



CC-2 "canaletto"

SDI colour corrector



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l System Overview

This manual describes the function of the CC-2 processing card. When packaged as a system incorporating a 1RU chassis, CC-2 processing card and control panel it is called "canaletto". The CC-2 is a simple cost effective colour correction system, which will give individual control of R, G, and B Gain, lifts and Gamma. The system also inherently legalises the signal enabling the user to make full use of the colour correction without fear of the resultant picture being rejected by broadcasters.

The CC-2 is a unit that will accept one standard SDI video input, and has three SDI outputs, a loop, program out and an "indicate" out to highlight the illegal part of the picture. The main features are :-

- Full 10 bit processing.
- Simple individual control of RGB gain, lift and master gamma.
- Overall luma, chroma gain and black level adjustment.
- Overall hue correction.
- Gamut legalization as standard with EBU R103-2000 set up mode.
- Indicate output put shows "clipped" areas with individual R,G, and B indicators.
- Adjustable legalisation levels.
- Highly effective luma overshoot and undershoot suppression.
- EDH re-insertion.
- 6 user memories.
- Integrated "safe area generator" on indicate output.



Figure 1 The CC-2 colour correction PCB.

I.I Applications for the CC-2

Applications for the CC-2 include the following:

- Post production grading.
- Correcting level and colour errors in source material.

The CC-2 will be used in a situation where a device such as a caption generator is required to overlay captions onto a video background.



Figure 2 Connection of a CC-2 colour corrector

I.2 Associated Equipment for the CC-2

The CC-2 is a module and requires both a chassis and a control surface to function.

I.2.I Chassis Types

- **flexiBox** is a 1RU chassis. The order code is FB-9. This will hold a maximum of 6 CC-2 Modules with "Hot Swap" redundant PSU option and "Hot Swap" CC-2 modules.
- **maxiBox** is an alternative low cost 1RU chassis. The order code is MX-9. This also will hold a maximum of 6 CC-2 modules but it has no redundant PSU option and the CC-2 units must be factory fitted.



Figure 3 flexiBox with flexiPanel fitted

I.2.2 Control Surfaces

- **flexiPanel** is a IRU control surface that fits on the Front of a 1RU flexiBox. The order code is FP-9. A FlexiPanel can also be used in conjunction with a miniBox, in this case the extra accessory (Order code RR-9) will be required
- **FP-10** is a desk mounting control surface (Order code FP-10). This unit is a modular unit which can be used in conjunction with the units below.



Figure 4 FP-10 desktop modular panel



Figure 5 FP-9 1RU modular panel

2 Installation

2.1 Installation of the CC-2 product

If this unit is already pre-installed in a flexiBox (FB-9), or a maxiBox, with either a local or a remote panel from the factory then refer to the "Hardware Installation Guide" which will be enclosed with the system. If this unit is pre-installed in a miniBox (MB-9), then also refer to the "Hardware Installation Guide" which will be enclosed with the system

If this unit has been ordered separately, we assume here that you already have a flexiBox system with a Flexipanel and that the flexiBox has at least two spare slots above each other for the CC-2 card.

2.2 Installing the CC-2 into a flexiBox

To install the CC-2 into a flexiBox it is desirable (but not necessary) to power down the flexiBox. Follow these instructions.

On the rear of the flexiBox are 6 slots for Products. Remove any spare blanking plate. There are 2 off M2.5 Screws, which require unfastening for each blanking plate.

Slide the Product PCB into the spare slot and firmly push it "home".

Use the two thumbscrews to fasten the unit in place.

Now refer to the "GeNETics User Guide". If your system consists of a single flexiBox with a single flexiPanel then refer to the section titled "flexiPanel Auto Set-up". If your system is part of a network with more than one flexiPanel then refer to the section titled "flexiPanel Manual Set-up". This will guide you through acquiring your product as a device on the flexiPanel.

2.3 Connecting Video to an CC-2

A Typical Connection diagram for the CC-2 is shown below. All signals are SDI:



Figure 6 Connections for a CC-2 module showing internal links

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The CC-2 Module has a number of user configurable jumpers which can change the function of the 5 SDI BNC Connectors. These are shown along with their default configuration below. These jumpers are found close to the BNC Connectors.

2.4 Connecting Panels to the CC-2

The CC-2 may be operated using a FP-9 Flexipanel locally mounted. For a more operational environment the CC-2 may be supplied with a desk mounting FP-10 unit and also possible a VP-10 Desk mounting Video T-Bar manual transition unit. For detailed information on connecting remote panels refer to the section "Connection of Remote Panels to a flexiBox" in the geNETics Hardware Installation Guide.

Below is shown a typical system consisting of an CC-2 in a flexiBox controlled by a remote FP-9.



I-Bus pins 2 & 7

** The I-BUS Network requires terminating with 100 Ohms at each extreme end of the network. Ensure that this is done either by an external 100 ohm resistor OR ONE Panel/Product at each end has the termination set. See the "Genetics User Guide" Under the sections "Flexipanel Power/I-BUS Jumpers".For the 4RU Panels see "4RU Panel (FP-10) Jumpers for I-BUS" and "4RU Panel (VP-10, SW-10, AP-10) Jumpers for I-BUS". Alternatively The termination can be set on a Product (ie the MW-2 module). Information about this is given in this manual.

Figure 7 I-Bus Connections and Termination

N.B. From 1/10/02 Eyeheight introduced a change in the flexiBox Chassis. Most versions now have two 9 way connectors on the rear labelled "I-Bus" and "D-Bus". The "I-Bus" connector is the same as the previously labelled "Can-B" connector. Although a maxiBox is shown in this diagram the same arrangement applies for a flexiBox chassis.

3 Operation

3.1 Manual control of the CC-2

Manual Control of the CC-2 is done using one or more of the following control surfaces:

- The 1RU FP-9 Flexipanel.
- The FP10 Desk mounting Panel

The FP-9 and the FP-10 have identical manual control systems. (The FP-10 is simply a desktop version of the FP-9). The CC-2 is, as are all genetics modules, controlled using a set of MENUS. Each of these menus contains up to 3 parameters that are adjusted using the rotary digipots. The Menus define all of the adjustable operational parameters in the CC-2. Pressing the rotary digipots brings the parameter to its default value. Device selection is done using the device select switches which, when pressed, will offer the name of the device in the LCD Window. Modules can be acquired and then de-acquired using the set-up switch. For a full description of the operation philosophy of the geNETics system refer to the "geNETics User Guide" (section "Operation of the flexiPanel")

A full list of the Menus and their functions are given in section 3 of this chapter.

3.2 Automation Control of the CC-2

Automation of the geNETics products is achieved via an RS422 port.** This port is marked RS422 on the rear of a flexiBox. For the port to work a flexiPanel MUST be connected locally on the front of the flexiBox.

Automation control of the CC-2 can be done using two protocol methods:

- geNETics Automation Protocol.
- PresTX Automation Protocol.

Genetics protocol is described in detail in the "GeNETics User Guide" section titled "Automation Protocol on the geNETics Platform". The menu list in section 3 of this chapter contains the data information for the protocol.

PresTX Automation Protocol is used only for the PresTX Presentation Mixer and channel branding system. In this case an AU-2 Automation card is also required. Refer to the PresTX Product manual

**On most flexiBoxes later than 1/10/02 the RS422 port has been replaced by a "D-Bus" Port. The D-Bus port is for High Speed data transfer and is not used for serial control. In order to achieve serial control of any products on an I-Bus network Eyeheight Ltd have developed a RS232→I-bus converter "dongle", (DG-9) which enables greater flexibility of products on the I-Bus network whilst using the same protocols as the RS422 port. Please refer to the "User guide for the DG-9 eyeheight dongle and set-up software.

3.3 Operational Menus for the CC-2

Menu 00-03: Top level controls

Menu Num.	Heading	Automation	Function
0	Master	N/A	Pressing this button will select the MASTER control menus.
1	Grade	N/A	Pressing this button will select the Individual GRADE control menus.
2	Utils	N/A	Pressing this button will select the onboard utilities, such as the legaliser.
3	Memory	N/A	Pressing this button will select the memory control menus.

Menu 04-07: Master controls

LUMA	CHROMA	GAMMA	BACK
menu	menu	menu	=main=

Menu Num.	Heading	Automation	Function
4	LUMA	N/A	Pressing this button will select the luma control menus.
5	CHROMA	N/A	Pressing this button will select the chroma control menus.
6	GAMMA	N/A	Pressing this button will select the gamma control menus.
7	BACK	N/A	Pressing this button will take the user back to the main menu.

Menu 08-11: Luma control menu

Luma Gain=	Black	BACK
100.0%	+0. 0 I	master

Menu Num.	Heading	Automation	Function
8	Luma Gain (0 – 199.7%)	0 to 511 default is 256 (=100.0%)	This option sets the Luma gain.
9	Black Lift (-29 – 28.9)	-254 to +255, default is 0	This option sets the black lift
10		N/A	none
11	Back	N/A	Pressing this button will take the user back to the master control menu

Menu 12-15: Chroma control menu

Chroma	Hue	BACK
Gai n=	Rota' n	
100.0%	=+0	master

Menu Num.	Heading	Automation	Function
12	Chroma Gain (0 to 199.7%)	0 to 511 default is 256 (=100.0%)	This option sets the Chroma gain.
13	Hue Rota'n (-180 to +180)	-512 to +511 default is 0	This option sets the Hue rotation.
14		N/A	None
15	Back	N/A	Pressing this button will take the user back to the master control menu

Menu 16-19: Grade control menu

GAIN	LI FT	BACK
menu	menu	=main=

Menu Num.	Heading	Automation	Function
16	Gain N/A Pressing this button w grade gain control me		Pressing this button will select the grade gain control menu.
17	Lift menu	N/A	Pressing this button will select the grade lift control menu.
18		N/A	None
19	Back	N/A	Pressing this button will take the user back to the main menu

Menu 20-23: Grade gain control menu.

Red	Green	Blue	BACK
Gain	Gain	Gain	
=1.00	=1.00	=1.00	Grade=

Menu Num.	Heading	Automation	Function
20	Red Gain 0 to 16	0 to 4096 default is 256 (=1.00)	This option sets the Red gain.
21	Green Gain 0 to 16	0 to 4096 default is 256 (=1.00)	This option sets the Green gain.
22	Blue Gain 0 to 16	0 to 4096 default is 256 (=1.00)	This option sets the Blue gain.
23	Back	N/A	Pressing this button will take the user back to the main menu

Menu 24-27: Grade lift control menu.

Red	Green	Blue	BACK
Offset	Offset	Offset	
=+0	=+0	=+0	Grade=

Menu Num.	Heading	Automation	Function
24	Red Offset -512 to +511	-512 to +511 default is 0	This option sets the Red offset.
25	Green Offset -512 to +511	-512 to +511 default is 0	This option sets the Green offset.
26	Blue Offset -512 to +511	-512 to +511 default is 0	This option sets the Blue offset.
27	Back	N/A	Pressing this button will take the user back to the grade control menu

Menu 28-31: Utils control menu.

LEGALR	S. Area	GAMMA	BACK
menu	menu	menu	=main=

Menu Num.	Heading	Automation	Function
28	Legalr menu	N/A	Pressing this button will select the legaliser control menu.
29	S.Area menu	N/A	Pressing this button will select the Safe Area Generator control menu. (Menus 72→75)
30	Gamma menu	N/A	Pressing this will select the Gamma control menus
31	Back	N/A	Pressing this button will take the user back to the main menu

Menu 32-35: Legaliser control menu

Legal r	CLI P	RING	BACK
IS ON	menu	menu	Utils=

Menu Num.	Heading	Automation	Function
32	Legalr	0=Off,1=On Default is On	Pressing this will turn the legaliser on or off.
33	CLIP menu	N/A	Pressing this button will select the legaliser clip control menu.
34	RING menu	N/A	Pressing this button will select the legaliser ring control menu.
35	Back	N/A	Pressing this button will take the user back to the Utils menu

Menu 36-39: Clip control menu

LOW	HI GH	BACK
clip	clip	Legal =

Menu Num.	Heading	Automation	Function
36	LOW Menu	-512 to +511 default is 0	This option sets the Red offset.
37	HIGH menu	-512 to +511 default is 0	This option sets the Red offset.
38		N/A	None
39	Back	N/A	Pressing this button will take the user back to the Legaliser control menu

Menu 40-43: Low clip control menu.

LoClip	LoKnee	BACK
Level = +0.0 %	Level = +0. 0 %	=clip=

Menu Num.	Heading	Automation	Function
40	LoClip Level -7.1 to +50.8%	1 to 511, default is 64 (=0.0%)	This option sets the level of the low clip point.
41	LoKnee Level -7.1 to +50.8%	1 to 511, default is 64 (=0.0%)	This option sets the level of the low knee point.
42		N/A	None
43	Back	N/A	Pressing this button will take the user back to the Legaliser clip control menu

Menu 44-47: High clip control menu.

Hi CI i p	Hi Knee	BACK
Level =	Level =	
100.0%	100.0%	=clip=

Menu Num.	Heading	Automation	Function
44	HiClip Level 50.9 to 109%	512 to 1022, default is 943 (=100%)	This option sets the level of the high clip point.
45	HiKnee Level 50.9 to 109%	512 to 1022, default is 943 (=100%)	This option sets the level of the high knee point.
46		N/A	None
47	Back	N/A	Pressing this button will take the user back to the Legaliser clip control menu

Menu 48-51 Ring control menus

Ri ng	LoRi ng	Hi Ri ng	BACK
Supr' n	Thresh	Thresh	
=0FF	+0.0%	100.0%	=clip=

Menu Num.	Heading	Automation	Function
48	Ring Supr'n	0=Off, 1=Auto,2=Man Default is Off	Pressing this will select the mode of the ring suppression, off, automatic or manual.
49	LoRing Threshold –6.8 to +51.2%	0 to 511 default is 60 (- 0.0%)	This option sets the level of the low ring threshold point.
50	HiRing Threshold 50.9% to 109%	512 to 1023 default is 944 (=100%)	This option sets the level of the high ring threshold point.
51	Back	N/A	Pressing this button will take the user back to the Legaliser clip control menu

Menu 52-55: Memory Controls



Menu Num.	Heading	Automation	Function
52	MEM1	1=Recall	Pressing this will recall Memory number 1.User Names can be programmed in to the memories using a keyboard. See "geNETics User guide", section "Giving product Memories names"
53	MEM2	1=Recall	Pressing this will recall Memory number 2.

54	MEM3	1=Recall	Pressing this will recall Memory number 3.
55	Back	N/A	Pressing this button will take the user back to the main menu

Menu 56-59: Memory Controls



Menu Num.	Heading	Automation	Function
56	MEM4	1=Recall	Pressing this will recall Memory number 4.
57	MEM5	1=Recall	Pressing this will recall Memory number 5.
58	MEM6	1=Recall	Pressing this will recall Memory number 6.
59	Back	N/A	Pressing this button will take the user back to the main menu

Menu 60-63: Memory Controls

Save	Save	Save	BACK
Mem.	Mem.	Mem.	
1	2	3	=main=

Menu Num.	Heading	Automation	Function
60	Save Mem. 1	1= Save	Pressing this will Save Memory number 1.
61	Save Mem. 2	1= Save	Pressing this will Save Memory number 2.
62	Save Mem. 3	1= Save	Pressing this will Save Memory number 3.

	Mem. 3		number 3.
63	Back	N/A	Pressing this button will take the user back to the main menu

Menu 64-67: Memory Controls



Menu Num.	Heading	Automation	Function
64	Save Mem. 4	1= Save	Pressing this will Save Memory number 4.
65	Save Mem. 5	1= Save	Pressing this will Save Memory number 5.
66	Save Mem. 6	1= Save	Pressing this will Save Memory number 6.
67	Back	N/A	Pressing this button will take the user back to the main menu

Menu 68-71: Software version



Menu Num.	Heading	Automation	Function
68		N/A	Info
69		N/A	Info
70	CC-2 230103 Ver2.5	N/A	Info, the top line is product identifier, the middle is the date the software was last changed, and the last line is the software version.
71	BACK	N/A	Pressing this button will take the user back to the main menu

Menu 72-75: Top Level Controls

Set As	Recall	TOTAL!	BACK
Pow On	Pow On	RESETI	
Memory	Memory		=main=

Menu Num.	Heading	Automation	Function
72	Set As Pow On Memory	1=save	Pressing this will save the current set up as the power on default.
73	Recall Pow On Memory	1=Recall	Pressing this will recall the power on default settings.
74	TOTAL RESET	1=Reset	Pressing this will reset the system.
75	BACK	N/A	Pressing this button will take the user back to the main menu

Menu 76-79: Top Level Controls



Menu Num.	Heading	Automation	Function
76	SAFE ACTION	0=on 1=off	This Switches on and off the currently selected area. Pressing the "Red" switch next to this one and adjusting the rotary digipots with the lighted green LED's chooses the Selected area.
77	None		When this button is pressed to "Green". The Three-line display in the window indicates the three options, which can be changed by adjusting the three rotary digipots A, B and C.
		Level "A"	<u>Digipot A</u> Determines the basic Function Selects "Safe Action" option

		0=S.Action 1=S.Capt. 2=DigEdge 3=An Edge Level "B" 0=4:3 1=16:9 2=16p4:3 3=16p149 4=43p16:9	Selects "Safe Caption" option Selects "Digital Edge" option Selects the "An. Edge" option <u>Digipot B</u> Determines the Screen Format Standard 4:3 Screen Standard 16:9 Screen 16:9 Shoot to protect 4:3 16:9 Shoot to protect 14:9 4:3 Shoot to protect 16:9
		Level "C " 0=Thin 1=Thick 2=Shade 3=Black	<u>Digipot C</u> Determines the Style of Indicate Thin White lines are used Thick White lines are used Shade is used for "danger area" Black is used for "danger area"
78	Blank		
79	BACK	none	Go To the Utils submenu

Menu 80-83: RGB Gamma values.



Menu Num.	Heading	Automation	Function
80	Red Gamma	0x28→0x1fff	This option sets the Red Gamma. The action depends on menu#85.
81	Green Gamma	0x28→0x1fff	This option sets the Green Gamma. The action depends on menu#85.
82	Blue Gamma	0x28→0x1fff	This option sets the Blue Gamma. The action depends on menu#85.
83	Back	N/A	Pressing this button will take the user back to the main menu

Menu 84-87: RGB Gamma values.

Gamma	Gamma	BACK
Range= Fi xed	Mode= RGBsep	=util=

Menu Num.	Heading	Automation	Function
84	Gamma Range	0=Full,1=Fixed Default is Fixed	Pressing this will select whether the gamma function acts over the entire range (0-1023) or has two fixed points (64,940). The latter is the normal mode of operation.
85	Gamma mode	0=Ganged 1=RGB Separate	In Ganged mode the RGB Gamma controls in menus#80→82 act together (track) as a master gamma. In RGBsep mode, the RG and B gamma can be individually adjusted.
86	Blue Gamma	0x28→0x1fff	This option sets the Blue Gamma. The action depends on menu#85.
87	Back	N/A	Pressing this button will take the user back to the main menu

4 Technical Appendix

4.1 Technical Specification for the CC-2

Number of Inputs	1
Type of Inputs	270Mbit Serial Digital Video Inputs 75 Ohm
Line Length	At least 200 Meters of PSF1/3 (Typically 275 Meters)
Number of Outputs	3 Output BNC's per Card (Configurable).
Type Of Outputs	270Mbit Serial Digital Video Outputs, 75 Ohm, 800mV
Total Number Of	5, consisting of 1 Fixed Input and 3 Jumper
BNC Connections	Configurable outputs. (One BNC not used)
SDI Output Jitter	The system will add less than 0.2UI to the input Jitter.
	(This is only guaranteed on issue 2 or later cards)
Current Consumption	<800mA at +5V
Size	215mm by 100mm

4.2 Jumpering the I-BUS (CAN-BUS) Termination

The I-BUS Network is the "control system" under which all Products and Panels are networked together. Under certain circumstances it is necessary to terminate the network. This can be done on a Panel or a "Product". To terminate this product, locate J6 on the CC-2 Processor Card supplied which is between U1 (The large square "chip") and the Edge connector. (This is on the half of the card labelled "CHP-100 Spartan2 Processor"). Jumper this with a 2mm link.



Figure 8 Location Of I-Bus Termination Link