

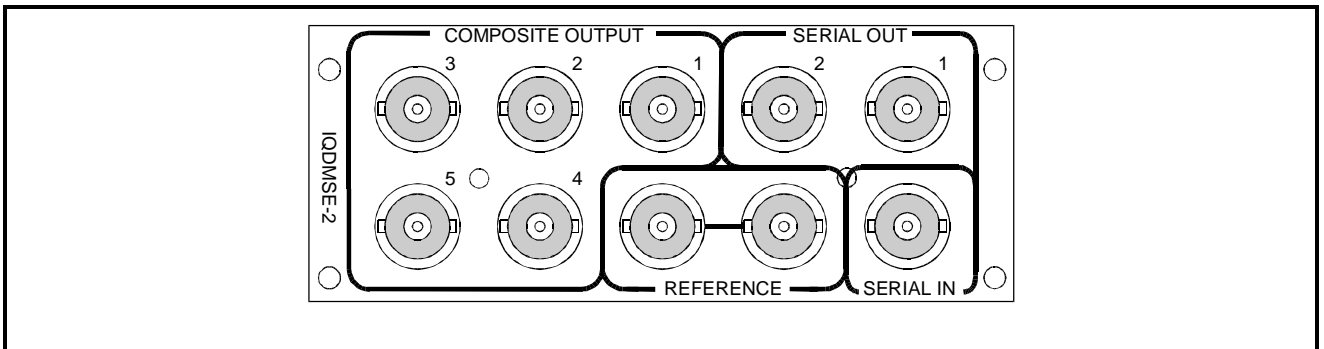
# IQDMSE Multi-standard Digital Encoder

## Module Description

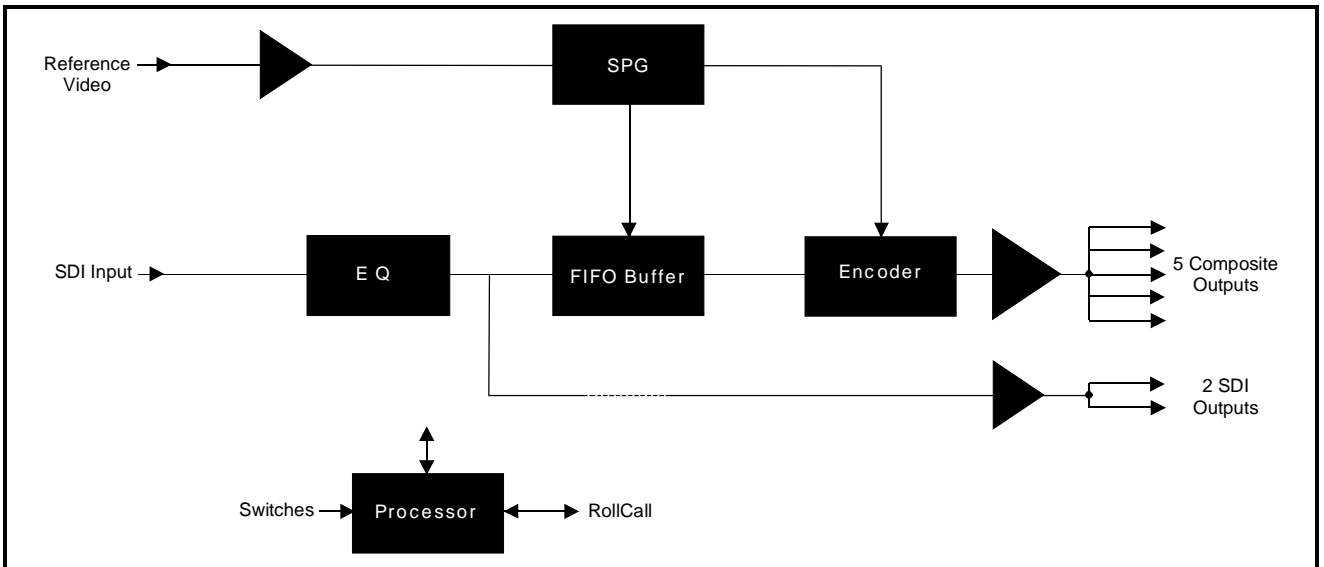
The IQDMSE is a full broadcast quality multi-standard encoder. A 10-bit SDI input is encoded into PAL for 625 line inputs or NTSC for 525 line inputs. A 2.8 line input buffer and color frame accurate genlock allows for simple installation. Without a reference a minimum delay mode is automatically selected. Illegal colors are prevented

from causing overflow problems by a unique, patented correction system which modifies both the luminance and chrominance information to produce the visually nearest color to the illegal color

## REAR PANEL VIEW



## BLOCK DIAGRAM



## Features

PAL/ NTSC/ NTSC-J broadcast quality encoding

Full genlock and minimum delay operation

- 2.8 line input buffer
- 12-bit oversampled, DAC with 601 quality reconstruction
- Gamut legalizer using optimal hue and intensity modification
- Internal pattern and VITS generation
- Pass or blank vertical interval data
- NTSC pedestal control
- 5 x composite outputs
- 2 x SDI reclocked outputs
- RollCall™ compatible

Versions of the module cards available are:

IQDMSE-2-0 Broadcast Encoder with 5 composite and 2 SDI outputs

Double width module

## Broadcast Encoder - Technical Profile

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### Features

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#### Signal Inputs

Serial input	Equalized 270 Mbit/s 10 bit 4:2:2 SDI
Reference input	Composite or black burst

#### Signal Outputs

Serial output	2 x reclocked
Composite output	5 x encoded Analog

#### Controls

Standard  
 Test pattern select  
 VITS insert  
 Vertical data  
 Genlock mode  
 Genlock H-Phase offset  
 Genlock Fine H-Phase offset  
 Genlock SC Phase offset  
 NTSC Pedestal  
 Blanking width  
 Gamut Legalizer  
 Gain  
 EDH Monitor  
 Preset Unit  
 Logging

#### Indicators

Power Supplies OK	
No I/P	
No reference	
ScH error / Buffer overflow	Output or Reference ScH error Flashes for input buffer over or underflow
EDH	Present : error minute : error hour

#### Additional Controls via RollCall™ Remote Control System

None

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## Specifications

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### Signal Inputs

Input Format	4:2:2 SDI Equalized 270 MHz
Serial Input Return Loss	Better than -15 dB to 270 MHz
Reference Input Standard	525/625 (same standard as D1 input)
Composite or Black Burst Reference Level	Standard level $\pm 3$ dB
Serial Input Return Loss	Better than -15 dB to 270 MHz

### Signal Outputs

Output Format	Analog Composite PAL/NTSC
Serial Output Return Loss	Better than -15 dB to 270 MHz
Composite Encoding	12 bit
Y Frequency Response	5.5 MHz $\pm$ 0.05 dB
U/I & V/Q Frequency Response	<-3 dB @ 1.3 MHz >20 dB @ 4.0 MHz
Differential Gain	Better than 0.2%
Differential Phase	Better than 0.2°
ScH Phase	0° $\pm$ 2° (or variable in Variable ScH Locked Genlock mode)
Composite Output Return Loss	Better than 35 dB to 5.8 MHz
Buffer delay	Up to 2.8 lines
Delay (minimum delay mode)	< 4 $\mu$ s

### Preset Control Ranges

Standard -	PAL or NTSC/NTSC-J
Test pattern select	Black, Colour bars, various test lines
VITS insert	ON/OFF
Vertical data	Pass/Strip
Genlock mode	Internal lock / Zero ScH Lock/Variable ScH lock
Genlock H-Phase offset	$\pm 1.9$ lines
Genlock Fine H-Phase offset	1 cycle of subcarrier
Genlock SC Phase offset	360°
NTSC Pedestal	ON/OFF
Blanking width	Normal/Legal minimum to CCIR 624
Gamut Legalizer	ON/OFF
Gain	$\pm 0.5$ dB
EDH Monitor	Show/Reset Statistics
Preset Unit	ON
Logging	Input change/EDH Errors

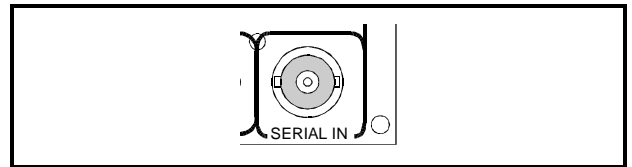
### Power

Supplied via rack connector

INPUTS AND OUTPUTS

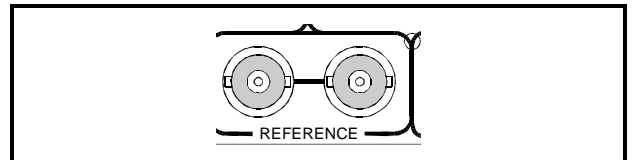
SERIAL INPUT

The connector is the serial digital video input to the encoder via a BNC connector terminated in 75 Ohms.



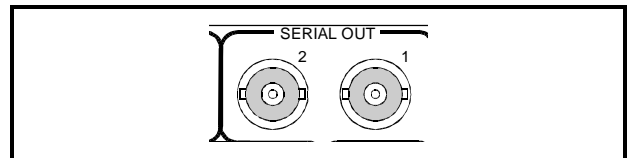
REFERENCE INPUT

These are the high impedance loop-through connections via BNC connectors for a black burst or composite video reference signal.



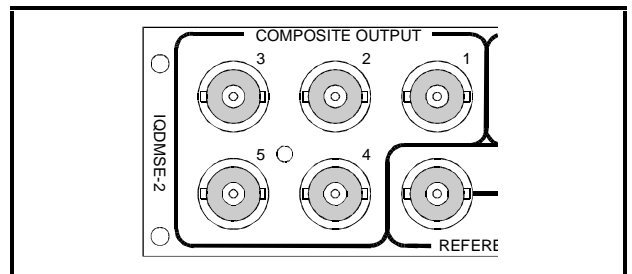
SERIAL OUTPUTS

These are the two Serial Digital outputs of the unit via BNC connectors.

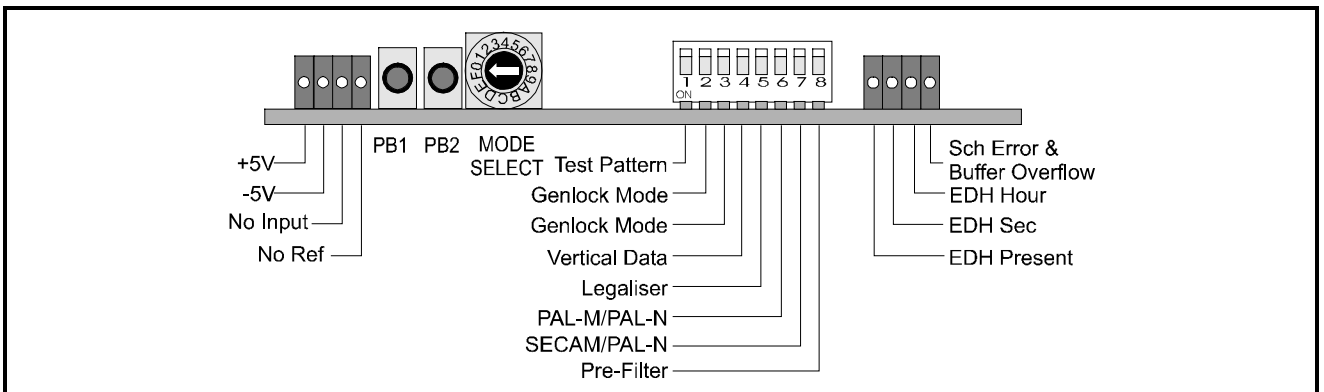


COMPOSITE OUTPUTS

These are the five composite video outputs of the unit via BNC connectors.



CARD EDGE CONTROLS



Adjustment of the settings of the IQDMSE is available either via card edge controls and/or via a more comprehensive remote control system using RollCall™

Note that the availability of some of the card edge controls will depend on the card version; see feature table for variations.

LED INDICATORS

**+5V and -5V**

When illuminated these LED's indicate that the +5 V and -5 V supplies are present.

**No Input**

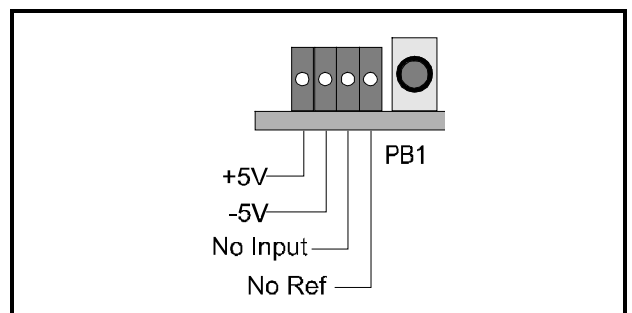
The **No Input** LED will be continuously illuminated when the unit is not receiving an input signal.

Note that in the **Genlock** mode this LED will flash when the input signal is of a different standard to that of the reference input. Under these conditions the output signal standard will be the same as the reference signal; the input signal will be ignored.

**No Ref**

When the **No Ref** LED is illuminated this indicates that the unit is not receiving a reference input signal.

Note that the **No Input** and **No Ref** LEDs will flash alternately when the unit is configuring or re-configuring in the event of a standard change. The message **Please wait....** will appear in the lower line of the Information window during this operation.



## EDH LEDs

**EDH Present**

This LED will be illuminated if EDH is present on the serial input. In the event of an EDH error being detected the EDH Present LED will become extinguished and the **EDH Min** and **EDH Hour** LEDs will become appropriately illuminated.

**EDH Sec**

The **EDH Sec** LED be extinguished if no errors have occurred during the previous second.

**EDH Hour**

The **EDH Hour** LED be extinguished if no errors have occurred during the previous hour.

**Sch Error/Buffer Overflow**

This dual function LED warns of Genlock error conditions.

It will be illuminated if Sch errors are detected in the reference signal (in Zero Sch Lock mode) or in the output signal (in Variable Sch Lock mode)

It will flash to warn of input buffer under or overflow.

A long ON period will warn of an overflow or within 1.2  $\mu$ s of overflow.

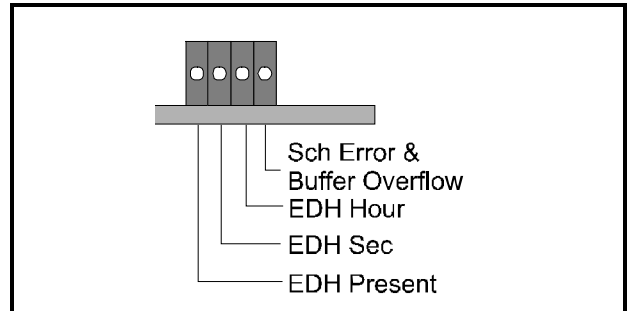
A long OFF period will warn of underflow or within 1.2  $\mu$ s of underflow.

Once the buffer has under or overflowed the output signal will be corrupted.

If **overflow** is indicated then the situation should be remedied by use of the Genlock H-Phase offset to delay the input signal compared to the reference signal or advance the reference signal compared to the input signal.

If **underflow** is indicated then the situation should be remedied by use of the Genlock H-Phase offset to advance the input signal compared to the reference signal or delay the reference signal compared to the input signal.

If the buffer has under or overflowed and Sch errors are detected in the reference/input signals this LED will flash with equal ON and OFF periods.



SWITCHES

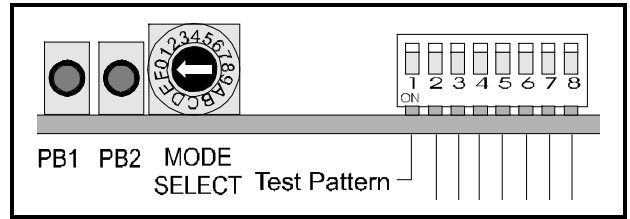
Two push buttons, a Hex switch and a 8 way DIL switch allow various functions and modes to be set.

The DIL switch selects a particular function and the Hex switch selects a mode or variable parameter.

The push buttons PB1, PB2 allow the value of the selected function/parameter to be adjusted.

The Mode select switch may select a mode or a parameter that may be adjusted.

**Note that to select the preset value both buttons should be pressed together.**



These switches allow the module to be operated when an active front panel is not available. All functions available via an active front panel are duplicated by these switches. More detailed information about these functions will be found under MENU DETAILS starting on page 11.

FUNCTION AND MODE SELECTIONS

DIL SWITCH FUNCTIONS

Position 1

When set to ON (Down) This position allows the encoder to produce a **test pattern** signal as an output.

Positions 2 and 3

These positions are used to set the **Genlock Mode** as shown in the table below: (ON=Down, OFF=Up and X = don't care)

PAL/NTSC operation

Mode	Position 2	Position 3
Zero SC/H Lock	OFF	OFF
Variable SC/H Lock	ON	OFF
Internal Lock	X	ON

*For detailed information on Genlock operation see Appendix 1 on page 15*

Position 4

This position allows the data in the **vertical interval** of the input signal to be either passed (ON) to the output or blanked (OFF) from the output.

Position 5

This position allows the **legaliser** to set ON or OFF. In the OFF position the legaliser will prevent the encoder from producing illegal (out of gamut) signals.

Positions 6, 7 and 8

These positions have no function.

**Operating Standard**

The output standard is determined by the operating line standard - for 525 line the output will be NTSC; for 625 line the output will be PAL. The operating line standard will be determined by the following detection method (in order of priority)

1. The **reference input standard** (signal input standard ignored) when in Genlock mode.
2. If there is no reference signal, by the **input signal standard**.
3. If there is no reference signal and no signal input the standard may be selected by using either the **Mode Select** switch or the **Menu system** of an active front panel.

*Note that to use this method of selection the module **must** be operating in the **Internal Lock** mode set by the DIL switch position 3 or via the Genlock menu.*

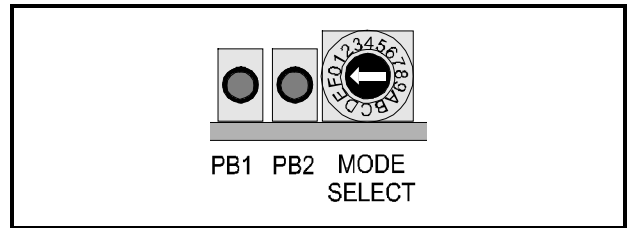


## MODE SELECT SWITCH

The Mode select switch may select a mode or a parameter that may be adjusted.

The push buttons allow the value of the selected function/parameter to be adjusted.

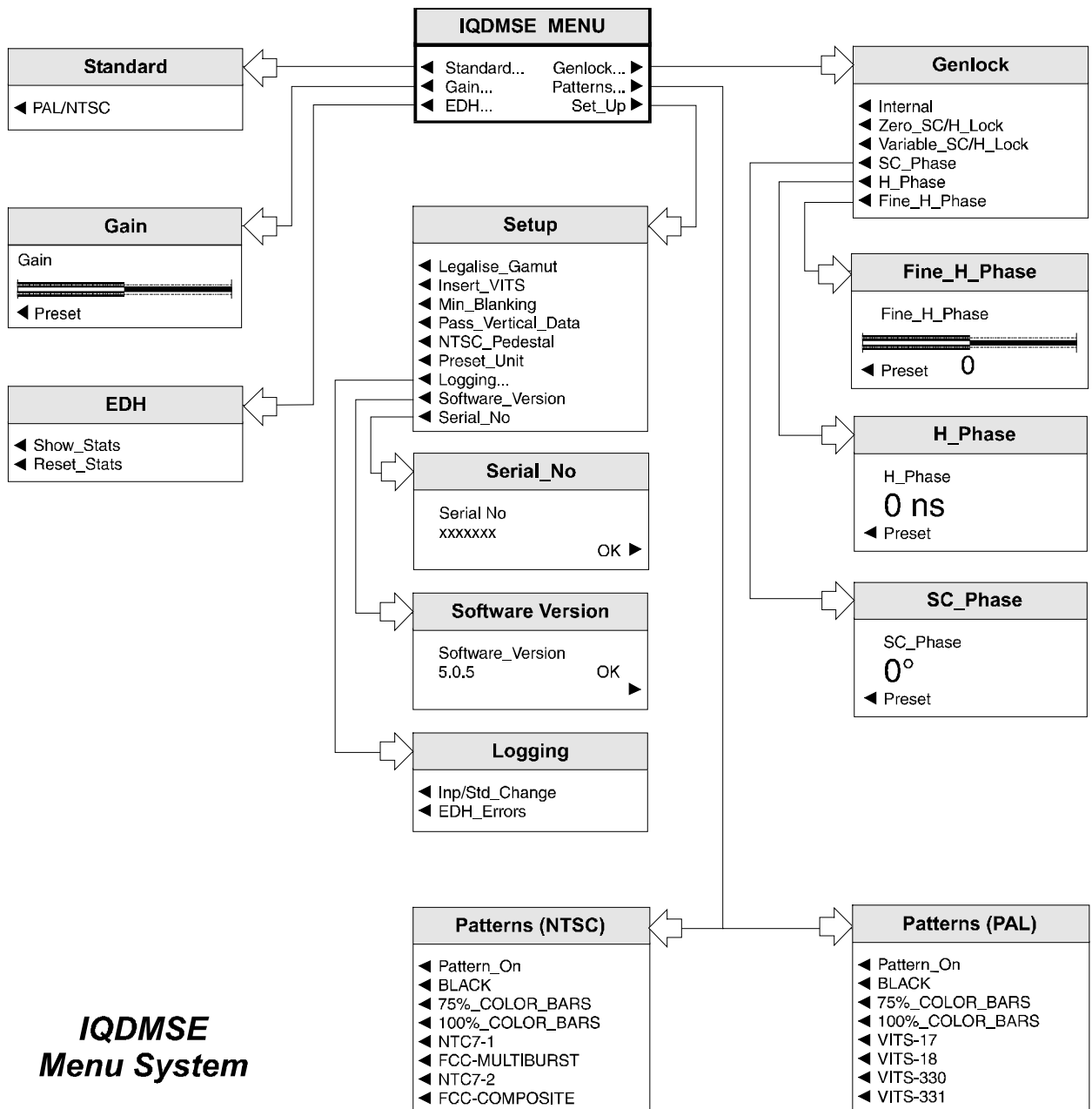
**Note that to select the preset value both buttons should be pressed together.**



Function	Switch	Action of PB1	Action of PB2
S/C Phase	0	Rotates vectors anticlockwise	Rotates vectors clockwise
H Phase	1	Moves output ahead of reference	Moves reference ahead of output
Pattern Select	2	Moves up through list of patterns	Moves down through list of patterns
NTSC Pedestal	3	Turns pedestal OFF	Turns pedestal ON
H Blanking	4	Selects standard composite blanking	Selects legal minimum allowed by CCIR 624
VITS Insert	5	Removes VITS	Inserts VITS
EDH Reset	6	Resets EDH statistics	Resets EDH statistics
Fine H-Phase	7	Moves output ahead of reference	Moves reference ahead of output
Gain	8	Reduces gain	Increases gain
Standard <sup>(1)</sup>	9	Selects 625 PAL standard	Selects 525 NTSC standard
Preset Unit	F	Press together to select all preset values	

(1) Normally the standard selection is automatic. If there is no input signal and no reference signal available to determine the operating standard this switch and the DIL switch (positions 6 and 7) should be used to set the output standard.

*Note that the availability of some of the above functions will depend on the operating mode of the module. e.g. test patterns will be different for different line standards; availability of phasing controls will depend on the genlock mode etc.*



## OPERATION FROM AN ACTIVE CONTROL PANEL

The card may be operated with an active control panel via the RollCall™ network.

The menus available for this card are shown on page opposite and will appear in the Control display window.

Operational details for the remote control panel will be found in SECTION 1 of the Modular System Operator's Manual.

### MENU DETAILS

(see IQDMSE Menu System Opposite)

#### MAIN MENU

The main, or top level menu allows various sub-menus to be selected by pressing the button adjacent to the required text line.

Note that where a menu item is followed by three dots (...) this indicates that a further sub-menu may be selected.

Whenever a menu item is selected the parameters of that selection will be displayed in the Information window of the front panel. Where the selection is purely a mode selection and does not enable a sub-menu, the text will become reversed (white-on-black) indicating that the mode is active. If the mode is not available for selection the text will remain normal.

### STANDARD

This menu selection allows the operating standard of the unit to be set.

The operating line standard will be determined by the following detection method (in order of priority)

1. The **reference input standard** (signal input standard ignored) when in Genlock mode
2. If there is no reference signal, by the **input signal standard**.
3. If there is no reference signal and no signal input the standard may be selected by using this menu. This allows the module to provide test signals in different standards.

*Note that to use this method of selection the module **must** be operating in the **Internal Lock** mode set in the **Genlock** menu.*

If the input standard as detected by either (1) or (2) above is 625 line PAL is selected as the output standard.

If the input standard as detected by either (1) or (2) above is 525 line NTSC is selected as the output standard.

If the signal input and reference input are of different line standards, the unit will output a black signal at the reference signal line rate.

**GENLOCK**

This sub-menu allows various modes of genlock to be enabled.

**Internal**

When this function is enabled the output signal will be locked to the serial input (if available) or free-running if no serial input is available.

In this mode the frequency accuracy will be  $\pm 10$  ppm

**Notes:**

1. *This mode will be automatically enabled if the signal input and reference input are of different line standards and the output will default to black burst in the reference standard.*
2. *This mode should be selected if test patterns of a particular line standard (and different to the reference input) are required at the output.*

**Zero\_ScH\_Lock**

In this mode the module locks to the reference subcarrier and will always produce a zero ScH (Subcarrier phase to H-Phase) output. The output H timing will be maintained as close as possible to the reference H timing in the correct colour frame. The ScH warning LED will light if the ScH error of the reference is  $> 20^\circ$  (approx.), indicating that the colour framing will be lost should the reference ScH error increase.

**Variable\_ScH\_Lock**

In this mode the module separately locks the H phase and subcarrier phase to the reference. The user then has independent control of H phase and subcarrier phase offsets and any output ScH relationship (and colour frame) is possible. The ScH warning LED will light to indicate an output ScH phase error of  $> 20^\circ$ .

**SC\_Phase**

This function allows the relative phasing between the reference subcarrier and the output signal subcarrier to be adjusted. Rotating the spin-wheel will adjust this value and the numerical display shows the phasing in degrees.

The range of adjustment is  $359.9^\circ$  (continuously adjustable) in steps of  $0.1^\circ$  and the preset value is  $0^\circ$  (Output coincident with reference)

**H\_Phase**

Selecting this item reveals a display showing the horizontal timing of the output signal relative to the reference sync signal, in nanoseconds. Rotating the spin-wheel will adjust this value.

The range is approximately  $\pm 1.9$  lines in steps of one cycle of subcarrier. (This ensures the correct SC/H timing is maintained)

Selecting Preset returns the setting to zero. (Output coincident with reference)

**Fine\_H\_Phase**

*(Only available in Variable\_ScH\_Lock mode)*

Selecting this item reveals a display showing the horizontal timing of the output signal relative to the reference sync signal. Rotating the spin-wheel will adjust this value.

The range is  $+1023$  to  $-1024$  units which is approximately equivalent to 1 cycle of subcarrier. Selecting Preset returns the setting to zero.

Any output ScH relationship (and colour frame) is possible in this mode.

The ScH error LED will light to indicate an output ScH phase error of  $> 20^\circ$ .

**GAIN**

This selection reveals a bargraph readout display for gain. The overall output signal level may be adjusted with this function.

The range of adjustment from standard level is  $+128$  to  $-127$  arbitrary units.

The overall range of adjustment approximately  $\pm 0.5$  dB

Selecting Preset returns the setting to the calibrated value of 0.

**PATTERNS**

This menu selection allows the unit to output test pattern signals. This function is enabled by selecting **Pattern\_On** and the following signals will then be available for selection:

625 Line	525 Line
BLACK	BLACK
75%COLOR_BARS	75%COLOR_BARS
100%COLOR_BARS	100%COLOR_BARS
VITS-17	NTC7-1
VITS-18	FCC-MULTIBURST
VITS-330	NTC7-2
VITS-331	FCC-COMPOSITE

**EDH**

The input stream is continuously monitored for EDH errors. Basic information on this can be monitored and/or reset here.

The following functions may be selected:

<b>Show_Stats</b>	The information will be displayed in the LCD window
<b>Reset_Stats</b>	Data will be reset

**SETUP**

This selection reveals a sub-menu that allows the following functions to be set up:

**Legalise\_Gamut**

When enabled this function prevents illegal colour signals (out of Gamut) being produced at the output.

This system will find the visually nearest legal colour in all circumstances. Normally this will involve desaturation, so maintaining the same hue, but where this is not possible (e.g. >100% yellow), the luminance value will be modified to give a legal visual approximation to the illegal colour.

The letters **GAM** will appear in the lower line of the control window when this is enabled.

**Insert\_VITS**

When this function is selected the four standard VITS lines are inserted in the vertical interval.

The letters **VTS** will appear in the lower line of the control window when this is enabled.

**Min\_Blanking**

When selected the blanking width will be reduced to the minimum allowed by CCIR 624.

**Pass\_Vertical\_Data**

When selected (text reversed) the unit will pass data (unblanked) present on the vertical interval, to the output.

In 525 line standards lines from 11 to 274 are unblanked. In 625 standards lines from 7 to 320 inclusive are unblanked.

When de-selected (text normal) all data in the vertical interval will be blanked.

When this item is selected the word VITS will appear on the bottom line in the information window.

**NTSC\_Pedestal** (for NTSC output only)

This toggle ON/OFF function allows the pedestal to be ON (included) or OFF (removed) from the output signal.

When selected the output standard will be shown as NTSC; when unselected it will show NTSC-J, the version of NTSC used in Japan.

*Note that after changing the NTSC\_Pedestal selection the output signal will be blanked for about 5 seconds to allow for reconfiguration.*

**Preset\_Unit**

Selecting this function presets various functions such that some sort of signal is produced at the output even though some settings may be inappropriate for the input signal. This is useful if many settings have been set in error such that no output signal is being produced.

**Logging**

If a logging device is attached to the RollCall™ network, information about various parameters will be reported to the logging device assigned in the Remote Control Interface system. (See Section 1) The RCIF Menu System can be made available to such a device.

**Inp/Std\_Change**

When activated, a loss of input signal condition or change of input line standard will be available for the logging device.

**Ref\_Loss**

When activated a loss of reference signal condition will be notified to any logging device.

**EDH\_Errors**

When activated, EDH error information will be available for the logging device.

**Software\_Version**

Selecting this item reveals a display showing the version of the software fitted in the module. Select OK to return to the Setup Menu.

**Serial No**

This displays the serial number of the unit. Select OK to return to the setup menu.

THE INFORMATION WINDOW

The Information window has four lines of text indicating current selections and various information messages.

*Note that in a RollCall™ system some units will overwrite the information window indication with their own messages. Under these conditions the control panel will only be able to write to the information window when the unit has been disconnected.*

The first line will contain the name of the module which is currently being controlled.

The second, third and fourth lines provide specific information about the operating conditions of the module.

Example of text displayed

Line 1	01:IQDMSE				
Line 2	Inp:OK			Std:PAL	
Line 3	Ref:OK			EDH:	
Line 4	ZSC	GAM	VTS	PVD	PAT

Text Line Details

- Line 1 This line contains the name of the module and Gateway code data.
- Line 2 This line gives information about the state of the video input and the output standard.  
Input state may be OK, ERR (input error detected) or \*\*\*(no signal connected)  
Output standard may be PAL, NTSC, or NTSC-J.
- Line 3 This line gives information about the state of the reference input.  
Reference may be OK, \*\*\*(no signal connected) or SCE (an *input* subcarrier error detected. e.g. a ScH error of >60°)
- Line 4 This line will show EDH statistics(NONE, Fail or OK), the state of the input buffer as OK, OF (overflow of >2.8 lines) UF (underflow <2.8 lines) or set up messages:

**ZSC** Genlock Zero SC/H Lock enabled

If the text is static (not flashing) this indicates that the unit has successfully genlocked to the reference source.

If the text is flashing this indicates that the unit is attempting to genlock to the reference source.

**VSC** Variable SC/H Lock enabled

If the text is static (not flashing) this indicates that the unit has successfully genlocked to the reference source.

If the text is flashing this indicates that the unit is attempting to genlock to the reference source.

**>20°** Variable SC/H Lock enabled

This indicates that there is an output SC/H error of >20°.

If the text is static (not flashing) this indicates that the unit has successfully genlocked to the reference source.

If the text is flashing this indicates that the unit is attempting to genlock to the reference source.

**GAM** Legalise Gamut enabled

**VTS** Insert VITS enabled

**PVD** Pass Vertical Data enabled

**PAT** Pattern ON enabled

## Appendix 1

### GENLOCK

To cater for all preferences the genlock will operate in one of three modes. The default mode (switches off), locks to the reference subcarrier and will always produce a zero ScH output. The output H timing will be maintained as close as possible to the reference H timing in the correct colour frame.

The ScH warning LED will light if the ScH of the reference is  $> \pm 20^\circ$  (approx.), indicating that colour framing may be lost should the reference ScH error increase.

A second genlock mode separately locks the H phase and subcarrier phase to the reference. The user then has independent control of H phase and subcarrier phase offsets. In this mode any output ScH relationship (and colour frame) is possible. The ScH error LED will light to indicate an output ScH phase of  $> 20^\circ$ .

With no reference applied or internal lock selected the output will lock to the input D1 with the buffer delay set to a minimum. Incoming jitter will be suppressed and the output ScH is guaranteed to be zero.

In the event of conflicting standards being applied to the reference and the D1 input the output will default to black burst in the reference standard. With no input or reference the output will also be black burst (or any available pattern) in a user selectable standard. In this mode the frequency accuracy will be  $\pm 10\text{ppm}$ .

In reference genlock modes the subcarrier may be offset by up to  $360^\circ$ . H phase offset is limited to approx.  $\pm 1.9$  lines. A genlock offset of  $\pm 1.9$  lines is allowed but the encoded output is only valid when delayed between approximately  $5\ \mu\text{s}$  and 2.8 lines of the input D1 data. The ScH warning LED will flash when the buffer is under or overflowed indicating an invalid output or where the buffer is within  $1.2\ \mu\text{s}$  of overflow or underflow.

Genlock and delay limits (without comb option):

