ARC-20MC

10 bit aspect ratio converter

Crystal Vision

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1 Introduction

Designed to change the aspect ratio of an SDI video signal while preserving the geometry, the 10 bit ARC-20MC has presets for the six standard conversions between 4:3 and 16:9. It also allows the user to customise both the size and position of the picture, with continuous compression or expansion in line and pixel increments of up to +/- 25% of nominal picture size, and vertical and horizontal offsets of +/- 50% of screen size. Vertical and horizontal cropping from 0-100% of picture size also make it possible to completely blank the image starting from any edge and so remove unwanted material.

The ARC-20MC features motion adaptive video de-interlacing which maximises the picture's vertical resolution and ensures that it will choose the best processing method based on the video content. Other picture improvements come from noise reduction and detail enhancement for image sharpening, while RGB and YUV lift and gain controls are available to help maintain colour fidelity.

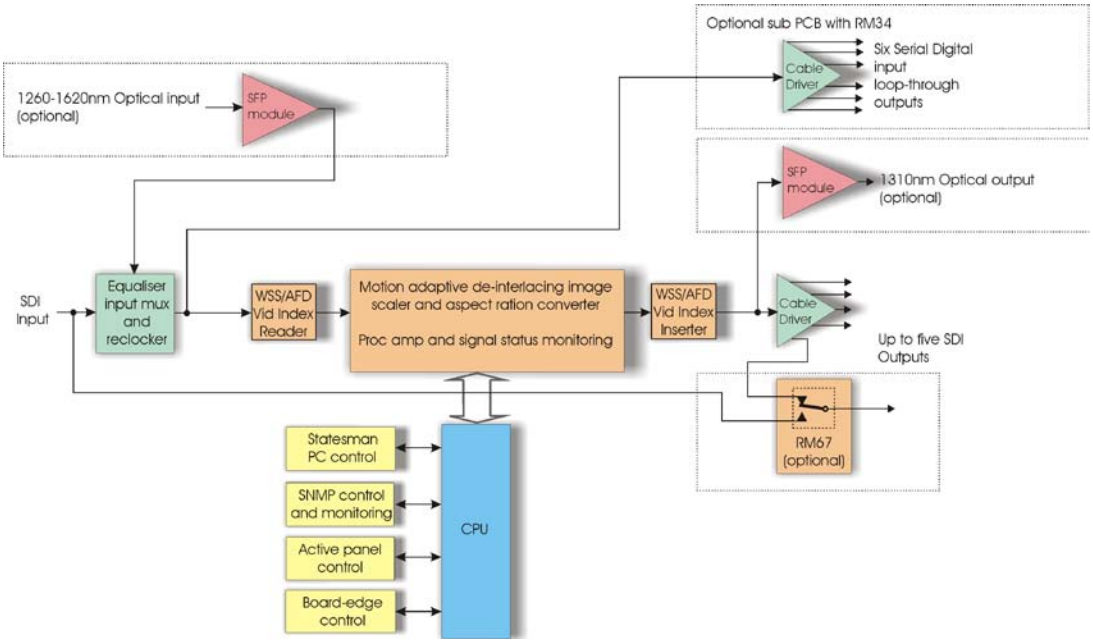
The ARC-20MC can switch instantly and cleanly between two conversions in a single frame blanking period, allowing aspect ratios to be changed live on air. The board is well suited to following AFD data for automatic switching of the aspect ratio and can dynamically select the best conversion based on the video index, WSS or SMPTE 2016 data in the incoming video. Video indexing, WSS and SMPTE 2016 can also be inserted into the output video for use by downstream equipment.

The ARC-20MC passes embedded audio, while it can also compensate for delays generated by other equipment: on top of the minimum fixed delay of one frame minus 16 lines there is a variable video delay of up to one frame.

For those that need to send their signals over larger distances, the ARC-20MC can be fitted with the FIP or FOP fibre options which give integrated fibre I/O connectivity on the actual board – while still only using up a single frame slot.

The ARC-20MC provides the most outputs Crystal Vision has ever featured on one of its aspect ratio converters, with five outputs of the converted signal. It can additionally be fitted with a DA6 top board to give six reclocked loop-throughs for distribution of the original SDI signal – useful for those that have both 4:3 and 16:9 versions of a programme or for those who want to monitor the picture before and after the aspect ratio conversion.

ARC-20MC is a space-saving 100mm x 266mm module which fits in the standard Crystal Vision frames, with the inputs and outputs accessed by using the RM41, RM67 (with relay bypass) or RM57 (with optical connectivity) frame rear modules. Control options include board edge switches, an active front panel on the frame, a remote control panel, SNMP and the Statesman PC software.



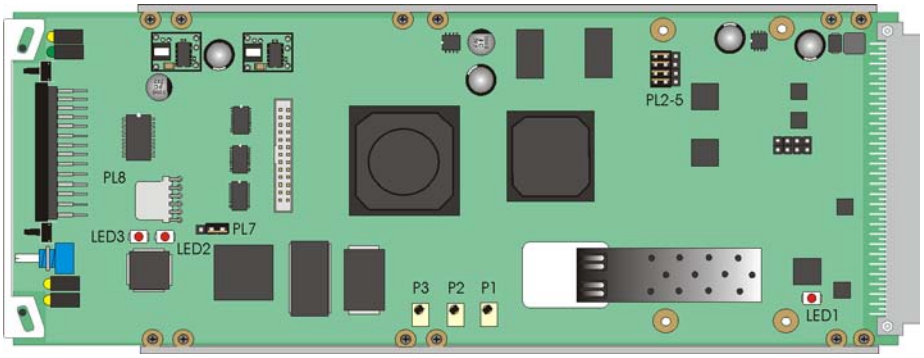
The main features are as follows:

- Aspect ratio and picture position selection. Six input loop-throughs with an additional sub PCB
- Noise reduction with detail and edge enhancement
- Signal probe function
- Optical input or optical output option
- Board edge switches, active front panel, remote control panel, SNMP and Statesman PC software control options
- Compact single height board design (double height with extra input loop-throughs)

2 Hardware installation

2.1 Module configuration

There are five user-settable links on the ARC-20MC. These are PL2, PL3, PL4, PL5 and PL7. Links PL2, PL3 PL4 and PL5 are used to select between GPI inputs or 422 comms. ARC-20MC does not support any 422 comms function so these links should be left in their factory set GPI position. PL7 sets the ARC-20MC IP address to default (10.0.0.201) or to a user-selected IP address.



ARC-20MC top side

The surface-mounted LEDs on the top side of the PCB are not visible from the front of the frame and are included for diagnostic purposes only.

Note: The three potentiometers have been factory set and should not require further adjustments.

Engineering link and LEDs

PL7 sets the ARC-20MC IP address to default (10.0.0.201) or to a user-selected IP address. The LEDs LED1, LED2 and LED3 are included for diagnostic purposes and are not visible from the front of the frame.

Link	Towards front of board	Towards the rear of board
PL7	Default IP address 10.0.0.201	Custom set IP address
PL2-5	422 controller on GPI 1-4	GPI Preset control
LED1	Input equalizer locked to valid input	No input or invalid input
LED2	Data	
LED3	Link	

Note: PL2-5 GPI/Controller select is factory set to GPI Preset control.

Potentiometers

These potentiometers have been factory set and should not require further adjustment.

Potentiometer	Function
P1	Standard Definition free-running frequency
P2	Not applicable
P3	Not applicable

2.2 Rear modules and signal I/O

The 4U Indigo 4 frame will house up to 24 single height modules with up to four power supplies. The 2U Indigo 2 frame will house up to 12 single height modules and dual power supplies. The 1U Indigo 1 frame will house six single height modules and a single power supply. The Indigo 1-DP 1U frame with power supply redundancy includes two fixed power supplies and can hold up to six single height modules. The Indigo DT desk top boxes have a built-in power supply and will house up to two single height modules. All modules can be plugged in and removed while the frame is powered without damage.

Note: For details of fitting rear connectors please refer to the appropriate frame manual.

Rear module connections with RM41

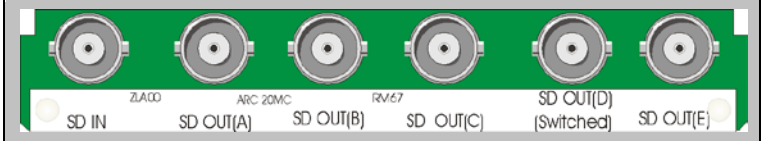
The RM41 being a single height module will allow maximum packing density with the maximum number of outputs available.

RM41 rear module connector	Description
	**RM41** • 24 ARC-20MC modules per Indigo 4 frame • 12 per Indigo 2 frame • Six per Indigo 1 frame • Two per Indigo DT • All frame slots can be used

BNC	I/O assignment
SDI OUT(E)	Standard Definition serial digital output
SDI OUT(D)	Standard Definition serial digital output
SDI OUT(C)	Standard Definition serial digital output
SDI OUT(B)	Standard Definition serial digital output
SDI OUT(A)	Standard Definition serial digital output
SDI IN	Standard Definition serial digital input

Rear module connections with RM67

The RM67 being a single height module will allow maximum packing density with the maximum number of outputs available. The RM67 also has the benefit of relay bypass.

RM67 rear module connector	Description
	**RM67** • 24 ARC-20MC modules per Indigo 4 frame • 12 per Indigo 2 frame • Six per Indigo 1 frame • Two per Indigo DT • All frame slots can be used

BNC	I/O assignment
SDI OUT(E)	Standard Definition serial digital output
SDI OUT(D) (Switched)	Standard Definition serial digital output with relay bypass
SDI OUT(C)	Standard Definition serial digital output
SDI OUT(B)	Standard Definition serial digital output
SDI OUT(A)	Standard Definition serial digital output
SDI IN	Standard Definition serial digital input

Rear module connections with RM57

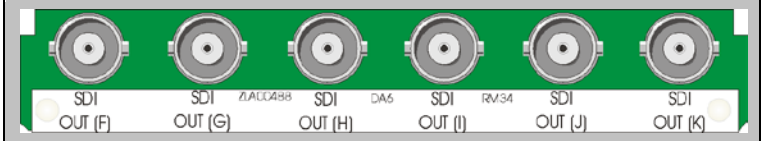
The RM57 is a single height module used when an optical option is fitted.

RM57 rear module connector	Description
	**RM57** • 24 ARC-20MC modules per Indigo 4 frame • 12 per Indigo 2 frame • Six per Indigo 1 frame • Two per Indigo DT • All frame slots can be used

BNC	I/O assignment
OPTICAL I/O	SC optical connector. Input or output depending on optical module option fitted
SDI OUT(D)	Standard Definition serial digital output
SDI OUT(C)	Standard Definition serial digital output
SDI OUT(B)	Standard Definition serial digital output
SDI OUT(A)	Standard Definition serial digital output
SDI IN	Standard Definition serial digital input

Note: Ensure the internal dust-cap has been removed before mounting the RM57 into the frame.

When fitted with an optional DA6 input distribution sub PCB, the upper slot will use an RM34 and all six BNCs will be input loop-through outputs.

RM34 rear module connector	Description
	**RM34** • 12 ARC-20MC modules per Indigo 4 frame • Six per Indigo 2 frame • Three per Indigo 1 frame • One per Indigo DT • Alternate frame slots can be used.

2.3 General Purpose Interface (GPI)

Each frame slot has up to six connections 'a-f' for GPI control and monitoring. These connections are available at the rear of the frame on the 26-way D-Type remote connectors.

GPI			Low (<1V)	High (+5V)
1	'a'	Recall preset bit 1	See following table for user preset control	
2	'b'	Recall preset bit 2		
3	'c'	Recall preset bit 4		
4	'd'	Recall preset bit 8		
5	'e'	Input missing, Video frozen / Black, Audio silence / missing	Selected Alarms asserted after set delay	No alarm
6	'f'	Input missing, Video frozen / Black, Audio silence / missing	Selected Alarms asserted after set delay	No alarm

Note: Input missing will assert the selected alarm immediately

As supplied, each GPI output has a 270Ω resistor in series with its output. This allows for an external LED to be driven, connected to a DC voltage of +5V.

Each General Purpose Input (GPI) is fitted with a 6800Ω resistor connected to the internal +5V.

The 16 user preset configurations can be recalled using binary notation.

GPI Preset	Bit 8	Bit 4	Bit 2	Bit 1	GPI Preset	Bit 8	Bit 4	Bit 2	Bit 1
1	H	H	H	H	9	L	H	H	H
2	H	H	H	L	10	L	H	H	L
3	H	H	L	H	11	L	H	L	H
4	H	H	L	L	12	L	H	L	L
5	H	L	H	H	13	L	L	H	H
6	H	L	H	L	14	L	L	H	L
7	H	L	L	H	15	L	L	L	H
8	H	L	L	L	16	L	L	L	L

4U frame GPI connections

GPI lines ‘a’ to ‘f’ of each card connect to two of eight rear remote connectors as follows:

Slot no.	‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)
3	8 (3)	9 (3)	18 (3)	26 (3)	19 (4)	20 (4)
4	7 (3)	16 (3)	17 (3)	25 (3)	10 (4)	11 (4)
5	5 (1)	6 (1)	15 (1)	24 (1)	1 (2)	2 (2)
6	4 (1)	14 (1)	13 (1)	23 (1)	3 (2)	4 (2)
7	5 (3)	6 (3)	15 (3)	24 (3)	1 (4)	2 (4)
8	4 (3)	14 (3)	13 (3)	23 (3)	3 (4)	4 (4)
9	3 (1)	12 (1)	22 (1)	21 (1)	12 (2)	13 (2)
10	10 (1)	11 (1)	19 (1)	20 (1)	21 (2)	22 (2)
11	3 (3)	12 (3)	22 (3)	21 (3)	12 (4)	13 (4)
12	10 (3)	11 (3)	19 (3)	20 (3)	21 (4)	22 (4)
Slot no.	**‘a’ pin**	**‘b’ pin**	**‘c’ pin**	**‘d’ pin**	**‘e’ pin**	**‘f’ pin**
1	8 (5)	9 (5)	18 (5)	26 (5)	19 (6)	20 (6)
2	7 (5)	16 (5)	17 (5)	25 (5)	10 (6)	11 (6)
3	8 (7)	9 (7)	18 (7)	26 (7)	19 (8)	20 (8)
4	7 (7)	16 (7)	17 (7)	25 (7)	10 (8)	11 (8)
5	5 (5)	6 (5)	15 (5)	24 (5)	1 (6)	2 (6)
6	4 (5)	14 (5)	13 (5)	23 (5)	3 (6)	4 (6)
7	5 (7)	6 (7)	15 (7)	24 (7)	1 (8)	2 (8)
8	4 (7)	14 (7)	13 (7)	23 (7)	3 (8)	4 (8)
9	3 (5)	12 (5)	22 (5)	21 (5)	12 (6)	13 (6)
10	10 (5)	11 (5)	19 (5)	20 (5)	21 (6)	22 (6)
11	3 (7)	12 (7)	22 (7)	21 (7)	12 (8)	13 (8)
12	10 (7)	11 (7)	19 (7)	20 (7)	21 (8)	22 (8)

Upper

Lower

Table shows pin number (remote number)

Note: Remote 1, Remote 3, Remote 5 and Remote 7 are 26-way high-density D-Type female sockets. Frame ground is pin 2 and +5V @500mA is pin 1 in each case.

Remote 2, Remote 4, Remote 6 and Remote 8 are 26-way high-density D-Type male plugs and frame ground is pin 6 in each case and +5V @500mA is pin 15 on Remote 2 and Remote 6.

Note: The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-4 to approximately 1A. Remotes 5-8 are similarly protected.

2U frame GPI connections

GPI lines ‘a’ to ‘f’ of each card connect to two of four rear remote connectors as follows:

Slot no.	‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)
3	8 (3)	9 (3)	18 (3)	26 (3)	19 (4)	20 (4)
4	7 (3)	16 (3)	17 (3)	25 (3)	10 (4)	11 (4)
5	5 (1)	6 (1)	15 (1)	24 (1)	1 (2)	2 (2)
6	4 (1)	14 (1)	13 (1)	23 (1)	3 (2)	4 (2)
7	5 (3)	6 (3)	15 (3)	24 (3)	1 (4)	2 (4)
8	4 (3)	14 (3)	13 (3)	23 (3)	3 (4)	4 (4)
9	3 (1)	12 (1)	22 (1)	21 (1)	12 (2)	13 (2)
10	10 (1)	11 (1)	19 (1)	20 (1)	21 (2)	22 (2)
11	3 (3)	12 (3)	22 (3)	21 (3)	12 (4)	13 (4)
12	10 (3)	11 (3)	19 (3)	20 (3)	21 (4)	22 (4)

Table shows pin number (remote number)

Note: Remote 1 and Remote 3 are 26-way high-density D-Type female sockets. Frame ground is pin 2 and +5V @500mA is pin 1 in each case.

Remote 2 and Remote 4 are 26-way high-density D-Type male plugs and frame ground is pin 6 in each case and +5V @500mA is pin 15 on Remote 2.

Note: The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-4 to approximately 1A.

1U frame GPI connections

GPI lines ‘a’ to ‘f’ of each card connect to two rear remote connectors as follows:

Slot no.	‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)
3	5 (1)	6 (1)	15 (1)	24 (1)	1 (2)	2 (2)
4	4 (1)	14 (1)	13 (1)	23 (1)	3 (2)	4 (2)
5	3 (1)	12 (1)	22 (1)	21 (1)	12 (2)	13 (2)
6	10 (1)	11 (1)	19 (1)	20 (1)	21 (2)	22 (2)

Table shows pin number (remote number)

Note: Remote 1: 26-way high-density D-Type female socket. Frame ground is pin 2 and +5V @500mA is pin 1.

Remote 2: 26-way high-density D-Type male plugs and frame ground is pin 6 and +5V @500mA is pin 15.

Note: The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-2 to approximately 1A.

Indigo DT desk top box GPI connections

GPI lines ‘a’ to ‘f’ of each card connect to two rear remote connectors as follows:

Slot no.	‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)

Table shows pin number (remote number)

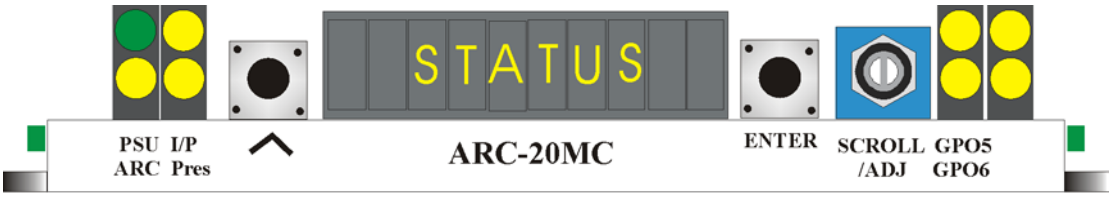
Note: Remote 1: 26-way high-density D-Type female socket. Frame ground is pin 2 and +5V @500mA is pin 1.

Remote 2: 26-way high-density D-Type male plugs and frame ground is pin 6 and +5V @500mA is pin 15.

Note: The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-2 to approximately 1A.

3 Card edge operation

3.1 Card edge controls



ARC-20MC board edge

3.2 Card edge buttons

The two tactile push button switches allow the operator to navigate within the menu structure.

Button	Function	Normal state Up, Action Down
^	Up Menu	Push to jump up a menu level or cancel a selection
ENTER	Select/Action	Push to select a menu and to action and confirm a change

3.3 Card edge rotary control

The board edge rotary encoder is used to navigate through the menu categories and adjust parameter values.

Control	Function
SCROLL /ADJUST	Rotate SCROLL to identify a menu category. In combination with the ENTER button select and ADJUST to change the current level or select a further option.

Notes: The rotary control can access menus and parameter values by clockwise or anti-clockwise rotation.

3.4 Reading card edge LEDs

Card edge LEDs may be used in conjunction with status information from any connected remote status panel display or from Statesman if available.

Refer also to the trouble shooting chapter for more help with solving problems and monitoring status information.

The following table summarises the card edge LED functions and colours:

Name	LED Colour	Function when ON	Function when Off
PSU	Green	Good power supply (PSU) rails	One or more of the monitor supplies is out of specification
ARC	Yellow	Aspect ratio conversion selected	Full screen (anamorphic) selected
	Yellow	No function	
I/P Pres	Yellow	Video input present	Input not present
GPO5	Yellow	GPO5 active / low	GPO5 inactive / high
GPO6	Yellow	GPO6 active / low	GPO6 inactive / high
	Yellow	No function	
	Yellow	No function	

3.5 Navigating card edge menus

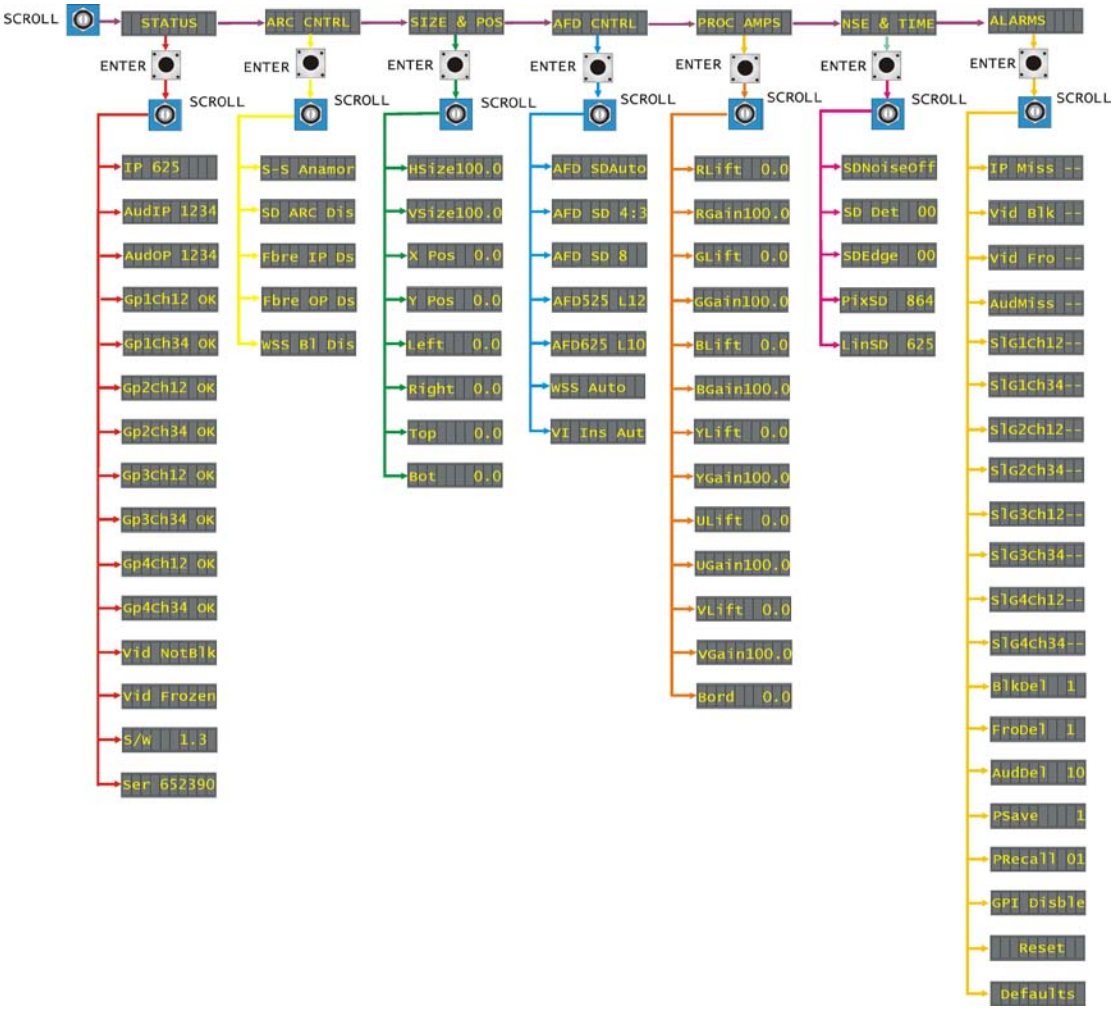
To access the card edge menu system proceed as follows:

- Press the up-arrow [⋀] until a top menu category is reached
- Rotate the SCROLL control until the desired menu category is found
- Push ENTER to enter the sub menus of that category
- Rotate SCROLL to select a sub menu
- Push ENTER to select the desired function. Selection will be indicated by the text being displayed in ***italic*** text
- Rotate ADJUST to make the desired change to the selected parameter. The display brightness flashes slowly to indicate that a change has been made and requires confirmation
- When required push ENTER to action the change. The display will cease flashing
- Use the up-arrow [⋀] and SCROLL control to navigate to further menus

Note: The displayed menu brightness will flash slowly if confirmation of a change is required.

3.6 Card edge configuration

Menu tree



ARC-20MC Board edge menu structure

Tip: To reach the top menu push the [⋀] button repeatedly until a top menu is reached. Rotate the SCROLL control anti-clockwise until the STATUS menu appears.

Status menu

From the STATUS top menu press ENTER then SCROLL to access the status menu options.

	Menu	Comment
STATUS		
IP 625	Input video standard	The Input video standard is shown. ***IP 525, IP 625, IP Missing, IP Unknown.***
AudIP 1234	Input Embedded audio groups	Groups containing audio data present on the input video. ***IP Missing, 1234.*** '-' no audio group present.
AudOP 1234	Output audio groups present	Groups containing audio data present on the output video. ***IP Missing, 1234.*** '-' no audio group present.
Gp1Ch12 OK	Group 1 Ch1-2 Silence	Audio Group 1 channel 1 and 2 active. ***Gp1Ch12 OK, Gp1Ch12Sil, IP Missing.***
Gp1Ch34 OK	Group 1 Ch3-4 Silence	Audio Group 1 channel 3 and 4 active. ***Gp1Ch34 OK, Gp1Ch34Sil, IP Missing.***
Gp2Ch12 OK	Group 2 Ch1-2 Silence	Audio Group 2 channel 1 and 2 active. ***Gp2Ch12 OK, Gp2Ch12Sil, IP Missing.***
Gp2Ch34 OK	Group 2 Ch3-4 Silence	Audio Group 2 channel 3 and 4 active. ***Gp2Ch34 OK, Gp2Ch34Sil, IP Missing.***
Gp3Ch12 OK	Group 3 Ch1-2 Silence	Audio Group 3 channel 1 and 2 active. ***Gp3Ch12 OK, Gp3Ch12Sil, IP Missing.***
Gp3Ch34 OK	Group 3 Ch3-4 Silence	Audio Group 3 channel 3 and 4 active. ***Gp3Ch34 OK, Gp3Ch34Sil, IP Missing.***
Gp4Ch12 OK	Group 4 Ch1-2 Silence	Audio Group 4 channel 1 and 2 active. ***Gp4Ch12 OK, Gp4Ch12Sil, IP Missing.***
Gp4Ch34 OK	Group 4 Ch3-4 Silence	Audio Group 4 channel 3 and 4 active. ***Gp4Ch34 OK, Gp4Ch34Sil, IP Missing.***
Vid NotBlk	Input video status (Black)	Status of the input video. ***Vid Not Blk, Vid Black.***
Vid Frozen	Input video status (Frozen)	Status of the input video. ***Vid NotFro, Vid Frozen.***
S/W 1.3	Board software	The version number of the currently installed software.
Ser 652390	Serial number	The electronically stored PCB serial number.

ARC Control menu

From the STATUS top menu press ENTER then SCROLL to access the ARC Control menu options.

ARC CNTRL	Menu	Comment
S-S Anamor	SD ARC selection	Rotate the SCROLL/ADJ control to show the SD to SD aspect ratio selected. Press ENTER and rotate SCROLL/ADJ to make a new selection. ***S-S Anamor**, **S-S 16:9FS, S-S 14:9PB, S-S 4:3PBx, S-S 4:3FSc, S-S 14:9LB, S-S 16:9LB, S-S AutoAd, S-S Auto43, S-S Aut169**.*
SD ARC Dis	SD ARC bypass	Rotate the SCROLL/ADJ control to show the SD ARC bypass control. Press ENTER and rotate SCROLL/ADJ to make a new selection. ***SD ARC En, SD ARC Dis.***
Fbre IP Ds	Optical input enable	Rotate the SCROLL/ADJ control to show the optical input menu. Press ENTER and rotate ADJ to select. ***Fbre IP En, Fbre IP Dis.***
Fbre OP Ds	Optical output enable	Rotate the SCROLL/ADJ control to show the optical output menu. Press ENTER and rotate ADJ to select. ***Fbre OP En, Fbre OP Dis***
WSS Bl Dis	Wide Screen Signalling blanking control	Rotate the SCROLL/ADJ control to show the WSS blanking control. Press ENTER and rotate SCROLL/ADJ to make a new selection. ***WSS Bl Ena, WSS Bl Dis.***

Output aspect ratio

There are four fixed aspect ratios types which are: Anamorphic, Letterbox (14:9, 16:9), Pillarbox (4:3, 14:9) and centre cut. Anamorphic will map the input picture directly to the native aspect ratio of the viewing display along with the resulting distortion associated with this. Should it be necessary to view the output on a 4:3 display, setting the aspect ratio selection to Letterbox will give the correct picture dimensions by adding black bars to the top and bottom of the picture. 14:9 Letterbox will crop the picture to 87.5%, and depending on the aspect ratio of the display will either add black bars to the top and bottom or to both sides of the picture. There will be some loss of picture. Pillarbox will compress the picture to the centre part of the screen and add black bar to both sides. There may be a minimal picture loss depending on the selected video format. Centre cut will show the central 75% of a 16:9 widescreen picture mapped to the full monitor height or width with the corresponding loss of the left, right or bottom picture edges.

There also three auto modes available. When any of these is selected the actual aspect ratio selected will depend on the input video AFD. The AFD reader will also automatically set the output WSS when Wide Screen Signalling is set to auto. The effect of AFD varies depending on the conversion being done, with three auto modes. In these modes the conversion applied (and output AFD data) will depend on the input coded frame and AFD code, which may be presented as WSS, Video index or SMPTE 2016.

Auto 16:9: The output coded frame is fixed at 16:9. If the input coded frame is 16:9, there will be an Anamorphic conversion and the output AFD will follow the input AFD. If the input coded frame is 4:3 then AFD codes for undefined/reserved, 14:9 and full frame inputs will produce a Pillarbox output. AFD codes for 16:9 Letterbox inputs will produce a conversion to

a full frame output. **Auto 4:3:** The output coded frame is fixed at 4:3. If the input coded frame is 4:3, there will be an Anamorphic conversion and the output AFD will follow the input AFD. If the input coded frame is 16:9 then AFD codes for full frame and 14:9 inputs will produce a Letterbox output. AFD codes for a Pillarbox input will produce a conversion to a full screen output. **Auto Adaptive:** If the input coded frame is 16:9, a 4:3 Pillarbox AFD will produce a 4:3 full frame output, with appropriate Video index and/or WSS.

All other AFD values will cause an Anamorphic conversion and the output AFD will follow the input value. If the input coded frame is 4:3, a 16:9 Letterbox AFD will produce a 16:9 full frame output, with appropriate Video index and/or WSS. All other AFD values will cause an Anamorphic conversion and the output AFD will follow the input value

Response to SMPTE 2016 AFD SD codes

Incoming (SD) AFD value	Explanation	Auto 4:3 conversion (output WSS)	Auto adaptive Conversion (output WSS)
0, 8, 9, 13	Pillarbox 4:3	Letterbox (box 16:9 centre)	No change, as previous
2, 4, 10, 14, 15	Centre Cut 16:9	Letterbox (box 16:9 centre)	Anamorphic (full format 16:9)
3, 11	Pillarbox 14:9	Centre cut (full format 4:3)	Centre cut (full format 4:3)
Others	Anamorphic	Centre cut (full format 4:3)	No change, as previous
16:9	Anamorphic	Centre cut (full format 4:3)	No change, as previous

Note: Wide Screen Signalling must be set to Auto for the output WSS to be automatically set by the incoming AFD data.

SD ARC disable

Enabling the SD ARC disable control will set the ARC-20MC into bypass. In bypass mode the proc-amps will be disabled. AFD and WSS insertion will remain active.

Optical I/O

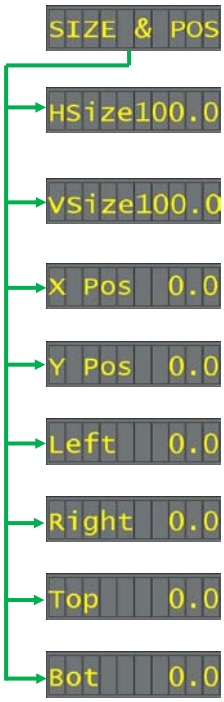
The ARC-20MC has the option of either receiving an optical input or transmitting an optical output once the necessary optical equipment has been fitted. If the optical receiver module is fitted, the fibre optic I/O input enable will allow the video input to be selected between the input BNC and the optical input. The input loop-through will show whichever of the inputs are selected so with an optical input, the input loop-through BNCs will give a reclocked output of the optical input. With the fibre transmitter module fitted, the optical output can also be enabled or disabled. The output BNCs remain active when the optical output is both enabled and disabled. When the optical output is fitted the number of electrical outputs will be reduced from five to four.

WSS blanking

A video signal containing wide screen signalling information on line 21, once aspect ratio converted, will have had what was previously line 21 moved into the screen, actually becoming the first active line of the video after the top border. As this line will then have become very visible, the wide screen blanking control allows this line to be blanked.

Size and position controls

Depending on the input format and selected output format there are up to seven fixed aspect ratios available. Each of these seven aspect ratios can be adjusted independently for picture size and position; the picture may also be cropped on all four edges. Once the controls are set they are automatically recalled whenever the particular aspect ratio is active.



Menu	Comment
Horizontal size	Rotate the SCROLL/ADJ control to show the horizontal size ratio control. Press ENTER and rotate ADJ to vary. 75***.0-125.0***.
Vertical size	Rotate the SCROLL/ADJ control to show the vertical size ratio control. Press ENTER and rotate ADJ to vary. 75***.0-125.0***.
X position	Rotate the SCROLL/ADJ control to show the vertical position control. Press ENTER and rotate ADJ to vary. ***-50.0% – +50.0%.***
Y position	Rotate the SCROLL/ADJ control to show the horizontal position control. Press ENTER and rotate ADJ to vary. ***-50.0% – +50.0%.***
Left side crop	Rotate the SCROLL/ADJ control to show the left-hand side crop control. Press ENTER and rotate ADJ to vary. ***0% – 100.0%.***
Right side crop	Rotate the SCROLL/ADJ control to show the right-hand side crop control. Press ENTER and rotate ADJ to vary. ***0% – 100.0%.***
Top crop	Rotate the SCROLL/ADJ control to show the top edge crop control. Press ENTER and rotate ADJ to vary. ***0% – 100.0%.***
Bottom crop	Rotate the SCROLL/ADJ control to show the bottom edge crop control. Press ENTER and rotate ADJ to vary. ***0% – 100.0%.***

AFD control

From the STATUS top menu press ENTER then SCROLL to access the AFD Control menu options.

Menu	Comment
SD output AFD mode	Rotate the SCROLL/ADJ control to show the SD output AFD mode selected. Press ENTER and rotate SCROLL/ADJ to make a new selection.
SD output AFD coded frame	Rotate the SCROLL/ADJ control to show the SD output AFD coded frame selected. Press ENTER and rotate SCROLL/ADJ to make a new selection. ***4:3, 16:9.***

AFD SD 8	SD output AFD code	Rotate the SCROLL/ADJ control to show the SD output AFD code selected. Press ENTER and rotate SCROLL/ADJ to make a new selection. ***code - 0 – code -15.***
AFD525 L12	525 AFD line select	Rotate the SCROLL/ADJ control to show the 525 AFD line select control. Press ENTER and rotate ADJ to select. ***Line 12, Line 13.***
AFD625 L10	625 AFD line select	Rotate the SCROLL/ADJ control to show the 625 AFD line select control. Press ENTER and rotate ADJ to select. ***Line 8, Line 9, Line 10.***
WSS Auto	Wide screen signalling control menu	Rotate the SCROLL/ADJ control to show the wide screen signalling insertion menu. Press ENTER and rotate ADJ to set WSS option. ***WSS Auto, WSS 4:3 FF, WSS 149LB, WSS 169LB, WSS 169FF, Blank, WSS Pass.***
VI Ins Aut	Video Indexing Inserter	Rotate the SCROLL/ADJ control to show the Video Index inserter mode control. Press ENTER and rotate ADJ to select. ***Auto, Manual (follow AFD), Blank, Pass.***

Output AFD

There are three sets of controls associated with Active Format Descriptor (AFD). These are: the inserter mode control, entire image aspect ratio selector (coded frame) and the group of 16 AFD codes.

The output has further controls to select the line to be inserted. There are separate controls for both 525-line and 625-line.

The 16 available codes are described in the following table

AFD code	Description	AFD code	Description
0	Undefined	8	Full Frame (as coded frame)
1	Reserved	9	4:3 centre
2	16:9 top	10	16:9 centre
3	14:9 top	11	16:9 centre
4	16:9+	12	Reserved for future use
5	Reserved	13	4:3 with shoot and protect 14:9 centre
6	Reserved	14	16:9 with shoot and protect 14:9 centre
7	Reserved	15	16:9 with shoot and protect 4:3 centre

Note: When inserting SMPTE 2016 data the inserter will blank any incoming SMPTE 2016 data.

Wide Screen Signalling

Output wide screen signalling can be set to automatically follow the input AFD data or be manually selected. If WSS data should be present on the input video this can either be passed to the output unchanged or substituted for a user-selected code. WSS data can also be set to be blanked. It is only possible to insert WSS information into a PAL output.

Out going WWS codes	Explanation	Conversion
0001	full format 4:3	Centre cut
1000	box 14:9 centre	Letterbox
1101	box 16:9 centre	Letterbox
1110	full format 16:9	Anamorphic

Video Indexing

Video indexing can also be inserted into the output video for use by downstream equipment. Output video indexing is enabled by selecting the required output aspect ratio. Although in most applications the output selection will mirror the conversion setting, the output video index control remains independent from the conversion setting, so that a user-specified aspect ratio can have assigned the most appropriate ratio information. It is also possible to either insert blank video index data or pass the input data to the output unchanged.

RGB and YUV lift and gain controls

From the STATUS top menu press ENTER then SCROLL to access the RGB and YUV lift and gain controls.

ARC-20MC's RGB and YUV lift and gain controls allow independent digital image adjustments in both the RGB and YUV domains, essential for maintaining colour fidelity.

PROC AMPS	Menu	Comment
RLift 0.0	R component lift	Rotate the SCROLL/ADJ control to show the R component lift control. Press ENTER and rotate ADJ to vary. ***-10.0% – +10.0%.***
RGain100.0	R component gain	Rotate the SCROLL/ADJ control to show the R component gain control. Press ENTER and rotate ADJ to vary. ***-80% – +120.0%***
GLift 0.0	G component lift	Rotate the SCROLL/ADJ control to show the G component lift control. Press ENTER and rotate ADJ to vary. ***-10.0% – 10.0%.***
GGain100.0	G component gain	Rotate the SCROLL/ADJ control to show the G component gain control.
BLift 0.0	B component lift	Rotate the SCROLL/ADJ control to show the B component lift control. Press ENTER and rotate ADJ to vary. ***-10.0% – +10.0%.***
BGain100.0	B component gain	Rotate the SCROLL/ADJ control to show the B component gain control.
YLift 0.0	Y component lift	Rotate the SCROLL/ADJ control to show the Y component lift control. Press ENTER and rotate ADJ to vary. ***-10.0% – +10.0%.***
YGain100.0	Y component gain	Rotate the SCROLL/ADJ control to show the Y component gain control.
ULift 0.0	U component lift	Rotate the SCROLL/ADJ control to show the U component lift control. Press ENTER and rotate ADJ to vary. ***-10.0% – +10.0%.***
UGain100.0	U component gain	Rotate the SCROLL/ADJ control to show the U component gain control.

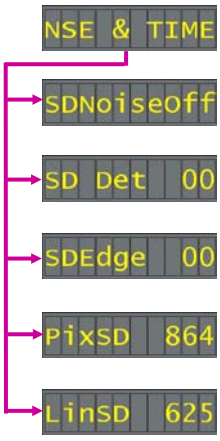
V component lift	Rotate the SCROLL/ADJ control to show the V component lift control. Press ENTER and rotate ADJ to vary. ***-10.0% – +10.0%.***
V component gain	Rotate the SCROLL/ADJ control to show the V component gain control.
Picture border Luma control	Rotate the SCROLL/ADJ control to show the picture border Luma adjustment. Press ENTER and rotate SCROLL/ADJ to adjust. ***Bord 0.0-100.0.***

Border Luma control

This control varies the Luma level of the picture border if present, to be adjusted from zero giving a black border to 100% white.

Noise reduction, detail enhancement and delay menu

From the STATUS top menu press ENTER then SCROLL to access the noise reduction and delay controls.



Menu	Comment
SD Noise Reduction	Rotate the SCROLL/ADJ control to show the SD noise reduction control.
SD Detail Enhancement	Rotate the SCROLL/ADJ control to show the SD Detail Enhancement control. Press ENTER and rotate ADJ to vary. ***-50% – +50.0%.***
SD Edge Enhancement	Rotate the SCROLL/ADJ control to show the SD Edge Enhancement control. Press ENTER and rotate ADJ to vary. ***-50% – +50.0%.***
SD Pixel Delay	Rotate the SCROLL/ADJ control to show the SD delay in pixels menu. Press ENTER and rotate ADJ to set the delay in pixels. ***-864-0-+864.***
SD Line Delay	Rotate the SCROLL/ADJ control to show the SD delay in lines menu. Press ENTER and rotate ADJ to set the delay in lines. ***-625-0-+625.***

Note: The maximum variable delay in line and pixels is one frame in all video standards.

Noise reduction

ARC-20MC is able to detect and remove mosquito noise, a common compression artefact caused by MPEG decoders and which is often exhibited as a cloud around the edges of text and computer generated graphics. Algorithms within the ARC-20MC detect areas where mosquito noise would be the most likely to occur and then work to diminish the mosquito noise without blurring the edge of the text or graphics.

Edge detail and detail enhancement

Fine Detail and Edge Enhancement is a video processing technology that increases the sharpness or detail of images. It is especially useful when Standard Definition video is scaled to fit high resolution displays.

ARC-20MC's fine detail and edge enhancement uses a technique known as 'unsharp mask'. This is a superior method of enhancing images that does not introduce ringing. ARC-20MC enhances images both horizontally and vertically.

Two types of enhancement are provided, one for fine detail and one for object edges. Fine detail enhancement applies sharpening to the entire image. Edge enhancement applies sharpening only to object edges. Both detail enhancement and edge enhancement produce similar results, but there are subtle differences. Fine detail enhancement works best when the source is 'clean' and free from noise. Edge enhancement works well for less pristine sources. It produces a sharpening effect without making noise more visible.

Note: Noise reduction, detail enhancement and edge enhancement controls are not active in bypass mode.

Delay

The ARC-20MC has separate delay controls giving up to two frames of delay adjustable in both lines and pixels. With controls set to zero the delay with respect to the input will be one frame. By increasing the delay in the positive direction, up to two frames will be achieved. Setting the delay controls to a negative value will give a delay of less than one frame until a minimum delay is reached; this minimum delay is one frame less 16 lines. Any further negative delay setting will cause the delay to jump to two frames less the dialled delay number. A negative delay value will also cause the Delay less than a frame LED to illuminate.

Alarms menu

There are two GPI outputs reserved for alarm indication – GPO5 and GPO6, which may have assigned to them any of the 12 video and audio alarms.

Any number of alarms may be assigned to each GPI output. All but input present can be assigned a delay timer to delay the time after which an alarm is asserted. This ability is especially useful to prevent false alarming during quiet periods in the audio or brief pauses in the video programme.

Where more than one alarm is flagged and an alarm condition is asserted, use the various status indicators to determine the exact cause. Visual indication of GPO5 and GPO6 status is provided on the board edge.

See Section 2.3 for further discussion of GPIs and pinout details.

	Menu	Comment
ALARMS		
IP Miss --	Input missing alarm	Rotate the SCROLL/ADJ control to show the input missing alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.
Vid Blk --	Video black alarm	Rotate the SCROLL/ADJ control to show the video black alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.
Vid Fro --	Video frozen alarm	Rotate the SCROLL/ADJ control to show the video frozen alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.

AudMiss --	Audio missing alarm	Rotate the SCROLL/ADJ control to show the audio missing alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.
slG1Ch12--	Group l channel 1-2 silent	Rotate the SCROLL/ADJ control to show the group l channel 1-2 silent alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.
slG1Ch34--	Group l channel 3-4 silent	Rotate the SCROLL/ADJ control to show the group l channel 3-4 silent alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.
slG2Ch12--	Group 2 channel 1-2 silent	Rotate the SCROLL/ADJ control to show the group 2 channel 1-2 silent alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.
slG2Ch34--	Group 2 channel 3-4 silent	Rotate the SCROLL/ADJ control to show the group 2 channel 3-4 silent alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.
slG3Ch12--	Group 3 channel 1-2 silent	Rotate the SCROLL/ADJ control to show the group 3 channel 1-2 silent alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.
slG3Ch34--	Group 3 channel 4-3 silent	Rotate the SCROLL/ADJ control to show the group 3 channel 3-4 silent alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.
slG4Ch12--	Group 4 channel 1-2 silent	Rotate the SCROLL/ADJ control to show the group 4 channel 1-2 silent alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.
slG4Ch34--	Group 4 channel 4-3 silent	Rotate the SCROLL/ADJ control to show the group 4 channel 3-4 silent alarms. Press ENTER and rotate SCROLL/ADJ to select the alarm option. ***-6, 5-, 56, --.*** '-' alarm not asserted.
BlkDel 1	Picture black delay interval	Rotate the SCROLL/ADJ control to show the black delay interval control. Press ENTER and rotate SCROLL/ADJ to adjust the delay in seconds. ***(0-40 seconds).***
FroDel 1	Picture frozen delay interval	Rotate the SCROLL/ADJ control to show the frozen delay interval control. Press ENTER and rotate SCROLL/ADJ to adjust the delay in seconds. ***(0-40 seconds).***
AudDel 10	Audio channel silence delay interval	Rotate the SCROLL/ADJ control to show the audio silent delay interval control. Press ENTER and rotate SCROLL/ADJ to adjust the delay in seconds. ***(0-120 seconds).***
PSave 1	Save preset control	Rotate the SCROLL/ADJ control to show the preset save menu. Press ENTER and rotate SCROLL/ADJ to select the location to save to. Press ENTER to action. ***1-16.***
PRecall 1	Recall preset control	Rotate the SCROLL/ADJ control to show the preset recall menu. Press ENTER and rotate SCROLL/ADJ to select the location to recall from. Press ENTER to action. ***1-16.***

GPI Disble	Enable GPI control of presets	Selecting ENABLE allows the recall of previously saved user configurations via GPI inputs 1-4. ***Enable, Disable.***
Reset	Factory reset	Rotate the SCROLL/ADJ control to show the factory reset menu. Press ENTER to action.
Defaults	Factory defaults	Rotate the SCROLL/ADJ control to show the defaults menu. Press ENTER to action.

Note: With delay controls set to their minimum there will remain a small delay to prevent false triggering.

Silence detect delay

The silence detect delay can be set from 0 to 120 seconds for the amount of time a signal is allowed to remain below -56dB, with respect to Full Scale, before a silence error is flagged. To prevent false alarms during quiet passages there is a minimum delay period of approximately four seconds in which silence must be maintained before the delay timer is initiated.

Note: The minimum delay will become significant at short delay settings.

Video frozen and black delay

A picture is considered frozen when a frame is identical to the previous frame. If this condition is met consistently for the period of time set by the video frozen delay control, a video frozen error will be flagged.

Video black is defined as values in the range of 58 to 70 around digital black (approx +/- 5mV). If digital black is present for longer than the delay time set by the video black delay control, a video black error will be flagged.

Note: Press the cal button at any time to reset the timer delays to their default values.

Preset menu and factory reset

Up to 16 user-defined configurations may be stored and recalled either from the board control, active front panel, Statesman or through the use of external GPIs. Presets store the board setup data including operating mode card status. The presets are numbered 1-16.

Note: Take care when storing presets that the desired config is not changed by an external input prior to saving.

Saving and recalling presets

The current board settings can be saved in one of 16 locations to be recalled as desired. This allows the user to store and recall up to 16 different configurations for later use.

To save the current settings, select the preset location and press Enter. This will write the current settings into this location.

Note: If the selected location contains previously saved setting information it will be over-written by the new setting data.

To recall previously stored setting information, again select the selected location and press Enter to recall the stored configuration.

The recalling of previously stored presets can also be implemented externally via the GPI port. To sanction this facility, enable the GPI controls preset recall box.

Factory reset

The user has the choice of performing a total factory reset or a partial reset. Factory Reset will return all parameters to their factory default values and erase all user-stored configuration presets. Selecting the Defaults option will perform the same reset to factory default values but will leave any user-stored configurations unaffected.

Note: Factory reset will erase all user-stored presets

Parameter	Default value
Fibre Optic I/O	Unselected
Aspect ratio	Anamorphic
Output AFD	Auto, 8-Full Frame 525 line 12 & 275, 625 line 8 & 321
Coded Frame	4:3
WSS and Video indexing	Auto
WSS blanking	Unchecked
H and V Size	100%
Position and Crop	0
Border Luma	0 (Black)
Proc-amp lift (all)	0
Proc-amp gain (all)	100
GPO alarms	Unchecked
Noise and Detail enhance	Off & 0
Alarm delay video black	1
Alarm delay video frozen	1
Alarm delay audio silence	10 seconds
Video delay	Frame delay, Pixels 0, Lines 0
Bypass	Unchecked
Presets	Set to Preset 1 and all contents erased
GPI Enable	Not enabled

4 Using the front control panel

4.1 Module selection

This operational guide assumes that the panel has been set up according to the panel setup procedure described in the Crystal Vision Control Panel manual.

Note: It is **ESSENTIAL** that the panel setup procedure is followed and any old or unknown passwords cleared prior to using the panel for the first time.

At power up all eight control panel keys LEDs will illuminate briefly. Once the panel has completed its power up and configuration sequence the panel will enter its status mode showing the current software version and frame IP address. Pressing the Device key followed by the Home key will return to this screen.

Active control panel Home screen

To continue with control panel operation or configuration, press the Device key once.

The control panel will display the name of the card that first responds to the polling request together with its location number.

The location number consists of the frame number plus the card position in the frame. Rotate the Shaft control to poll through the available cards.

Use the F2 soft key to toggle between the card's serial number and issue number with modification level.

Available Cards

To select the card being displayed press the ENTER key.

Note: Please refer to the Crystal Vision Control Panel manual for details of the Panel Set up and Diagnostic menus.

Selecting an ARC-20MC

Once selected the display will show the ARC-20MC's home menu and illuminate the active function keys. Press any active function key to enter the indicated sub-menu.

The ARC-20MC Home menu

Updating the display

The values displayed on an active front panel are only updated when an adjustment is made and when changing menu level. If changes occur through the use of card edge controls or other remote control, the text displayed on the active front panel will not be updated immediately. If necessary, use the upward arrow to leave and then re-enter a menu to update the display.

4.2 The ARC-20MC active panel menu structure

At any time the main top-level menu (Home) is obtained by pressing the HOME key. From the Home menu further selections can be made. Active function keys are indicated by illuminated, integrated LEDs.

The main top-level menus for the ARC-20MC are obtained by pressing the F1- F4 keys from the Home menu. Menu keys are illuminated when active and when further menus are available.

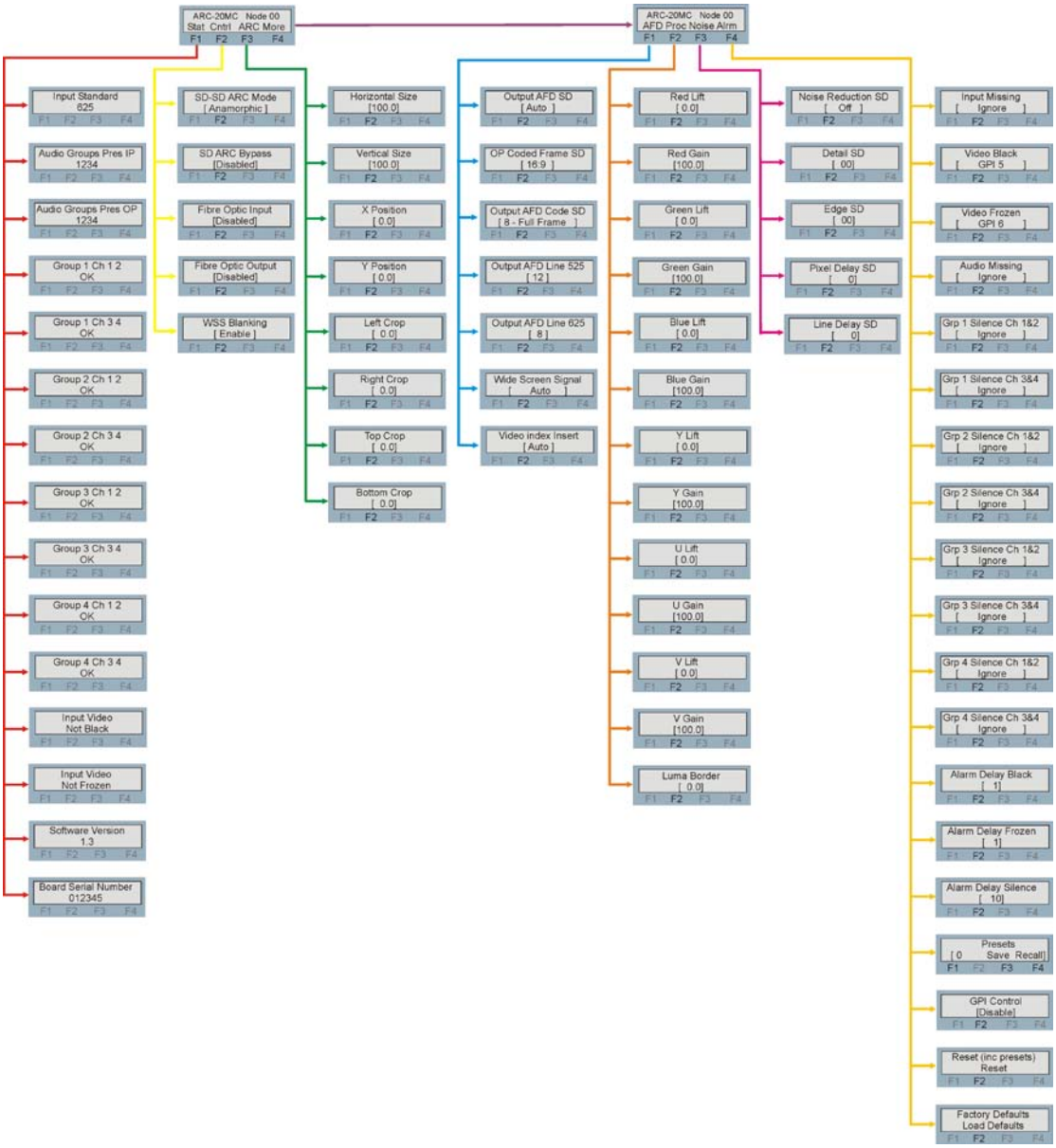
The top-level menus are:

- Status – Press F1
- Control – Press F2
- ARC (Size, position and crop) – Press F3
- More selections – Press F4
    - AFD – Press F1
    - Proc-amp – Press F2
    - Noise (Noise reduction, detail and edge enhancement) – Press F3
    - Preset (Alarms, User presets and factory reset) – Press F4

When a sub menu has been selected, further options may be obtained by using the Shaft control to scroll through them. Once the desired option has been located, a selection or value change can be made by either toggling the appropriate function key or by selecting and using the shaft control to alter a numerical value. A configuration change or value will be activated as the shaft control is rotated or function button is toggled. The variable being adjusted will appear in brackets. If the variable updates in real time it will be contained within square brackets [letter box] or if the change needs to be accepted, angular brackets will be used <CVBS>. Pressing Enter will fix the new value.

The following chart shows the available ARC-20MC menus. The actual menus available may vary slightly as software is updated.

Active control panel menus

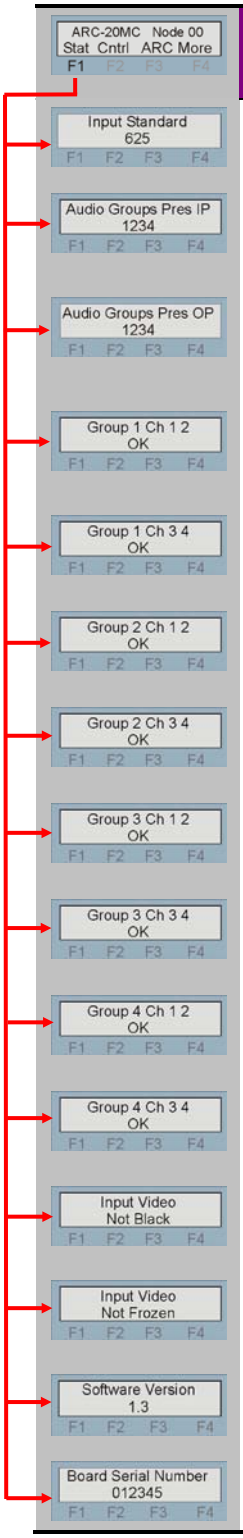


Note: Function key LEDs are illuminated when active.

The Status menu

Pressing button F1 from the Home menu will enter the Status menu. This menu is traversed by rotating the shaft control. No changes can be made from this read only menu.

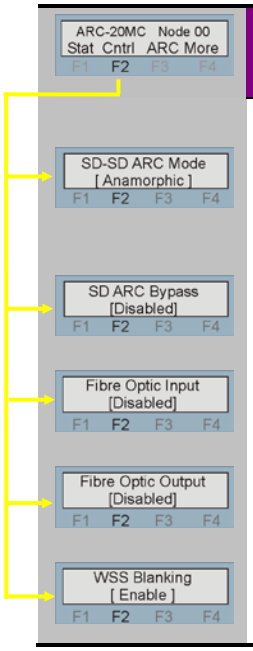
Note: Not all status information will be updated in real time. Press the * button to update.



Menu	Description
Input standard	Rotate the shaft control to view the input standard. ***PAL, NTSC, Input Missing.***
Audio groups available on video input	Rotate the shaft control to view the embedded audio groups present on the input video. Groups = ***1,2,3,4, Input Missing. '-'*** group not present.
Audio groups re-embedded at the output	Rotate the shaft control to view the embedded audio groups present on the output video. Groups = ***1,2,3,4, Input Missing. '-'*** group not present.
Audio groups 1 channel 1 & 2 status	Rotate the shaft control to view the audio group 1 channel 1 & 2 status. ***OK, Silent, Input Missing.***
Audio groups 1 channel 3 & 4 status	Rotate the shaft control to view the audio group 1 channel 3 & 4 status. ***OK, Silent, Input Missing.***
Audio groups 2 channel 1 & 2 status	Rotate the shaft control to view the audio group 2 channel 1 & 2 status. ***OK, Silent, Input Missing.***
Audio groups 2 channel 3 & 4 status	Rotate the shaft control to view the audio group 2 channel 3 & 4 status. ***OK, Silent, Input Missing.***
Audio groups 3 channel 1 & 2 status	Rotate the shaft control to view the audio group 3 channel 1 & 2 status. ***OK, Silent, Input Missing.***
Audio groups 3 channel 3 & 4 status	Rotate the shaft control to view the audio group 3 channel 3 & 4 status. ***OK, Silent, Input Missing.***
Audio groups 4 channel 1 & 2 status	Rotate the shaft control to view the audio group 4 channel 1 & 2 status. ***OK, Silent, Input Missing.***
Audio groups 4 channel 3 & 4 status	Rotate the shaft control to view the audio group 4 channel 3 & 4 status. ***OK, Silent, Input Missing.***
Input video status (Black)	Rotate the shaft control to view the input video status. ***Active, Black.***
Input video status (Frozen)	Rotate the shaft control to view the input video status. ***Active, Frozen.***
Software version	Fitted software level.
PCB serial number	Electronically stored board serial number.

The control menu

Press F2 from the Home menu and rotate the shaft control to view the control menu.



Menu	Description
SD ARC selection	Rotate the shaft control to view the SD aspect ratio menu. Press F2 and rotate the shaft control to make the selection. ***Anamorphic, 16:9 Full Screen, 14:9 Pillarbox, 4:3 Pillarbox, 4:3 Full Screen, 14:9 Letterbox, 16:9 Letterbox, Auto Adaptive, Auto 4:3, Auto 16:9.***
SD bypass control	Rotate the shaft control to view the bypass control menu. Press F2 and rotate the shaft control to make the selection. ***Enable, Disable.***
Optical input enable	Rotate the shaft control to view the fibre input select menu. Press F2 and rotate the shaft control to make the selection. ***Enable, Disable.***
Optical output enable	Rotate the shaft control to view the fibre output select menu. Press F2 and rotate the shaft control to make the selection. ***Enable, Disable.***
Wide Screen Signalling blanking	Rotate the shaft control to view the WSS blanking select menu. Press F2 and rotate the shaft control to make the selection. ***Enable, Disable.***

Output aspect ratio

There are four fixed aspect ratios types which are: Anamorphic, Letterbox (14:9, 16:9), Pillarbox (4:3, 14:9) and centre cut. Anamorphic will map the input picture directly to the native aspect ratio of the viewing display along with the resulting distortion associated with this. Should it be necessary to view the output on a 4:3 display, setting the aspect ratio selection to Letterbox will give the correct picture dimensions by adding black bars to the top and bottom of the picture. 14:9 Letterbox will crop the picture to 87.5%, and depending on the aspect ratio of the display will either add black bars to the top and bottom or to both sides of the picture. There will be some loss of picture. Pillarbox will compress the picture to the centre part of the screen and add black bar to both sides. There may be a minimal picture loss depending on the selected video format. Centre cut will show the central 75% of a 16:9 widescreen picture mapped to the full monitor height or width with the corresponding loss of the left, right or bottom picture edges.

There also three auto modes available. When any of these is selected the actual aspect ratio selected will depend on the input video AFD. The AFD reader will also automatically set the output WSS when Wide Screen Signalling is set to auto.

The effect of AFD varies depending on the conversion being done, with three auto modes. In these modes the conversion applied (and output AFD data) will depend on the input coded frame and AFD code, which may be presented as WSS, Video index or SMPTE 2016.

Auto 16:9: The output coded frame is fixed at 16:9. If the input coded frame is 16:9, there will be an Anamorphic conversion and the output AFD will follow the input AFD. If the input coded frame is 4:3 then AFD codes for undefined/ reserved, 14:9 and full frame inputs will produce a Pillarbox output. AFD codes for 16:9 Letterbox inputs will produce a conversion to a full frame output. **Auto 4:3:** The output coded frame is fixed at 4:3. If the input coded frame is 4:3, there will be an Anamorphic conversion and the output AFD will follow the input AFD.

If the input coded frame is 16:9 then AFD codes for full frame and 14:9 inputs will produce a Letterbox output. AFD codes for a Pillarbox input will produce a conversion to a full screen output. **Auto Adaptive:** If the input coded frame is 16:9, a 4:3 Pillarbox AFD will produce a 4:3 full frame output, with appropriate Video index and/or WSS.

All other AFD values will cause an Anamorphic conversion and the output AFD will follow the input value. If the input coded frame is 4:3, a 16:9 Letterbox AFD will produce a 16:9 full frame output, with appropriate Video index and/or WSS. All other AFD values will cause an Anamorphic conversion and the output AFD will follow the input value

Response to SMPTE 2016 AFD SD codes

Incoming (SD) AFD value	Explanation	Auto 4:3 conversion (output WSS)	Auto adaptive Conversion (output WSS)
0, 8, 9, 13	Pillarbox 4:3	Letterbox (box 16:9 centre)	No change, as previous
2, 4, 10, 14, 15	Centre Cut 16:9	Letterbox (box 16:9 centre)	Anamorphic (full format 16:9)
3, 11	Pillarbox 14:9	Centre cut (full format 4:3)	Centre cut (full format 4:3)
Others	Anamorphic	Centre cut (full format 4:3)	No change, as previous
16:9	Anamorphic	Centre cut (full format 4:3)	No change, as previous

Note: Wide Screen Signalling must be set to Auto for the output WSS to be automatically set by the incoming AFD data.

SD ARC disable

Enabling the SD ARC disable control will set the ARC-20MC to bypass mode. In bypass mode the proc-amps will be disabled. AFD and WSS insertion will remain active.

Optical I/O

The ARC-20MC has the option of either receiving an optical input or transmitting an optical output once the necessary optical equipment has been fitted. If the optical receiver module is fitted, the fibre optic I/O input enable will allow the video input to be selected between the input BNC and the optical input. The input loop-through will show whichever of the inputs are selected so with an optical input the input loop-through BNC will give a reclocked output of the optical input.

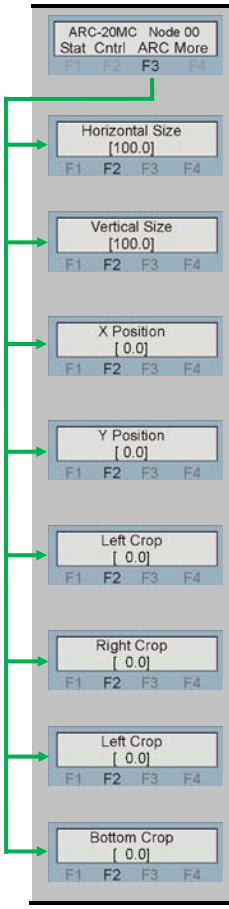
With the fibre transmitter module fitted, the optical output can also be enabled or disabled. The output BNCs remain active when the optical output is both enabled and disabled. When the optical output is fitted the number of outputs will be reduced from five to four.

WSS blanking

A video signal containing wide screen signalling information on line 21, once aspect ratio converted, will have had what was previously line 21 moved into the screen, actually becoming the first active line of the video after the top border. As this line will then have become very visible, the wide screen blanking control allows this line to be blanked.

ARC size and position controls

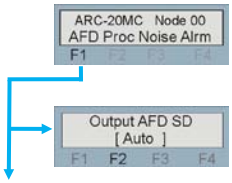
Depending on the input format and selected output format there are up to seven fixed aspect ratios available. Each of these seven aspect ratios can be adjusted independently for picture size and position; the picture may also be cropped on all four edges. Once the controls are set they are automatically recalled whenever the particular aspect ratio is active.



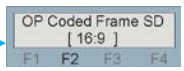
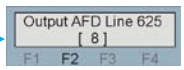
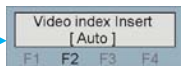
Menu	Description
Horizontal size adjustment	Press F2 to select and rotate the shaft control to adjust the picture's horizontal size. 75***.0-125.0.***
Vertical size adjustment	Press F2 to select and rotate the shaft control to adjust the picture's vertical size. 75***.0-125.0.***
X position adjustment	Press F2 to select and rotate the shaft control to adjust the picture's horizontal position. ***-50.0% – +50.0%.***
Y position adjustment	Press F2 to select and rotate the shaft control to adjust the picture's vertical position. ***-50.0% – +50.0%.***
Left side crop	Press F2 to select and rotate the shaft control to crop the left edge of the picture. ***0-100%.***
Right side crop	Press F2 to select and rotate the shaft control to crop the right edge of the picture. ***0-100%.***
Top edge crop	Press F2 to select and rotate the shaft control to crop the top edge of the picture. ***0-100%.***
Bottom edge crop	Press F2 to select and rotate the shaft control to crop the bottom edge of the picture. ***0-100%.***

AFD control

From the Home top menu press F4 (More) then F1 and SCROLL to access the AFD Control menu options.



Menu	Comment
SD output AFD mode	Rotate the shaft control to view the SD output AFD mode menu. Press F2 and rotate the shaft control to select. ***Auto, Manual, Blank, Pass.***

	SD output AFD coded frame	Rotate the shaft control to view the SD output AFD coded frame menu. Press F2 and rotate the shaft control to select. ***4:3, 16:9.***
	SD output AFD code	Rotate the shaft control to view the HD output AFD code menu. Press F2 and rotate the shaft control to select. ***code 0 – code 15. See table.***
	525 AFD line select	Rotate the shaft control to view the 525 AFD line select control menu. Press F2 and rotate the shaft control to select lines. ***11, 12.***
	625 AFD line select	Rotate the shaft control to view the 625 AFD line select control menu. Press F2 and rotate the shaft control to select lines. ***08, 09, 10.***
	Wide Screen Signalling insertion	Rotate the shaft control to view the Wide Screen Signalling insertion menu. Press F2 and rotate the shaft control to select. ***Auto, Full Frame 4:3, Letterbox 14:9, Letterbox 16:9, Full Frame 16:9, Blank, Pass.***
	Video Indexing inserter	Rotate the shaft control to view the Video Indexing inserter menu. Press F2 and rotate the shaft control to select. ***Auto, Manual (follow AFD), Blank, Pass.***

Output AFD

There are three sets of controls associated with Active Format Descriptor (AFD). These are: the inserter mode control, entire image aspect ratio selector (coded frame) and the group of 16 AFD codes.

The output has further controls to select the line to be inserted. There are separate controls for both 525-line and 625-line.

The 16 available codes are described in the following table

AFD code	Description	AFD code	Description
0	Undefined	8	Full Frame (as coded frame)
1	Reserved	9	4:3 Centre
2	16:9 top	10	16:9 centre
3	14:9 top	11	16:9 centre
4	16:9+	12	Reserved for future use
5	Reserved	13	4:3 with shoot and protect 14:9 centre
6	Reserved	14	16:9 with shoot and protect 14:9 centre
7	Reserved	15	16:9 with shoot and protect 4:3 centre

Note: When inserting SMPTE 2016 data the inserter will blank any incoming SMPTE 2016 data.

Wide Screen Signalling

Output wide screen signalling can be set to automatically follow the input AFD data or be manually selected. If WSS data should be present on the input video this can either be passed to the output unchanged or substituted for a user-selected code. WSS data can also be set to be blanked. It is only possible to insert WSS information into a PAL output.

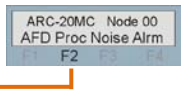
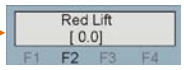
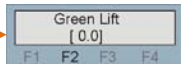
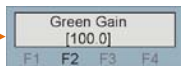
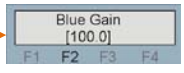
Out going WWS codes	Explanation	Conversion
0001	full format 4:3	Centre cut
1000	box 14:9 centre	Letterbox
1101	box 16:9 centre	Letterbox
1110	full format 16:9	Anamorphic

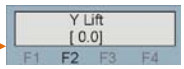
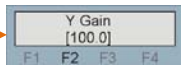
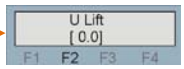
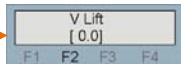
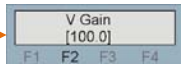
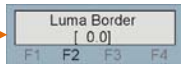
Video Indexing

Video indexing can also be inserted into the output video for use by downstream equipment. Output video indexing is enabled by selecting the required output aspect ratio. Although in most applications the output selection will mirror the conversion setting, the output video index control remains independent from the conversion setting, so that a user-specified aspect ratio can have assigned the most appropriate ratio information. It is also possible to either insert blank video index data or pass the input data to the output unchanged.

RGB and YUV lift and gain controls

ARC-20MC's RGB and YUV lift and gain controls allow independent digital image adjustments in both the RGB and YUV domains, essential for maintaining colour fidelity. Press F4 (More) then F2 from the Home menu and rotate the shaft control to view the proc-amp controls menu.

	Menu	Comment
		
	R component lift	Rotate the shaft control to view the red component lift control menu. Press F2 and rotate the shaft control to adjust. ***-10.0% – +10.0%.***
	R component gain	Rotate the shaft control to view the red component gain control menu. Press F2 and rotate the shaft control to adjust. ***-80% – +120.0%.***
	G component lift	Rotate the shaft control to view the green component lift control menu. Press F2 and rotate the shaft control to adjust. ***-10.0% – +10.0%.***
	G component gain	Rotate the shaft control to view the green component gain control menu. Press F2 and rotate the shaft control to adjust. ***-80% – +120.0%.***
	B component lift	Rotate the shaft control to view the blue component lift control menu. Press F2 and rotate the shaft control to adjust. ***-10.0% – +10.0%.***
	B component gain	Rotate the shaft control to view the blue component gain control menu. Press F2 and rotate the shaft control to adjust. ***-80% – +120.0%.***

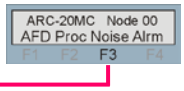
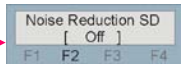
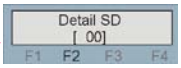
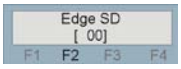
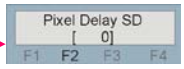
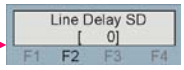
	Y component lift	Rotate the shaft control to view the Y component lift control menu. Press F2 and rotate the shaft control to adjust. ***-10.0% – +10.0%.***
	Y component gain	Rotate the shaft control to view the Y component gain control menu. Press F2 and rotate the shaft control to adjust. ***-80% – +120.0%.***
	U component lift	Rotate the shaft control to view the U component lift control menu. Press F2 and rotate the shaft control to adjust. ***-10.0% – +10.0%.***
	U component gain	Rotate the shaft control to view the U component gain control menu. Press F2 and rotate the shaft control to adjust. ***-80% – +120.0%.***
	V component lift	Rotate the shaft control to view the V component lift control menu. Press F2 and rotate the shaft control to adjust. ***-10.0% – +10.0%.***
	V component gain	Rotate the shaft control to view the V component gain control menu. Press F2 and rotate the shaft control to adjust. ***-80% – +120.0%.***
	Border Luma control	Rotate the shaft control to view the V component gain control menu. Press F2 and rotate the shaft control to adjust. ***0% – +100.0%.***

Border Luma control

This control varies the Luma level of the picture border, if present, to be adjusted from zero giving a black border to 100% white.

Noise reduction, detail enhancement and delay menu

From the Home top menu press F4 (More) then F3 and SCROLL to access the noise reduction, edge and detail enhancement, and delay menu options.

	Menu	Comment
		
	SD Noise Reduction	Rotate the shaft control to view the SD Noise Reduction control menu. Press F2 and rotate the shaft control to adjust. ***Off, Low, Medium, High.***
	SD Detail Enhancement	Rotate the shaft control to view the SD Detail Enhancement control menu. Press F2 and rotate the shaft control to adjust. ***-50% – +50%.***
	SD Edge Enhancement	Rotate the shaft control to view the SD Edge Enhancement control menu. Press F2 and rotate the shaft control to adjust. ***-50% – +50%.***
	SD Delay in pixels	Rotate the shaft control to view the SD Delay in pixels menu. Press F2 and rotate the shaft control to adjust. ***-864 – +864.***
	SD delay in lines	Rotate the shaft control to view the SD delay in lines menu. Press F2 and rotate the shaft control to adjust. ***-625 – +625.***

Note: The maximum variable delay in line and pixels is one frame in all video standards.

Noise reduction

ARC-20MC is able to detect and remove mosquito noise, a common compression artefact caused by MPEG decoders which is often exhibited as a cloud around the edges of text and computer generated graphics. Algorithms within the ARC-20MC detect areas where mosquito noise would be the most likely to occur and then work to diminish the mosquito noise without blurring the edge of the text or graphics.

Edge detail and detail enhancement

Fine Detail and Edge Enhancement is a video processing technology that increases the sharpness or detail of images. It is especially useful when Standard Definition video is scaled to fit high resolution displays.

ARC-20MC's fine detail and edge enhancement uses a technique known as 'unsharp mask'. This is a superior method of enhancing images that does not introduce ringing. ARC-20MC enhances images both horizontally and vertically.

Two types of enhancement are provided, one for fine detail and one for object edges. Fine detail enhancement applies sharpening to the entire image. Edge enhancement applies sharpening only to object edges. Both detail enhancement and edge enhancement produce similar results, but there are subtle differences. Fine detail enhancement works best when the source is 'clean' and free from noise. Edge enhancement works well for less pristine sources. It produces a sharpening effect without making noise more visible.

Note: Noise reduction, detail enhancement and edge enhancement control are not active in bypass mode.

Delay

The ARC-20MC has separate delay controls giving up to two frames of delay adjustable in both lines and pixels. With controls set to zero, the delay with respect to the input will be one frame. By increasing the delay in the positive direction, up to two frames will be achieved. Setting the delay controls to a negative value will give a delay of less than one frame until a minimum delay is reached; this minimum delay is one frame less 16 lines. Any further negative delay setting will cause the delay to jump to two frames less the dialled delay number. A negative delay value will also cause the 'delay less than a frame' LED to illuminate.

The Alarms menu

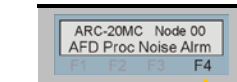
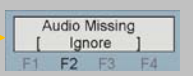
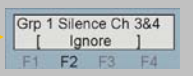
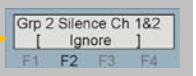
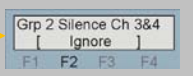
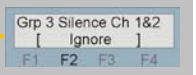
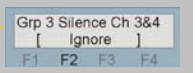
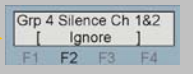
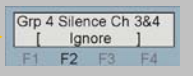
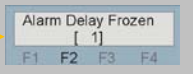
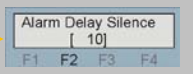
There are two GPI outputs reserved for alarm indication – GPO5 and GPO6, which may have assigned to them any of the 12 video and audio alarms.

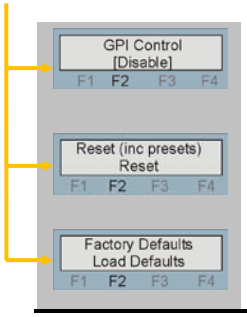
Any number of alarms may be assigned to each GPI output. All but input present can be assigned a delay timer to delay the time after which an alarm is asserted. This ability is especially useful to prevent false alarming during quiet periods in the audio or brief pauses in video programmes.

Where more than one alarm is flagged and an alarm condition is asserted, use the various status indicators to determine the exact cause.

Visual indication of GPO5 and GPO6 status is provided on the board edge.

See Section 2.3 for further discussion of GPIs and pinout details.

	**Menu**	**Description**
	Input present alarm	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6.***
	Input video black	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6.***
	Input video frozen	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6.***
	Audio on input missing	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6.***
	Group l channel 1-2 silent	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6.***
	Group l channel 3-4 silent	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6.***
	Group 2 channel 1-2 silent	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6..***
	Group 2 channel 3-4 silent	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6.***
	Group 3 channel 1-2 silent	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6.***
	Group 3 channel 3-4 silent	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6.***
	Group 4 channel 1-2 silent	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6.***
	Group 4 channel 3-4 silent	Press F2 to select and rotate the shaft control to select alarm option. ***Ignore, GPI5, GPI6, GPI5 & GPI6.***
	Video black delay setting	Press F2 to select and rotate the shaft control to set the delay time. ***0-40sec.***
	Video frozen delay setting	Press F2 to select and rotate the shaft control to set the delay time. ***0-40sec.***
	Audio silence delay setting	Press F2 to select and rotate the shaft control to set the delay time. ***0-120sec.***
	Save and recall Presets 1-16	Rotate the shaft control to view the presets menu. Press F1 and rotate the shaft control to find the required preset location. Press F3 the save the current board set up. Press F4 to recall a previously save board set up.



Enable GPI control of presets	Rotate the shaft control to view the GPI control menu. To enable GPI control press F2 rotate the shaft control to toggle. Enable, Disable.
Factory reset	Rotate the shaft control to show factory reset. Press F2 to select and press F3 to confirm.
Factory defaults	Rotate the shaft control to show factory defaults. Press F2 to select and press F3 to confirm.

Note: With delay controls set to their minimum there will remain a small delay to prevent false triggering.

Silence detect delay

The silence detect delay can be set from 0 to 120 seconds for the amount of time a signal is allowed to remain below -56dB, with respect to Full Scale, before a silence error is flagged. To prevent false alarms during quiet passages there is a minimum delay period of approximately four seconds in which silence must be maintained before the delay timer is initiated.

Note: The minimum delay will become significant at short delay settings.

Video frozen and black delay

A picture is considered frozen when a frame is identical to the previous frame. If this condition is met consistently for the period of time set by the video frozen delay control, a video frozen error will be flagged.

Video black is defined as values in the range of 58 to 70 around digital black (approx +/- 5mV). If digital black is present for longer than the delay time set by the video black delay control, a video black error will be flagged.

Note: Press the cal button at anytime to reset the timer delays to their default values.

Preset menu and factory reset

Up to 16 user-defined configurations may be stored and recalled either from the board control, active front panel, Statesman or through the use of external GPIs. Presets store the board setup data including operating mode card status. The presets are 1 to 16.

Note: Care should be taken when storing presets that the desired configuration is not changed by any external input prior to saving.

Saving and recalling presets

The current board settings can be saved in one of 16 locations to be recalled as desired. This allows the user to store and recall up to 16 different configurations for later use. To save the current settings, select the preset location and press Enter. This will write the current settings into this location. If a preset has previously been used any data will be over-written. To recall previously stored setting information, again choose the selected location and press Enter to recall the stored configuration. The recalling of previously stored presets can also be implemented externally via the GPI port. To sanction this facility, enable the GPI controls preset recall box.

Factory reset

The user has the choice of performing a total factory reset or a partial reset. Factory Reset will return all parameters to their factory default values and erase all user-stored configuration presets. Selecting the Defaults option will perform the same reset to factory default values but will leave any user-stored configurations unaffected.

Parameter	Default value
Fibre Optic I/O	Unselected
Aspect ratio	Anamorphic
Output AFD	Auto, 8-Full Frame 525 line 12 & 275, 625 line 8 & 321
Coded Frame	4:3
WSS and Video indexing	Auto
WSS blanking	Unchecked
H and V Size	100%
Position and Crop	0
Border Luma	0 (Black)
Proc-amp lift (all)	0
Proc-amp gain (all)	100
GPO alarms	Unchecked
Noise and Detail enhance	Off & 0
Alarm delay video black	1
Alarm delay video frozen	1
Alarm delay audio silence	10 seconds
Video delay	Frame delay, Pixels 0, Lines 0
Bypass	Unchecked
Presets	Set to Preset 1 and all contents erased
GPI Enable	Not enabled

5 Statesman

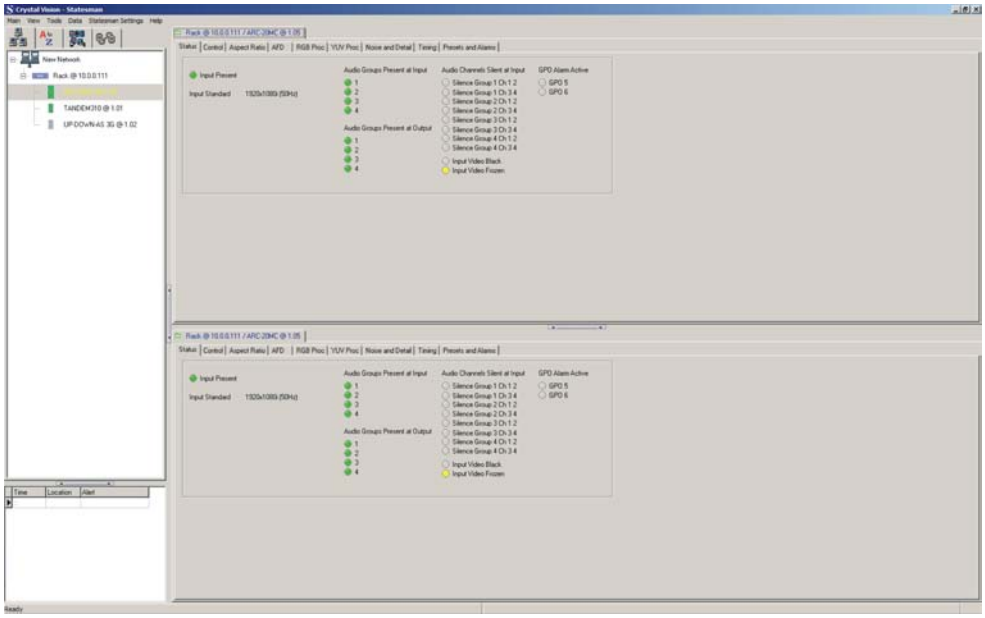
5.1 Statesman introduction

The Crystal Vision Statesman PC control software is designed to control a range of Crystal Vision modules via serial control from a PC. Statesman provides a user-friendly means of configuring and operating Crystal Vision modules with the benefit of “see-at-a-glance” status monitoring.

The main Statesman application communicates with each module in a frame through a Statesman capable or active control panel. An active panel or REMIND remote control panel must be fitted to allow Statesman control.

5.2 Statesman operation

The initial view will show an Explorer style view of the connected frames and modules. Double clicking on a module will enable the display of the main application menus.



Statesman main application window

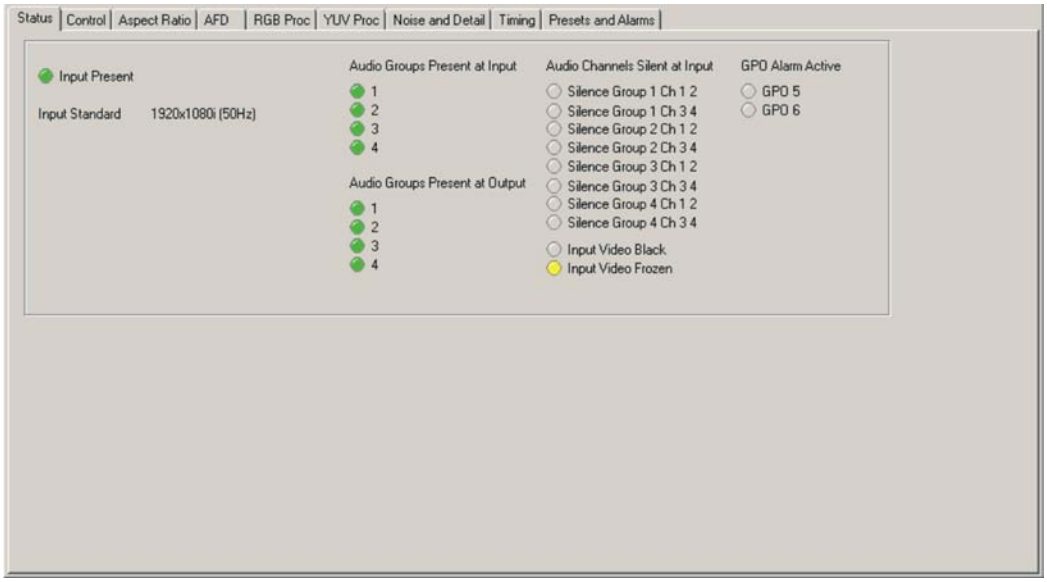
The two large control panes shown in the upper and lower halves of the window may display different menus for the same card, or controls for different cards. Click on the horizontal button-bar between the two panes to close the lower pane or drag the button to vary the size of the panes.

Note: For further details of Statesman configuration and operation please refer to the Statesman manual.

Status

The board status is shown using a mixture of simulated LEDs and text information. As a general rule a green LED shows a good condition such as input present. An amber LED will give a warning as with video black or video frozen. If an LED turns red this is a fault condition so input present will turn red if the input should go away. The GPO alarms will also show red when active. A greyed LED will indicate an absence such as non-alarm or non-warning status.

Text is used where more information is required than can be inferred by a simple LED such as video standards.



Status monitoring

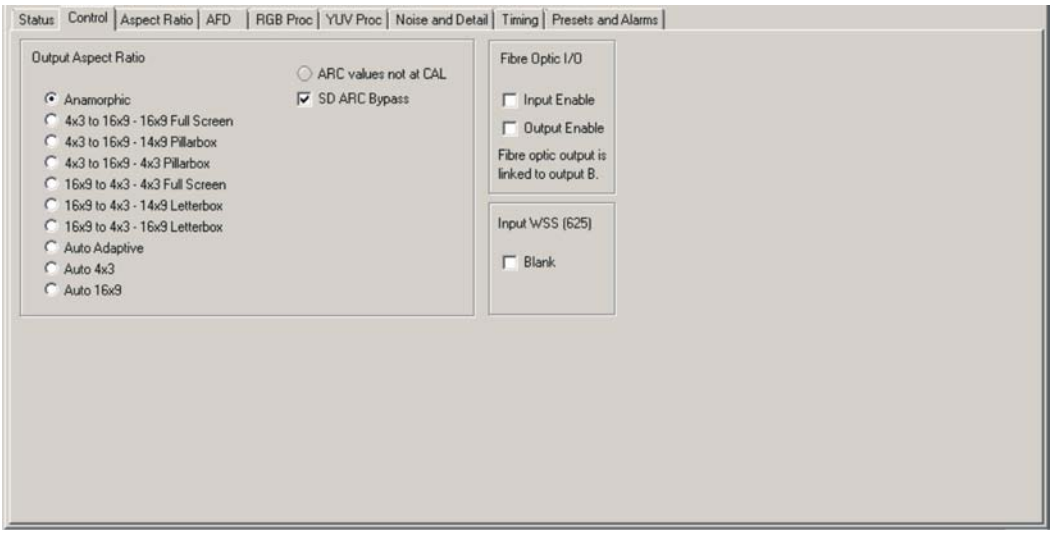
Input video and audio status

Input present is indicated by a simulated LED; green will indicate that the input is present, red for no input. The video standard of the incoming video is also given in text. Text is also used to show the video standard of both output groups. There are two further LEDs that indicate if the video is frozen or black. Both of these indications have an associated delay control which can be set to prevent unwanted triggering during short periods of black or no movement in the programme material.

All the various status indications can also be allotted to trigger either of the GPI outputs. Indication of the GPI state is also provided for convenience.

Control

The control tab is where the output formats are configured and output aspect ratios selected.



Video output format selection

Output aspect ratio

There are four fixed aspect ratios types which are: Anamorphic, Letterbox (14:9, 16:9), Pillarbox (4:3, 14:9) and centre cut. Anamorphic will map the input picture directly to the native aspect ratio of the viewing display along with the resulting distortion associated with this. Should it be necessary to view the output on a 4:3 display, setting the aspect ratio selection to Letterbox will give the correct picture dimensions by adding black bars to the top and bottom of the picture. 14:9 Letterbox will crop the picture to 87.5%, and depending on the aspect ratio of the display will either add black bars to the top and bottom or to both sides of the picture. There will be some loss of picture. Pillarbox will compress the picture to the centre part of the screen and add black bar to both sides. There may be a minimal picture loss depending on the selected video format. Centre cut will show the central 75% of a 16:9 widescreen picture mapped to the full monitor height or width with the corresponding loss of the left, right or bottom picture edges.

There also three auto modes available. When any of these is selected the actual aspect ratio selected will depend on the input video AFD. The AFD reader will also automatically set the output WSS when Wide Screen Signalling is set to auto.

The effect of AFD varies depending on the conversion being done, with three auto modes. In these modes the conversion applied (and output AFD data) will depend on the input coded frame and AFD code, which may be presented as WSS, Video index or SMPTE 2016.

Auto 16:9: The output coded frame is fixed at 16:9. If the input coded frame is 16:9, there will be an Anamorphic conversion and the output AFD will follow the input AFD. If the input coded frame is 4:3 then AFD codes for undefined/ reserved, 14:9 and full frame inputs will produce a Pillarbox output. AFD codes for 16:9 Letterbox inputs will produce a conversion to a full frame output. **Auto 4:3:** The output coded frame is fixed at 4:3. If the input coded frame is 4:3, there will be an Anamorphic conversion and the output AFD will follow the input AFD. If the input coded frame is 16:9 then AFD codes for full frame and 14:9 inputs will produce a Letterbox output. AFD codes for a Pillarbox input will produce a conversion to a full screen output. **Auto Adaptive:** If the input coded frame is 16:9, a 4:3 Pillarbox AFD will produce a 4:3 full frame output, with appropriate Video index and/or WSS.

All other AFD values will cause an Anamorphic conversion and the output AFD will follow the input value. If the input coded frame is 4:3, a 16:9 Letterbox AFD will produce a 16:9 full frame output, with appropriate Video index and/or WSS. All other AFD values will cause an Anamorphic conversion and the output AFD will follow the input value.

Response to SMPTE 2016 AFD SD codes

Incoming (SD) AFD value	Explanation	Auto 4:3 conversion (output WSS)	Auto adaptive Conversion (output WSS)
0, 8, 9, 13	Pillarbox 4:3	Letterbox (box 16:9 centre)	No change, as previous
2, 4, 10, 14, 15	Centre Cut 16:9	Letterbox (box 16:9 centre)	Anamorphic (full format 16:9)
3, 11	Pillarbox 14:9	Centre cut (full format 4:3)	Centre cut (full format 4:3)
Others	Anamorphic	Centre cut (full format 4:3)	No change, as previous
16:9	Anamorphic	Centre cut (full format 4:3)	No change, as previous

Note: Wide Screen Signalling must be set to Auto for the output WSS to be automatically set by the incoming AFD data.

SD ARC bypass

Enabling the SD ARC bypass control will set the ARC-20MC into bypass mode. In bypass mode the proc-amps will be disabled. AFD and WSS insertion will remain active.

Optical I/O

The ARC-20MC has the option of either receiving an optical input or transmitting an optical output once the necessary optical equipment has been fitted. If the optical receiver module is fitted, the fibre optic I/O input enable will allow the video input to be selected between the input BNC and the optical input. The input loop-through will show whichever of the inputs are selected so with an optical input the input loop-through BNC will give a reclocked output of the optical input.

With the fibre transmitter module fitted, the optical output can also be enabled or disabled. The output BNCs remain active when the optical output is both enabled and disabled. When the optical output is fitted the number of outputs will be reduced from five to four.

WSS blanking

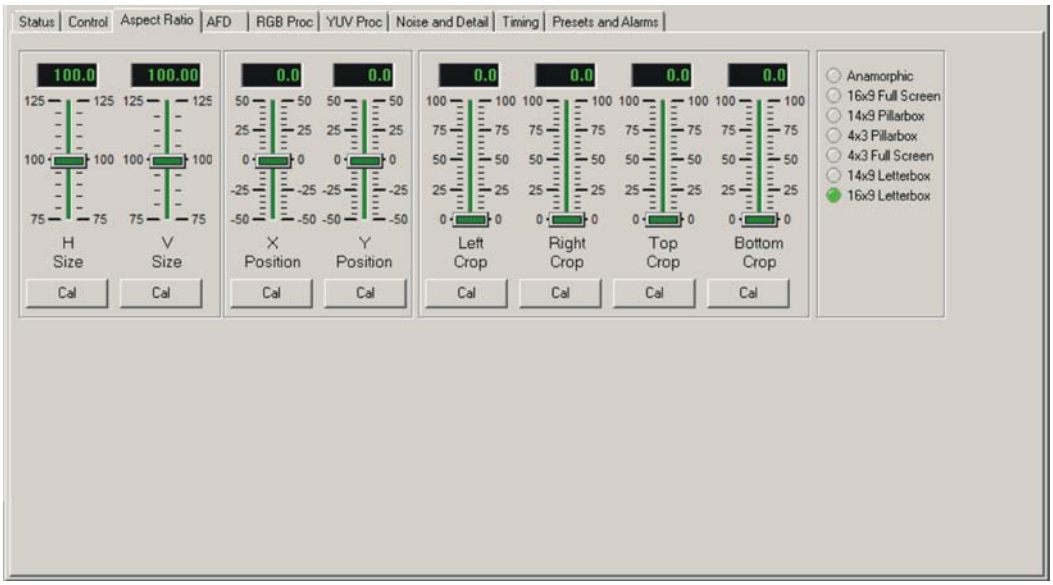
A video signal containing wide screen signalling information on line 21, once aspect ratio converted, will have had what was previously line 21 moved into the screen, actually becoming the first active line of the video after the top border. As this line will then have become very visible, the wide screen blanking control allows this line to be blanked.

Aspect ratio control

Depending on the input format and selected output format there are up to seven fixed aspect ratios available. Each of these seven aspect ratios can be adjusted independently for picture

size and position; the picture may also be cropped on all four edges. Once the controls are set they are automatically recalled whenever the particular aspect ratio is active.

Pressing the Cal button will return all slider control to their default value.

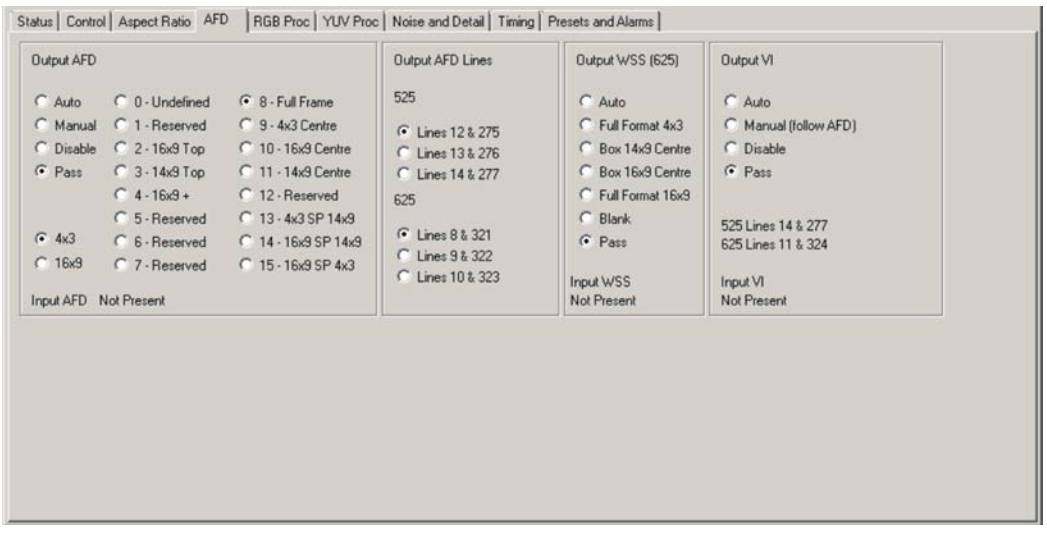


Aspect ratio size, position and crop controls

AFD controls

There are three sets of controls associated with Active Format Descriptor (AFD). These are: the inserter mode control, entire image aspect ratio selector (coded frame) and the group of 16 AFD codes. The SD output has further controls to select the line to be inserted. There are separate controls for both 525-line and 625-line.

The output wide screen signalling and video index control are also presented here.



Output AFD, Wide Screen Signalling and Video Indexing inserter controls

The 16 available codes are described in the following table:

AFD code	Description	AFD code	Description
0	Undefined	8	Full Frame (as coded frame)
1	Reserved	9	4:3 centre
2	16:9 top	10	16:9 centre
3	14:9 top	11	16:9 centre
4	16:9+	12	Reserved for future use
5	Reserved	13	4:3 with shoot and protect 14:9 centre
6	Reserved	14	16:9 with shoot and protect 14:9 centre
7	Reserved	15	16:9 with shoot and protect 4:3 centre

Note: When inserting SMPTE 2016 data the inserter will blank any incoming SMPTE 2016 data.

Wide Screen Signalling

Output wide screen signalling can be set to automatically follow the input AFD data or be manually selected. If WSS data should be present on the input video this can either be passed to the output unchanged or substituted for a user-selected code. WSS data can also be set to be blanked. It is only possible to insert WSS information into a PAL output.

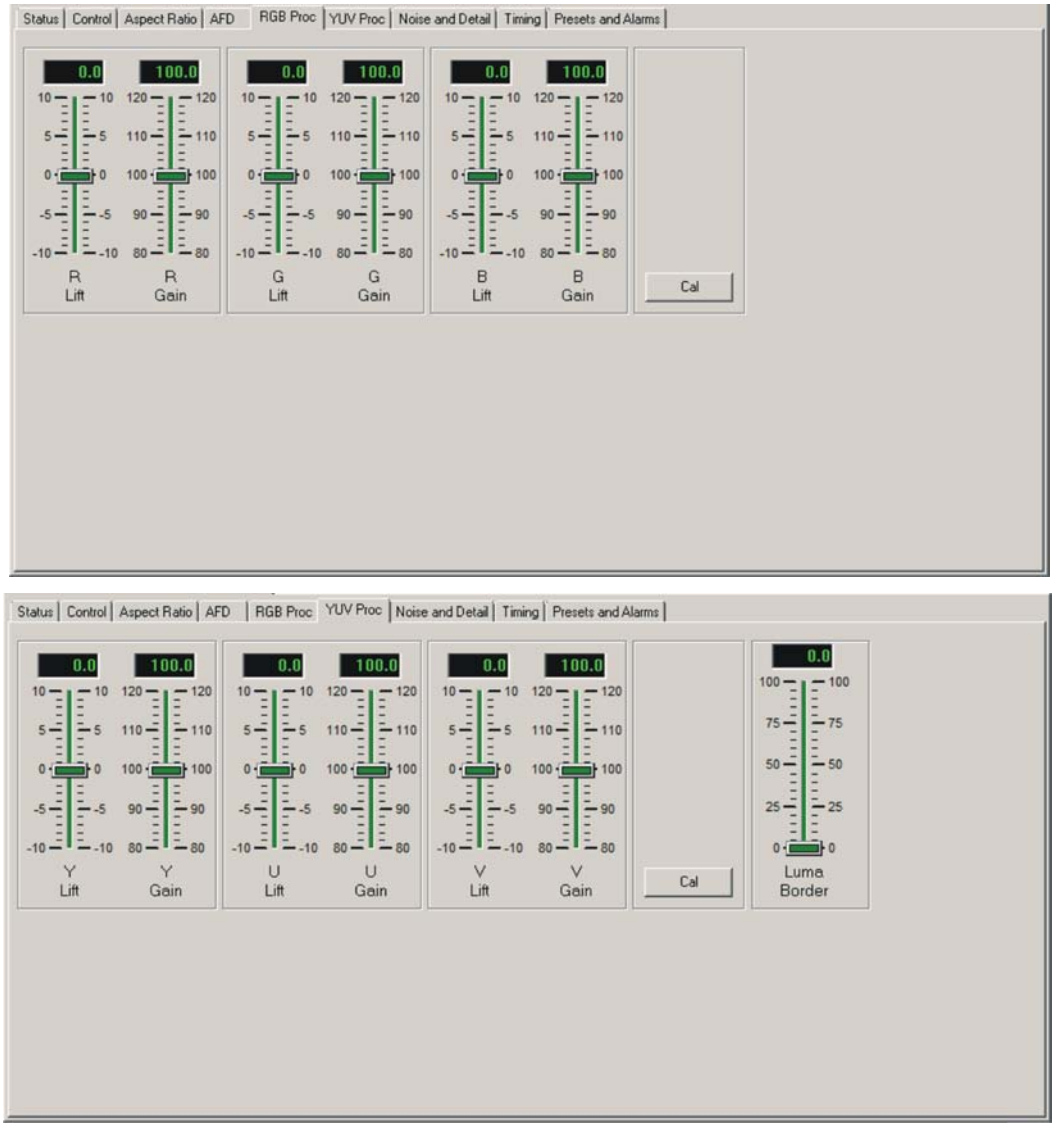
Out going WWS codes	Explanation	Conversion
0001	full format 4:3	Centre cut
1000	box 14:9 centre	Letterbox
1101	box 16:9 centre	Letterbox
1110	full format 16:9	Anamorphic

Video Indexing

Video indexing can also be inserted into the output video for use by downstream equipment. Output video indexing is enabled by selecting the required output aspect ratio. Although in most applications the output selection will mirror the conversion setting, the output video index control remains independent from the conversion setting, so that a user-specified aspect ratio can have assigned the most appropriate ratio information. It is also possible to either insert blank video index data or pass the input data to the output unchanged.

RGB and YUV lift and gain controls

ARC-20MC's RGB and YUV lift and gain controls allow independent digital image adjustments in both the RGB and YUV domains, essential for maintaining colour fidelity.



RGB and YUV lift and gain controls

Border Luma control

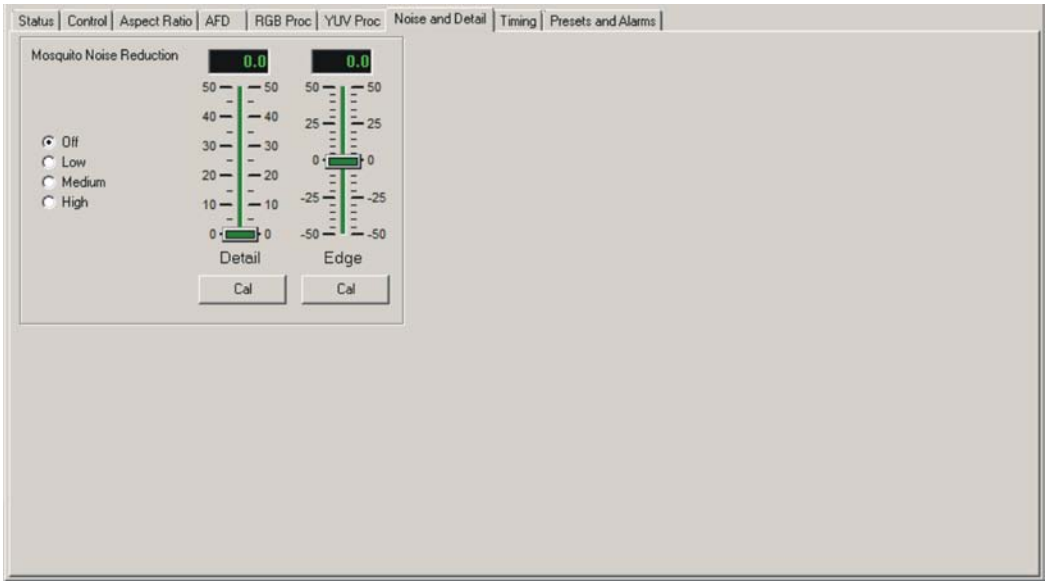
This control varies the Luma level of the picture border if present to be adjusted from zero giving a black border to 100% white.

Noise reduction and picture enhancement controls

ARC-20MC is able to detect and remove mosquito noise, a common compression artefact caused by MPEG decoders which is often exhibited as a cloud around the edges of text and computer generated graphics. Algorithms within the ARC-20MC detect areas where mosquito noise would be the most likely and then work to diminish the mosquito noise without blurring the edge of the text or graphics.

Fine Detail and Edge Enhancement is a video processing technology that increases the sharpness or detail of images. It is especially useful when Standard Definition video is scaled

to fit high resolution displays. The controls allow the image to be either sharpened or softened as required.



Noise reduction, edge and detail enhancements controls

Edge detail and detail enhancement

ARC-20MC's fine detail and edge enhancement uses a technique known as 'unsharp mask'. This is a superior method of enhancing images that does not introduce ringing. ARC-20MC enhances images both horizontally and vertically.

Two types of enhancement are provided, one for fine detail and one for object edges. Fine detail enhancement applies sharpening to the entire image. Edge enhancement applies sharpening only to object edges.

Both detail enhancement and edge enhancement produce similar results, but there are subtle differences. Fine detail enhancement works best when the source is 'clean' and free from noise. Edge enhancement works well for less pristine sources. It produces a sharpening effect without making noise more visible.

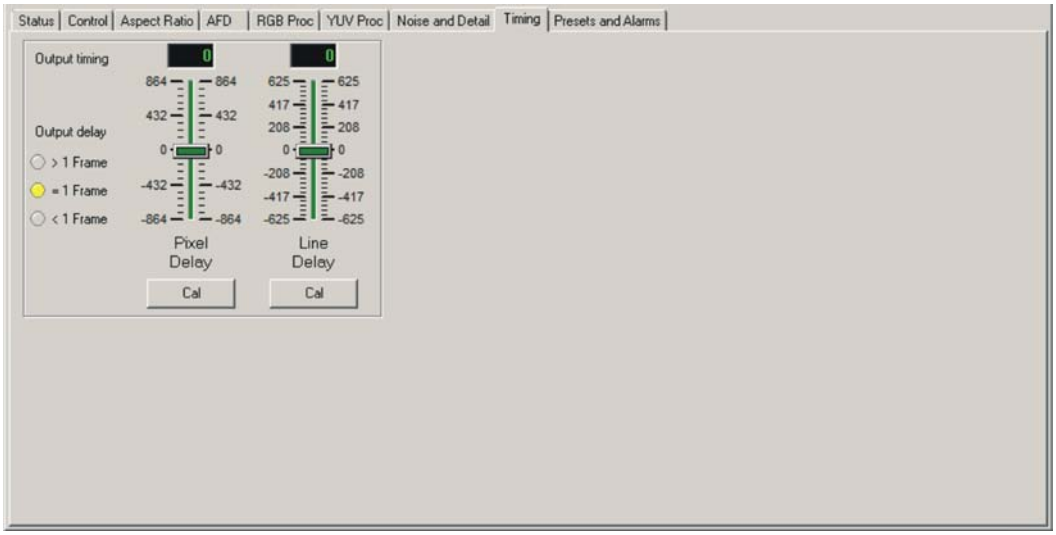
Note: Noise reduction, detail enhancement and edge enhancement control are not active in bypass mode.

Timing

Delay

The ARC-20MC has separate delay controls giving up to two frames of delay adjustable in both lines and pixels. With controls set to zero the delay with respect to the input will be one frame. By increasing the delay in the positive direction, up to two frames will be achieved. Setting the delay controls to a negative value will give a delay of less than one frame until a minimum delay is reached; this minimum delay is one frame less 16 lines. Any further

negative delay setting will cause the delay to jump to two frames less the dialled delay number. A negative delay value will also cause the 'delay less than a frame' LED to illuminate.



Delay timing

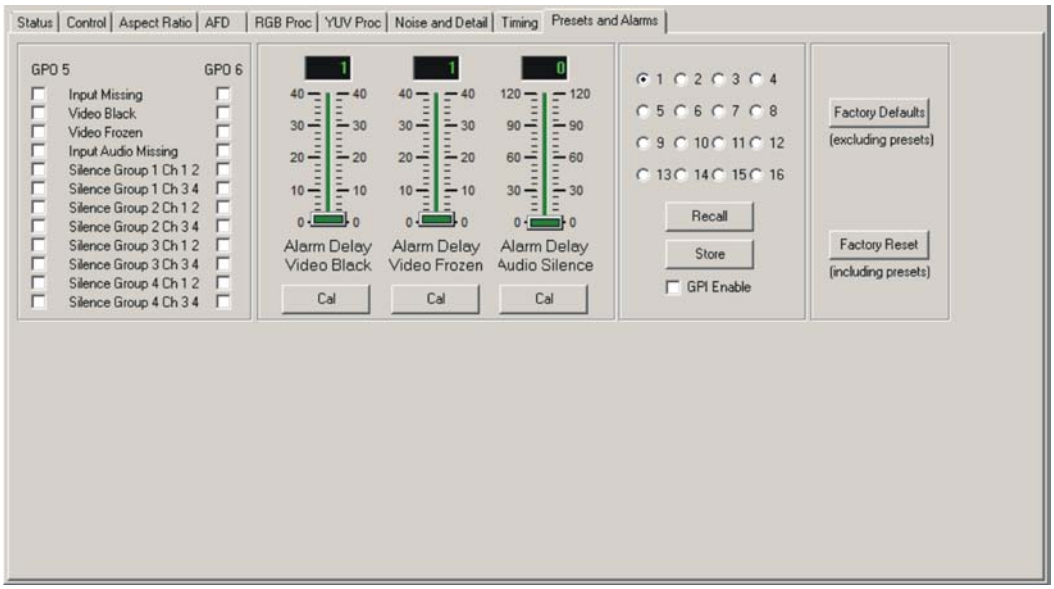
Presets and GPI alarm outputs

The Preset and Alarms tab contains the GPI output alarm configuration, alarm delay controls and Preset save/recall. The reset controls are also found here. There are two GPI outputs reserved for alarm indication – GPO5 and GPO6, which may have assigned to them any of the 12 video and audio alarms.

Any number of alarms may be assigned to each GPI output. All but input present can be assigned a delay timer to delay the time after which an alarm is asserted. This ability is especially useful to prevent false alarming during quiet periods in the audio or brief pauses in video program.

Where more than one alarm is flagged and an alarm condition is asserted, use the various status indicators to determine the exact cause. Visual indication of GPO5 and GPO6 status is provided on the board edge.

See Section 2.3 for further discussion of GPIs and pinout details.



Preset and GPI alarm configuration

Silence detect delay

The silence detect delay can be set from 0 to 120 seconds for the amount of time a signal is allowed to remain below -56dB, with respect to Full Scale, before a silence error is flagged. To prevent false alarms during quiet passages there is a minimum delay period of approximately four seconds in which silence must be maintained before the delay timer is initiated.

Note: The minimum delay will become significant at short delay settings.

Video frozen and black delay

A picture is considered frozen when a frame is identical to the previous frame. If this condition is met consistently for the period of time set by the video frozen delay control, a video frozen error will be flagged.

Video black is defined as values in the range of 58 to 70 around digital black (approx +/- 5mV). If digital black is present for longer than the delay time set by the video black delay control, a video black error will be flagged.

Note: Press the cal button at anytime to reset the timer delays to their default values.

Preset menu and factory reset

Up to 16 user-defined configurations may be stored and recalled either from the board control, active front panel, Statesman or through the use of external GPIs. Presets store the board setup data including operating mode card status. The presets are numbered 1-16.

Note: Care should be taken when storing presets that the desired configuration is not changed by any external input prior to saving.

Saving and recalling presets

The current board settings can be saved in one of 16 locations to be recalled as desired. This allows the user to store and recall up to 16 different configurations for later use. To save the current settings, select the preset location and press enter. This will write the current settings into this location.

Note: If the selected location contains previously saved setting information it will be over-written by the new setting data.

To recall previously stored setting information, again select the selected location and press enter to recall the stored configuration.

The recalling of previously stored presets can also be implemented externally via the GPI port. To sanction this facility, enable the GPI controls preset recall box.

Factory reset

The user has the choice of performing a total factory reset or a partial reset. Factory Reset will return all parameters to their factory default values and erase all user-stored configuration presets. Selecting the Defaults option will perform the same reset to factory defaults values but will leave any user-stored configurations unaffected.

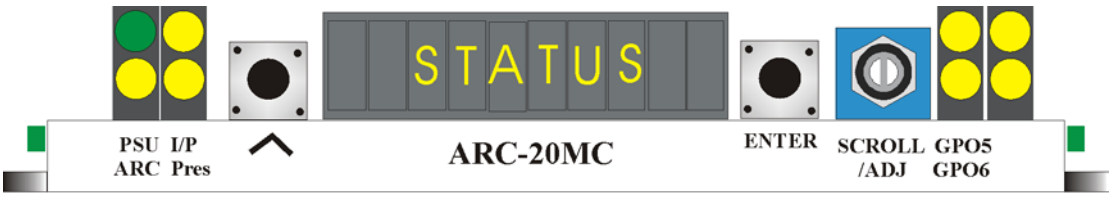
Note: Factory reset will erase all user-stored presets

Parameter	Default value
Fibre Optic I/O	Unselected
Aspect ratio	Anamorphic
Output AFD	Auto, 8-Full Frame 525 line 12 & 275, 625 line 8 & 321
Coded Frame	4:3
WSS and Video indexing	Auto
WSS blanking	Unchecked
H and V Size	100%
Position and Crop	0
Border Luma	0 (Black)
Proc-amp lift (all)	0
Proc-amp gain (all)	100
GPO alarms	Unchecked
Noise and Detail enhance	Off & 0
Alarm delay video black	1
Alarm delay video frozen	1
Alarm delay audio silence	10 seconds
Video delay	Frame delay, Pixels 0, Lines 0
Bypass	Unchecked
Presets	Set to Preset 1 and all contents erased
GPI Enable	Not enabled

6 Trouble shooting

Card edge monitoring

The front edge of the card provides useful power rail monitoring, input status, vertical filter and analogue output format.



ARC-20MC front edge view

The following table summarises the card edge LED functions and colours:

Name	LED Colour	Function when ON	Function when Off
PSU	Green	Good power supply (PSU) rails	One or more of the monitor supplies is out of specification
ARC	Yellow	Aspect ratio conversion selected	Full screen (anamorphic) selected
	Yellow	No function	
I/P pres	Yellow	Video input present	Input not present
GPO5	Yellow	GPO5 active / low	GPO5 inactive / high
GPO6	Yellow	GPO6 active / low	GPO6 inactive / high
	Yellow	No function	
	Yellow	No function	

The card edge LEDs and 10-digit display may be used in conjunction with status information from any connected remote status panel display or from Statesman if available.

Basic fault finding guide

The Power OK LEDs are not illuminated

Check that the frame PSU is functioning – refer to the appropriate frame manual for detailed information

There is no video output

Check that a valid SDI input is present and that any cabling is intact

The video output exhibits jitter

Check that the input SDI stability is within normal limits

The card no longer responds to card edge or front panel control

Check that the card is seated correctly and that the Power OK LEDs are lit

Check any active control panel cabling

Check if the control panel can control another card in the same rack

If necessary re-set the card

Re-setting the card

If required, the card may be reset by removing the card from the rack and then re-inserting it

It is safe to re-insert the card whilst the rack is powered. Any previous configuration will be retained, use a factory reset to erase any configurations stored in the card.

7 Specification

General

Dimensions	100mm x 266mm module with DIN 41612 connector.
Weight	180g.
Power consumption	ARC-20MC - 10 Watts.
	DA6 - 3 Watts.
	FIP - 0.6 Watts.
	FOP - 0.6 Watts.

Inputs

Video	SD SDI 270Mb/s serial digital compliant to EBU 3267-E, SMPTE-259M.
	Cable equalisation:
	SD (270Mb/s) >250 metres, Belden 8281 or equivalent.
Video standards supported	PAL, NTSC.
	Input format auto selected.
Return loss	50Mhz to 1.5GHz -15dB.

Outputs

Serial digital	Up to five reclocked SDI outputs 270Mb/s SMPTE 259M
RM41	The ARC-20MC has five video outputs.
RM41 + RM34	The ARC-20MC plus DA6 has six input loop-through outputs and five video outputs
RM67	The ARC-20MC has five video outputs with relay bypass between the input and 4th output (OUT D).
RM67 + RM34	The ARC-20MC plus DA6 has six input loop-through outputs and five video outputs
RM57	The ARC-20MC with optical I/O has one optical input or optical output and four video outputs.
RM57 + RM34	The ARC-20MC plus DA6 has one optical input or optical output plus four video outputs plus six input loop-through outputs.
Delay through board	Adjustable up to 2 frames. Minimum delay: 1 frame less 16 lines.
Auxiliary data	Auxiliary data passed.

Status monitoring

LEDs	Front of card edge LED indicators to indicate: PSU rails present Input present ARC selected GPI Out 5 GPI Out 6 active

GPI inputs

Number and type:	4 x GPI inputs. Recall of presets

GPI outputs

Number and type:	2 x GPI outputs, selectable from loss of input, video black and frozen, audio missing, audio channel silence

Input fail output

Type:	Dark Blue