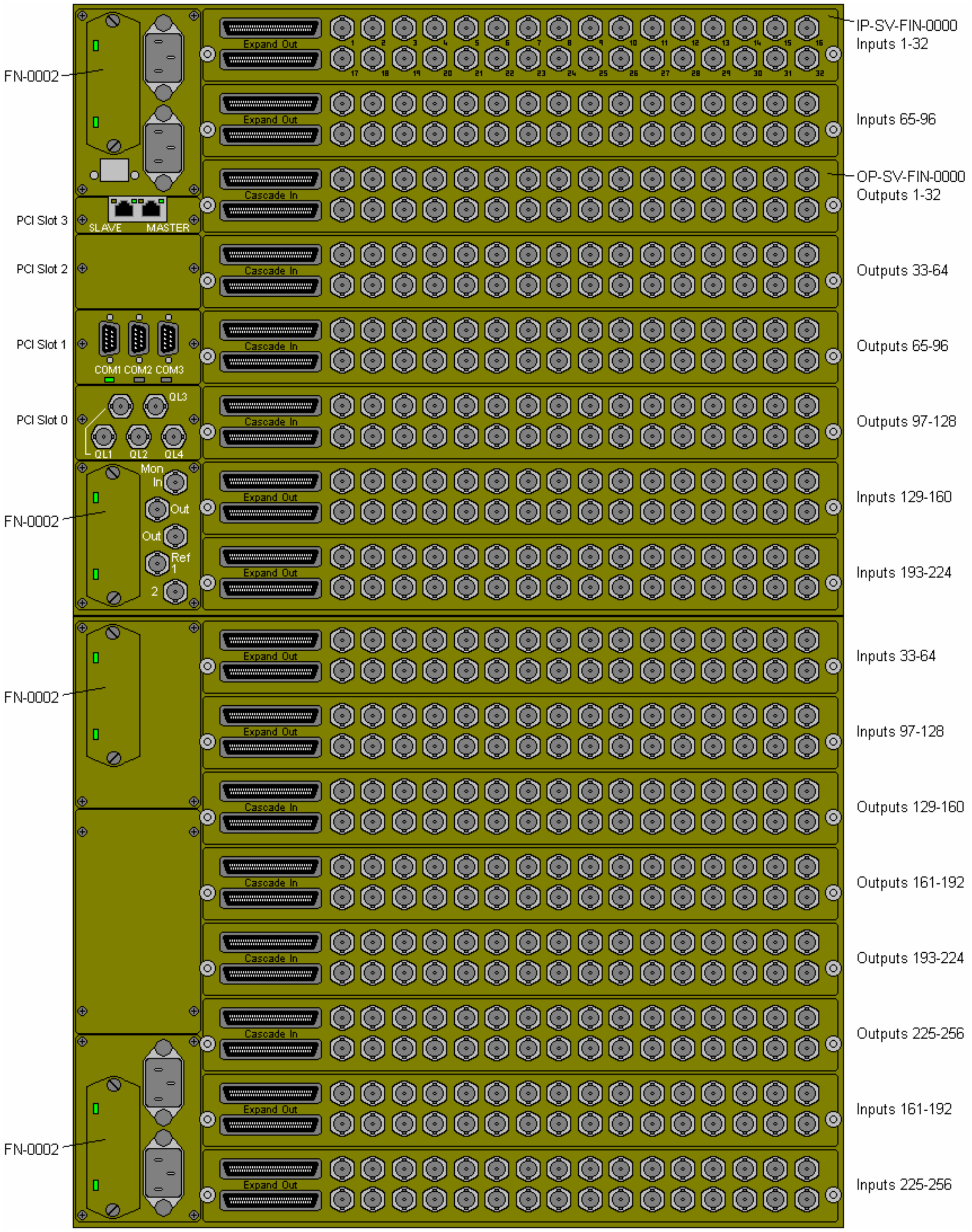


All video inputs are terminated in 75R, all video outputs are single outputs.

An analogue video reference signal should be connected to the Ref 1 input and this is terminated in 75R. The Q256 supports dual references for combined 525/625 operation and in these systems the Ref 2 connector should be used for the other reference signal.

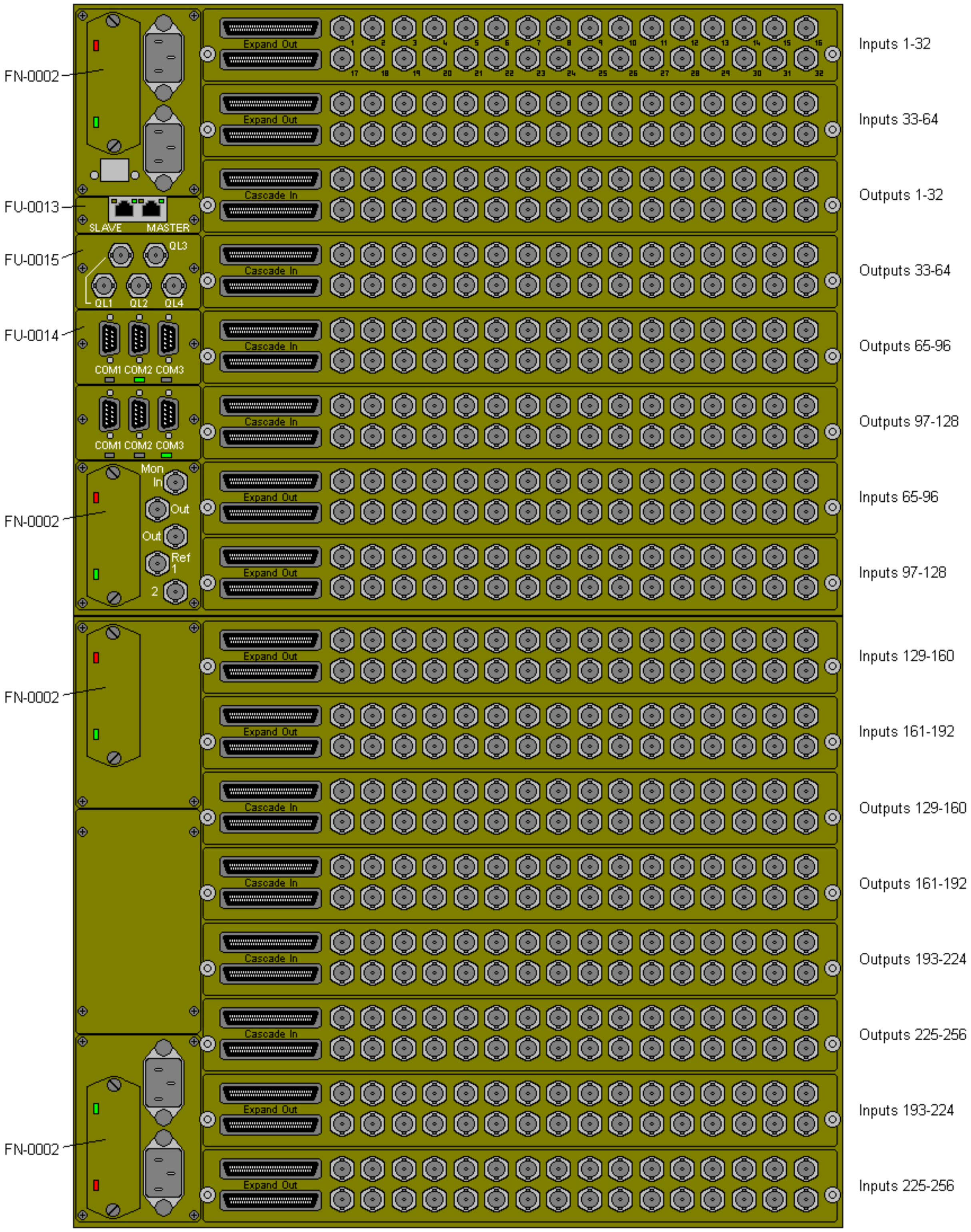
The SCSI expansion connectors carry video signals in an internal differential format and are only used when expanding outside a single chassis system. The input fin SCSI connector feeds buffered versions of the BNC input signals on to other frames in the system to expand the outputs. The output fin SCSI connector takes a routed input signal from other routers to cascade the higher numbered inputs.

The 16U chassis is available with two different input numbering plans, software selectable, and the standard numbering plan is shown below.



All video inputs are terminated in 75R, all video outputs are single outputs. An analogue video reference signal should be connected to the Ref 1 input and this is terminated in 75R. The Q256 supports dual references for combined 525/625 operation and in these systems the Ref 2 connector should be used for the other reference signal. Note that the dual reference signalling works at a crosspoint module level. Therefore all 32 outputs from one ‘fin’ must change to the same video reference.

The **non-standard** numbering plan is shown below. This can only be used on 128x128 systems or systems with a full complement of input fins.



All video inputs are terminated in 75R, all video outputs are single outputs. An analogue video reference signal should be connected to the Ref 1 input and this is terminated in 75R. The Q256 supports dual references for combined 525/625 operation and in these systems the Ref 2 connector should be used for the other reference signal. Note that the dual reference signalling works at a crosspoint module level. Therefore all 32 outputs from one ‘fin’ must change to the same video reference.

Reference

There MUST be an analogue reference present to ensure the crosspoint changes occur during the field-blanking interval. If the reference is missing then the routing will occur asynchronously. The reference must contain syncs of between 300 mV and 5V when terminated, e.g. colour bars or black burst. If you experience problems with clean switching then refer to our application note AN-0008.

The reference signal should be connected to the Ref 1 input and this is terminated in 75R. The Q256 supports dual references for combined 525/625 operation and in these systems the Ref 2 connector should be used for the other reference signal. Note that the dual reference signalling works at a crosspoint module level. Therefore all 32 outputs from one ‘fin’ must change to the same video reference.

Serial RS232 Port (front of processor)

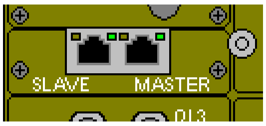
The main (lower) and backup (upper) processors both have a D9 serial port connector that can be used for some engineering functions. At power the serial port reports the software version, hardware version, TCP/IP address, plus the configuration of the router with a list of what modules are fitted. The serial port can be used with the BootChange program to change the TCP/IP address from the factory default setting. This connector has the following pin-out.

M-FU-0012-0100 (PC-306-C1)

RS232 9 WAY FEMALE D-TYPE	
PIN	**SIGNAL**
1	0V
2	RTS
3	RXD
4	0V
5	n/c
6	0V
7	TXD
8	CTS
9	n/c

Ethernet Port

The Q256 Ethernet port is a standard RJ45 connector supporting twisted pair Ethernet (10BaseT or 100BaseT).



The port can be connected via a standard network switch or hub if required. When a network cable is connected to the router the rear panel Green LED will illuminate to indicate a physical connection. The Green LED flashes when data is received on the network. The Amber LED will be off for 10BaseT and on for 100BaseT.

The router supports the TCP/IP protocol with the TCP/IP address being set by a program called *bootChange*. At the factory this program is used via the RS232 serial port to set the initial address of the processor.

Backup/Slave (upper) processor	192.0.2.201
Main/Master (lower) processor	192.0.2.200

Router diagnostic monitoring can be performed from WinSetup diagnostics screen, see the Maintenance section in this manual. If there is a problem using WinSetup over Ethernet then you can check there is a network connection to the router from a PC command prompt by typing ping followed by the IP address. e.g.
> Ping 192.0.2.200

To change the TCP/IP addresses use the *bootChange* program with a network or RS232 connection to the main (lower) processor. Set a new address but make a careful note of the address for future reference. Also make sure that the router has a unique address from any other device on the same physical network. Use the same process for the backup (upper) processor.

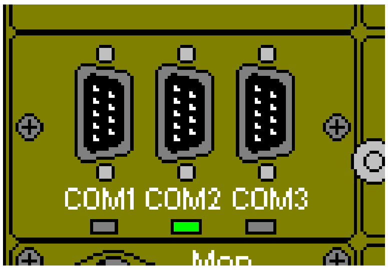
Very basic control and monitoring can also be achieved from a PC using the Telnet function, but this should only be used during system commissioning. See Appendix 1 for a full list of commands that can be used via the Telnet connection.

The basic Telnet command to get general help is 'hw'. At the telnet prompt -> type:

```
-> hw
 ------------------------------------------------------------------
| Help                                                             |
|                                                                  |
| confighelp           Displays help on configuring the router     |
| monhelp              Displays help on monitoring functions.      |
| routehelp            Displays help on setting up route in diagnostic|
|                      mode. !!!ENGINEERING ONLY!!!                |
| ver                  Displays software and firmware versions.    |
 ------------------------------------------------------------------
```

Serial RS422/485 Ports (rear panel)

The Q256 can be supplied with the Q256-RS option, which adds three RS422/485 ports for serial control of the router.



RS422 9 WAY FEMALE D-TYPE	
PIN	SIGNAL
1	0V
2	Tx-
3	Rx+
4	0V
5	-
6	0V
7	Tx+
8	Rx-
9	-

The serial ports each have a rear panel LED that indicates activity on the RS422 receive line, but this LED does not indicate the validity of the data. The FU-0012 processor module has a corresponding *RS Comms* LED that indicates that valid bytes (parity and framing are good) are being received by the processor. Neither LED indicates the protocol is valid or matches the Q256 configuration.

Unless specified otherwise these ports will allow control of the router using Quartz standard ASCII protocol. This operates at 38400,N,8,1.

Basic command to set a route:	.S(level)(destination),(source)(cr)
To set route source 4 to output 28:	.SV028,004(cr)
To interrogate a route:	.IV(dest)(cr)

Other protocols are available such as Pro-bel SW-P-02 protocol. This operates at 38400,E,8,1.

Basic command to set a route (6 byte message):	0xFF	0x02	mult	dest	srce	csum
To set route source 4 to output 28 (6 byte message):	0xFF	0x02	0x00	0x1B	0x03	0x60
To interrogate a route (a 5 byte message):	0xFF	0x01	mult	dest	csum	

To configure the operation of the rear serial ports refer to the Telnet command *commssetup* listed in Appendix 1 of this manual. Note that this module has a un-used 4th RS232 port.

The rear control module PCI bus is numbered from slot 0 for the lower module position to slot 3 for the upper (Ethernet) module position. The lowest installed RS422 or Q-Link module will be port 1. For a typical installation this will give:

PCI Slot	Module	Port Numbers
3	Ethernet Module	n/a
2	Blank	n/a
1	RS422 Module	Ports 5 $^{(RS422)}$, 6 $^{(RS422)}$, 7 $^{(RS422)}$, 8 $^{(RS232)}$
0	Q-Link Module	Ports 1 $^{(QL1)}$, 2 $^{(QL2)}$, 3 $^{(QL3)}$, 4 $^{(QL4)}$

Note that the RS422 module has three RS422 ports (5, 6, 7 in the example above) and an un-used 4th RS232 port (8 in the example above).

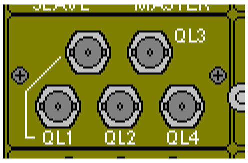
With modules installed in a different order:

PCI Slot	Module	Port Numbers
3	Ethernet Module	n/a
2	Q-Link Module	Ports 5 $^{(QL1)}$, 6 $^{(QL2)}$, 7 $^{(QL3)}$, 8 $^{(QL4)}$
1	RS422 Module	Ports 1 $^{(RS422)}$, 2 $^{(RS422)}$, 3 $^{(RS422)}$, 4 $^{(RS232)}$
0	Blank	n/a

The configuration of the serial ports can be checked using Telnet command Interfacedump x, see Appendix 1 for more details.

Q-Link Ports (rear panel)

The Q256 can be supplied with the Q256-QL option, which adds one main looping Q-Link and three terminated Q-Links.



To configure the operation of the rear Q-Link ports refer to the Telnet command *commssetup* listed in Appendix 1 of this manual. Also note that Q-Link operation requires all Q-Link devices to have a unique one byte Q-Link address, also set by the commssetup command.

The rear control module PCI bus is numbered from slot 0 for the lower module position to slot 3 for the upper (Ethernet) module position. The lowest installed RS422 or Q-Link module will be port 1. For a typical installation this will give:

PCI Slot	Module	Port Numbers
3	Ethernet Module	n/a
2	Blank	n/a
1	RS422 Module	Ports 5 (RS422), 6 (RS422), 7 (RS422), 8 (RS232)
0	Q-Link Module	Ports 1 (QL1), 2 (QL2), 3 (QL3), 4 (QL4)

Note that the RS422 module has three RS422 ports (5, 6, 7 in the example above) and an un-used 4th RS232 port (8 in the example above).

With modules installed in a different order:

PCI Slot	Module	Port Numbers
3	Ethernet Module	n/a
2	Q-Link Module	Ports 5 (QL1), 6 (QL2), 7 (QL3), 8 (QL4)
1	RS422 Module	Ports 1 (RS422), 2 (RS422), 3 (RS422), 4 (RS232)
0	Blank	n/a

The configuration of the Q-Link ports can be checked using Telnet command Interfacedump x, see Appendix 1 for more details.

Video Monitoring Connectors

There are three video monitoring BNC connectors on the rear panel.

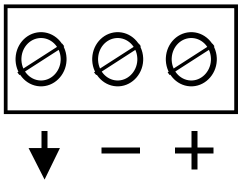
Connector	Function	Description
IN1	Input	Connection from other frames O/P OUT2 in multi-frame systems.
OUT1	Output	Allows the input monitoring to be connected to a signal monitor
OUT2	Output	On the frame with output 1 this allows the output monitoring to be connected to a waveform monitor. On frames above this output range this signal should be connected to the next lower frames IN1 connector.

In a multi-frame system the OUT2 (output monitoring) of the highest output range frame is connected to the IN1 of the next lower frame, and this is repeated until the frame with output 1, where OUT2 is connected to a waveform monitor and/or picture monitor.

The OUT1 (input monitoring) cannot be cascaded as above and so is only useable in single frame installations or where manual connection is a suitable working practice.

Alarm Connector

A 3-pin alarm terminal provides external alarm indication. The alarm signal conforms to SMPTE 269M Standard for fault reporting in television systems. This requires that the user connect an external fault indicator and power supply to the alarm terminals. The power supply should be 24 VDC max. and current limited to 20mA (See SMPTE 269M for further details). The pin-out for the Alarm connector is shown below:



The alarm connector will only function correctly if the main and backup processors are configured correctly with information about what modules are installed in the router. Refer to Appendix 1 for details of the Telnet 'piset' (Product Inventory Set) command.

Multi-rack Systems

Very large routers can be built by combining at least one standard Q256 router with expand and/or cascade Q256 routers. These are connected using high speed, high-density multi-core cables similar to computer SCSI cables.

Multi-rack routers are built from 4 basic chassis types, designated A, B, C, and D frames.

Router Type (A, B, C, or D)	**Input Fin Type**	**Output Fin Type**
Q256-SV-256256-A	BNC Input Fin	BNC Output Fin
Q256-SV-256256-B	BNC Input Fin	Cascade Fin
Q256-SV-256256-C	Expand Fin	BNC Output Fin
Q256-SV-256256-D	Expand Fin	Cascade Fin

From these four basic router types it is possible to build a 1024x1024 router.

	Inputs 1-256	Inputs 257-512	Inputs 513-768	Inputs 769-1024
Outputs 1-256	Q256-SV-256256-A	Q256-SV-256256-B	Q256-SV-256256-B	Q256-SV-256256-B
Outputs 257-512	Q256-SV-256256-C	Q256-SV-256256-D	Q256-SV-256256-D	Q256-SV-256256-D
Outputs 513-768	Q256-SV-256256-C	Q256-SV-256256-D	Q256-SV-256256-D	Q256-SV-256256-D
Outputs 769-1024	Q256-SV-256256-C	Q256-SV-256256-D	Q256-SV-256256-D	Q256-SV-256256-D

Signal Monitoring

In a multi-frame system where signal monitoring is required every output rack must be fitted with the Q256-SV-SM signal-monitoring module. Other frames can be fitted with the module when sophisticated fault analysis is required.

The O/P Mon Out of the last frame is connected to the O/P Mon In of the next frame, and this is repeated until the first frame, where the O/P Mon Out is connected to a signal monitor and/or picture monitor.

The I/P Mon Out cannot be cascaded as above and so is only useable in single frame installations or where manual connection is a suitable working practice.

Connecting The Inter-Rack Cables

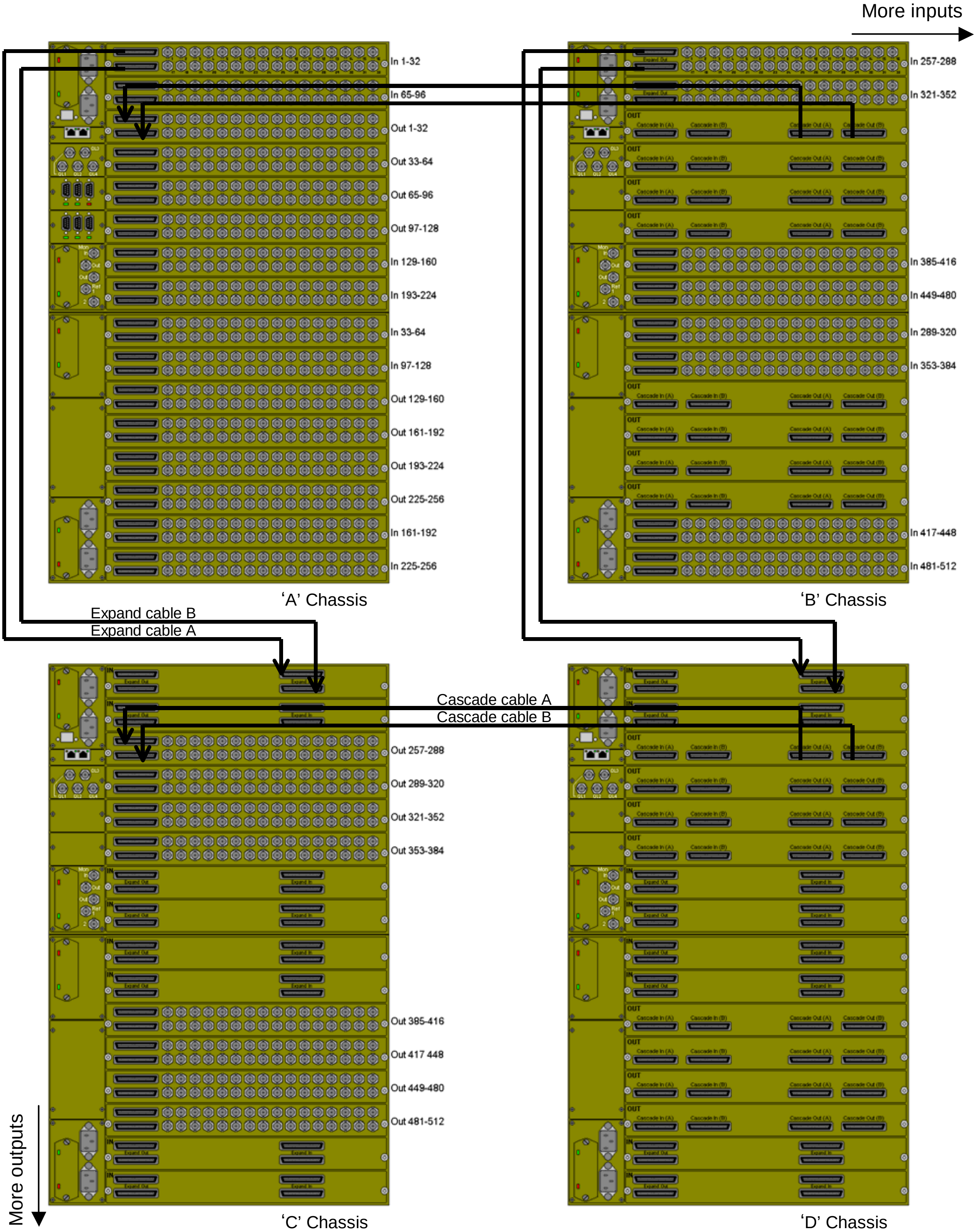
The SCSI expansion connectors carry video signals in an internal differential format and are only used when expanding outside a single chassis system. The input fin SCSI connector feeds buffered versions of the BNC input signals on to other frames in the system to ‘Expand’ the outputs. The output fin SCSI connector takes a routed input signal from other routers to ‘Cascade’ the higher numbered inputs.

The Inter-Rack Cables which connect the 'Expand' Outputs to the 'Expand' Inputs, and the ‘Cascade’ Outputs to the ‘Cascade’ Inputs are provided by Quartz in a Standard 2.5 Metre length, part AK-0013.

Because of the cable length, the racks should be closely located, either directly above one another, or side by side in adjacent rack frames (with no obstruction between rack frames so cables can run directly between routers).

Warning: The cable connectors are relatively fragile and should be handled with care. The cables must be adequately supported so that no more that 0.5m of cable are hanging on the connector. Avoid straining the cables.

Typical Q256 System: 512 Inputs by 512 Outputs

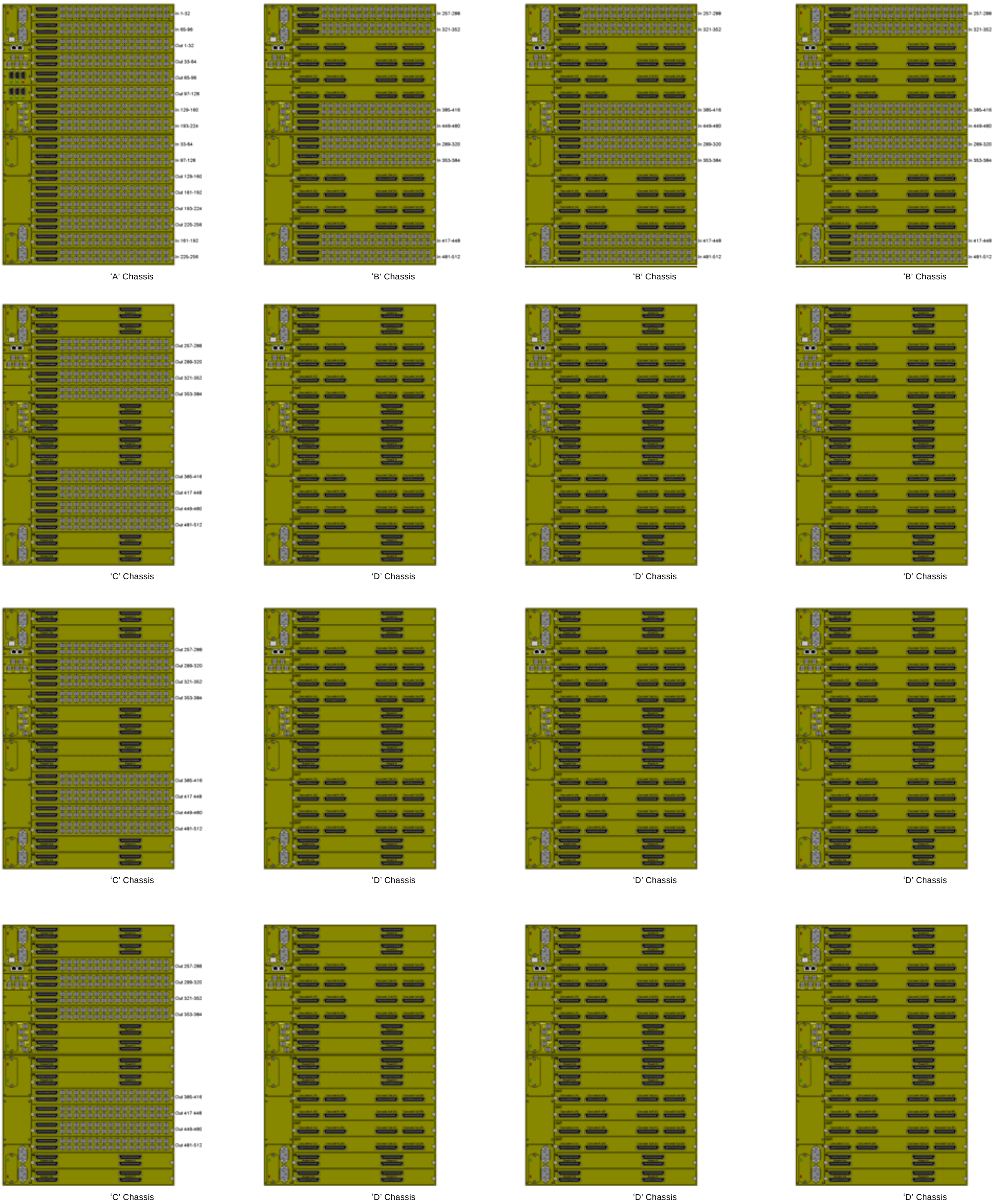


All inter-rack connections are via Quartz Expansion Cables, only 8 cables shown for clarity, 64 cables required in total. The 'A' chassis refers to the letter at the end of the Q256-SV part number.

Typical Q256 System: 1024 Inputs by 1024 Outputs

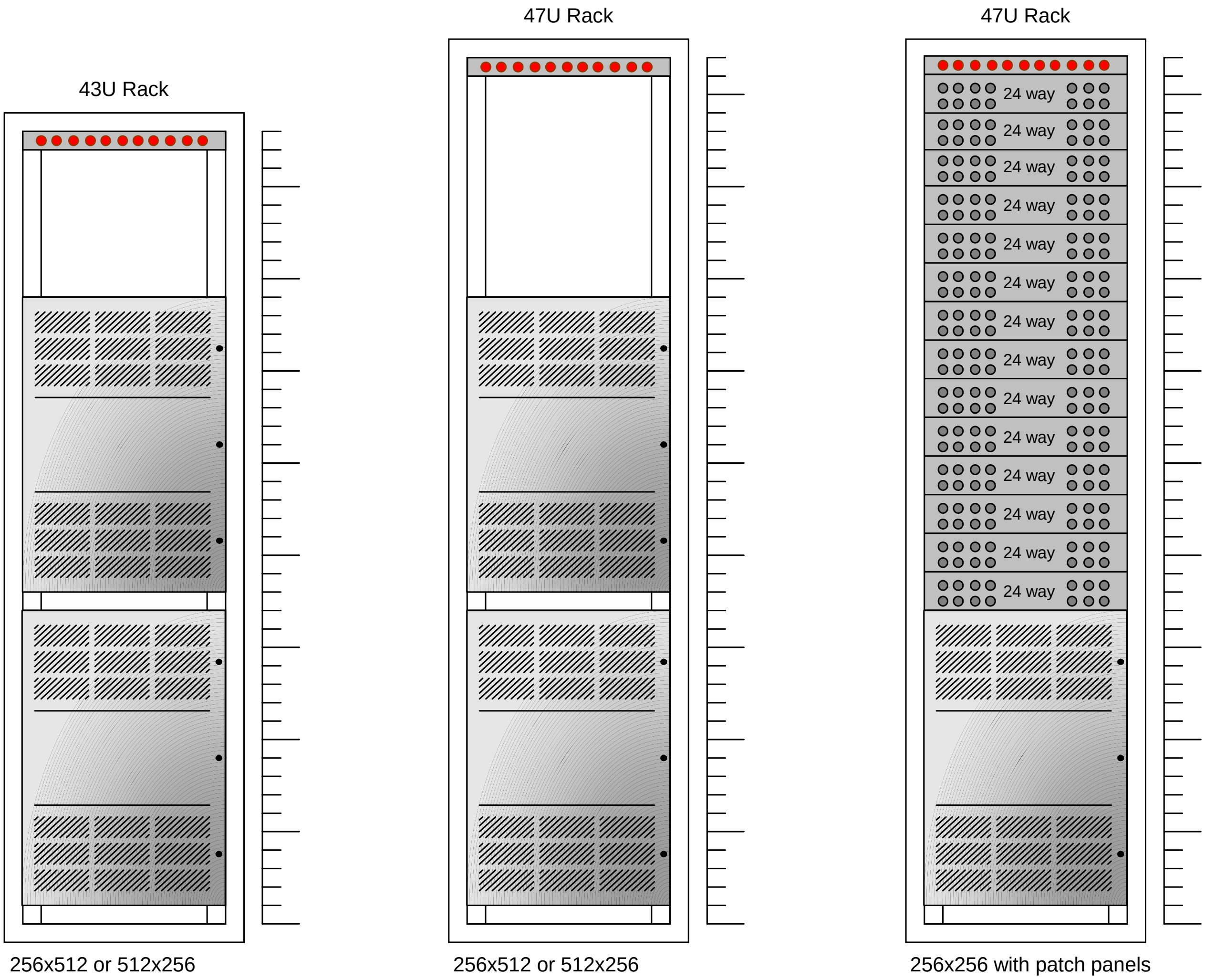
A 1024x1024 system built from Q256 frames occupies 256RU of rack space. In systems of this size it is unlikely that all outputs need access to all inputs. In this case a saving can be made by not using all of the 'D' frames, effectively giving a matrix with some 'holes'.

The SCSI interconnect cable on the diagram below are not shown for clarity.



Typical Rack Layouts

The typical rack sizes used in studios have 43U, 45U or 47U of useable rack space. These racks will accommodate two Q256-SV 16U chassis without patch bays or one chassis with 336 patch fields.



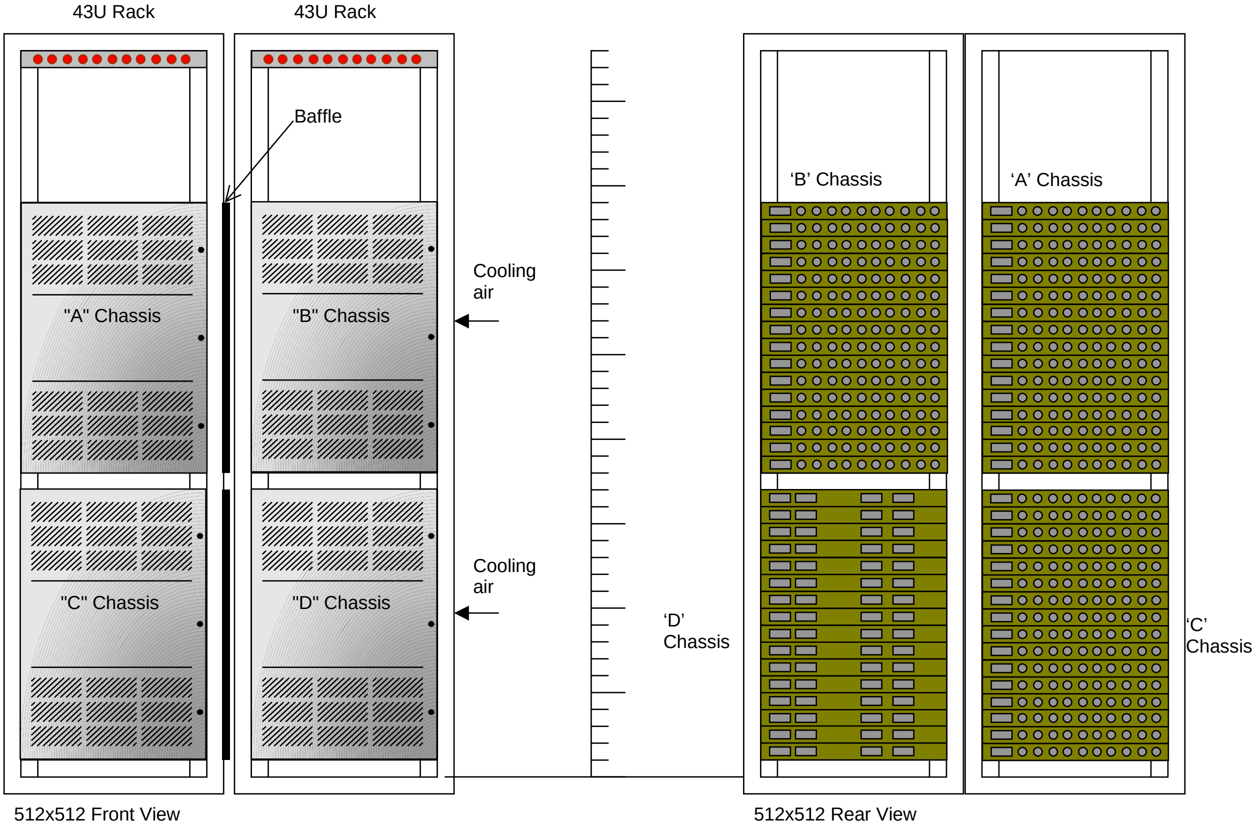
With the Q256 chassis loaded vertically in the rack there will be no mutual heating effects as cool air is drawn from the right hand side and expelled to the left hand side. Remember to allow adequate clearance to the sides to allow good airflow.

In outside broadcast (OB) trucks where space is limited careful planning is required for both airflow and weight.

In general:

- Try to arrange good airflow from the air conditioning outlet to the router inlet.
- Allow room for the hot air to exhaust and plan what equipment will be located to the left of the Q256. The air leaving a Q256 is 18ºC hotter then the air entering !!
- The Q256 is heavy so keep the units low in the racks to ease installation. This is particularly important in OB's to keep the overall centre of gravity as low as possible. This is also relevant to the cables as the large number of input and output cables will have significant weight.
- Due to its weight the Q256 should sit on a rack mount tray or shelf.
- Try to loom cable in groups of 32 to match the rear Fin size. Allow the groups of 32 cables some room to move so that the rear fins can be removed for servicing if required.

A typical Q256 512x512 installation is shown below. With four Q256 units the power density is high and there is 6.5KW of heat to be dissipated. The cooling air is drawn from right to left so in this example racks A and C will be getting the hot exhaust air from racks B and D. To avoid this ensure that the inter-rack spacing is as large as possible and install a metal baffle between the routers. Ideally this should be the same size as the router side panel and placed centrally in the gap between the routers.



System Overview

Nomenclature

Expansion refers to expanding the number of outputs of a system beyond 256. This is achieved by copying the inputs to one or more additional chassis.

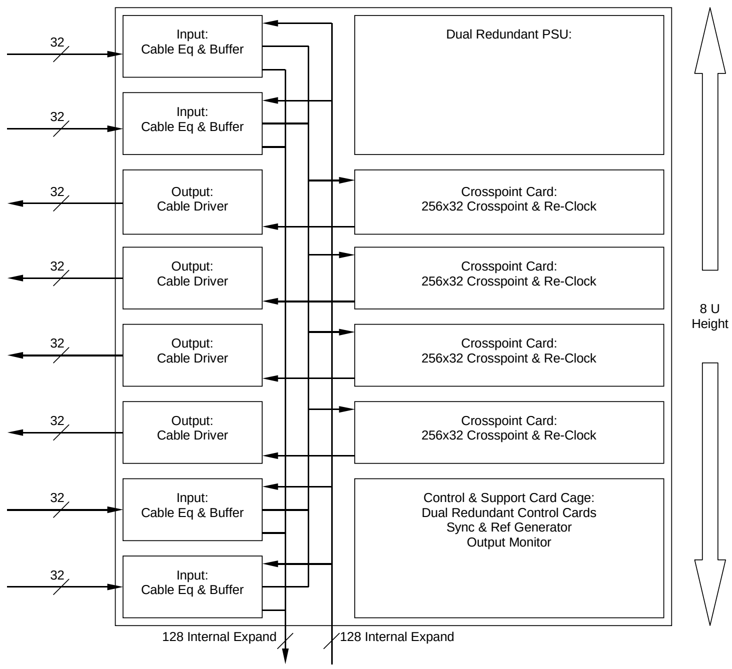
Cascade refers to increasing the number of inputs of a system beyond 256. This is achieved by utilising the in-built combiner switch at the output of the crosspoint card.

Fins are rear plug-in modules which allow the signals in or out of the system.

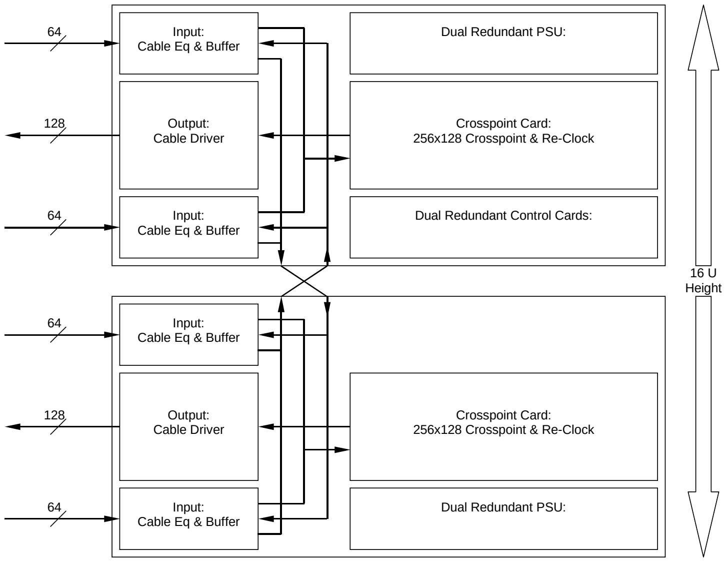
Video

A basic Q256, a 256x256 matrix consists of one 16U rack, which allows the system to be configured in steps of 32 inputs and 32 outputs. A fully loaded system consists of eight Input Fins, eight Output Fins, eight Crosspoint cards, two Control Cards (optional), a Monitor Card (optional) and two sets of redundant Power Supplies (optional).

The frame is organised in two 8U sections with the first 128 inputs and outputs in the top half and the second 128 inputs and outputs in the lower half. The lower half of the frame replicates the signal switching only; with the control function provided by the top half. The first diagram below shows the architecture for the top half of the frame, with the second diagram showing how this arrangement is repeated in the lower half to form the complete system.



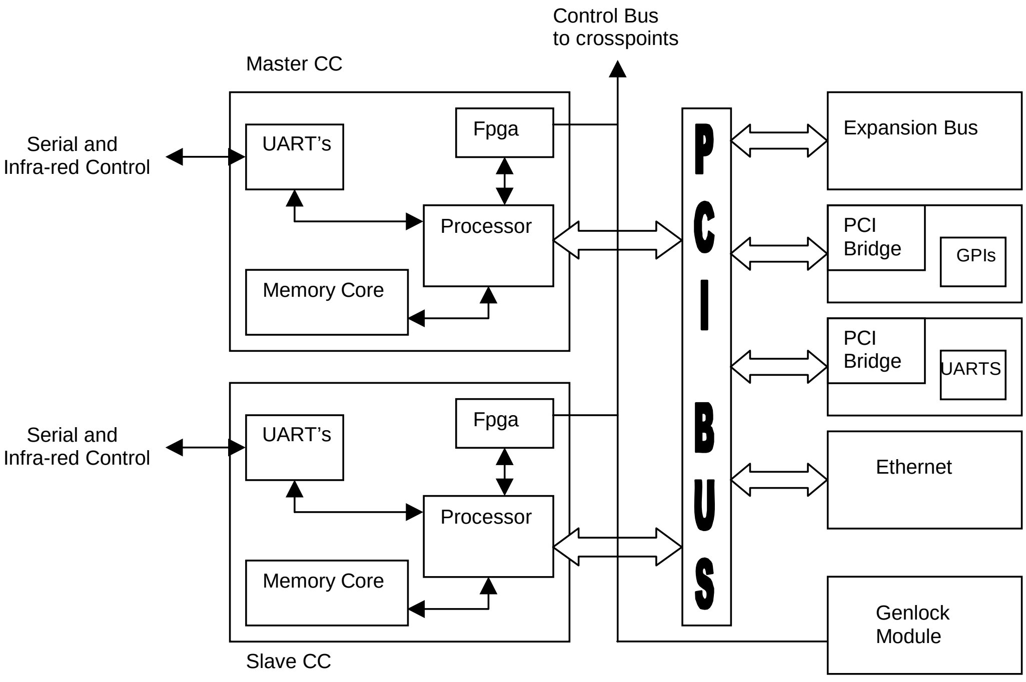
Block Diagram for the Upper 8U Section



System Block Diagram

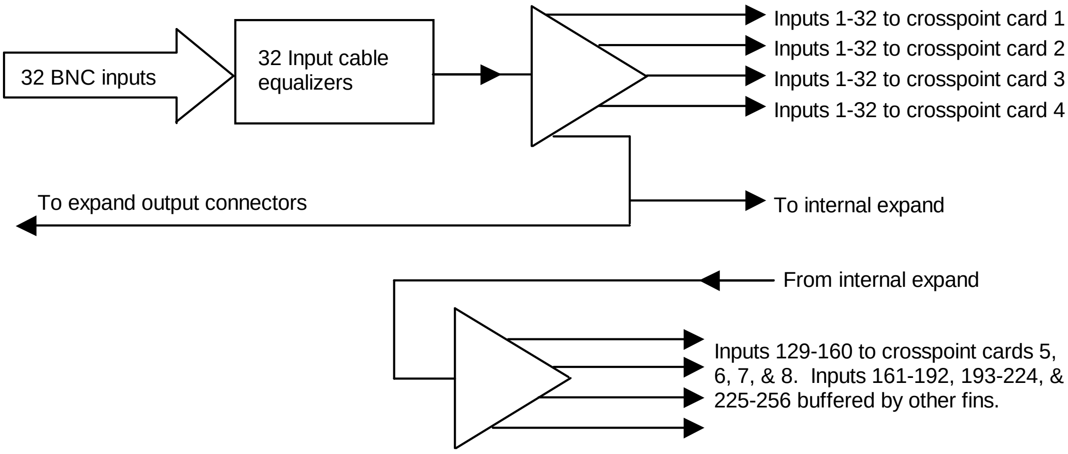
Control

The control structure is shown below.



Input Fin: Standard SD

Input signals are handled via the rear mounted ‘input fins’. These provide the interface between signals arriving from BNC and the ‘crosspoint motherboard’. Cable BNC inputs are equipped with cable equalisers on the fins in addition to the amplifiers necessary to drive the motherboard and the ‘expansion out’ connector.

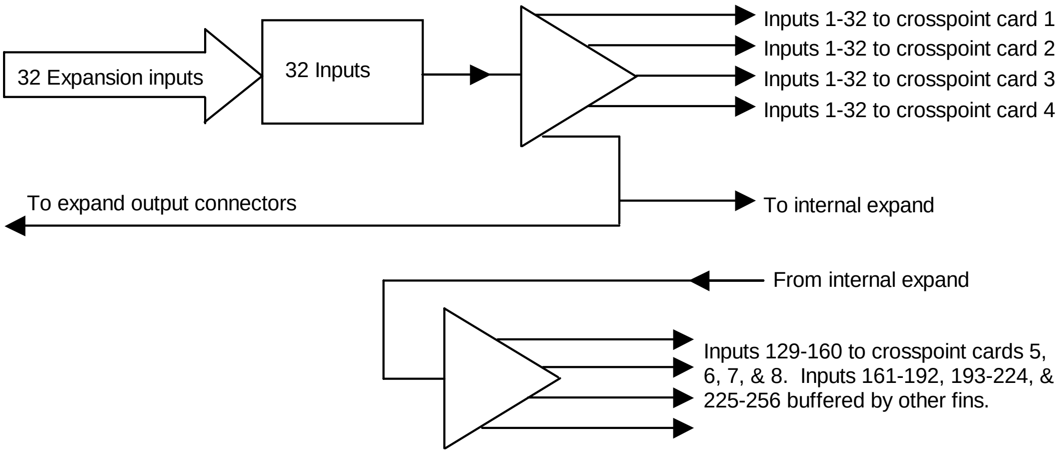


Block Diagram of Standard Input Fin.

Input status for ‘No Signal’ can be obtained from the control system via the Ethernet port.

Input Fin: Expand SD

Input signals are handled via the rear mounted ‘input fins’. These provide the interface between signals arriving from the expansion cables and the ‘crosspoint motherboard’. Rack frames which provide outputs beyond the 256 of the primary chassis receive inputs via the Expand Fin expansion cable, and provide a further two copies to further expansion connectors, facilitating systems larger than 512 by 512.



Block Diagram of Expand Input Fin.

Crosspoint Module, SD or HD

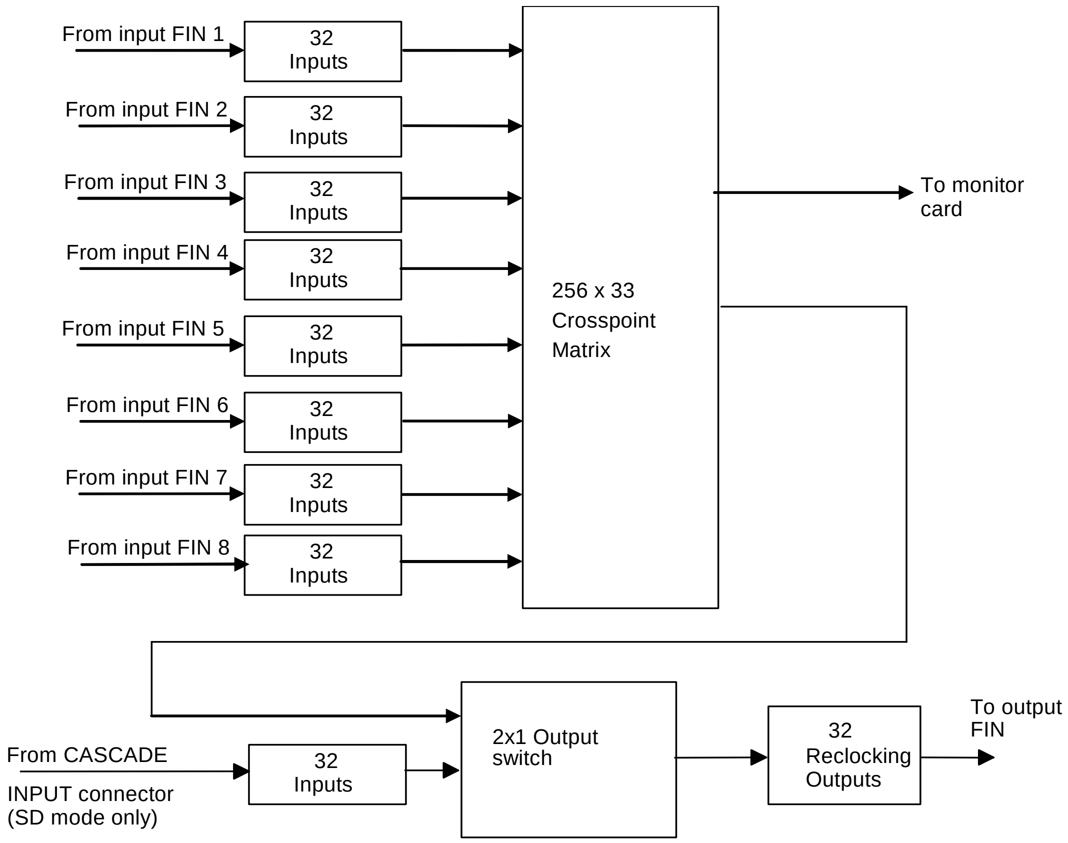
The crosspoint card is organised as a 256 input by 32 output crosspoint. The 256 input signals on the motherboard are driven directly to sixteen crosspoint chips [each chip handles 32 input and 16 output signals]. The first 128 inputs to each card are from the BNC's local to that half of the frame, with the next 128 provided via an internal expand path from the other half of the frame.

The outputs are combined with the Cascade Input from another chassis [if present] at a 2 input multiplexer located at the 'reclocker' SIMM style module (SD mode only). The selected output of the multiplexer switch is then reclocked and driven from the board to an 'output fin'. Data rate selection is fully automatic and requires no adjustment. The data rate status can be obtained from the control system via the Ethernet port.

The LED's at the front of the board provide an indication of:

- FPGA Loaded
- FPGA can 'see' write activity on xpt bus
- FPGA has been addressed
- Temperature, Green = OK, Red = overheat

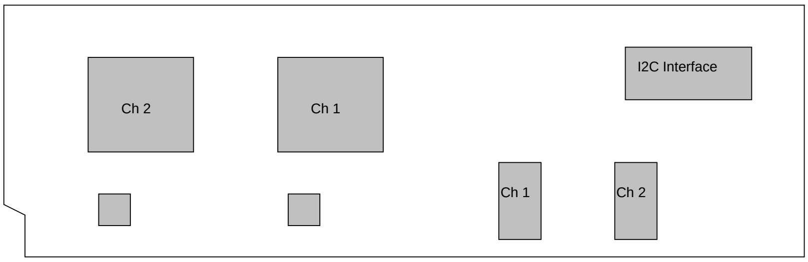
This module also carries the input signal monitor combiner circuitry.



Block Diagram of Crosspoint Card.

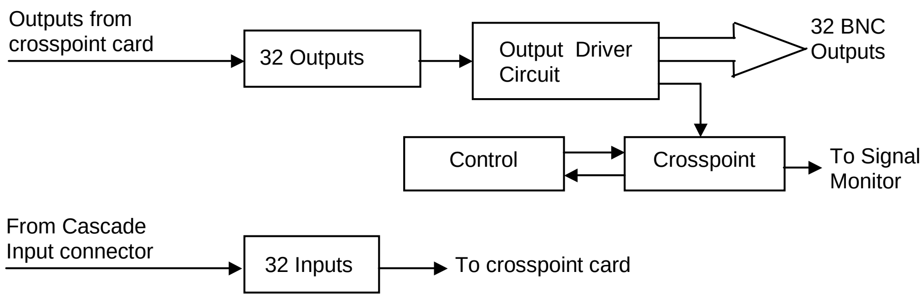
Output SIMM: Reclock, SD

The crosspoint module can hold up to 16 two channel output SIMM's. Each SIMM contains a SDI re-clocker circuit and driver chip, as well as a control system diagnostic I^2C interface.



Output Fin: Standard SD

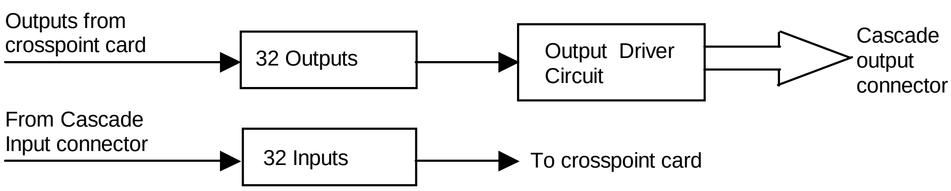
The 'BNC output fin' translates the signals from the crosspoint card back to normal SDI format. It also provides an output signal monitor and the 'cascade in' path.



Block Diagram of Output Fin.

Output Fin: Cascade SD

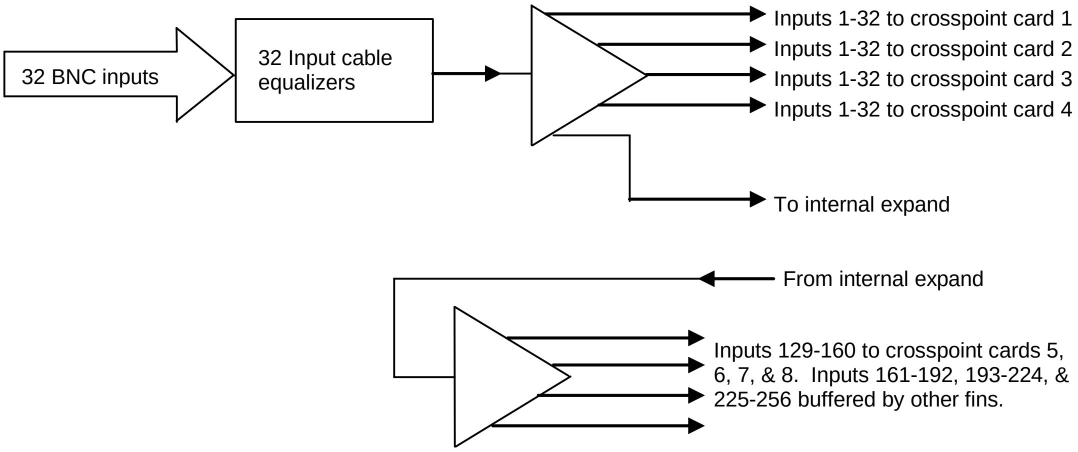
The 'cascade output fin' is fitted to chassis providing for inputs beyond 256. It also provides a 'cascade input' path for inputs beyond 512.



Block Diagram of Output Cascade Fin.

Input Fin: Standard HD

Input signals are handled via the rear mounted ‘input fins’. These provide the interface between signals arriving from BNC and the ‘crosspoint motherboard’. Cable BNC inputs are equipped with cable equalisers on the fins in addition to the amplifiers necessary to drive the motherboard.



Block Diagram of Standard HD Input Fin.

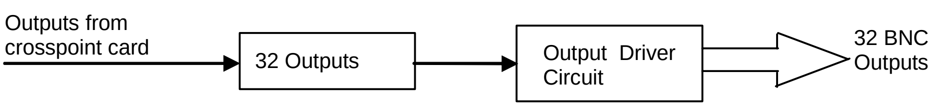
Input status for ‘No Signal’ can be obtained from the control system via the Ethernet port.

Output SIMM: Re-clock, HD

This is located on the main crosspoint module.

Output Fin: Standard HD

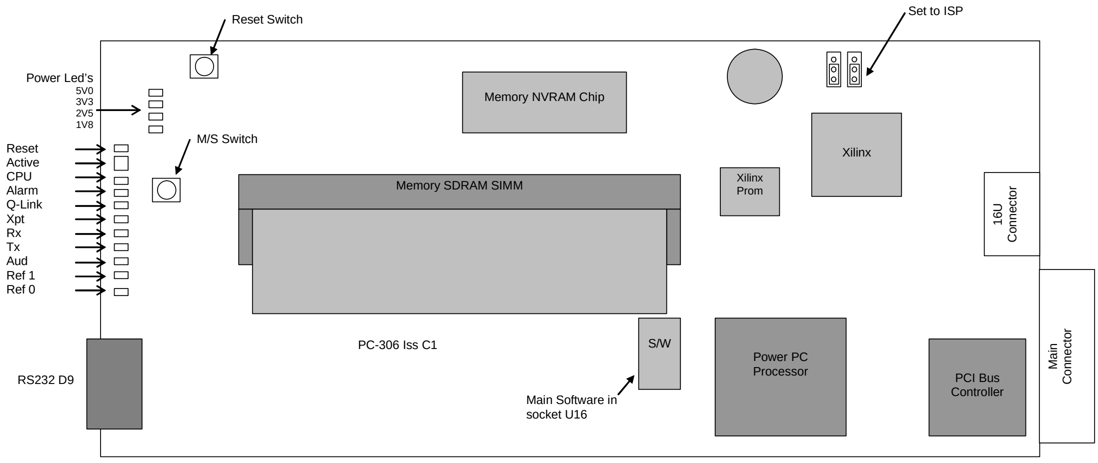
The ‘BNC output fin’ translates the signals from the crosspoint card back to normal HD format. It also provides the ‘cascade in’ path.



Block Diagram of HD Output Fin.

Control Module

The Q256 processor module, part M-FU-0012-0100 (PC-306-C1), is based around a PowerPC microprocessor. The module is designed to operate in an optional redundant configuration.



Status LED's

The status LED's on the front edge of the control processor give the following information.

Power	Normally all amber, shows the status of the 5.0V, 3.3V, 2.5V, and 1.8V rails are OK.
Reset	Normally off, red indicates a reset has been asserted.
Active	Green indicates this module is controlling the router, normally the lower processor. Red indicates a controller in standby mode, normally the upper processor.
CPU	Green slow flash indicates the processor is running.
Alarm	Red indicates an alarm state is active (fan fail etc, or the H/W config does not match PISET).
Q-Link	Off = No Q-Link. Flashing = Data on cable. On = On Line.
XPT	Green flashes every time this chassis makes a crosspoint.
RX	Green flashes every time a rear serial RS422 or front RS232 valid byte is received.
TX	Inter-module communications. Green on the active controller if link OK, off in the standby controller, but only functional on software V1.46 or later.
Aud	Off in video frames, Green in audio frames.
Ref 1	Green indicates a valid TV reference is connected to Ref 2.
Ref 0	Green indicates a valid TV reference is connected to Ref 1.

Functional Block Diagram

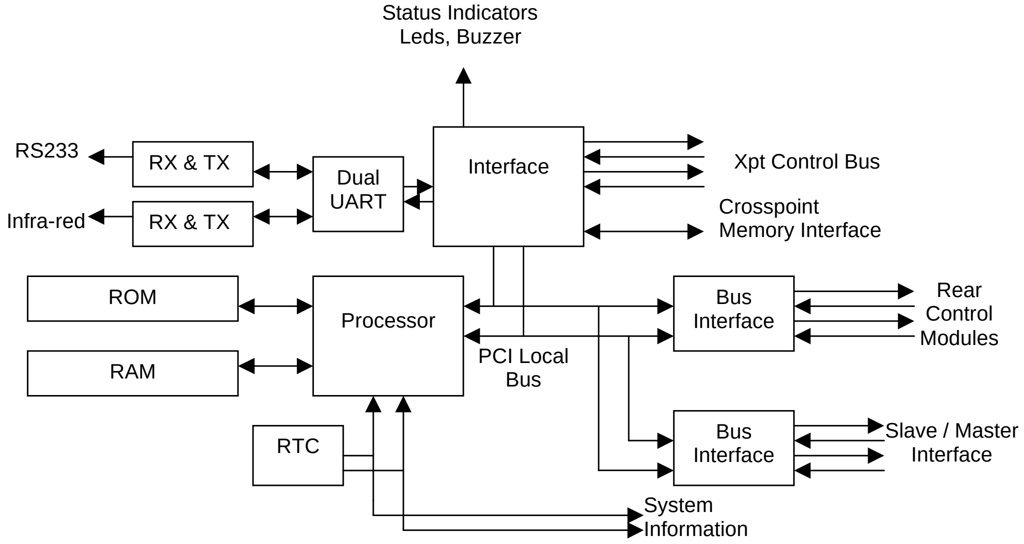
The PowerPC processor communicates with the main crosspoint modules using a crosspoint control bus managed by the processor Xilinx chip. The processor also communicates with the rear Ethernet, Q-Link, and RS422 modules via a PCI Bus Controller.

The SDRAM, normally a 32Mb device, is used by the processor to store temporary data during normal operation. The main operational software and hardware configuration data are stored in flash memory in U16. Crosspoint routing data changes frequently and is stored in the NVRAM (note that this is a 3V3 part).

Alarm status is mostly gathered through the I^2C bus but some fan status is gathered directly by the processor module. The module is powered from the main 5V supply but sub-regulates this to 3V3, 2V5, and 1V8 to operate the modules circuitry.

In systems with a reserve controller, the lower module is normally active and the upper module is normally in standby. The upper module only becomes active if the lower module fails or is removed from the frame. The lower module will become active again once re-installed. When installing a new module, you should wait for its LED's to stabilise (approximately 15 seconds) before removing the other controller.

The functional block diagram is shown below:



The processor module hardware has been updated to add new features and the revision history is recorded below.

M-FU-0012-0100 (Feb-2003)	This is the version documented in this manual. Has a modified main connector pin-out and audio oscillator to support the Q256-DA router. Uses the 'DE' type connector. Front edge D9 pin-out now conforms to Quartz standard.
M-FU-0012-0010 (Nov-2002)	Uses the 'DE' type main edge connector that has a better keyway arrangement. Front edge D9 pin-out does NOT conform to Quartz standard.
M-FU-0012-0000 (Apr-2001)	First production release. Front edge D9 pin-out does NOT conform to Quartz standard.

Software Chip

The main operational software is programmed into a small flash memory part and held in a socket (U16). The socket is opened by sliding the door in the direction of the small arrow, then hinge open. The pins of the flash memory chip are very delicate and so the part should be handled with care. Pin 1 of the flash memory chip is marked with a small dot and this should align with the pin 1 text on the PCB silk screen.

Current software revisions are as follows.

Q256 V1.49 (9-Dec-04)	Added frame take mode for V1.4 Xilinx. Also added PCI debugging.
Q256 V1.46 (12-Jul-04)	Interlink LED now supported.
Q256 V1.38 (9-Dec-03)	Multiple changes to Q256-DA operation.
Q256 V1.27 (11-Jun-03)	Q256-DA now fully supported. 525 operation now supported.
Q256 V1.25 (2-Apr-03)	JTAG Capability added
Q256 V1.21 (21-Nov-02)	Removed Q-link device status info.
Q256 V1.20 (20-Nov-02)	Adds multi-rack support for systems with more than 256 inputs. Q256-DA preliminary support added.
Q256 V1.18 (16-Jul-02)	Adds TCP/IP Quartz protocol and corrects temperature limits, which were too low, resulting in errors being logged that were not errors. Telnet command *piset* must be re-run when upgrading to this version.

RS232 Connector

The control module has a D9 connector on the front edge to allow serial RS232 communication with a PC. See the installation section for the pin-out of this connector.

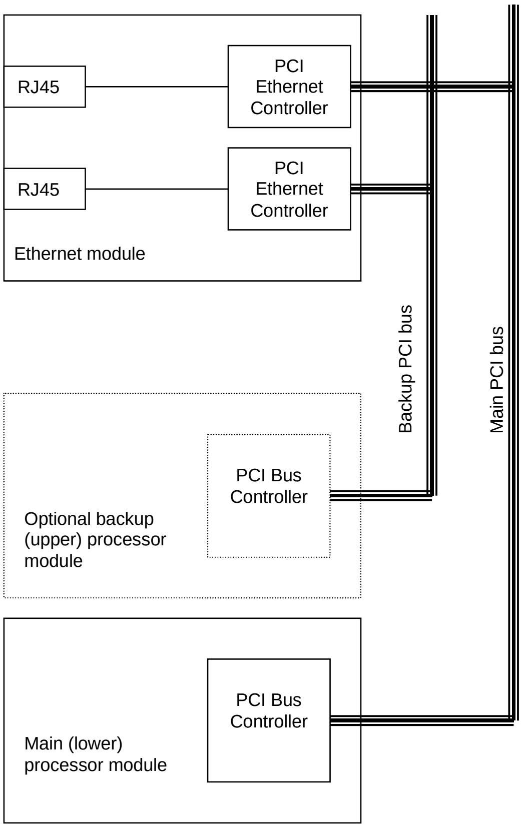
Analogue Reference

There MUST be an analogue reference present to ensure the crosspoint changes occur during the field-blanking interval. If the reference is missing then the routing will occur asynchronously. The reference must contain syncs of between 300 mV and 5V when terminated, e.g. colour bars or black burst. If you experience problems with clean switching then refer to our application note AN-0008.

The reference signal should be connected to the Ref 1 input and this is terminated in 75R. The Q256 supports dual references for combined 525/625 operation and in these systems the Ref 2 connector should be used for the other reference signal. Note that the dual reference signalling works at a crosspoint module level. Therefore all 32 outputs from one ‘fin’ must change to the same video reference.

Ethernet Rear I/O Module

The control cards connect to a number of rear I/O modules including an Ethernet Module. Internal communication is over a high speed PCI bus, with two busses being used in dual redundant controller systems. The Ethernet Module has two separate RJ45 connectors for the main and backup processors.



If both processors are to be joined on the same network then an external 10-Bast-T or 100-Base-T hub should be used.

Each control processor has a unique IP (Internet Protocol) address which will be set to the Quartz default address of 192.0.2.200 on the master (lower) processor and 192.0.2.201 on the backup (upper) processor. These addresses should be changed before connecting to your own network, see the installation section on Ethernet. If Quartz supplies a multi-router system where it has been made clear by the customer that the routers will be used on one network, then the IP address will be set on each processor to the next in the sequence e.g. 192.0.2.200, 2.201, 2.202, 2.203, 2.204.

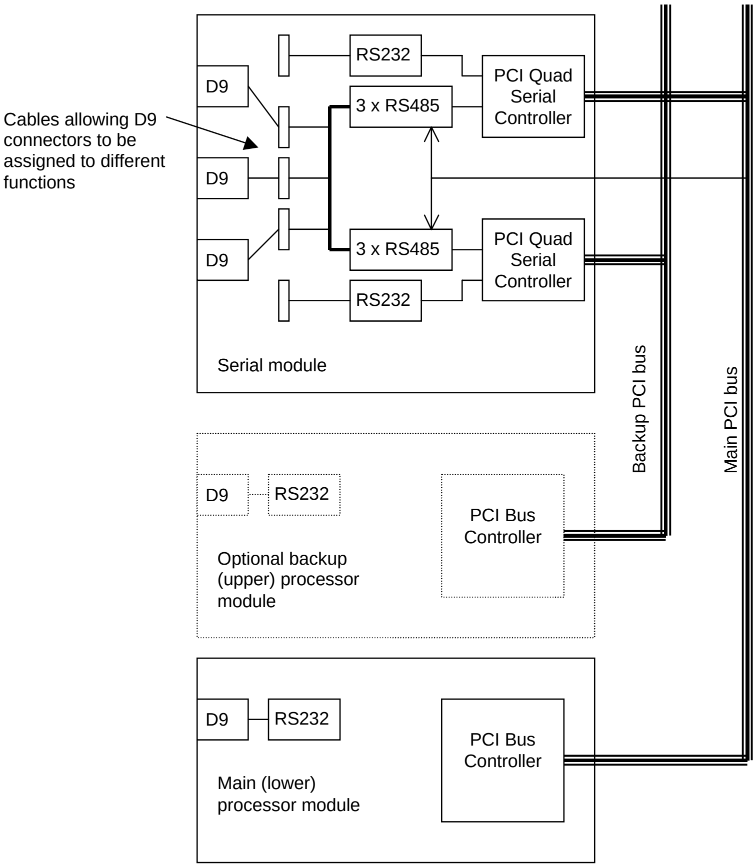
A low level Ethernet packet consists of:

Preamble	SFD	Destination	Source	Length	Data	CRC
62-bits	2-bits	6-bytes	6-bytes	2-bytes	46-1500 bytes	4-bytes

At 10Mb/s a 1500 byte message would take just 1.22mS to transmit. This makes the Ethernet port a good choice for high speed/high data rate communications.

Serial Rear I/O Module

The control cards connect to a number of rear I/O modules including a Serial Module. Internal communication is over a high speed PCI bus, with two busses being used in dual redundant controller systems. The Serial Module has three separate D9 female connectors that are allocated as shown below.



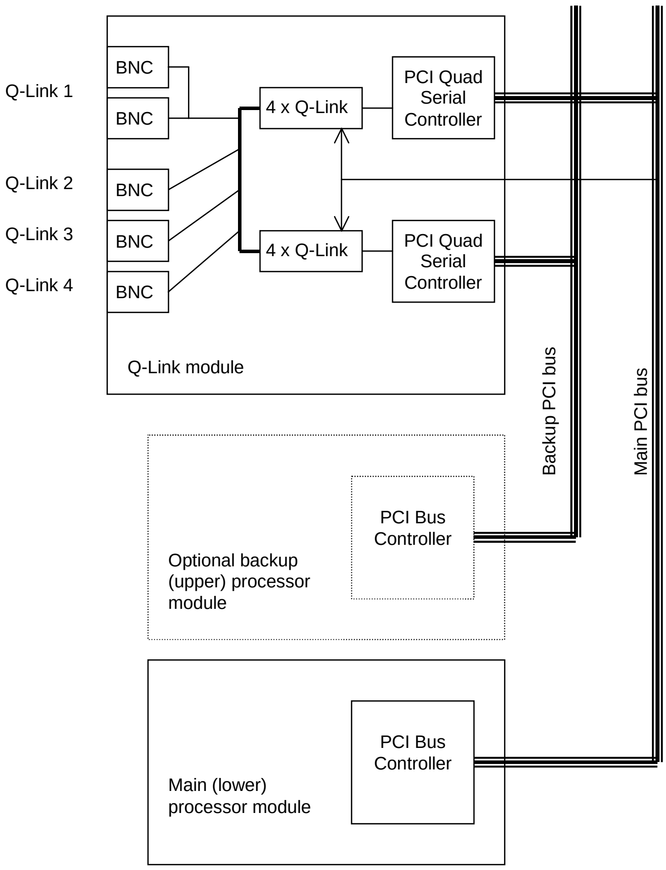
The processor that is currently in control (usually the master) has control of the RS485 serial ports via a control signal passed on the back plane.

To configure the operation of the rear serial ports refer to the Telnet command *commssetup* listed in Appendix 1 of this manual.

The serial ports have a rear panel LED that indicates activity on the RS422 receive lines, but this LED does not indicate the validity of the data. The FU-0012 processor module has a corresponding a RX LED that indicates that valid bytes (parity and framing are good) are being received by the processor. Neither LED indicates the protocol is valid or matches the Q256 configuration.

Q-Link Rear I/O Module

The control cards connect to a number of rear I/O modules including a Q-Link Module. Internal communication is over a high speed PCI bus, with two busses being used in dual redundant controller systems. The Q-Link Module has five BNC connectors to allow connection to one looping Q-Link and three terminated Q-Links.

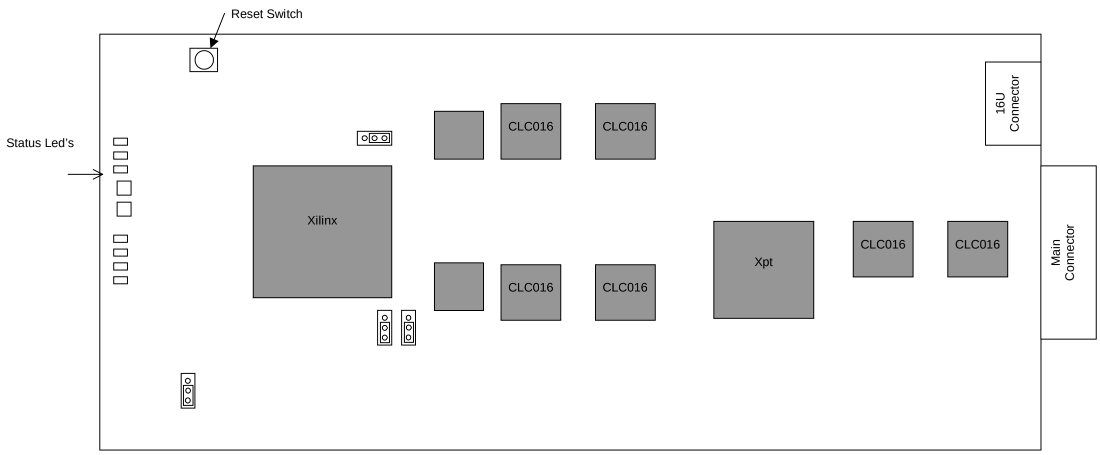


The processor that is currently in control (usually the master) has control of the Q-Link connectors via a control signal passed on the back plane.

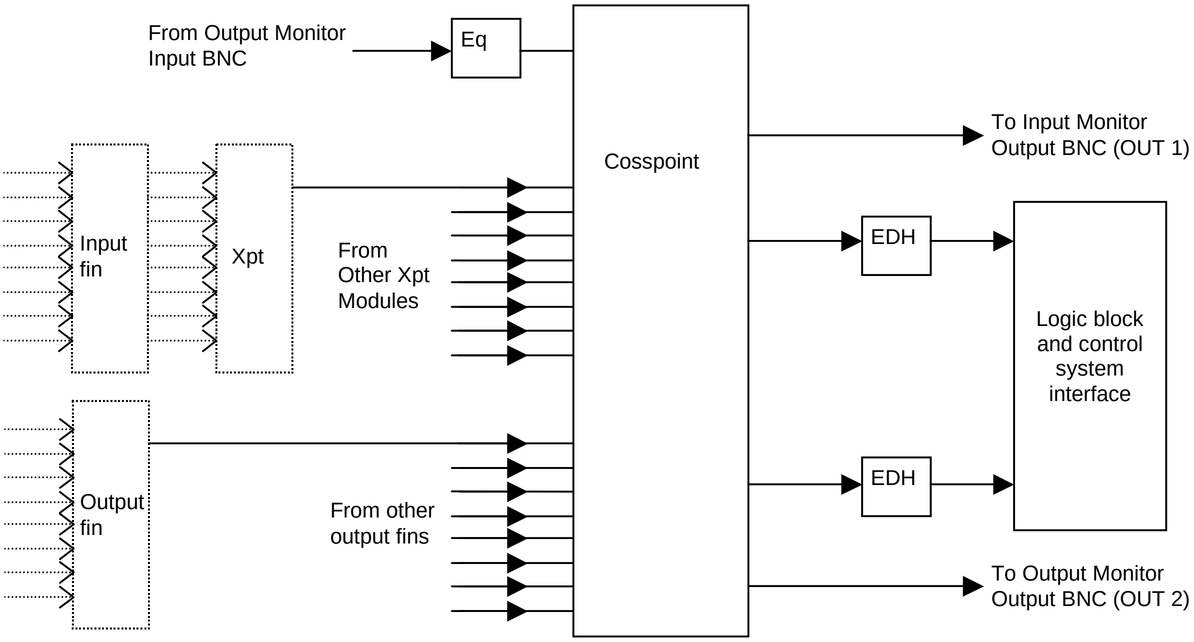
Q-Link operation requires all Q-Link devices to have a unique one byte Q-Link address. This is set by the Telnet command *commssetupt*. Refer to Appendix 1 for details of the Telnet *commssetup* (Comms Setup) command.

Monitor Module

The optional Monitor Module provides down stream routing of Output Monitor from each Output 'Fin', the Input Monitor form the Crosspoint and the Monitor Loop Input to eventually produce the Monitor Output. These Signals are also routed to an EDH monitor for signal integrity checking; the results of which are passed back to the Control System.



A block diagram of the monitor module is shown below.



Block Diagram of Monitor Module.

The monitor module Output Monitor BNC is switched from the main processor and control system by sending serial control messages in the same way as for normal outputs. Before this will work the router must be configured to say what destination number the monitor BNC will respond to, using the telnet command *commssetup*. This is usually a number outside the normal destination range of the router. Serial messages to the destination then use the source number to select which output is to be monitored.

The automatic signal detection using the EDH monitors is controlled from the Ethernet Telnet commands such as *monallip* and *monallop* and these are detailed in Appendix A.

Power Supply

Each Q256 power supply Q256-V-PS (PS-0015) has it's own independent IEC inlet. A thermal circuit breaker is built in to each PSU On/Off switch to protect the power supply and associated mains cabling and therefore no external main fuse is fitted to this product.

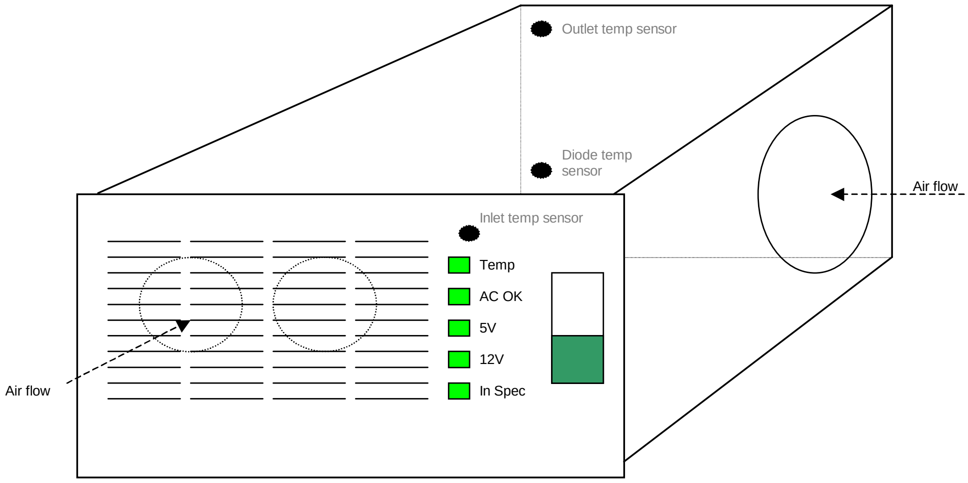
Q256-V (8U): This has one main power supply, the left hand unit. A second right hand unit can be fitted as a backup.

Q256-V (16U): This has two independent sections, the upper 8U, and the lower 8U; each section has its own power supply. A second right hand unit can be fitted to each section as a backup. Therefore a non-redundant Q256 16U chassis will be fitted with two power supplies (upper and lower), and a redundant Q256 16U will be fitted with four power supplies (two upper and two lower).

- The upper 8U handles inputs 1-32, 65-96, 129-160, 193-224, outputs 1-128, the control processor, rear panel I/O, and all the fans in the upper section.
- The lower 8U handles inputs 33-64, 97-128, 161-192, 225-256, outputs 129-256, and all the fans in the lower section.

The power supply PS-0015 has environmental sensing for

- Inlet air temperature
- Exhaust air temperature
- +5V OR'ing diode
- AC OK
- DC OK
- +5V PSU Rail
- +5V Motherboard Rail
- +12V Rail



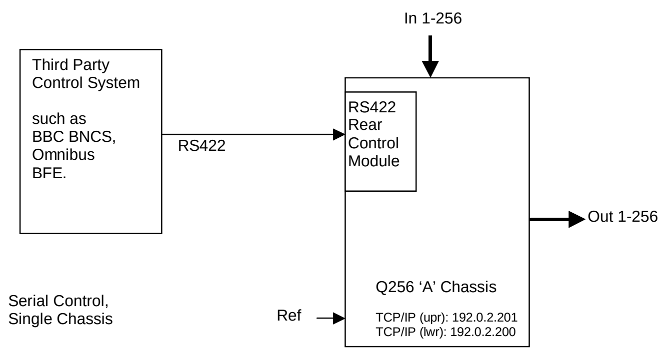
The switcher block used within the PS-0015 can deliver +5V at 155A, and +12V at 17A. The +5V rail is used inside the router to run all electronics and is locally sub-regulated to 3.3V, 2.5V, and 1.8V where required. The +12V is used for all the cooling fans.

System Control Architectures

There are many different control architectures that can be used with the Q256 depending on the type of control system and the number of Q256 chassis's involved.

Serial Control, Single Chassis

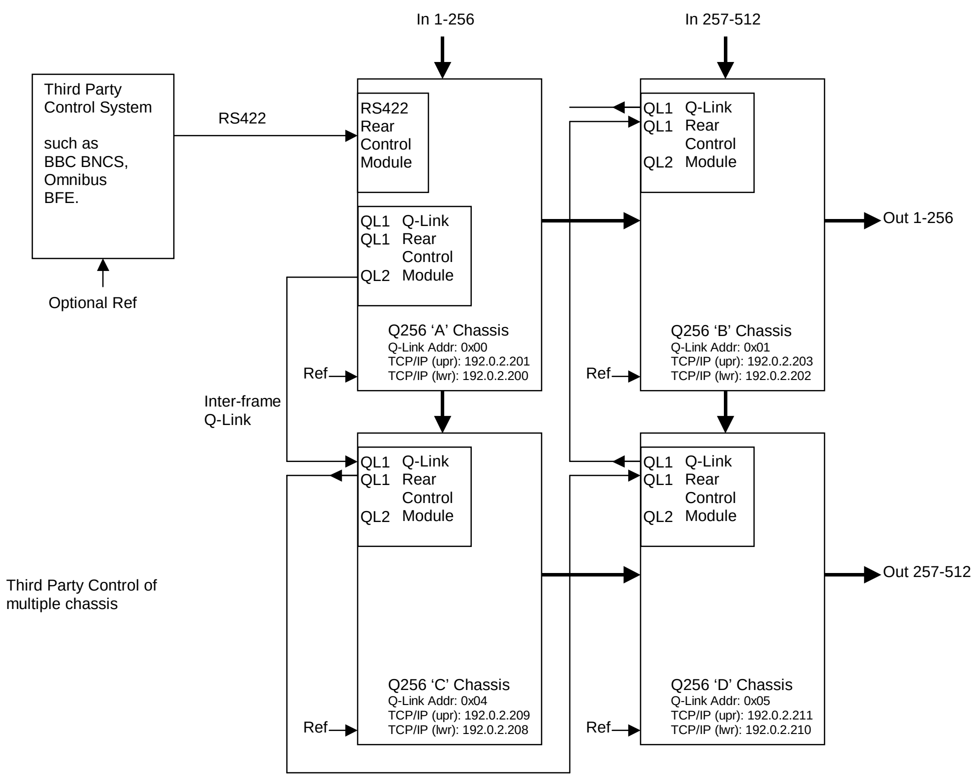
This is the simplest architecture and involves a third party (non Quartz) control system such as BBC BNCS, Omnibus, or BFE, and a single Q256 chassis.



As Quartz is only supplying a router in this example and not a control system, all input and output mapping must be handled by the third party control system.

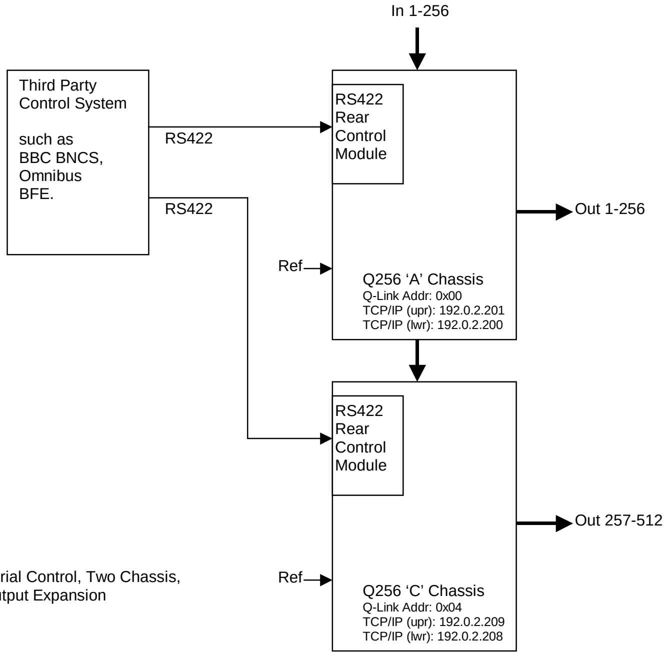
Serial Control, Multiple Chassis

This architecture involves a third party (non Quartz) control system such as BBC BNCS, Omnibus, or BFE, and two or more Q256 chassis's.



Message from the third party control system are passed on the RS422 link to the 'Master' Q256-SV chassis. The message is then re-transmitted on the Q-Link system, synchronised to video reference timing, to all other chassis forming the routing system. This ensures that all chassis switch during the same vertical interval, which is essential for the output cascade to work correctly.

For systems that only have output expansion then the timing requirements do not apply and the alternative method shown below can be used, but requires multiple serial ports on the third party control system.

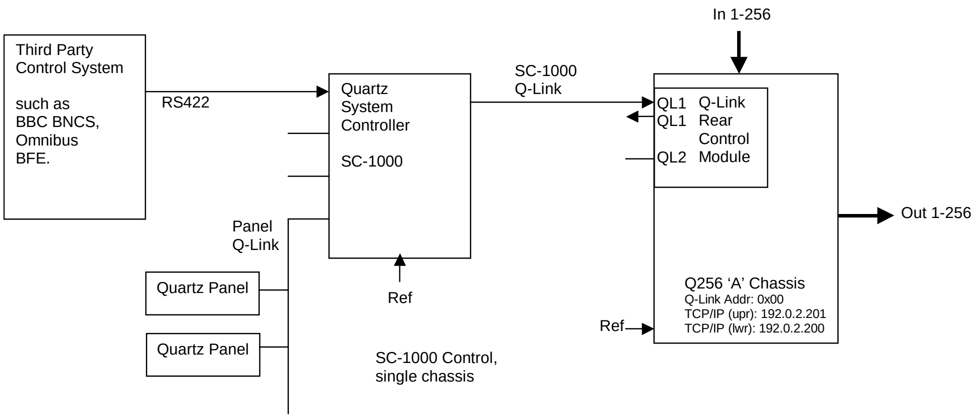


Serial Control, Two Chassis, Output Expansion

As Quartz is only supplying the routers in these examples and not a control system, all input and output mapping must be handled by the third party control system.

SC-1000 Control, Single Chassis

This architecture uses the Quartz System Controller, SC-1000.



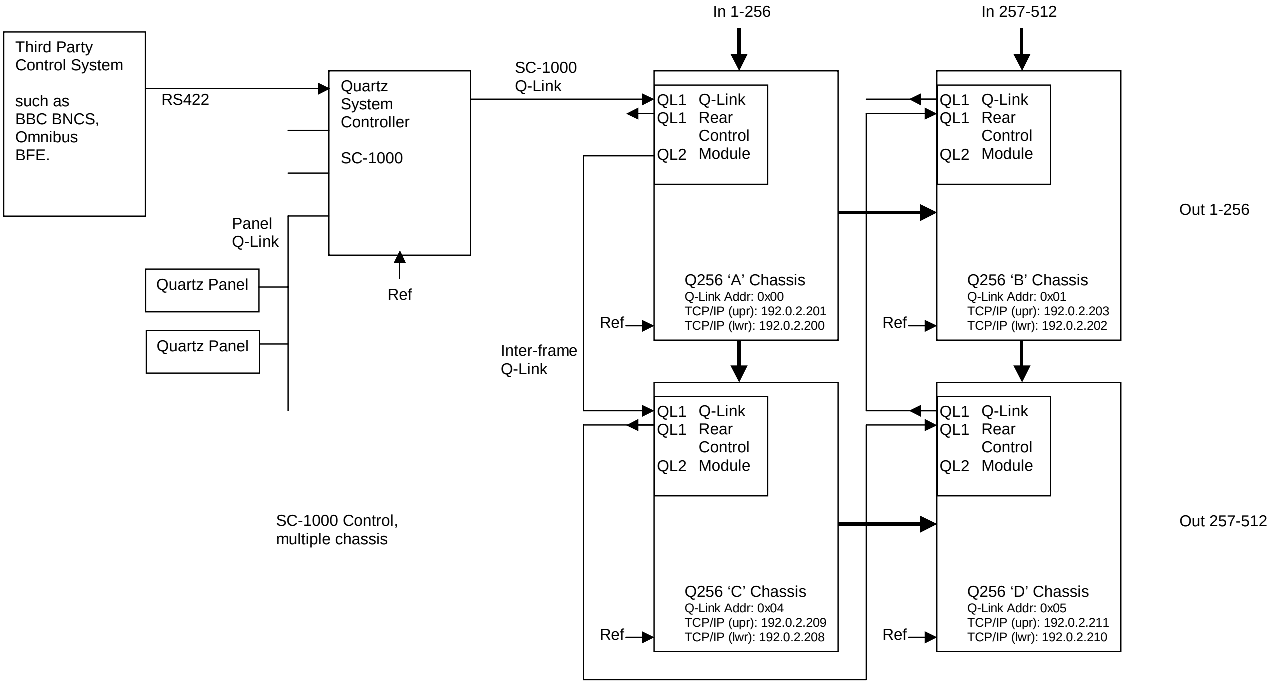
SC-1000 Control, single chassis

The SC-1000 passes messages to the Q256-SV chassis using Q-Link protocol. The SC-1000 provides a comprehensive router control system allowing inputs and outputs to be named and mapped in various ways, panels and their operation to be defined, salvoes to be defined, as well as many other features.

As well as controlling the crosspoints, the SC-1000 also collects error status for any power supplies, fans, etc, that have failed in any of the Q256 chassis.

SC-1000 Control, Multiple Chassis

This architecture uses the Quartz System Controller, SC-1000.



The SC-1000 passes messages to the 'Master' Q256-SV chassis using Q-Link protocol. The message is then re-transmitted on the Q-Link system, synchronised to video reference timing, to all other chassis forming the routing system. This ensures that all chassis switch during the same vertical interval, which is essential for the output cascade to work correctly. For systems running with dual references (625 & 525) then two inter-frame Q-Links may be required. One carries messages locked to the 525 reference and the other messages locked to the 625 reference.

As well as controlling the crosspoints, the SC-1000 also collects error status for any power supplies, fans, etc, that have failed in any of the Q256 chassis. In the above diagram the Q-Link and TCP/IP address have been allocated from those used in a 1024x1024 routing system based around Q256 16U chassis. These would be numbered as follows.

16U systems	Inputs 1-256	Inputs 256-512	Inputs 513-768	Inputs 769-1024
Outputs 1-256	Q-Link addr: 0x00 TCP/IP (upr): 192.0.2.201 TCP/IP (lwr): 192.0.2.200	Q-Link addr: 0x01 TCP/IP (upr): 192.0.2.203 TCP/IP (lwr): 192.0.2.202	Q-Link addr: 0x02 TCP/IP (upr): 192.0.2.205 TCP/IP (lwr): 192.0.2.204	Q-Link addr: 0x03 TCP/IP (upr): 192.0.2.207 TCP/IP (lwr): 192.0.2.206
Outputs 256-512	Q-Link addr: 0x04 TCP/IP (upr): 192.0.2.209 TCP/IP (lwr): 192.0.2.208	Q-Link addr: 0x05 TCP/IP (upr): 192.0.2.211 TCP/IP (lwr): 192.0.2.210	Q-Link addr: 0x06 TCP/IP (upr): 192.0.2.213 TCP/IP (lwr): 192.0.2.212	Q-Link addr: 0x07 TCP/IP (upr): 192.0.2.215 TCP/IP (lwr): 192.0.2.214
Outputs 513-768	Q-Link addr: 0x08 TCP/IP (upr): 192.0.2.217 TCP/IP (lwr): 192.0.2.216	Q-Link addr: 0x09 TCP/IP (upr): 192.0.2.219 TCP/IP (lwr): 192.0.2.218	Q-Link addr: 0x0A TCP/IP (upr): 192.0.2.221 TCP/IP (lwr): 192.0.2.220	Q-Link addr: 0x0B TCP/IP (upr): 192.0.2.223 TCP/IP (lwr): 192.0.2.222
Outputs 769-1024	Q-Link addr: 0x0C TCP/IP (upr): 192.0.2.225 TCP/IP (lwr): 192.0.2.224	Q-Link addr: 0x0D TCP/IP (upr): 192.0.2.227 TCP/IP (lwr): 192.0.2.226	Q-Link addr: 0x0E TCP/IP (upr): 192.0.2.229 TCP/IP (lwr): 192.0.2.228	Q-Link addr: 0x0F TCP/IP (upr): 192.0.2.231 TCP/IP (lwr): 192.0.2.230

The Q-Link address refers to the inter-frame Q-Link and not the SC-1000 Q-Link. For expansion with 8U chassis the Q-Link address becomes 0x10 in place of 0x00.

Ordering Guide

Systems up to 256x256

The standard router sizes are listed below:

Q256-SV-128128-A	Serial digital routing switcher, 16U, loaded as 128x128
Q256-SV-256256-A	Serial digital routing switcher, 16U, loaded as 256x256

For other sizes it is necessary to specify the empty chassis (8U or 16U) and then specify the list of modules to be installed, see the section below on sub-loaded systems.

For a redundant controller order Q256-FU. For redundant power supply order Q256-V-PS, see the table below for correct quantity.

	Q256-V (16U) Up to 128x128	**Q256-V (16U) 128x128 - 256x256**
Q256-V-PS	2 fitted (note 1)	2 fitted (note 2)

Note 1 The 16U chassis loaded as 128x128 can be configured for two different input numbering plans. The standard numbering plan requires two PSU's for normal operation (four for redundancy). A non-standard numbering plan allows the unit to operate with one PSU (two for redundancy) but would require input fins to be moved once the unit is expanded above 128 outputs or a full complement of input fins fitted.

Note 2 Two extra Q256-V-PS required to give a backup power supply.

Quartz products are subject to continuous product improvement as part of our quality programme. As a consequence, all specifications are subject to change without notice.

Sub-Loaded Systems

Both the Q256-V 8U and 16U routers can be purchased in a sub-loaded format, without all the routing modules installed. In these cases it is necessary to specify the empty chassis (Q256-SV-08 or Q256-SV-16) and then specify the list of modules to be installed. As this is a complex process and mistakes are likely to be costly it is best to seek advice directly from Quartz. The following table clarifies which parts are required

	Q256-V-08 (8U) Up to 128x128	**Q256-V-16 (16U) Up to 128x128**	**Q256-V-16 (16U) 128x128 - 256x256**
Input Fin	1 to 4	2 or 4	6 or 8
Output Fin	1 to 4	1 to 4	5 to 8
Fin blanking	As required	As required	As required
Crosspoint Module	1 to 4	1 to 4 (note 6)	5 to 8
Controller Module	1 fitted (note 1)	1 fitted (note 1)	1 fitted (note 1)
Fan Module	All fans fitted	All fans fitted	All fans fitted
Power Supply	1 fitted (note 2)	2 fitted (note 5)	2 fitted (note 3)
Signal Monitor	Not fitted (note 4)	Not fitted (note 4)	Not fitted (note 4)
Ethernet Module	Always fitted	Always fitted	Always fitted
Serial Module	Not fitted (note 7)	Not fitted (note 7)	Not fitted (note 7)
Q-Link Module	Not fitted (note 7)	Not fitted (note 7)	Not fitted (note 7)

Note 1 One extra Q256-FU required to give a backup controller

Note 2 One extra Q256-V-PS required to give a backup power supply.

Note 3 Two extra Q256-V-PS required to give a backup power supply.

Note 4 One Q256-SV-SM signal monitor can be fitted as an option.

Note 5 The 16U chassis loaded as 128x128 can be configured for two different input numbering plans. The standard numbering plan requires two PSU's for normal operation (four for redundancy). A non-standard numbering plan allows the unit to operate with one PSU (two for redundancy) but would require input fins to be moved once the unit is expanded above 128 outputs or a full complement of input fins fitted.

Note 6 For units that will never be expanded above 128 inputs there is a special build of the crosspoint module that removes unwanted components to save cost.

Note 7 Both the 8U and 16U chassis will accept 3 rear I/O modules allocated as required to Serial I/O, Q-Link I/O, or blanking plates.

Any system with more than 128 outputs requires 2 x Q256-V-PS for normal operation and 4 x Q256-V-PS for backup power supplies.

Systems above 256x256

For system above 256x256 contact the Quartz sales office. Multi-rack routers are built from 4 basic chassis types, designated A, B, C, and D frames.

Router Type (A, B, C, or D)	**Input Fin Type**	**Output Fin Type**
Q256-SV-256256-A	BNC Input Fin	BNC Output Fin
Q256-SV-256256-B	BNC Input Fin	Cascade Fin
Q256-SV-256256-C	Expand Fin	BNC Output Fin
Q256-SV-256256-D	Expand Fin	Cascade Fin

From these four basic router types it is possible to build a 1024x1024 router.

	Inputs 1-256	Inputs 257-512	Inputs 513-768	Inputs 769-1024
Outputs 1-256	Q256-SV-256256-A	Q256-SV-256256-B	Q256-SV-256256-B	Q256-SV-256256-B
Outputs 257-512	Q256-SV-256256-C	Q256-SV-256256-D	Q256-SV-256256-D	Q256-SV-256256-D
Outputs 513-768	Q256-SV-256256-C	Q256-SV-256256-D	Q256-SV-256256-D	Q256-SV-256256-D
Outputs 769-1024	Q256-SV-256256-C	Q256-SV-256256-D	Q256-SV-256256-D	Q256-SV-256256-D

There is a general description of a 512x512 router in the Installation section of this manual.

Options & Spares

The following items can be purchased at any time to add extra facilities to the Q256 or as spares.

Q256-V-08	Empty 8U Chassis (includes fans, Ethernet module, & door)
Q256-V-16	Empty 16U Chassis (includes fans, Ethernet module, & doors)
Q256-V-PS	Power supply
Q256-FU	Control processor
Q256-SV-SM	Signal Monitoring Module
Q256-QL	Rear Q-Link Module
Q256-RS	Rear RS422 Module
AK-0013	Multi-router expansion cable (SCSI).
Q256-SV-IN	Input Fin with BNC connectors
Q256-SV-OUT	Output Fin with BNC connectors
Q256-V-XP-128	Crosspoint & Output Module, 128 inputs
Q256-V-XP-256	Crosspoint & Output Module, 256 inputs
Q256-SV-SIMM-R	Output SIMM, Re-clock, 2 channels
Q256-HD-IN	Input Fin, HD, with BNC connectors
Q256-HD-OUT	Output Fin, HD, with BNC connectors
Q256-HD-SIMM-R	Output SIMM, HD, Re-clock, 2 channels.
Q256-SV-IN-E	Input Fin with Expand connectors
Q256-SV-OUT-E	Output Fin with Expand connectors

The Q256-SV/HD routers have a matching audio router, the Q256-DA/AA. This is available in both an 8U chassis (128x128 AES, 128x128 Analog stereo, or 256x256 analog mono) and a 16U chassis. The audio router has a digital core and uses both digital and analog fins to allow any combination of signal formats to be used. Contact Quartz for more information.

Technical Specification

General

AC voltage:	85-264V
AC frequency:	50/60 Hz
Power consumption:	0.85KW maximum (8U, fully loaded) 1.60KW maximum (16U, fully loaded)
Power Factor:	0.94
Cooling:	Air drawn from right hand side, expelled left hand side. Maximum temperature rise of cooling air is 18°C.
Temperature operating range:	10° to 30° Celsius, specification maintained

Video inputs, SD

Input signal type:	10 bit serial digital video to SMPTE 259M.
Cable equalisation:	Automatic to >300m of Belden 8281 coax.
Connector type:	75Ω BNC
Return loss:	At least 15dB, 5MHz to 270MHz.

Video outputs, SD

Output data type and format:	Serial digital video to SMPTE 259M.
Output Impedance:	75Ω
Output return loss:	At least 15dB, 5MHz to 270MHz.
Signal amplitude:	800mV +/- 10% terminated into 75Ω.
Output connector:	75Ω BNC
Output jitter:	<0.2UI pk-pk with <300m input cable.

Video inputs, HD (maximum 128 inputs)

Input signal type:	10 bit serial digital video to SMPTE 292M.
Cable equalisation:	Automatic to >85m of Belden 8281 coax.
Connector type:	75Ω BNC
Return loss:	At least 15dB, 5 MHz to 1485MHz.

Video outputs, HD (maximum 128 outputs)

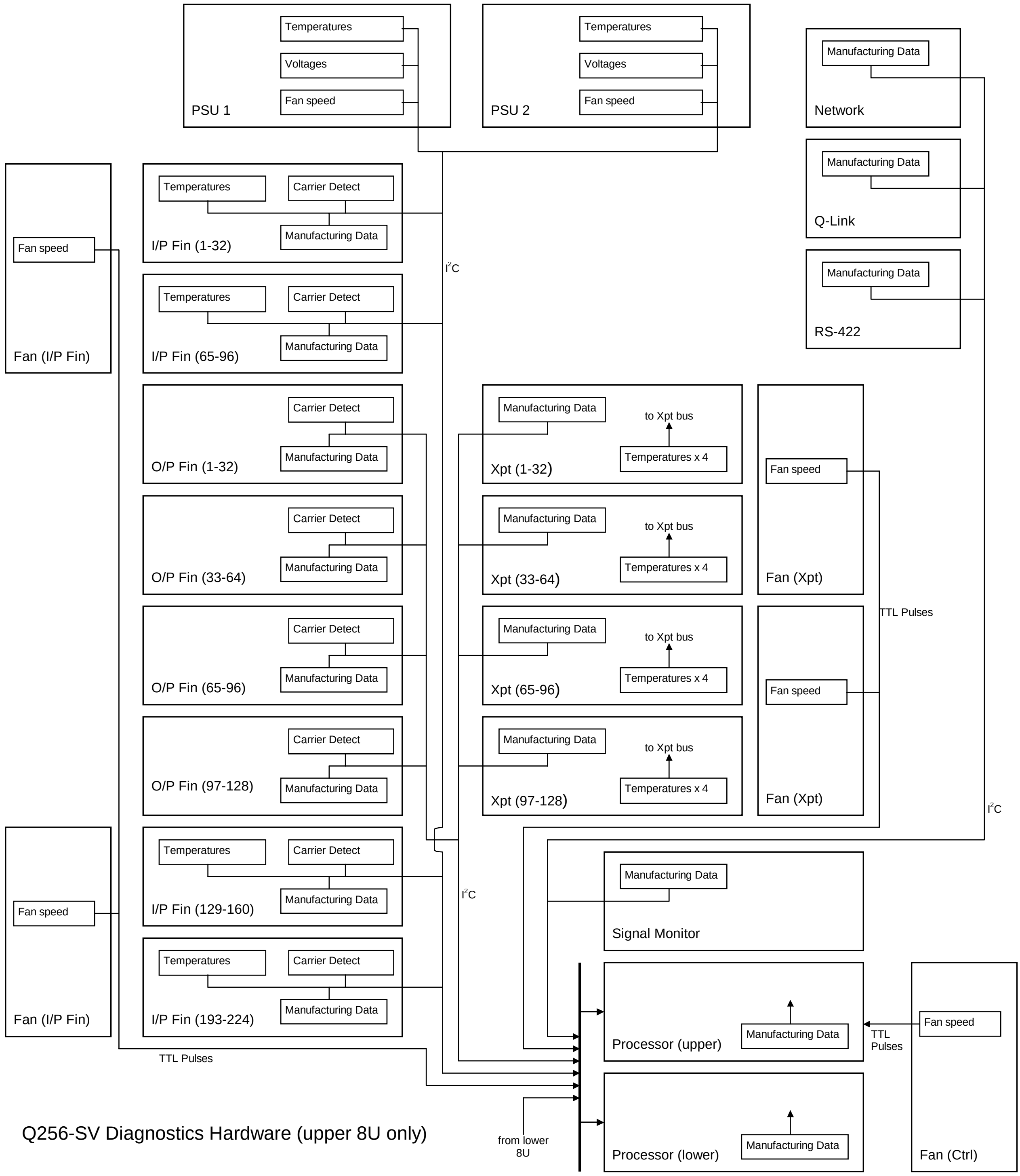
Output data type and format:	Serial digital video to SMPTE 292M.
Output Impedance:	75Ω
Output return loss:	At least 15dB, 5MHz to 1485MHz.
Signal amplitude:	800mV +/- 10% terminated into 75Ω.
Output connector:	75Ω BNC
Output jitter:	<0.2UI pk-pk with <85m input cable.

Mechanical Specification

Width	19" (483mm)
Height	Up to 128x128 = 8RU or 14" (356mm) Up to 256x256 = 16RU or 28" (712mm)
Depth	20.3" (515mm)
Weight	Q256 8U = 46Kg max Q256 16U = 94Kg max

Maintenance

Q256 series products are designed to require minimal maintenance. To aid fault diagnosis there are a large number of internal temperature sensors, fan speed sensors, and signal present sensors. All of the diagnostic information can be accessed either through the WinSetup software, directly using an Ethernet Telnet port, or through a serial port.

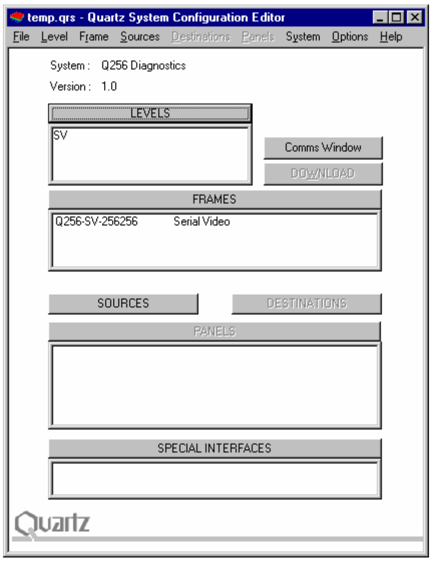


Q256-SV Diagnostics Hardware (upper 8U only)

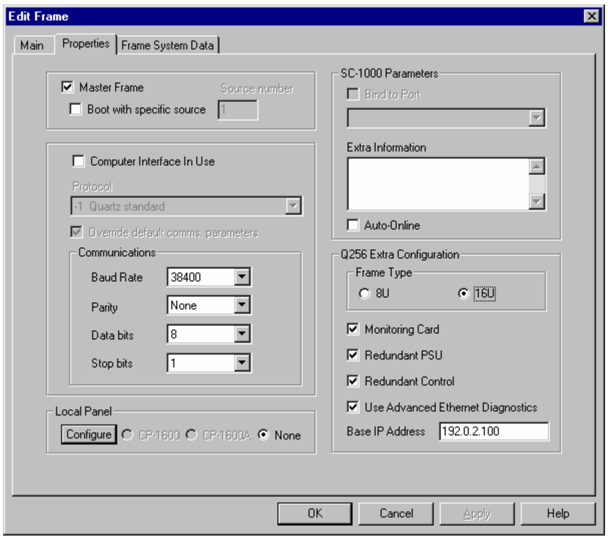
WinSetup Diagnostics

To use WinSetup diagnostics it is first necessary to configure WinSetup for a Q256 router and set the communications to be either Ethernet (recommended) or Serial (single device only). The '*piset'* command should already have been used on the Q256 to tell the router its exact configuration (number of PSU's fitted, etc).

First configure WinSetup for a Q256 router.



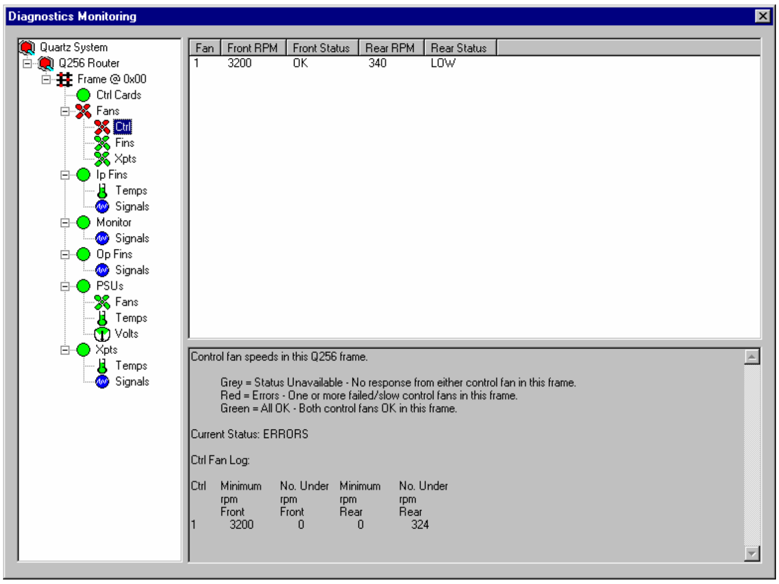
Configure the Q256 TCP/IP address and tick which options are fitted.



Serial communication can be used but is not recommended as it only allows connection to a single device. The Q256 processor module front D9 connector must be used.

For Ethernet the rear panel Ethernet connectors are used. There is a dedicated RJ45 connector for each processor module so in a dual redundant controller system connection would normally be made via a network hub.

Once WinSetup is configured and the physical connections have been made, select the System, Diagnostics Monitoring menu item and you will be presented with a dialog similar to the one shown below.

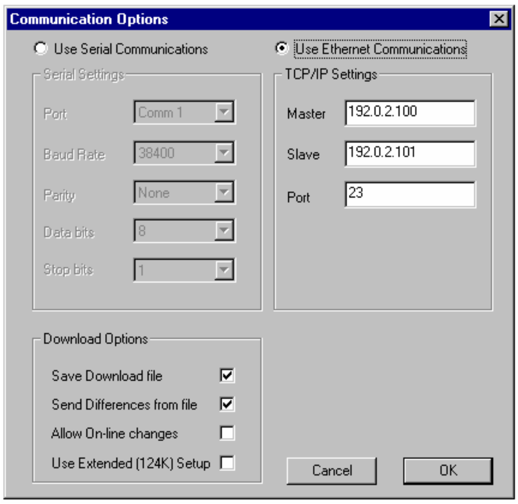


In the above example the windows style tree structure has been expanded out to show all the items that are being monitored.

Low Level Diagnostics

It is possible to talk directly to the Q256 in engineering mode. This is best done over Ethernet but can also be performed over a Serial link, useful if the Ethernet address of the router is not known.

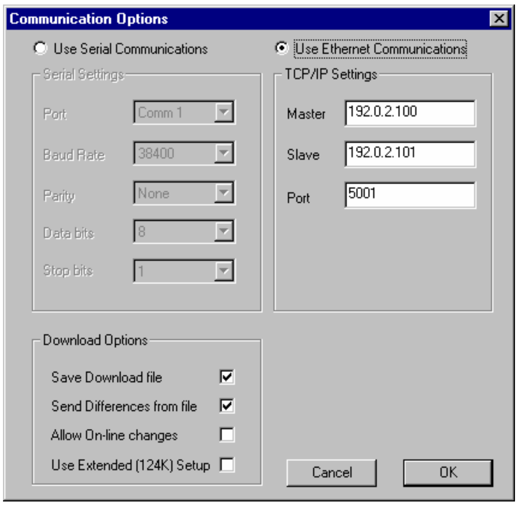
The Q256 supports two TCP/IP port numbers, port 23 is a Telnet port, and port 5001 is a Quartz standard protocol port. The WinSetup dialog to enable Ethernet/Telnet communications is shown below.



With Winsetup configured and the physical connections made, the communication link should be tested by using the WinSetup PC Comms Window. With the cursor in the large text box press carriage return (cr) a few times and the router should respond with a command prompt '->'.

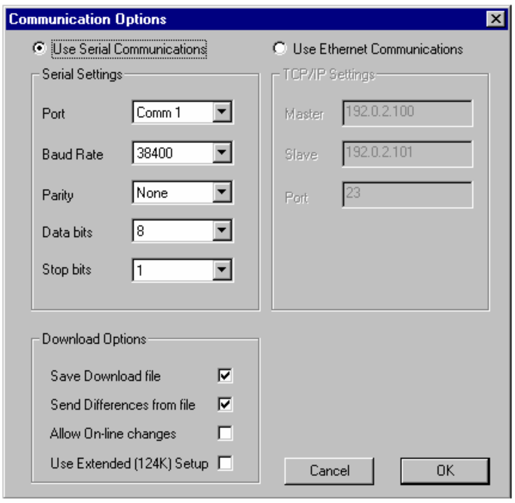
With a communication link established any or the Telnet commands detailed in Appendix 1 can be used to examine Signal status, Fan speeds, internal temperatures, and PSU voltages.

It is also possible to use Quartz standard protocol commands over Ethernet by changing the TCP/IP port number from 23 (Telnet) to 5001 (Quartz protocol). The setting is shown below.



Again test the communications link by using the WinSetup PC Comms Window. With the cursor in the large text box press the Acknowledge button and the router should respond with the '.A' reply.

The Quartz protocol commands can also be used over a serial link and the WinSetup dialog to enable Serial communications is shown below.



Fans

There are several fans in the Q256 router used to keep the power supplies and other electronics at a low operating temperature. The fans should be checked every six months to ensure they are functioning correctly using the Winsetup diagnostics functions, or alternatively Refer to Appendix 1 for details of the Telnet 'fans' and 'temps' commands. There are no fan filters to change.

Power supply

Each Q256 power supply Q256-V-PS (PS-0015) has it's own independent IEC inlet. A thermal circuit breaker is built in to each PSU On/Off switch to protect the power supply and associated mains cabling and therefore no external main fuse is fitted to this product.

Power supply status can be monitored by the front panel indicators or via the control system using the Ethernet port and WinSetup. Basic monitoring can also be achieved from the Telnet command, refer to Appendix 1 for details of the Telnet 'volts' command.

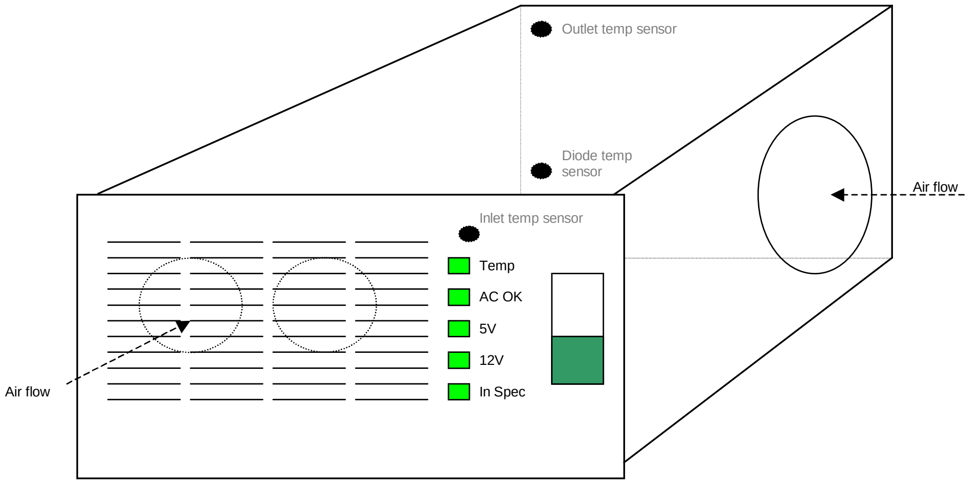
Q256-V (8U): This has one main power supply, the left hand unit. A second right hand unit can be fitted as a backup.

Q256-V (16U): This has two independent sections, the upper 8U, and the lower 8U; each section has its own power supply. A second right hand unit can be fitted to each section as a backup. Therefore a non-redundant Q256 16U chassis will be fitted with two power supplies (upper and lower), and a redundant Q256 16U will be fitted with four power supplies (two upper and two lower).

- The upper 8U handles inputs 1-32, 65-96, 129-160, 193-224, outputs 1-128, the control processor, rear panel I/O, and all the fans in the upper section.
- The lower 8U handles inputs 33-64, 97-128, 161-192, 225-256, outputs 129-256, and all the fans in the lower section.

The power supply PS-0015 has environmental sensing for

- Inlet air temperature
- Exhaust air temperature
- +5V OR'ing diode
- AC OK
- DC OK
- +5V PSU Rail
- +5V Motherboard Rail
- +12V Rail



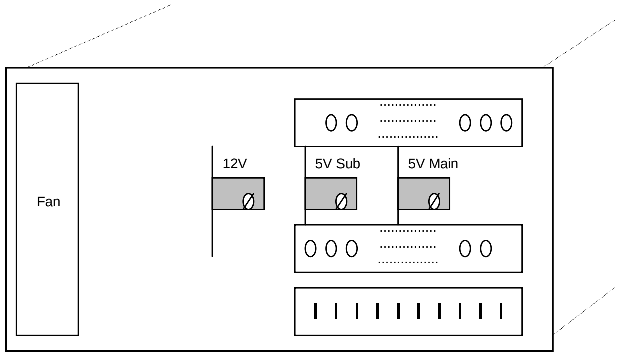
The internal switcher block used within the PS-0015 can deliver +5V at 155A, and +12V at 17A. The +5V rail is used inside the router to run all electronics and is locally sub-regulated to 3.3V, 2.5V, and 1.8V where required. The +12V is used for all the cooling fans.

Adjusting the PSU voltages

The 5V and 12V rails are factory set to 5.00V on the motherboard (approximately 5.30V inside the PSU) and 12.50V. In the unlikely event that these need to be adjusted then use the following notes.

Warning: Great care must be taken with the +5V as setting this too high could destroy most of the router electronics.

The rear view of the Q256-V-PS (PS-0015) is shown below:



- To check the voltages first switch off the backup supply and then use Winsetup diagnostics, or Telnet to the router using the *volts* command, and note the voltages.

- If the voltage needs adjusting then switch off the PSU and wait for the green LED's to turn off.

- Remove the supply and adjust the voltage:

    5V: Set the 5V supply for a Motherboard voltage of 4.99-5.01V using the 5V Main adjuster only. Adjust clockwise to increase the voltage but adjust by no more than ¼ turn at each adjustment. This will usually give a PSU voltage of 5.30V

    12V: Set the 12V supply for a PSU voltage of 12.4-12.6V using the 12V adjuster. Adjust clockwise to increase the voltage but adjust by no more than ¼ turn at each adjustment.

- Reinstall the supply and switch on. Re-check the voltages using Winsetup diagnostics or Telnet.

Repeat for the backup PSU by running the unit with the main PSU switched off.

Appendix 1: Telnet Commands

Very basic control and monitoring can be achieved from a PC using the Telnet function. This should only be used during commissioning as Telnet runs as the highest priority task and can cause loss of Q-Link or Serial communications during some commands. On a standard Windows PC, use the Start and Run… command and at the prompt type ‘Telnet 192.0.2.200’ and click OK which will open a Telnet window connected to the main (lower) processor.

If there is a problem using Telnet then you can check there is a network connection to the router from a PC command prompt by typing ping followed by the IP address. e.g. > Ping 192.0.2.200

Help

General Help (cmd: hw)

Example of ‘Telnet’ display for general help.

```
-> hw
 ------------------------------------------------------------------
| Help                                                             |
|                                                                  |
| confighelp         Displays help on configuring the router       |
| monhelp            Displays help on monitoring functions.        |
| routehelp          Displays help on setting up route in diagnostic|
|                    mode. !!!ENGINEERING ONLY!!!                  |
| ver                Displays software and firmware versions.      |
 ------------------------------------------------------------------
```

Configuration Help (cmd: confighelp)

Example of ‘Telnet’ display for configuration help.

```
-> confighelp
 ------------------------------------------------------------------
| Configuration Help                                               |
|                                                                  |
| config             Displays current hardware setting and current |
|                    product inventory listing.                    |
| piset              Allows user to set up the router product      |
|                    inventory.                                    |
 ------------------------------------------------------------------
```

Route Status Help (cmd: routehelp)

Example of ‘Telnet’ display for monitoring help.

```
-> routehelp
 ------------------------------------------------------------------
| Route Setting Help                                               |
|                                                                  |
| allto <src>        Sets all destinations to <src>.               |
| incsrcto <dest>    Sets source 1 to <dest>. Pressing enter       |
|                    increments the source to the given destination.|
| take <src>,<dest>  Makes route <src> to <dest>.                  |
| xtoy               Sets all destinations to their corresponding  |
|                    source (eg. 1->1, 2->2, 3->3 ... 256->256).   |
 ------------------------------------------------------------------
```

Monitoring Help (cmd: monhelp)

All signal monitoring functions require the presence of a monitor card. Example ‘Telnet’ display for monitoring help.

```
-> monhelp
 -------------------------------------------------------------------
| Monitoring Help                                                   |
|                                                                   |
| xptstd             Displays xpt standards for all cards.          |
| temps              Displays current router temperatures.          |
| volts              Displays current router voltages.              |
| fans               Displays current fan speed.                    |
| opcd               Displays the output carrier detect status of   |
|                    all outputs.                                   |
| ipcd               Displays the input carrier detect status of all|
|                    inputs.                                        |
| iffitted <fin>     Returns '1' if input fin <fin> is fitted and   |
|                    configured correctly (0->15).                  |
| offitted <fin>     Returns '1' if output fin <fin> is fitted and  |
|                    configured correctly (0->8).                   |
| xptfitted <xpt>    Returns '1' if the xpt card <xpt> is fitted and|
|                    configured correctly (0->15).                  |
| monfitted          Returns '1' if the monitor card is fitted      |
| commsfitted <card> Returns '1' if the communications module <card>|
|                    is fitted and configured correctly (0->4).     |
| monallop <dur>,<op>Monitors all outputs for edh and standard for  |
|                    a duration of <dur> s and to monitor op <op>.  |
| monallip <dur>,<op>Monitors all inputs for edh and standard for   |
|                    a duration of <dur> s, to monitor op <op> using|
|                    xpt card <xpt>.                                |
| testops <start_src>Sets all destinations to input <start_src> and |
|                    outputs the xpt standard of all destinations   |
|                    from that source. <Enter> increments the source|
|                    used. !!!ENGINEERING ONLY!!!                   |
 -------------------------------------------------------------------
```

Signal Monitoring

Input Fin Carrier Detect (cmd: ipcd)

This function reads via I^2C the status of the equalizer IC’s CD output.

Example of ‘Telnet’ display, for Fin 1, Inputs 1,12, & 32 are ‘good’, Fin 2 is missing/failed

```
>ipcd
INPUT FIN CARRIER DETECT

INPUT   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16
FIN 1   1   0   0   0   0   0   0   0   0   0   0   1   0   0   0   0
        0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   1
FIN 2   Not Fitted
        Not Fitted
FIN 3   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
.
.
.
FIN 8   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
        1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
```

Output Fin Carrier Detect (cmd: opcd)

Example of 'Telnet' display, for Fin 1, Outputs 1,12, & 32 are 'good', Fin 2 is missing/failed

```
>opcd
OUTPUT FIN CARRIER DETECT

OUTPUT  1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16
FIN 1   1   0   0   0   0   0   0   0   0   0   0   1   0   0   0   0
        0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   1
FIN 2   Not Fitted
        Not Fitted
FIN 3   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
.
.
FIN 8   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
        1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
```

Crosspoint Card Standard Detect (cmd: xptstd)

Example of 'Telnet' display, Slots 1 – 4 are not fitted and slot 8 output 3 & 4 are missing output 5 is oscillating.

```
->xpstd 1
XPT CARD STANDARD DETECT

XPOINT    1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16
Slot 1   NOT FITTED
         NOT FITTED
Slot 2   NOT FITTED
         NOT FITTED
Slot 3   NOT FITTED
         NOT FITTED
Slot 4   NOT FITTED
         NOT FITTED
Slot 5   270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
Slot 6   270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
Slot 7   270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
Slot 8   270 270  0   0   ?  270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
```

Monitor Inputs (cmd: monip <fin>,<duration>,<Mon op>,<xpt>)

Feeds Input signals from crosspoint card through monitor channel 1 or 2. Can select high or low crosspoint bank, i.e. 2 reads of the same input can be made per card. Can use any available xpt card.

NOTE: fin and duration are required to run the test, Mon op and xpt are optional. However, if xpt is to be specified, Mon op must also be. Example of 'Telnet' display: Testing input fin 1, with an EDH test duration of 5 second, to monitor output 2 using xpt card 3.

```
-> monip 1,5,2,3
INPUT MONITOR
CONFIG: FIN: 1, DURATION: 05s, MON OP: 2

              LOW  BANK        HIGH  BANK
              (OP 1-16)        (OP 17-32)
FIN 1       CD  STD  EDH     CD  STD  EDH

  01        1   270  PASS    1   270  PASS
  02        1   270  PASS    1   270  PASS
```

```
  03        1   270  PASS    1   270  PASS
     .
     .
     .
  32        1   270  PASS    1   270  PASS
```

Monitor All Inputs (cmd: monallip <duration>,<Mon op>,<xpt>)

Performs test as above, but on all input fins fitted.

Monitor Outputs (cmd: monop <output fin>,< duration>,<Mon op>)

Feeds Output signals from the output drivers on the output fins via a 32 to 1 combiner (controlled by I^2C) and then through monitor channel 1.

Example of ‘Telnet’ display.

```
>monop 1,5,1
OUTPUT MONITOR
CONFIG: FIN: 1, DURATION: 05s, MON OP: 1

FIN 01     CD  STD  EDH

  01        1   270  PASS    1   270  PASS
  02        1   270  PASS    1   270  PASS
  03        1   270  PASS    1   270  PASS
     .
     .
  32        1   270  PASS    1   270  PASS
```

Monitor All Outputs (cmd: monallop < duration>,<Mon op>)

Performs test as above, but on all output fins fitted.

Test All Routes (cmd: testops <src>)

Sets input <src> to all destinations and then gets the crosspoint standards for each available destination. Pressing enter increments the source and re-checks the crosspoint standards. For engineering use only.

Example of ‘Telnet’ display shows that all outputs have been fed with a 270Mbit signal:

```
-> testops 1
INPUT: 1
XPT CARD STANDARD DETECT

XPOINT    1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16
Slot 1   270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
Slot 2   270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
Slot 3   270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
Slot 4   270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
Slot 5   270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
Slot 6   270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
Slot 7   270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
Slot 8   270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
         270 270 270 270 270 270 270 270 270 270 270 270 270 270 270 270
PRESS ENTER TO CONTINUE... (b AND ENTER TO GO BACK)
```

Alarm Monitoring

Alarm Monitoring (cmd: amon)

Turns alarm monitoring off (amon) or on (amon 1).

Temperature Status (cmd: temps)

Example of 'Telnet' display

```
->temps

PSU TEMPERATURES:

PSU   IN AMB  OUT AMB   DIODE
 1      31       42       29
 2      NOT FITTED
 3      38       43       33
 4      31       50       35

INPUT FIN TEMPERATURES:
INPUT FIN     1     2     3     4     5     6     7     8
            42-47 xx-xx xx-xx xx-xx xx-xx xx-xx xx-xx xx-xx

XPT TEMPERATURES:
CROSSPOINT   REAR XPT   FRONT XPT   REAR SIMM   FRONT SIMM
     1      NOT FITTED
     2      NOT FITTED
     3      NOT FITTED
     4      NOT FITTED
     5          31         39           34          36
     6          28         38           35          37
     7          30         42           36          33
     8          34         37           38          40
```

Voltage Status (cmd: volts)

Example of 'Telnet' display

```
->volts

PSU VOLTAGES

PSU   PSU O/P 5V  PSU O/P 12V  MTHRBRD 5V
 1       5.27       12.81         4.97
 2    NOT FITTED
 3       5.22       12.69         4.94
 4       5.25       12.69         4.97
```

Fan Status (cmd: fans)

Example of 'Telnet' display

```
>fans
PSU FAN SPEEDS

PSU       SPEED
 1         5037
 2      NOT FITTED
 3         0000
 4         5152

FRONT MAIN - FRNT  BACK
 SLOT 1/2    3107  3144
```

```
 SLOT 3/4    3141  3236
 SLOT 5/6    3095  3183
 SLOT 7/8    3238  3632

FRONT CTRL - FRNT  BACK
             5052  5052

REAR
 FINS 1/2    4859
 FINS 3/4    4812
 FINS 5/6    4524
 FINS 7/8    4552
```

Configuration

Configuration Status (cmd: config)

Example of ‘Telnet’ display for a 16U 128x256

```
>config
ROUTER CONFIGURATION

               SOFTWARE   HARDWARE
               Q256-16U
PSUS              2          4
CONTROLLERS       2          1
MONITOR           0          1
INPUT FINS        4          4
CROSSPOINTS       8          8
OUTPUT FINS       8          8
MAIN FANS         4          4
CTRL FANS         1          1
REAR FANS         4          4
```

Product Inventory Set (cmd: piset)

Asks the user a series of questions to ascertain what type of router the control card is in (eg 8/16U) and what cards should be fitted – Used to allow alarm monitoring to work correctly. This function MUST be run on both control cards independently.

Example of ‘Telnet’ display for a 8U 128x128

```
-> piset
Router Product Type ('8' or '16' U) 8/16
Router Signal Type (Video (v) or Mono Audio (m) or Stereo Audio (s)) v/m/s
Rack Address for Inter-rack link 0…15
```

If Video:

```
Are input fins to be in non-consecutive order? (y/n) y
```

If Audio:

```
Are analogue fins to have standard(1) or Quartz(2) pin-out?  1/2

No. Xpt Cards Fitted 8
No. PSUs Fitted 4
No. IP Fins Fitted 8
No. OP Fins Fitted 8
No. Monitor Cards Fitted 1
No. Controller Cards Fitted 2
Total No. Outputs in Q256 Routing system(excluding monitoring outputs) 32/64/…256
Total No. Inputs in Q256 Routing system 32/64/…256
```

If Video:

```
Xpt Reference Card x (1=525,2=625,3=HD) 1/2/3
```

If Audio:

```
Default Input Reference (1=AUDIO,2=VIDEO,3=FREE) 1/2/3
Default Input Rate (1=48kHz,2=96kHz) 1/2
Default Input Bypass (1=ON(Crash),2=OFF(Softswitch)) 1/2
Default Input ADC Alignment (1=18dB,2=21dB,3=24dB) 1/2/3
Default Output Reference (1=AUDIO,2=VIDEO,3=FREE) 1/2/3
Default Output Rate (1=48kHz,2=96kHz) 1/2
Default Output Bypass (1=ON(Crash),2=Softswitch(Instant),3=Softswitch(Fast),
4=Softswitch(Med),5=Softswitch(Slow),
6=Softswitch(Super Slow - Engineering Only) 1/2/3/4/5
Default Output DAC Alignment (1=18dB,2=21dB,3=24dB) 1/2/3
Default Phase Change (1=OFF,2=ON) 1/2

Is router a single rack? (y/n) y/n
```

If single rack:

```
Inter-rack Reference (1=Audio,2=Video) 1/2
Cascade cable 1 length in meters (Input expansion): 0…55
Expansion cable 1 length in meters (Output expansion): 0…55
Cascade cable 2 length in meters (Input expansion): 0…55
Expansion cable 2 length in meters (Output expansion): 0…55
Cascade cable 3 length in meters (Input expansion): 0…55
Expansion cable 3 length in meters (Output expansion): 0…55
```

Comm Port Setup (cmd: commssetup)

Allows the rear D9 serial ports to be configured for protocol, baud rate, etc. First disable alarm monitoring using command *amon*. Then type *commssetup* and answer the following questions (typical user responses in bold). Note that normal Quartz protocol settings are 38400 baud, no parity, 8 data bits, 1 stop bit. Normal Pro-bel settings are 38400 baud, even parity, 8 data bits, 1 stop bit.

When using this command it is important to understand the comm port numbering scheme. The rear control module PCI bus is numbered from slot 0 for the lower module position to slot 3 for the upper (Ethernet) module position. The lowest installed RS422 or Q-Link module will be comm port 1. For a typical installation this will give:

PCI Slot	Module	Port Numbers
3	Ethernet Module	n/a
2	Blank	n/a
1	RS422 Module	Ports 5 (RS422), 6 (RS422), 7 (RS422), 8 (RS232)
0	Q-Link Module	Ports 1 (QL1), 2 (QL2), 3 (QL3), 4 (QL4)

Note that the RS422 module has three RS422 ports (5, 6, 7 in the example above) and an un-used 4th RS232 port (8 in the example above).

With modules installed in a different order could give:

PCI Slot	Module	Port Numbers
3	Ethernet Module	n/a
2	Q-Link Module	Ports 5 (QL1), 6 (QL2), 7 (QL3), 8 (QL4)
1	RS422 Module	Ports 1 (RS422), 2 (RS422), 3 (RS422), 4 (RS232)
0	Blank	n/a

```
-> commssetup
Continue to setup comms (y to continue) y
Is router a single rack? (y/n) y/n
How many comms ports are in use (excluding diagnostics and ethernet ports)? 1…12
Lowest SRC 1
Highest SRC 256
Lowest DEST 1
Highest DEST 257
Input Monitoring Output (MON1) 257
Output Monitoring Output (MON2) 258
Source number to use for tone 257
Source number to use for mute 258
```

Then for each port:

```
Configuration for port X
1. NOT USED
2. QUARTZ
3. PROBEL
4. Q-LINK (SC-1000 or PC215)
5. PASSTHROUGH
6. Q256 LINK MASTER
7. Q256 LINK SLAVE
Please select port X usage: 1…7
```

If not a Q-Link or Q256-Link port:

```
Use default comms parameters - 38400, none, 8 data and 1 stop? (y/n) y/n
```

If not using defaults:

```
1. 1200
2. 2400
3. 4800
4. 9600
5. 38400
6. 57600
7. 115200
Please select port 3 baud: 1…7
```

```
1. NONE
2. ODD
3. EVEN
4. MARK
Please select port 3 parity: 1…4

1. 7 data bits
2. 8 data bits
Please select port 3 data bits: 1/2

1. 1 stop bit
2. 2 stop bits
Please select port 3 stop bits: 1/2
```

If Quartz Protocol selected:

```
Enter first level to map to (eg 1=V(default), 2=A, 3=B) 1…8

Should port 1 show take update messages?(y/n) y/n
```

If Q-Link port:

```
Please enter the Q-Link address for this port: 0…64
```

…then repeats for each port….
…then returns with value = 0.

You must then reset the processor before the new values will take effect.

Set Ethernet Address (cmd: setmacaddr)

Allows the user to set the mac (low level Ethernet) address. This is for Quartz use only.

Get Ethernet Address (cmd: getmacaddr)

Allows the user to set the mac (low level Ethernet) address. This is for Quartz use only.

Set Manufacturing Data (cmd: epset)

Allows the user to set the electronic manufacturing data to be programmed into each module. Do not use as this feature is not fully supported and is for Quartz factory use only.

Get Manufacturing Data (cmd: epget)

Allows the user to get the electronic manufacturing data programmed into each module. Do not use as this feature is not fully supported and is for Quartz factory use only.

Comms Fitted Data (cmd: commsfitted)

Allows the user to get the electronic data programmed into each rear comms module. Do not use as this feature is not fully supported and is for Quartz factory use only. Note that this command uses the I^2C diagnostic bus and any device numbers displayed will not match PCI bus numbers.

Interrogate and Set Routes

Interrogate Route (not implemented)

This command is not implemented.

Set Route (cmd: take <source>,<destination>)

Makes route source to destination. The source and destination numbers correspond to the ranges set for port 0 using the *commssetup* command. Writes directly to crosspoint and does NOT update the serial ports, it should therefore only be used as an in-house engineering function.

Example of 'Telnet' display:

```
-> take 1,3
Src 1 to Dest 3
```

Set All Destinations (cmd: allto <src>)

Sets all destinations (256) to the defined source. The source and destination numbers correspond to the ranges set for port 0 using the *commssetup* command. Writes directly to crosspoint and does NOT update the serial ports – It should therefore only be used as an in-house engineering function.

Example of 'Telnet' display:

```
-> allto 1
All destinations set to source 1
```

Set Diagonal Route (cmd: xtoy)

Sets input 1 to output 1, input 2 to output 2 ….. input 256 to output 256. Writes directly to crosspoint and does NOT update the serial ports – It should therefore only be used as an in-house engineering function.

Example of 'Telnet' display:

```
-> xtoy
XY mapping set
```

Step Sources (cmd: incsrcto <destination>)

Sets input 1 to output defined by the destination value passed to the function. Pressing any key will increment the source to that destination until input 256. To quit the function press ctrl-c. The source and destination numbers correspond to the ranges set for port 0 using the *commssetup* command. Writes directly to crosspoint and does NOT update the serial ports – It should therefore only be used as an in-house engineering function.

Example of 'Telnet' display:

```
-> incsrcto 3
Src 1 -> Dest 3 (Enter to continue)
Src 2 -> Dest 3 (Enter to continue)
Src 3 -> Dest 3 (Enter to continue)
```

Miscellaneous Commands

Software Version (cmd: ver)

Firmware and software version read back.

Example of ‘Telnet’ display:

```
-> ver
Time: 00:38:34.
FIRMWARE VERSION: 1.04
CONTROLLER XILINX VERSION: 5
XPT 1 XILINX VERSION: 2
XPT 2 XILINX VERSION: 2
XPT 3 XILINX VERSION: 2
XPT 4 XILINX VERSION: 2
MON CARD XILINX VERSION: 1
```

Installing New Software (cmd: flashwritefile, addr, “file”)

Transfers new control module software from a FTP file server to the processor module and writes the file to Flash memory.

Example of ‘Telnet’ display:

```
-> FlashWriteFile 0xfff00000, “Q256.110”
```

Set the Time (cmd: settime)

Example of ‘Telnet’ display:

```
-> settime
Please enter current hour: 11
Please enter current minute: 21
Time: 11:21:38.
```

Set the Date (cmd: setdate)

Example of ‘Telnet’ display:

```
-> setdate
Please enter day of the month (0->31): 5
Please enter month (1->12): 06
Please enter year (20xx): 2001
Date: 05-06-2001.
```

Get the Time (cmd: gettime)

Example of ‘Telnet’ display:

```
-> gettime
Time: 11:24:25.
```

Get the Date (cmd: getdate)

Example of ‘Telnet’ display:

```
-> getdate
Date: 05-06-2001.
```

Serial Port Diagnostics (cmd: InterfaceDump x)

Where x is the number of the serial comms interface at the rear (counts from 0). NOTE: all telnet commands use data for serial port 0 (eg monitor output destinations).

When using this command it is important to understand the comm port numbering scheme. The rear control module PCI bus is numbered from slot 0 for the lower module position to slot 3 for the upper (Ethernet) module position. The lowest installed RS422 or Q-Link module will be comm port 0.

Note that for this command numbering is from 0 but commssetup numbering is from 1. Great care must be exercised when comparing interfacedump output with commssetup input.

For a typical installation this will give:

PCI Slot	Module	Port Numbers
3	Ethernet Module	n/a
2	Blank	n/a
1	RS422 Module	Ports 4 (RS422), 5 (RS422), 6 (RS422), 7 (RS232)
0	Q-Link Module	Ports 0 (QL1), 1 (QL2), 2 (QL3), 3 (QL4)

Note that the RS422 module has three RS422 ports (4, 5, 6 in the example above) and an un-used 4th RS232 port (7 in the example above).

With modules installed in a different order could give:

PCI Slot	Module	Port Numbers
3	Ethernet Module	n/a
2	Q-Link Module	Ports 4 (QL1), 5 (QL2), 6 (QL3), 7 (QL4)
1	RS422 Module	Ports 0 (RS422), 1 (RS422), 2 (RS422), 3 (RS232)
0	Blank	n/a