Quartz

Q1601

&

Q1602

Monitoring Router

System Manual

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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

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

Contents

DESCRIPTION

INTRODUCTION

The Q1601 and Q1602 are small routing switchers ideal for monitoring and emergency switching applications. The Q1601 is 16x1 and the Q1602 16x2; versions are available for both sizes to cover most signal formats including combined video and audio routers in the same 1U frame.

The Q1602 model has an internal mains/line power supply (PSU). The Q1602E uses one or two external power 'bricks' (PSU's) to convert mains/line voltages to low voltage DC and this allows the Q1602E series to support a backup PSU.

All models are available as a high definition, serial video, or analogue video base model complete with a main video module, a single power supply, and a standard controller. Options include an audio module, backup PSU (Q1602E only), passive local or remote panel, and a separate *Advanced Controller* module, which offers more control functionality.

Units may be stacked together so that for instance three video units could be used to provide a component analogue video router. This application is called *Stack Mode*.

With the standard controller, a local control panel may be attached in place of the blank front panel or a passive remote panel connected to the rear of the unit.

With the *Advanced Controller* option installed the full range of control features of the larger Quartz routers become available. The most obvious benefit of this option is that any of the standard Quartz remote control panels can be connected to the router via the Q-Link.

Another major benefit of the *Advanced Controller* is that several routers can be combined to appear and operate like a single router with a large number of inputs. This application is called *Cascade Mode*.

ANALOGUE VIDEO

A single main module is fitted to the base of the chassis. The video and control connectors are of the right-angle variety and protrude through apertures in the rear of the chassis for cabling.

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. In the 16x1 model there are four output feeds but in the 16x2 model there are twin output feeds of the signal.

Switching occurs during the vertical blanking interval of the signal on Input 1.

SERIAL VIDEO (SD)

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

143Mb/s	D2	NTSC	composite
177Mb/s	D2	PAL	composite
270Mb/s	D1		component
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 and complies with SMPTE RP-168.

HIGH DEFINITION VIDEO (HD)

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

1.485Gb/s
1.485/1.001Gb/s

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 AUDIO

This module fits above the main video module. It is installed from above and connects to the main module via a single ribbon cable for power and control. It is fixed in place with the audio connectors accessible from the rear of the unit. It is a dual channel module so video and stereo audio is available within a single unit.

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

This module fits above the main video module. It is installed from above and connects to the main module via a single ribbon cable for power and control. It is fixed in place with the audio connectors accessible from the rear of the unit. 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.

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 Q1602 model has an internal mains/line power supply (PSU). The Q1602E uses one or two external PSU's to convert mains/line voltages to low voltage DC and this allows the Q1602E series to support a backup PSU.

There are no ac power switches fitted to the equipment as these products are normally installed in permanent installations and power switched to whole equipment racks by overall power switches. This reduces the risk of a unit being switched off inadvertently.

The **Q1602** power IEC inlet connector is fitted on the rear panel and incorporates a fuse. The correct ac power for the country in which the unit is used is selected automatically by the internal PSU. The internal PSU consists of a self-contained switch mode supply that converts nominal 110v or 230v ac to DC power at +5V, +/-15V. These clean DC voltages are used directly by the router modules.

When power is applied to a Q1602 the front panel indicator will be on (Green).

The **Q1602E** external PSU is fitted with a mains/line IEC inlet and converts the nominal 110v or 230v ac to DC power at 12V. A 2m flying lead terminated with a two pin locking low voltage connector is then used to connect this 12V supply to the Q1602E. An internal PSU converts the +12V to +5V, +/-15V. These clean DC voltages are used directly by the router modules.

The Q1602E front panel indicator operation depends on an internal 'PSU's Fitted' link, located on the front of the right hand internal voltage converter module. If the 'PSU's Fitted' link is set to position '1' then the front panel LED will be on (Green) when power is applied. If the link is set to position '2' then the LED will be on when both external PSU's are connected and powered up, and flashing if one fails.

Options that can be ordered for use with the Q1602E are:

Backup or spare power supply	QT-PS
PSU mounting bracket, main/right	QT-TR
PSU mounting bracket, backup/left	QT-TL

STANDARD CONTROL SYSTEM

With the standard control system fitted the remote control port supports passive panels. These are panels in which each push button switch and its associated LED is connected to a single pin of the remote control connector. Thus the connector has one pin for each button/LED plus pins for power and 0V. When a button is pressed the control pin goes to 0V sending a command to the router where, if accepted, it is latched to a low state (near 0V) so that when the button is released the LED stays lit.

A series of jumper switches can be set up to determine how the unit operates. Refer to Page 18 in the Installation section for details of what they do and how they are set.

STACK MODE

When 16x1 routers are stacked for, say a component (YUV or RGB) analogue video router then the remote control port on the rear of each unit is wired externally in parallel and to the passive remote control panel, if used. For similar 16x2 applications the *Advanced Controller* is required.

ADVANCED CONTROL SYSTEM

INTRODUCTION

By fitting the optional FU-0003 controller module the full range of control features of the larger Quartz routers become available, 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 16x2 routers can be stacked, e.g. three routers to handle component analogue video signals. This is called *Stack Mode.*
4. Up to seventeen routers can be stacked to provide a router of up to 256x1 for large monitoring applications. In this application, called *Cascade Mode,* up to sixteen upstream routers are cascaded into a seventeenth downstream router which is designated the master and which is equipped with the *Advanced Controller* option. With this option fitted the rear control connector changes function and becomes a data bus feeding control commands from the downstream/master router to the upstream ones.

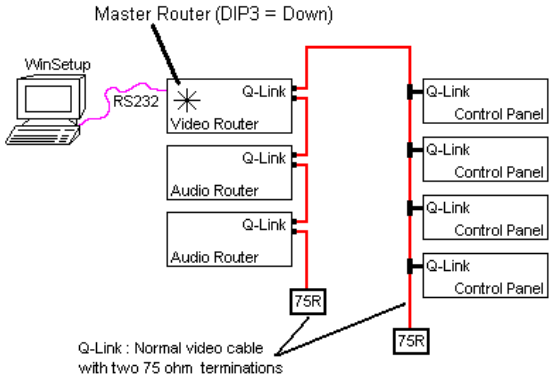
5. The FU-0003 *Advanced Controller* supports an RS232/422 port, enabling the router to be controlled from another piece of equipment. On the earlier FU-0001 this required a further option CI-0001.
6. Crosspoint status is maintained while the unit is powered down.

With this option fitted it is possible to reconfigure the system using the Quartz WinSetup Windows software package.

The option is currently supplied under the part number FU-0003.

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 75Ω at both ends**, standard video practice. One or two hex switches in each unit set the identity of each so that they are correctly addressed by the control system. Up to 32 devices can be supported.

The Q1601 and Q1602 routers, when equipped with the *Advanced Controller*, and the standard remote panels have a single Q-Link BNC connector so a T-piece is used to tap off the Q-link signal into the units. In this way a unit can be removed from service without the Q-link being interrupted, even momentarily.

SERIAL PORT

The serial port is used to connect to computers or other third party equipment. This feature is available when the *Advanced Controller* option is fitted, processor FU-0003.

CASCADE MODE

When the *Advanced Controller* option is fitted several routers can be connected together to appear like a much larger router, for instance a 76x1 router can be built from five 16x1 routers, or a 30x2 router can be built from two 16x2 routers. The outputs of the upstream routers are cascaded into the downstream router, which acts as a master controller for the system. In this application the *Advanced Controller* is installed in the downstream router only.

These techniques are applicable to video, audio and audio-follow-video mixed routers. The only limitation with this system is that the levels of the second destination of an ‘nx2’ router are always married.

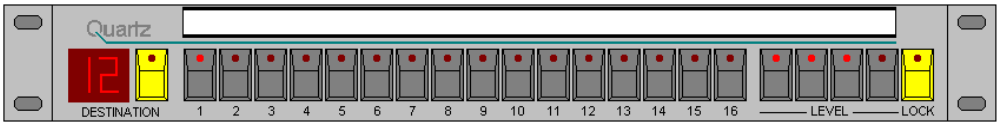
The following table gives the maximum sizes that can be achieved by cascading a number of Q1602 routers together.

Number of Routers	'n'x1 max.	'n'x2 max.
2	31x1	30x2
3	46x1	44x2
4	61x1	58x2
5	76x1	72x2
6	91x1	86x2
7	106x1	100x2
8	121x1	114x2
9	136x1	128x2
10	151x1	-
11	166x1	-
12	181x1	-
13	196x1	-
14	211x1	-
15	226x1	-
16	241x1	-
17	256x1	-

LOCAL CONTROL PANEL

On units with the standard controller the local panel is the CP-1601A-LP. It has sixteen grey buttons for source selection and a yellow button, which can be used either as a *Lock* or *Enable* button or to switch control between the two destinations, if fitted. These choices are made using jumper links inside the unit. See Page 31.

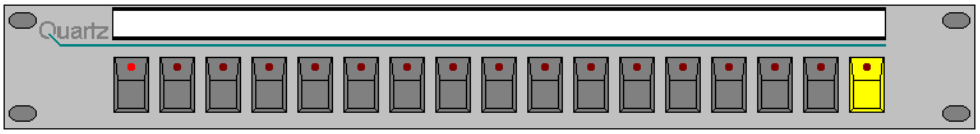
On units with the Q-Link Option then the local panel is the CP-1600A-LP.



This has more buttons and a display so it can support sixteen sources, two destinations, four levels of breakaway and a Lock function. Refer to Quartz manual MANUAL-05 for details of the Q-Link control panels and their operation.

REMOTE CONTROL PANELS

If the standard controller is fitted then the standard passive panel available with this product is the CP-1601A-P.



This is functionally identical to the CP-1601A-LP local panel, mentioned above. As there are no high voltages within the unit and as the panel is benign from the EMC point of view it is packaged without a rear cover.

Just one remote panel may be used but it can be set up to control both destinations, if fitted. Note the local panel and remote panel connectors are directly wired together internally pin for pin so that the two panels if used together will always follow each other exactly.

If the *Advanced Controller* option is installed then the rear panel control connector is not available for connection to passive remote panels so panels using Q-Link must always be used and 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	18dB, 20dB typical

VIDEO OUTPUTS

Impedance	75Ω
Return Loss to 5-270MHz	18dB, 20dB 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	0.02%, 0.01% typical
-10dBu to +20dBu and 20Hz to 20KHz	
Crosstalk	-85dB 20Hz to 20KHz
Noise	-90dB rms. 20Hz to 20KHz unweighted

COMMON FEATURES

Standard Control

Remote panel	D25 female, 50M max. length

With Q-Link Option

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

With Serial Card Option

Computer RS232/422	D9 female

POWER

Q1602 (internal PSU)	90-264v 50/60Hz,
Q1602E (external PSU)	90-264v 50/60Hz, 25 watts

PHYSICAL

Height	1U, 44mm
Width	rack mount
Depth of router	280mm
Depth of passive panel	45mm
Audio Connectors	2 x D50 female inputs 1 x D15 female outputs
Temperature, operating	0-40°C
Ventilation	natural convection

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. Note that some remote panels are mains powered and must be set to the correct mains (line) voltage.

PHYSICAL INSTALLATION

REMOTE PANELS

The passive remote panels are extremely shallow (45mm) and standard 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.

ROUTER FRAMES

All units are designed for mounting in standard 19" equipment racks. The depth of the frame is 280mm plus connectors. 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.

Q1602 models will have the IEC mains/line plugged directly into the rear of the frame.

Q1602E models have and external PSU and this can be mounted on the optional rear mount power supply tray if preferred, available in left hand and right hand versions. These trays must be fitted to the Q1602E chassis before installation in the equipment rack.

ELECTRICAL CONNECTIONS

The view of the rear panel shows the connections.

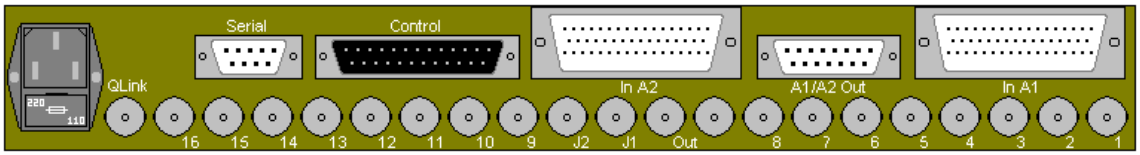


Figure 1: Rear View of Q1601 and Q1602 Routers

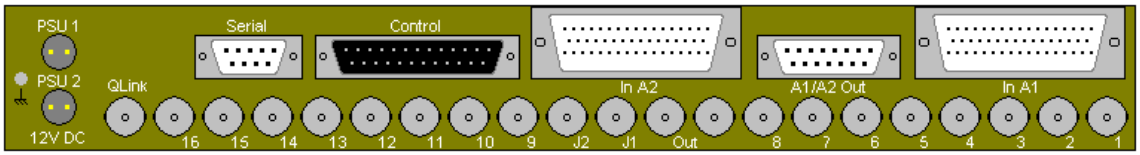


Figure 2: Rear View of Q1601E and Q1602E Routers

VIDEO INPUTS AND OUTPUTS

These connections are made using standard 75Ω video coaxial cable. 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 the Q1601-AV the four output feeds are provided on the two connectors marked OUT 1, J1 and J2. On the Q1602-AV the pair of OUT1 connectors are for the twin feeds of Output 1 and J1 & 2 for those of Output 2.

On the Q1601-SV and Q1602-SV J2 is used for the SYNC Input, OUT 1 for the twin feeds of the signal from Output 1 and J1 for the single feed from Output 2.

VIDEO SYNC

Analogue video routers take their switching reference signal from Input 1.

Serial Video routers have a separate terminating Sync input J2 that takes any standard analogue video signal with standard sync. Mixed sync pulses of 2V amplitude may also be used.

High Definition routers have a separate terminating Sync input J2 that takes either tri-level sync or any analogue video signal with standard sync.

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

AUDIO INPUTS AND OUTPUTS

The connections of the audio signals to the equipment are made using 50 way multi-way connectors. One input connector is used for each audio channel. The outputs are accessible on a single D15 connector.

The matching cable connectors are all PLUG types. An accessory kit AK-0010 contains a full set of matching halves of the audio and control connectors used on this equipment. 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 3 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.

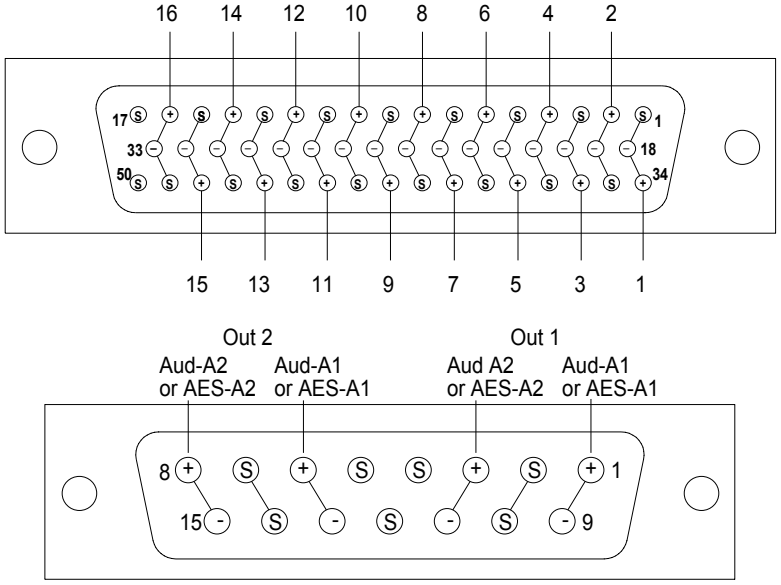


Figure 3: Audio Connector Wiring

REMOTE CONTROL - PASSIVE PANELS

The standard passive remote panel CP-1601A-P is connected to the router using D25 panels. The pin connections are as follows:

Pin	Signal	Pin	Signal
1	Input 1	14	Input 14
2	Input 2	15	Input 15
3	Input 3	16	Input 16
4	Input 4	17	Button 17
5	Input 5	18	Reserved
6	Input 6	19	Reserved
7	Input 7	20	Reserved
8	Input 8	21	Sync
9	Input 9	22	5 volts dc
10	Input 10	23	5 volts dc
11	Input 11	24	0 volts
12	Input 12	25	0 volts
13	Input 13		

Button 17 is used for the *Enable*, *Lock* or *Destination Toggle* function.

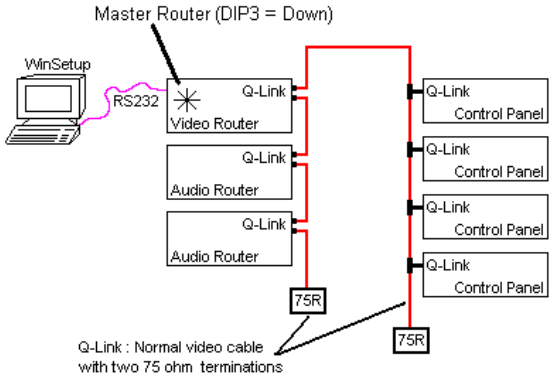
In *Stack Mode* one control panel is connected to more than one router and so it is necessary to use a daisy chain cable that links all the units together. Note that one router and one router only must be used to provide power to the panel, therefore pins 22 & 23 must be connected to one router only.

The *Sync* signal on pin 21 is a control signal used to interconnect several routers ensuring that they all switch in the same TV field or frame. This pin is not used in the passive panels and so it is acceptable for the pin to be wired in the cable to all units.

These pins have a different function when the router has an *Advanced Controller*.

REMOTE CONTROL - USING Q-LINK

If the *Advanced Controller* option is fitted then all the Q1601 and Q1602 routers fitted with this option, standard routers and standard remote control panels can be connected together 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 75Ω terminator at each end of the cable.**



Only one connector is fitted on each unit and a T-piece needed to tap off the Q-link. In this way a unit can be removed from service and replaced without disrupting the link, even temporarily.

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.

RS232/422 SERIAL PORT

The D9 connector on the rear of the router functions only if the *Advanced Controller* option has been installed. If the *Advanced Controller* option is the FU-0003 controller module then the serial port is included. Early units, however, have the FU-0001 controller, in which case the CI-0001 Serial Card is required.

RS422 or RS232 Mode

The FU-0003 controller has a jumper link to select either RS232 or RS422. Set the link to 232 or 422 as appropriate.

External Connections

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.

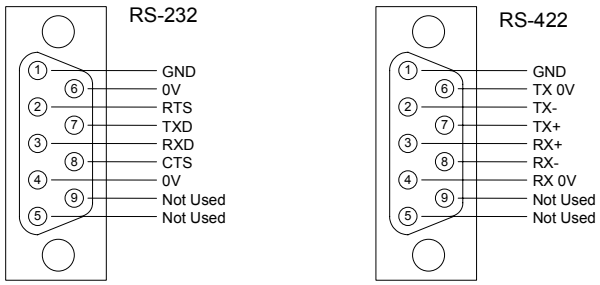
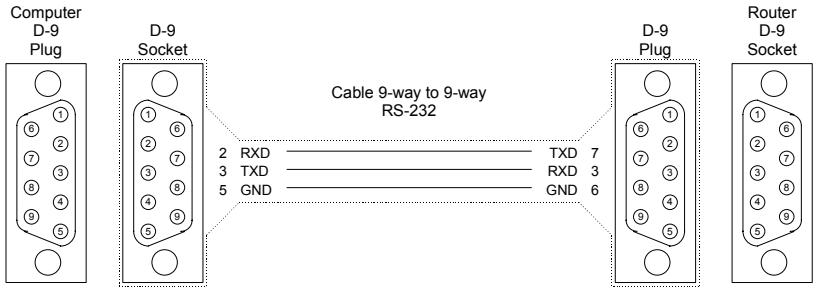


Figure 4: RS232/422 Connecting to the Router

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:



The cable between a PC with a D-Type 25 way connector and the router:

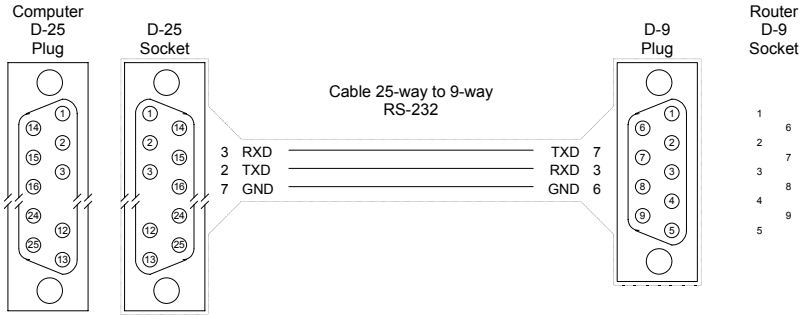


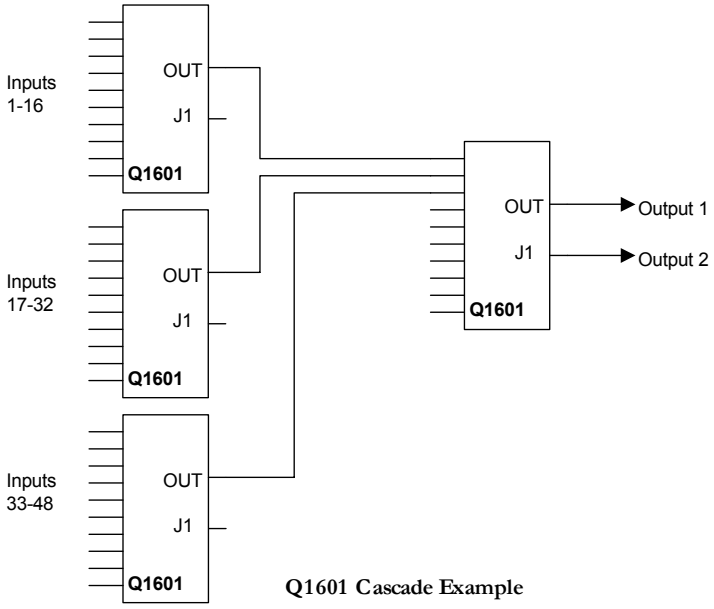
Figure 5: RS232/422 Connecting to the Computer

CASCADE MODE

In this application several routers are connected together to appear like a much larger router. The output of each of the upstream routers is connected to an input of the downstream router. In this way it is possible to build a 256x1 router or a 128x2 router.

Q1601 Cascade

This allows a maximum router size of 256x1 to be built. In the example below a 48x1 router can be built from four 16x1 routers. The outputs of the three upstream routers are cascaded into the downstream router, equipped with an *Advanced Controller* module, which acts as a master controller for the system.

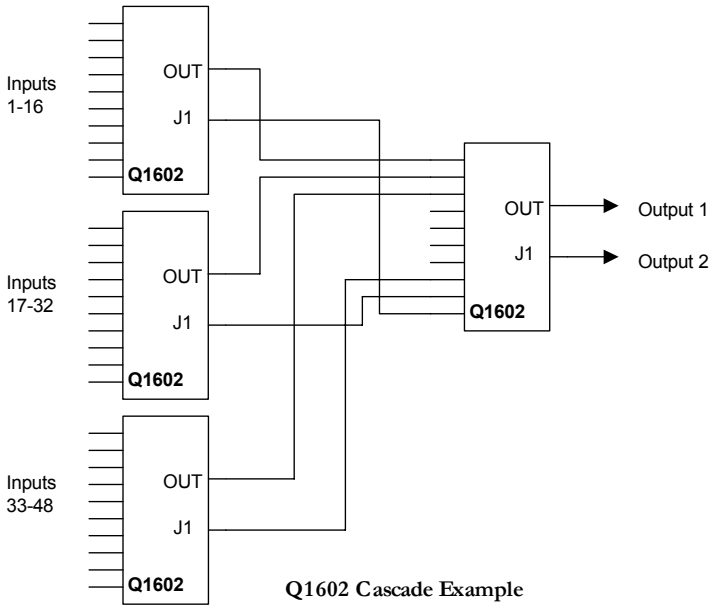


Q1601 Cascade Example

The OUT1 connector from the first upstream router is connected to the Input 1 of the downstream router. The OUT1 connector from the second upstream router is connected to the Input 2 of the downstream router and so on; as an example Input 19 is accessed by selecting Input 2 on the downstream router and Input 3 on the upstream.

Q1602 Cascade

This allows a maximum router size of 128x2 to be built. In the example below a 48x2 router can be built from four 16x2 routers.



Q1602 Cascade Example

The J1 connector from the first upstream router is connected to the Input 16 of the downstream router. The J1 connector from the second upstream router is connected to the Input 15 of the downstream router and so on.

Cascade Control

From a control point of view it is necessary to install the *Advanced Controller* module in the downstream router. This unit then connects to the Q-link just like any other Quartz router, communicating to the other routers and remote control panels.

The downstream router sends commands in parallel digital form through a cable connected to the CONTROL connector, which is daisy-chained to the upstream routers. When commands are received from the control panels they are processed in the *Advanced Controller* in the downstream router. It then sends commands to its own crosspoints to make a new route selection, but simultaneously sends commands out of the CONTROL connector to the upstream routers. If a new route selection requires a source from a different upstream router from that currently selected then a command is sent through the CONTROL connector to all the upstream routers, which switch in tandem to the new input at the same time as the downstream router.

This technique is applicable to video, audio and audio-follow-video mixed routers. The only limitation to this is that the levels on the second destination are always married.

Note that the analogue video router takes its switching reference point from the signal on Input 1. It is therefore important in a cascade application that all the inputs of the upstream router feeding Input 1 of the downstream router have valid video signals, otherwise video switching will not occur in the vertical blanking interval.

POWER

IEC connectors are used to supply power to the router frames, external PSU's, and panels. Each connector has an earth pin and as matter of safety this earth pin must be connected to a solid ground to ensure a proper earth connection.

Q1602E models use an external PSU and therefore the router chassis metalwork will not be directly connected to earth. A separate chassis earth point is provided for users that require equipment to be earthed.

All power cords are supplied with a mains plug suitable for the country of use (where known). Should it be necessary to change the mains plug please wire the plug using the colour code below:

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

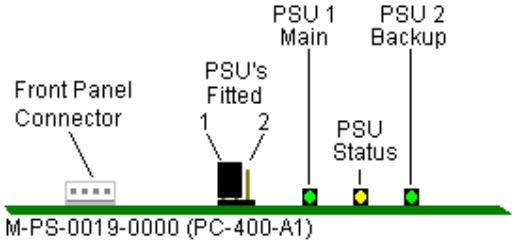
There is no power switch on the unit so it is essential that the power cord be removed before commencing to service the unit.

SETTING THE POWER LINE VOLTAGE

On units with no voltage selector the PSU is auto-ranging and no adjustments are required.

SETTING THE Q1602E PSU LINK

On Q1602E models the internal 'PSU's Fitted' link must be set to match the number of external PSU's connected, either 1 (main) or 2 (main plus backup).



The 'PSU's Fitted' link controls the action of the PSU Status LED and the Front Panel power on LED and is located on the front of the right hand internal voltage converter module. If the 'PSU's Fitted' link is set to position '1' then the front panel LED will be on (Green) when power is applied. If the link is set to position '2' then the LED will be on when both external PSU's are connected and powered up, and flashing if one fails.

CONFIGURING THE FRAMES

Analog Video

The router can be altered to set up the system to suit a customer's particular requirement. This section describes how this is done. In summary, the links have the following functions.

Link	Function
LK1	525 or 625 switching mode
LK2	Field or frame rate switching
LK3	Not used

LK4	Not used
LK5	Panel function for CP-1601A-P or CP-1601A-LP
LK6	Panel function for CP-1601A-P or CP-1601A-LP or breakaway mode when FU-0003 fitted
LK7	Panel function for CP-1601A-P or CP-1601A-LP or Stack/Cascade mode when FU-0003 fitted
LK8	Master or Slave control on D25 connector (A=Master)
LK9	FU-0003 installed or not (A=not installed)
LK10	Master or Slave in cascade mode (M=Master)

Serial Video and High Definition Video

The router can be altered to set up the system to suit a customer's particular requirement. This section describes how this is done. In summary, the DIP switches have the following functions.

DIP Switch	Function
SW1-1	Up=Master, Down=Slave
SW1-2	Panel function for CP-1601A-P or CP-1601A-LP Or Stack/Cascade mode when FU-0003 fitted
SW1-3	Panel function for CP-1601A-P or CP-1601A-LP Or Breakaway mode when FU-0003 fitted
SW1-4	Panel function for CP-1601A-P or CP-1601A-LP
SW1-5	Up=Standard, Down=Advanced
SW1-6	Sync Mode: SD Routers: Up= Sync from Slave, Down= from Master HD Routers: Up=Tri-level sync, Down=525/625 sync
SW1-7	Up=625, Down=525
SW1-8	Up=Frame, Down=Field

Note on SW1-3: When a FU-0003 processor controls the router module, this setting optionally switches all levels (video, audio1, and audio2) from the video 'take' i.e. married levels. This functionality is not required as the configuration can control this aspect of operation so it should be left in the Normal/Up state.

TV LINE SWITCHING

Serial Video Router

Switching 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 certain editing applications, using SW1-8.

Function	SW1-6
Sync from Master	Up
Sync from Slave	Down

Function	SW1-7
625	Up
525	Down

Function	SW1-8
Frame mode	Up
Field mode	Down

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

The Sync signal is derived from Input 1, so it is important that a valid signal is provided at this input, otherwise video switching will not occur in the vertical blanking interval. Note that in a cascade application all the inputs of the upstream router feeding Input 1 of the downstream router must also have valid video signals.

STANDARD CONTROL SYSTEM: ANALOG VIDEO

There are a number of jumper links on the main video module, which are used to determine how the router functions.

There are two main operating modes, called S*tand-alone* and *Stack.* In the *Stack* mode two or more 16x1 routers are used together, for instance, when the video and two levels of audio are provided by one router and a further two levels of audio by another router. In this application one router is set to be a master and the other as a slave. Figure 5 and Figure 6 show the link settings for these modes. Refer to Figure 12 to find the exact location of the jumper links on the module.

In addition there are modes to determine control panel operation, shown in the table below. Note that the functions of the jumper links are different if the Advanced Controller is fitted.

Mode	***LK 5***	***LK 6***	***LK 7***
17 button panels: CP-1601A-(L)P or custom panels			
16x1, Lock/Enable *	A	A	A
16x2, Destination Toggle	A	A	B
8x2**, Lock/Enable *	B	A	A
16x1 with Joystick operation	B	A	B
Dual 8x1***	B	B	A
20 button panels: custom panels only			
16x1, 3 Levels, Lock	A	B	A
16x1, 3 Levels, Destination Toggle	A	B	B
Not used	B	B	B

* Selecting jumper links in the control panel makes the choice between *Lock* and *Enable*.

** This mode is an 8x2 router with the panel split to give 8 buttons controlling destination 1, and the other 8 buttons controlling destination 2. Note that the *chop* function is not supported in this mode.

*** This mode is two 8x1 routers with the panel split to give 8 buttons controlling source 1-8, destination 1, and the other 8 buttons controlling source 9-16, destination 2. Note that the *chop* function is not supported in this mode.

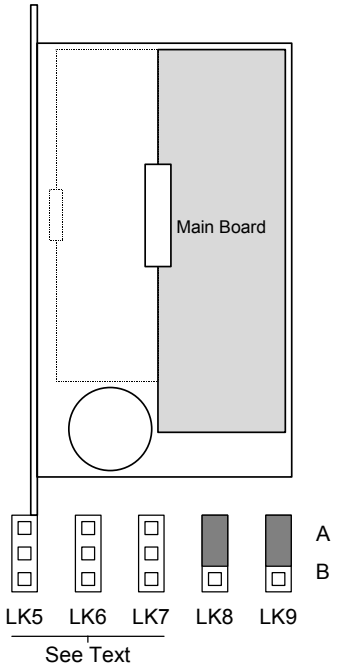


Figure 6: Stand-alone Mode

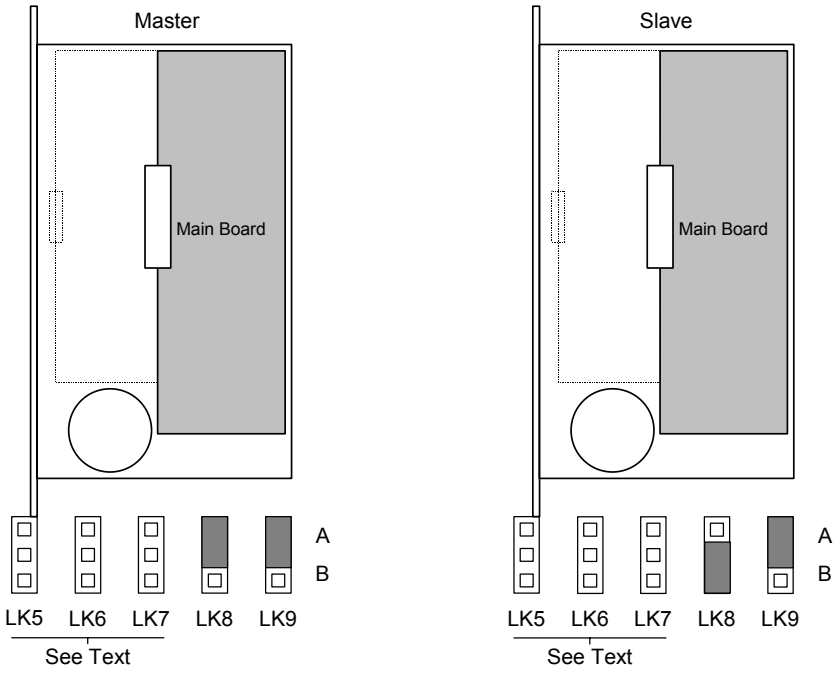


Figure 7: Stack Mode

STANDARD CONTROL SYSTEM: SERIAL VIDEO AND HD VIDEO

There is an eight way DIP switch on the main video modules, which are used to determine how the router functions.

There are two main operating modes, called S*tand-alone* and *Stack.* In the *Stack* mode two or more 16x1 routers are used together, for instance, when the video and two levels of audio are provided by one router and a further two levels of audio by another router. In this application one router is set to be a master and the other as a slave. Figure 7 and Figure 8 show the switch settings for these modes.

In addition there are modes to determine control panel operation, shown in the table below. Note that the functions of the DIP switches are different if the Advanced Controller is fitted.

Mode	***SW1-2***	***SW1-3***	***SW1-4***
17 button panels : CP-1601A-(L)P or custom panels			
16x1, Lock/Enable *	Up	Up	Up
16x2, Destination Toggle	Down	Up	Up
8x2**, Lock/Enable *	Up	Up	Down
16x1 with Joystick operation	Down	Up	Down
Dual 8x1***	Up	Down	Down
20 button panels : custom panels only			
16x1, 3 Levels, Lock	Up	Down	Up
16x1, 3 Levels, Destination Toggle	Down	Down	Up
Not used	Down	Down	Down

* Selecting jumper links in the control panel makes the choice between *Lock* and *Enable*.

** This mode is an 8x2 router with the panel split to give 8 buttons controlling destination 1, and the other 8 buttons controlling destination 2. Note that the *chop* function is not supported in this mode.

*** This mode is two 8x1 routers with the panel split to give 8 buttons controlling source 1-8, destination 1, and the other 8 buttons controlling source 9-16, destination 2. Note that the *chop* function is not supported in this mode.

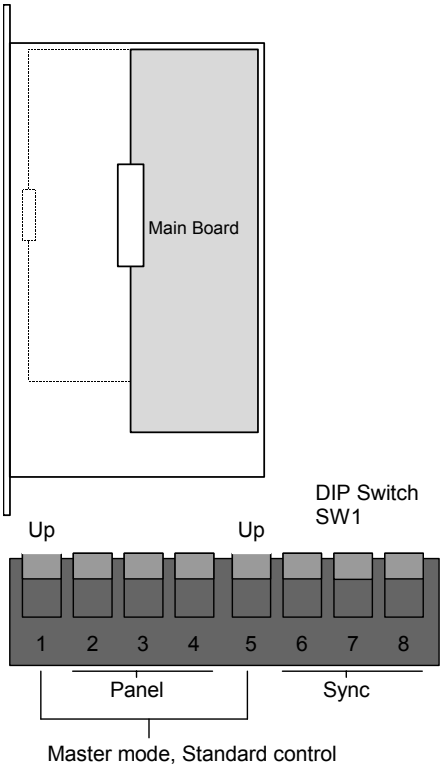


Figure 7: Stand-alone Mode

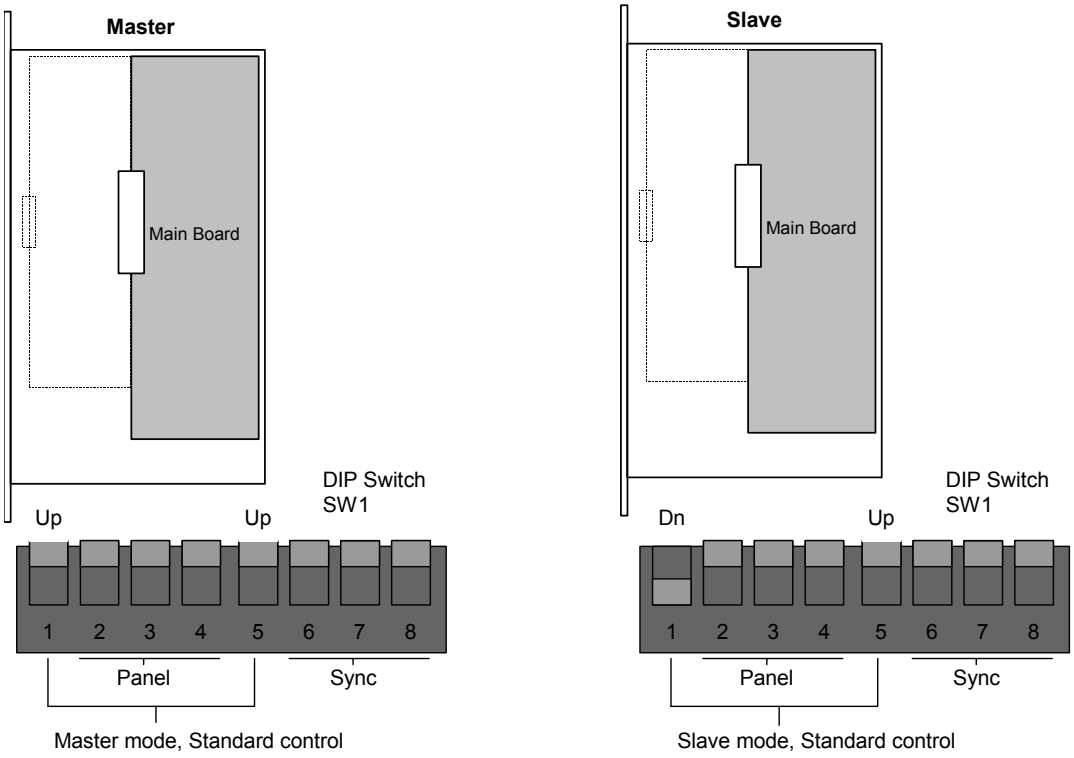


Figure 8: Stack Mode

ADVANCED CONTROL SYSTEM: ANALOG VIDEO

If this option is fitted most of the features provided by the jumper links are not needed for much greater variations in functionality are achieved by programming the controller using the WinSetup program.

There are three main operating modes determined by jumper links, called S*tand-alone, Stack* and *Cascade. Stand-alone* mode is shown in Figure 9.

In the *Stack* mode two or more 16x1 or 16x2 routers are used together, for instance, when the video and two levels of audio are provided by one router and a further two levels of audio by another router. In this application one router is set to be a master and the other as a slave. Figure 10 shows the link settings for this mode. Note that the 16x1 router can be configured to support four levels of breakaway, as can the first output of the 16x2 router, but Output 2 can support one level only.

In *Cascade* mode the outputs of one router feed the inputs of another router, to provide a large number of inputs, refer to Figure 11 for the link settings.

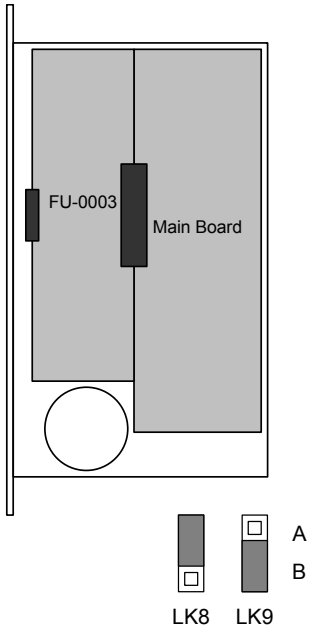


Figure 9: Stand-alone Mode

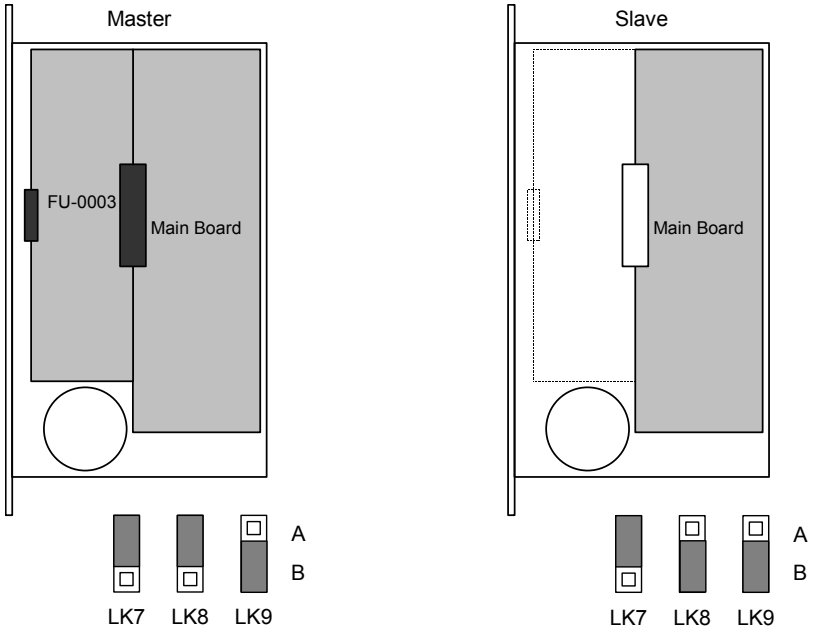


Figure 10: Stack Mode

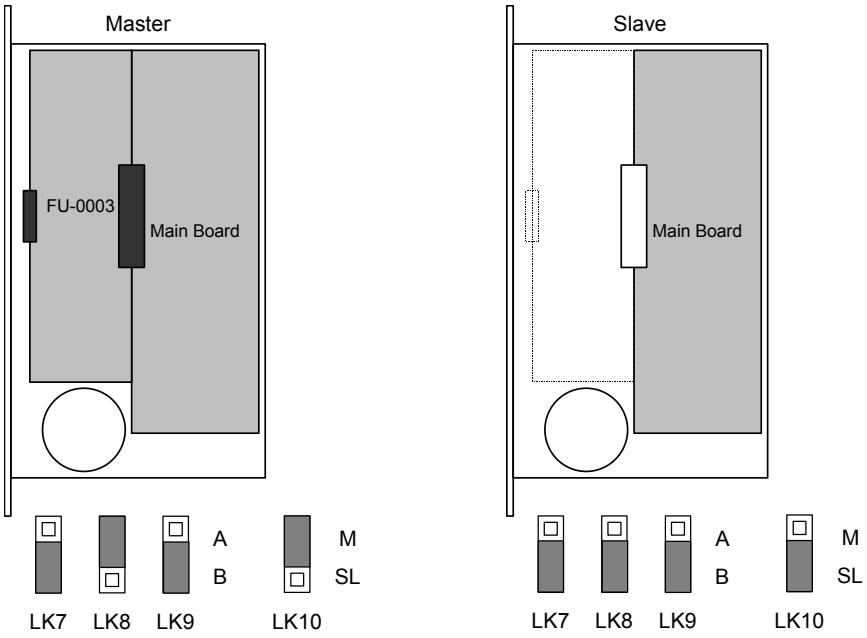


Figure 11: Cascade Mode

Analog Video Router

The position of the jumper links is shown in the diagram below:

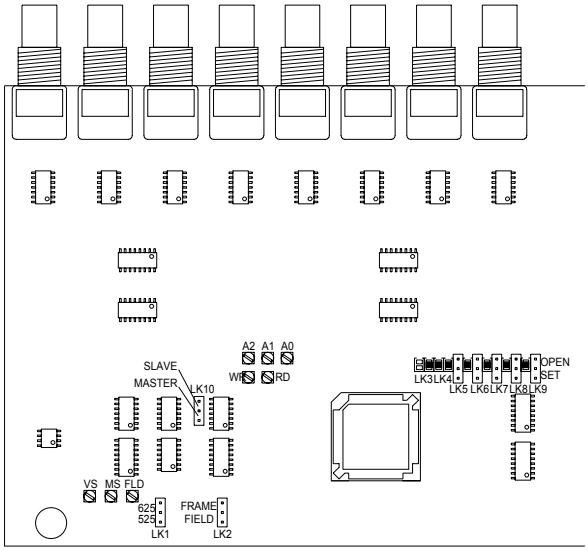


Figure 12: Setting Jumper Links

ADVANCED CONTROL SYSTEM: SERIAL VIDEO AND HD VIDEO

If this option is fitted most of the features provided by the DIP switch SW1 are not needed for much greater variations in functionality are achieved by programming the controller using the WinSetup program.

There are three main operating modes determined by the DIP switch SW1, called S*tand-alone, Stack* and *Cascade.* S*tand-alone* mode is shown in Figure 13.

In the *Stack* mode two or more 16x1 or 16x2 routers are used together, for instance, when the video and two levels of audio are provided by one router and a further two levels of audio by another router. In this application one router is set to be a master and the other as a slave. Figure 14 shows the link settings for this mode. Note that the 16x1 router can be configured to support four levels of breakaway, as can the first output of the 16x2 router, but Output 2 can support one level only.

In *Cascade* mode the outputs of one router feed the inputs of another router, to provide a large number of inputs, refer to Figure 15 for the link settings.

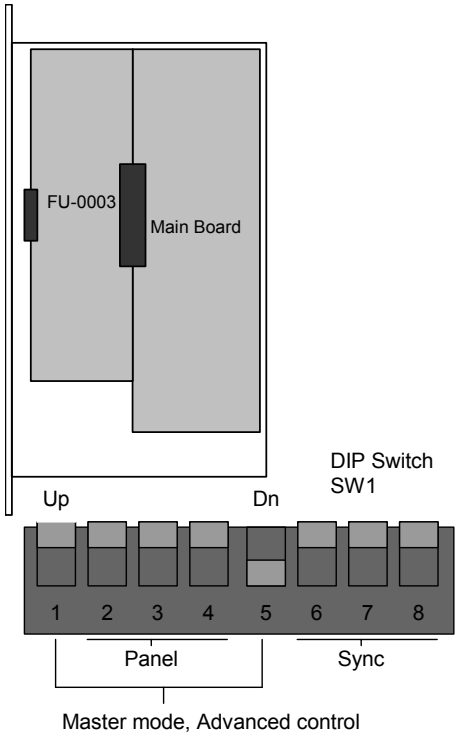


Figure 13: Stand-alone Mode

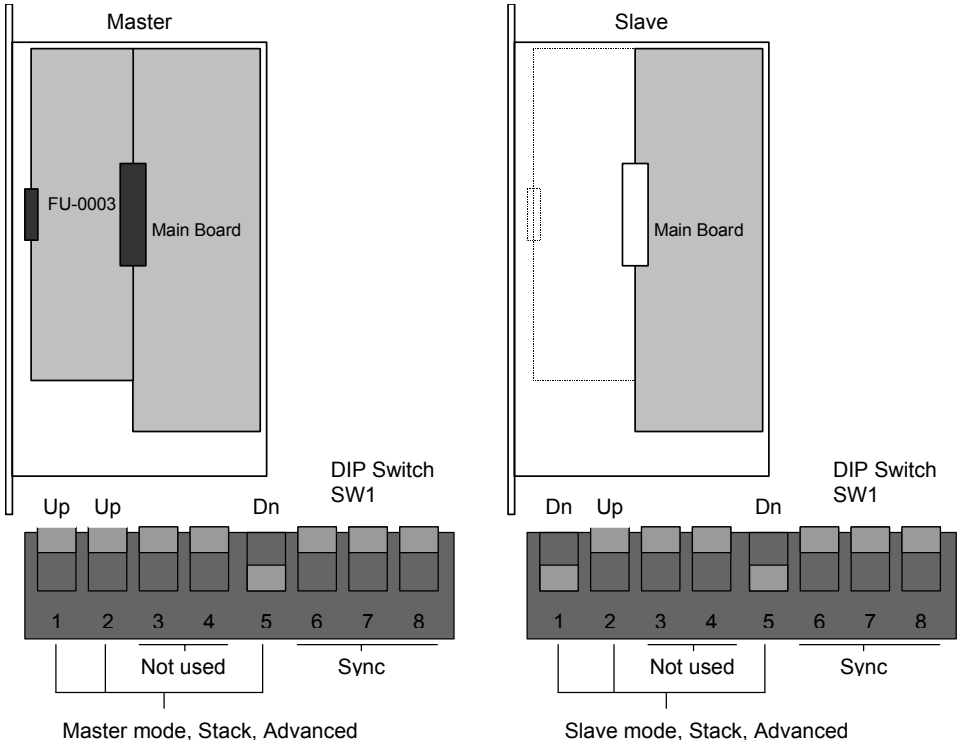
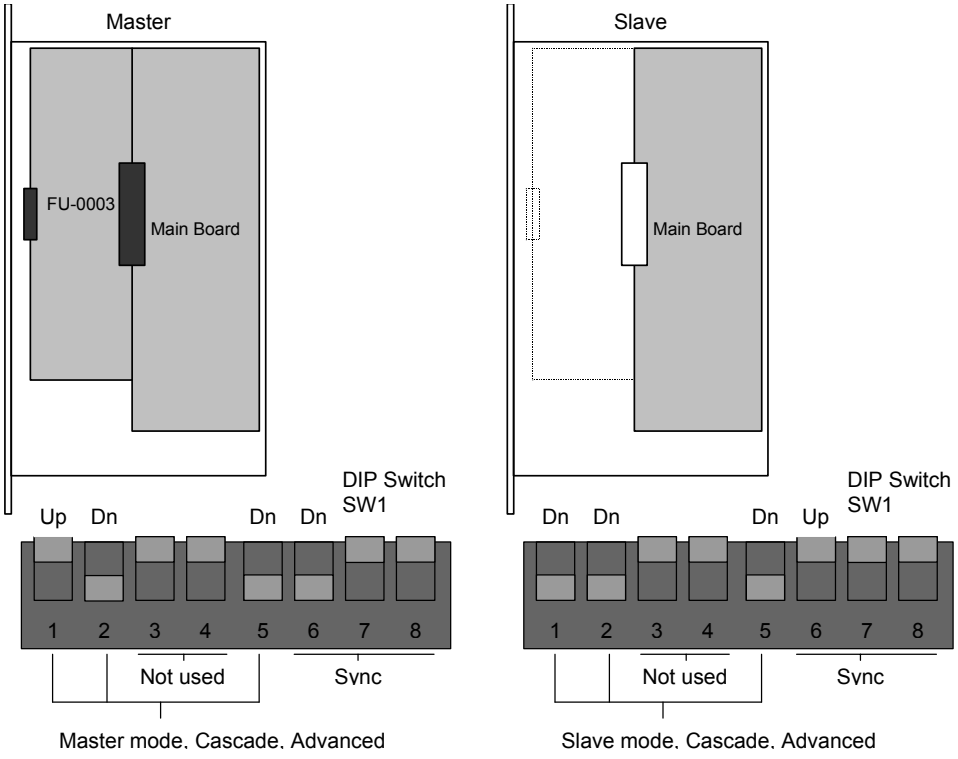


Figure 14: Stack Mode



Note: SW1-6 position is shown for SD routers, for HD routers this selects tri-level or 525/625 syncs.

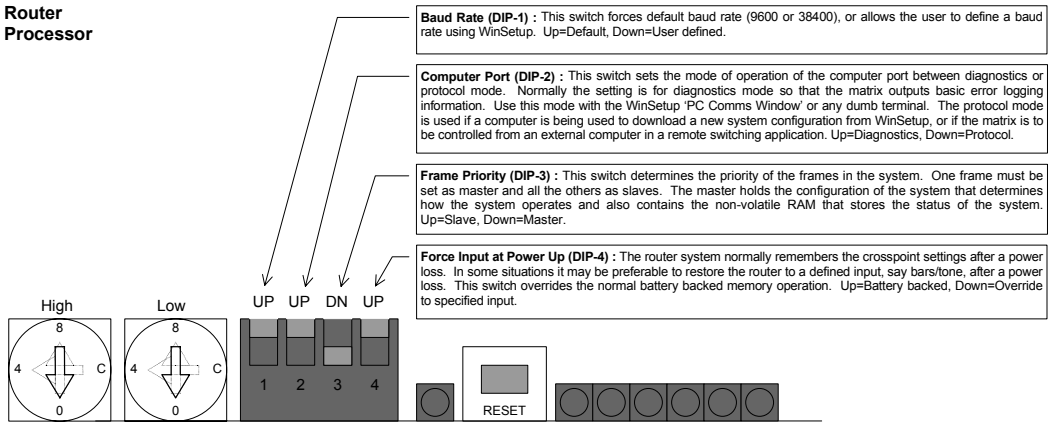
Figure 15: Cascade Mode

FU-0003 PROCESSOR CARD SETTINGS

Note: The rotary hex and DIP switches are only read at power up or following a RESET. If you make any changes you must press the RESET button so that the new settings are acted upon.

DIP Switches

One router in the system must be set as the Master and the others as Slaves. This is VERY IMPORTANT as there will be no communications unless this rule is followed. The Master router contains the non-volatile memory (NVRAM) to store the complete matrix status and the configuration of the system. The third DIP switch from the left is used for this function.

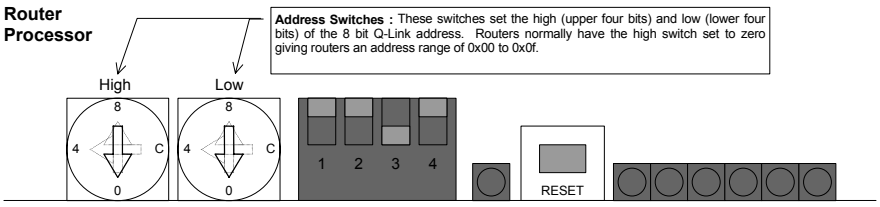


The reset switch must be pressed after changing the DIP switch.

Address Switch

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 matrix module in a frame has a different code. This distinguishes different routers in a multi-frame system so each is identified uniquely and updated with the correct crosspoint 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). At present the two switches together support the address range from 00 to 3F.



The reset switch must be pressed after changing the address switch.

CONFIGURING PASSIVE PANELS

CP-1601A-P REMOTE & CP-1601A-LP LOCAL

There are two jumper links in this control panel to set up Lock and Enable modes. Unscrew the front panel catches. The links are to be found on the right-hand side of the PCB upon which the buttons are mounted. Set the two links to the following positions as shown in the diagram below:

Mode	**Links**
Lock or *Destination Toggle*	Set to outer positions (away from each other)
Enable	Set to inner positions (close to each other)

The diagram shows the links in the *Lock* or *Destination Toggle* Mode

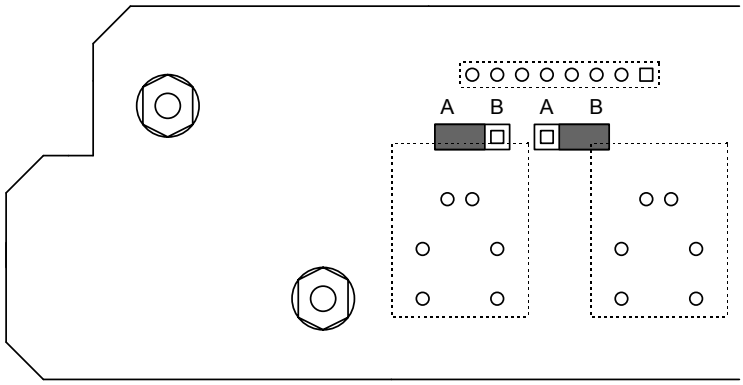


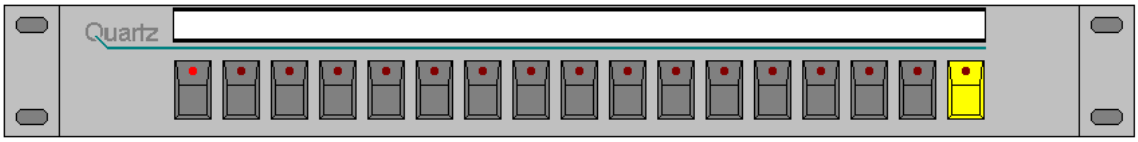
Figure 8: Setting Local Panel Mode

CP-1600A-LP

There is nothing to set on this panel since its operation is determined by the configuration stored in the *Advanced Controller* module.

CONTROL PANEL OPERATION

The Q1601 and Q1602 can be controlled from passive panels based on the standard CP-1601A panel used in other Quartz routing systems. The local panel is designated CP-1601A-LP and the remote panel CP-1601A-P. The operation is described below. The whole range of standard Q-Link panels, available if the Q-Link option is fitted, are described in a separate manual MANUAL-05.



DESCRIPTION

This panel has 17 buttons, sixteen buttons are used for source selection and the seventeenth can be used as a *Lock*/*Enable* button or, additionally in the Q1602 to toggle between destinations, depending on the setting of jumper links in the unit.

A slide-in designation strip may be used to label sources by easy-to-remember names above the buttons.

OPERATION

Press the required source button to select a new source.

If the *Enable* mode is active then press and hold the *ENABLE* button, then press the source button. This protects against accidental selection of a route.

If the *Lock* mode is enabled then the button toggles between the locked and unlocked state. First select the route, and then press the *LOCK* button to protect the selection.

If the *destination toggle* mode is active then when the LED is off routes are selected on Destination 1 and if the LED is on then routes are selected to Destination 2. Alternate key presses toggle the LED on or off.

CHOP

This is used to switch rapidly between two sources usually for calibration purposes.

Press the first source and hold, press the second source and hold both buttons down for half a second, release the second source first. The two sources will continue to switch rapidly indefinitely until any source button on the panel is pressed.

JOYSTICK OR MICROSWITCH OVERRIDE

This feature is used for matching the colour balance of several cameras. Micro switches in the joysticks of camera control units are pressed by the engineer conducting the line-up to select the camera in use onto the line-up monitor.

The rear CONTROL connector can be configured to function as a joystick controller by setting a jumper link inside the unit. In this mode the local panel will show the status on its LEDs.

Operation is as follows:

1. Press and hold the joystick button to make an override selection.
2. Release the joystick to return to the default selection made by the panel.

If the 17th button of the local panel is configured as a LOCK button and is in the *off* condition then the switches provide momentary action, just like the joystick buttons. On

the other hand, if the LOCK button is *on* then the panel has a latching action, which can be used to set a default or drop-back input for joystick operation. Alternatively the default input can be set permanently to any input other than Input 1, by wiring the relevant input pin in the remote CONTROL connector to 0V.

If joystick override is needed with a remote panel then the *Advanced Controller* option should be fitted. With this option several control panels can be used with the router, each with joystick override for eight cameras.