Contents

1 Introduction

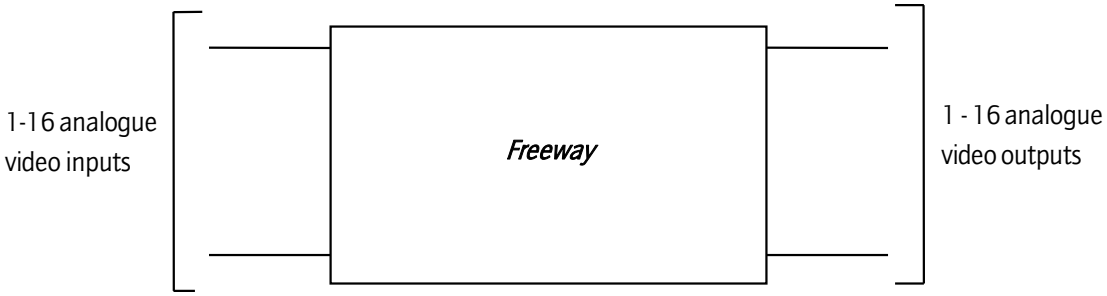
This manual covers the installation, operation and operational alignment of the analogue video routing card (3740) for the ***Freeway*** series of routing switchers.

■ Analogue video routing

Any demanding television applications will benefit from the inherent wide bandwidth and high slew-rate capacity of this router. The circuitry offers complete transparency to all encoded vertical-interval data and is fully compatible with SIS signals.

The main features are:

- 30MHz bandwidth
- dual standard vertical-interval switching
- DC coupled or DC restored operation
- composite and YUV/RGB(S) configurations



Block diagram

2 Installation and configuration

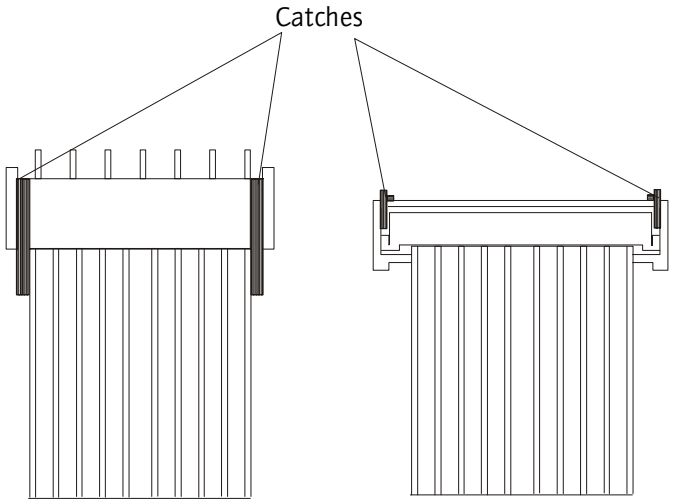
■ 2.1 Removal and replacement of module

The module can be removed and replaced from the frame, powered or un-powered, using the following procedure. When removing the bottom card it is necessary to remove the door before continuing. For removal purposes it is advisable to remove the ribbon cables first and then the cards.

- release the ribbon cables by pushing the catches up on either end of the connector as shown
- lift up the card ejector on the module and gently pull the card out

Replacement is the reverse of above:

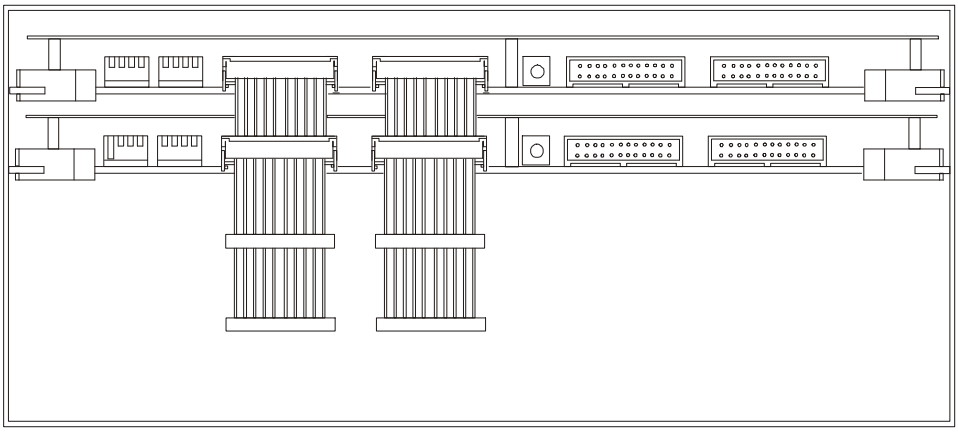
- slide the card along the guide rail of the required slot, gently pushing it fully home until it marries up with the connector on the motherboard


Catches
Top view
Front view

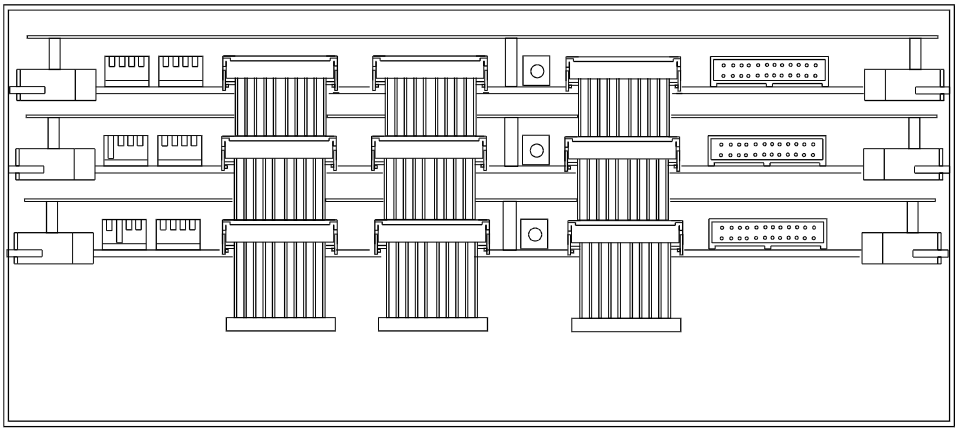
■ 2.2 Expanding from 16x16 to 64x64

The following diagrams show the cable connections required for expanding the router from 16x16.

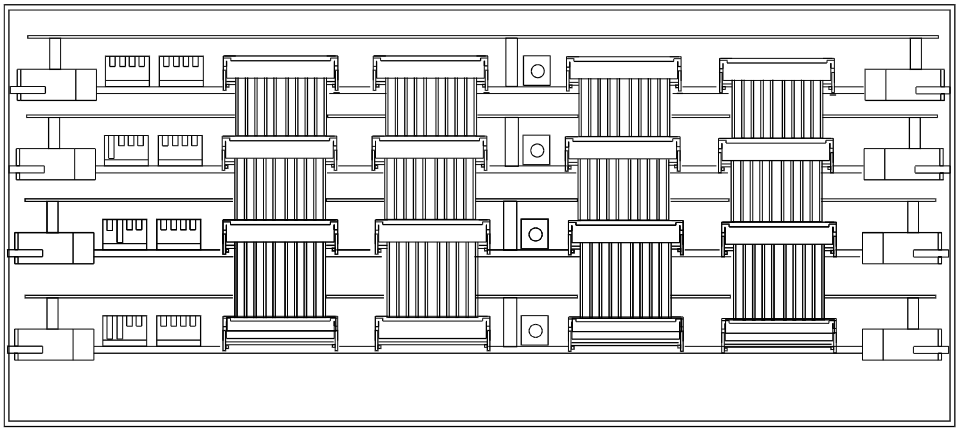
32x32 expansion



48x48 expansion



64x64 expansion



■ 2.3 Setting the level switch

The card edge controls and indicators on the router card are limited to the Level and Higher Destination Decode switches and the standard 3 LED array, both of which are described in part one of the ***Freeway*** Series User guide.

For separate routers to be controlled independently, each must have a different level address set. This operation is achieved by means of the DIL switch marked level on the front of each ***Freeway*** card.

The levels are set thus:

SW 1	SW 2	SW 3	SW 4	Level No
0	0	0	0	1
1	0	0	0	2
0	1	0	0	3
1	1	0	0	4
0	0	1	0	5
1	0	1	0	6
0	1	1	0	7
1	1	1	0	8

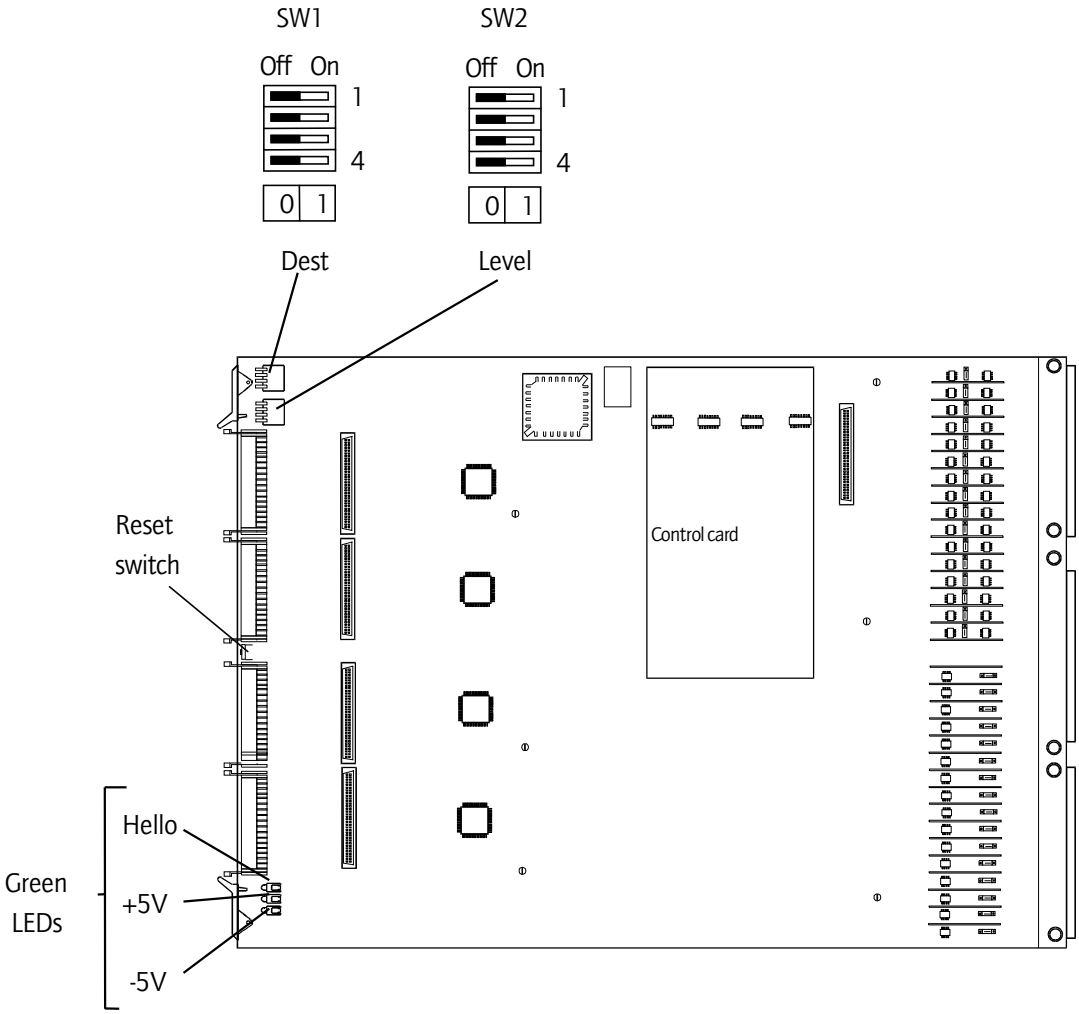
The maximum total number of independent levels is 8. A typical system might be arranged like this:

Level 1 Serial Digital Video

Level 2 Analogue Video

Level 3 AES Digital Audio

Level 4 Stereo Analogue Audio


SW1
Off On
1
4
0 1
SW2
Off On
1
4
0 1
Dest
Level
Reset
switch
Control card
Green
LEDs
Hello
+5V
-5V

■ 2.4 Setting the destination assign switch

What's the purpose of the switch marked 'HIGHER DEST DECODE'? Well, because we make all ***Freeway*** modules the same, in a router bigger than 16x16, you have to 'tell' each card what range of sources and destinations it's assigned to. That's the purpose of this switch. The range is assigned thus:

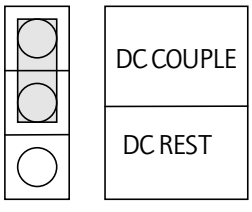
SW 1	SW 2	SW 3	SW 4	Source and destination Range
0	0	x	x	1-16
1	0	x	x	17-32
0	1	x	x	33-48
1	1	x	x	49-64

■ 2.5 Selecting DC couple/DC restore

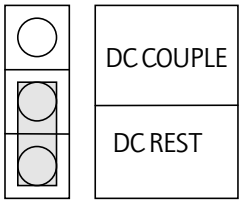
In traditional television applications a DC restore function is nearly always appropriate - in order to remove DC sit variations between signals. Without this function, switching between signals with different *DC components* can cause frame-roll due to corruption of sync field-block.

However, in other applications of a wideband analogue router, the DC restore function is definitely *not* appropriate. These include the routing of computer-type RGB graphics signals and medium rate telecoms signals. In these cases a stable DC path is required.

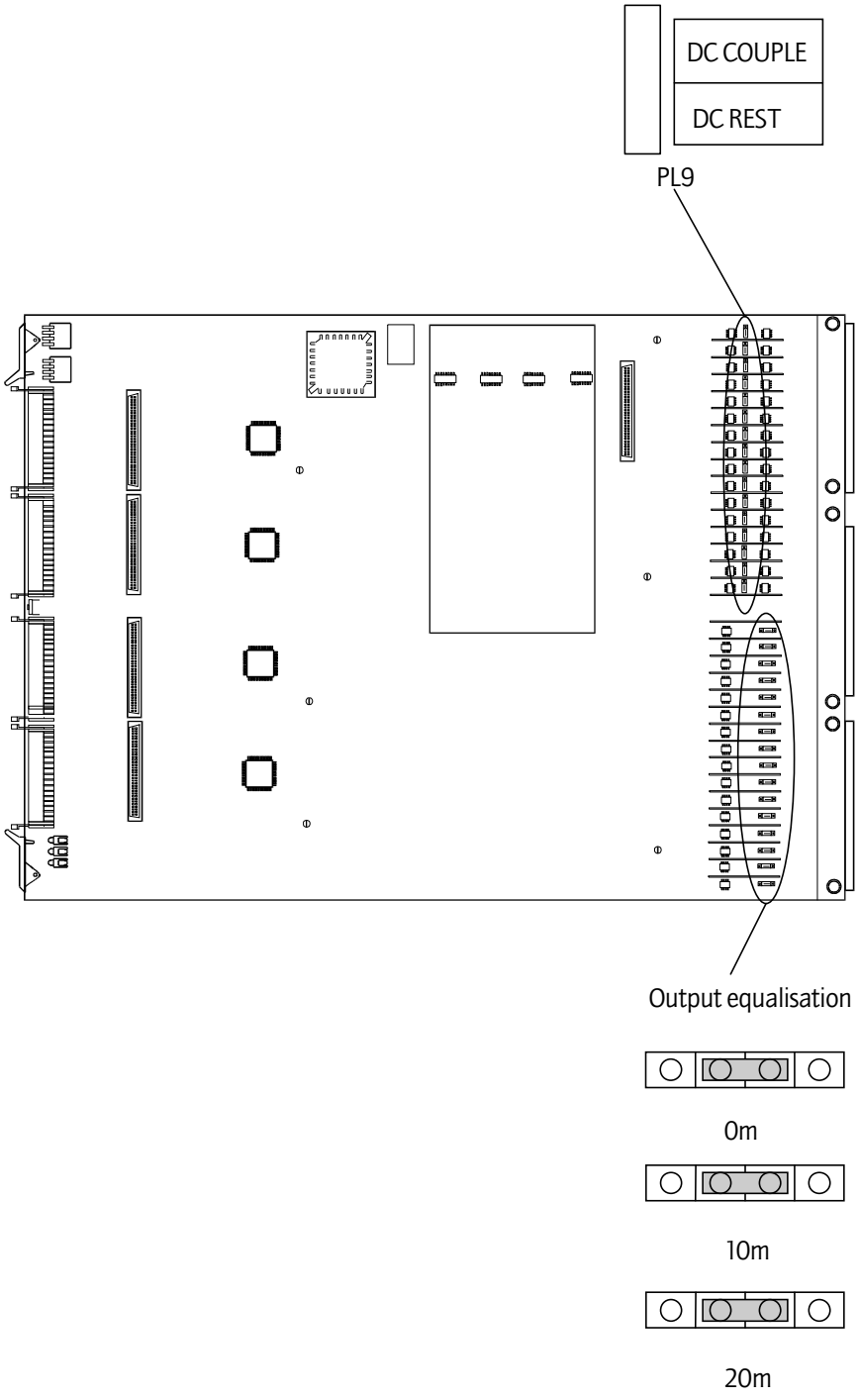
To cater for all circumstances, ***Freeway*** provides a user selection of a DC restored input signal stage, or a DC coupled input stage (all circuitry downstream is DC coupled). This is selectable by means of PL9 which may be found in each signal block.



DC COUPLE selection



DC RESTORE selection


DC COUPLE
DC REST
PL9
Output equalisation
0m
10m
20m

■ 2.6 Output cable equalisation

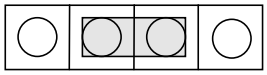
Output cable equalisation is useful in order to maintain frequency response in situations wher the equipment 'following' the router is not immediately adjacent to the router frame. Even 10 metres of good quality video cable can cause appreciable attenuation of colour information in a composite signal. For this reason ***Freeway*** includes selectable output cable equalisation. This is not continuously variable, but is selectable (on an input by output basis) in three regimes: 0 metres, 10 metres and 20 metres.

Provides PSF1/2, Belden 8281 or equivalent cable is used, these three settings can compensate for cable losses for cables up to 25 metres in length, ensuring response at subcarrier frequency never exceeds ±1% (±0.1dB).

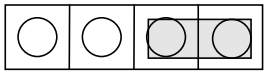
The table below notates the appropriate positions for output equalisation links for given cable lengths.

Cable length	Link position
PSF 1/2 between 0 and 5 metres	0m
PSF 1/2 greater than 5 metres, but less than 15 metres	10m
PSF 1/2 greater than 15 metres, but less than 25 metres	20m

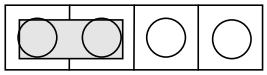
Link positions are shown below:



0m



10m



20m

■ 2.7 LED indications

Two of the three LEDs simply indicate that power is arriving at the board. ***Freeway*** routers all operate from two rails only (where others are needed these are generated on the ***Freeway*** cards themselves). The two rails are +5V and -5V.

The third LED is labelled 'HELLO'. This is useful in determining if the control system has spoken to a particular board and, specifically, to tell you if you set the 'level' and 'higher dest decode' switches correctly.

When the control system sends a command (say in response to a button push), the appropriate part of the router responds, depending on how the board configuration switches are set.

If a board receives a command on which it should act, it 'winks' the 'HELLO' LED. Meaning, *'Hello, I've just received a command that's relevant according to my programmed place in the scheme of things.'*

2.8 Resetting the module

There are physically two RESET switches available to perform a hard reset of the Freeway controller. One is located on the edge of the 2440 sub-module and the other is remotely located on the front edge of the video card on which the 2440 is sited. Pressing either has the same effect.

Initiating a hard reset is akin to powering down and powering up the control frame. The controller re-boots and follows the usual power-up sequence. It should be noted that the panels will shut down and then be restored after initialisation has completed. It should also be noted that resetting the active controller in a dual control environment will cause system changeover.

If no changes have been made to the database then no crosspoints will be changed.

However, crosspoint settings may change if the level type for a level was changed prior to the reset as during initialisation the crosspoints are set according to the level type for that level.

It is also advisable to perform a reset after database parameters are changed as certain changes only take effect after a reset, i.e. changing level type, panel type, source overrides, and controllable destinations.

3 Theory of operation

The 16 inputs are buffered using DC couple/DC restore circuitry and then routed by the 64x16 crosspoint array. The microprocessor sets control destination and source addresses and provides the strobes to the crosspoint array to set the routes.

The output amplifiers have three selectable eq/gain regimes which are selectable with a moveable link.

4 Problem solving

The green LEDs on the routing card are off?

There is no power on the card.

- check that there is power from the PSUs
- check cable interconnections
- ensure that the card is properly seated in the frame

The HELLO LED on the card remains off?

No command has been received by the board.

- check the power
- check that the 'level' and 'higher dest decode' switches are set correctly
- check cable interconnections

5 Specification

■ Inputs

Number and type:	16: unbalanced on BNCs, 1V pk-pk amplitude
Impedance:	75Ω
Return loss:	Better than 40dB to 3.58MHz and 4.43MHz
Superimposed DC:	±1V max
Coupling:	DC or sync-tip restored

■ Outputs

Number and type:	16 unbalanced on BNCs
Impedance:	75Ω
Return loss:	Better than 40dB to 3.58MHz and 4.43MHz
DC offset:	Less than 50mV

■ Performance

Gain:	0dB ±0.1dB
Freq. Response:	±0.1dB to 8MHz,+2/-3dB to 30MHz
Crosstalk }	-63dB (single adjacent)
}	-60dB (all hostile) @ 4.43MHz
Output eq.:	Selectable cable eq. on outputs
2T Pulse/Bar:	<0.2% K
Chrom/Lum gain:	<±0.5%
Chrom/Lum delay:	<±2ns
Group Delay Var:	<5ns 50Hz to 15MHz
Differential Phase:	<0.15° @ 4.43MHz

Signal to Noise:	Better than 60dB (wideband)
Delay Variation:	<±0.6ns between any output to one input
Switching Transients:	<±30mV
Black Level Steps:	<±250mV between inputs with same input coupling mode

■ Optional hardware

There exist some order codes which relate to optional extras and spare parts. These are detailed below:

Extra PSU	FRE-OPTN-1940
Extra μP card	FRE-OPTN-1940

Spare parts

SDV signal card	FRE-SPAR-3940
SDV rear connector card	FRE-SPAR-1740
AES signal card	FRE-SPAR-4940
AES rear connector card	FRE-SPAR-1463
Analogue video signal card	FRE-SPAR-3740
Analogue video rear connector card	FRE-SPAR-1740
Stereo analogue audio signal card	FRE-SPAR-4740
Stereo analogue audio rear connector card	FRE-SPAR-1747
AES Reference generator card	FRE-SPAR-4941
***Freeway* Frame**	FRE-SPAR-6540
Unbalanced AES rear panel	FRE-SPAR-1749
Replacement User Manual	FRE-SPAR-0000