FIG

VT3

Operation Manual

CO500 (SD) /509(HD) Single Channel Legalizer and Color Corrector

VT3 CO500/509 Single Channel Color Corrector
version 5.00 (Fig-F and above, for HD and SD)
www.vt3.tv

List of contents

Chapter

1

CO500/509 : application description

CO500/509 is a software application based on FIG, *the powerful OS free computer for video and audio signal processing developed by VT3.*

CO500/509 combines a full RGB color corrector and gamut legalizer,.

Current section will
- detail CO500/509 functionalities,
- explain how to insert CO500/509 in a working environment
- present FIG I/O connections

Functionalities

- Serial 4:2:2 SD and HD Input and Outputs (one output has bypass relay)
- EDH on SDI Outputs (SD),
- Full auto sense of SD and HD signal formats
- Complete RGB Color corrector
- True False Color Corrector/Legalizer with adjustable thresholds (RGB Clipper)
- H and V crop with linear edges
- Transparent to vertical blanking interval data of SDI Input
- 1RU height, half 19" width (2 units in 1RU)

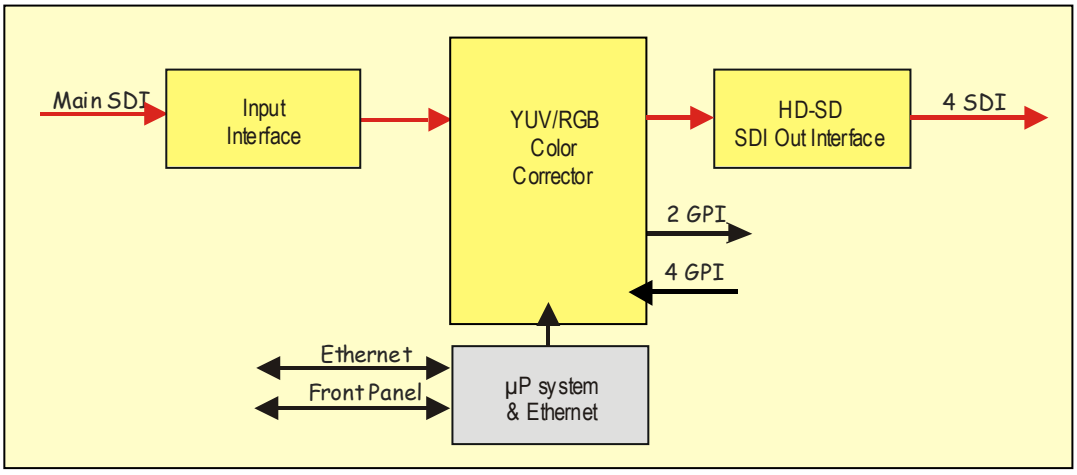


Figure 1 Internal organization of CO500/509

Inserting CO500/509 in a working environment

CO500/509 is particularly designed for:

- Satellite or transmission reception room
- Final transmission Room

… and more generally at any place where signals have to be legalized or color corrected.

Figure 2 Inserting CO500/509 in a working environment

FIG I/O connections

As CO500/509 is a software application running on FIG, I/O connections are identical to all FIG applications.

Simply connect In and Out according to your application.

In CO509, IN2 is **not used**, and must be left unconnected.

HD-SD SDI IN1 has **internal 75 ohms** matching resistor when power is on and is bypassed relayed on Out1-Byp1 when power is off;.

Customers willing to insert SFP modules : please contact VT3.

Eth (RJ45) can be used when operating the device through Tomato, otherwise must be **left open**.

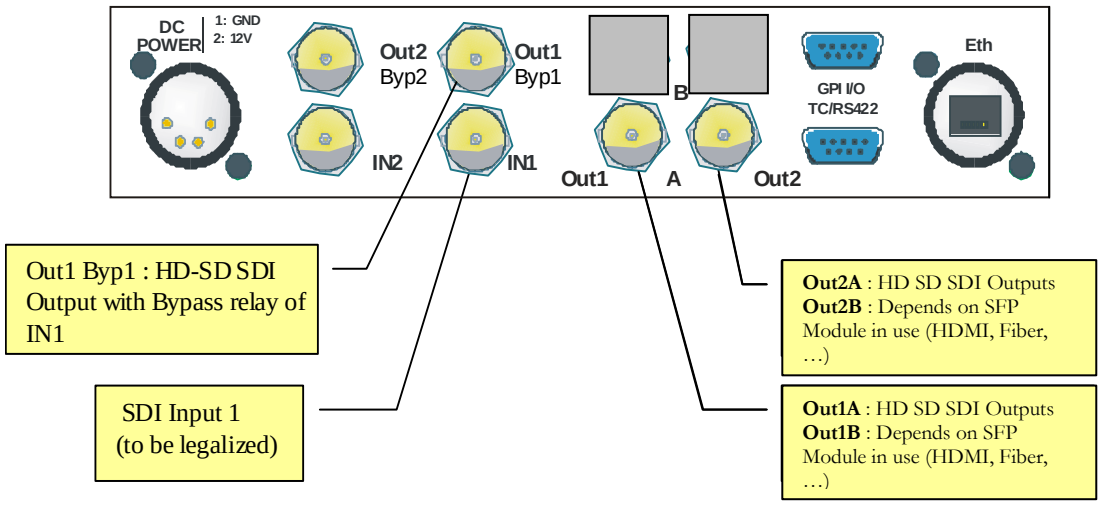
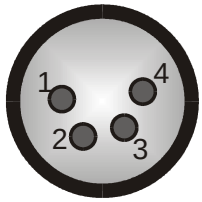


Figure 3 FIG connectors on back panel

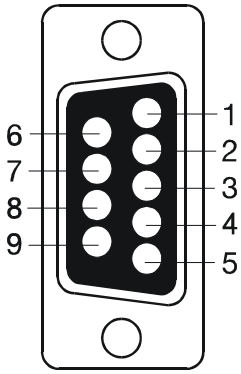
Connectors details

POWER (XLR 4 pin male type)



+12V	2
GND	1
OPEN (UNUSED)	3,4

GPI (DB9 female type)



In 1	6
In 2	2
In 3	7
In 4	3
Out 1	4
Out 2	9
GND	1, 5, 8

Chapter

2

Operating CO500/509 from FIG local front panel

Current section will
- introduce the functionality of FIG/CO500/509 front panel
- introduce the menu organization of CO500/509
- explain how to set up CO500/509 parameters from front panel

FIG Front panel presentation

Front panel is made of:

- 1 graphics screen
- 2 main buttons (***Group*** -***Status***)
- 1 control wheel (Control wheel has **2 functions**: ROTATE and PUSH)
- 1 Preset button
- 1 Reset Button

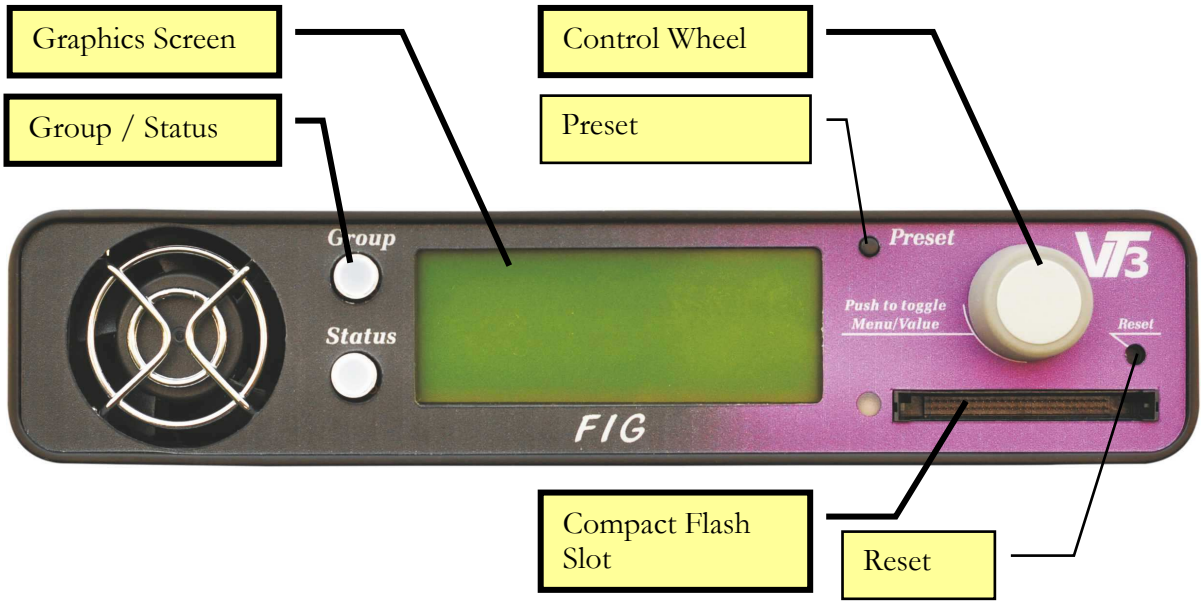


Figure 4 FIG front panel

Compact flash slot is **not used** in ordinary operation. It is reserved for firmware and software update of the product.

Status

Entering STATUS mode

The status of the device is accessed by pressing on the STATUS button.

Status screen is turned on either by pressing STATUS button or automatically after a few minutes without operation on front panel (sleep mode).

There are three status screens.

Status screen 1 indicates

- Input Status
- Input description
- On third row, BLANKING Status (when input is present)

Figure 5 Status screen1

Status screen 2 indicates

- On first row, product name (here CO500/509)
- On second row, Software version number

Figure 6 Status screen 2

Exiting STATUS mode (or wake up front panel)

To exit from STATUS mode, press STATUS button

Terminology

The different **parameters** of the device are accessible through dedicated **menus**.

Example: **Clip Black = +20mV** where
Clip Black represents the menu name
+20mV represents the value of the parameter

A **group** consists of a set of menus related to a single function of the device (example the group ***Proc Amp*** consists of all parameters related to the processing amplifier of the device: *Y Gain, Y lift, Sat level, ….*)

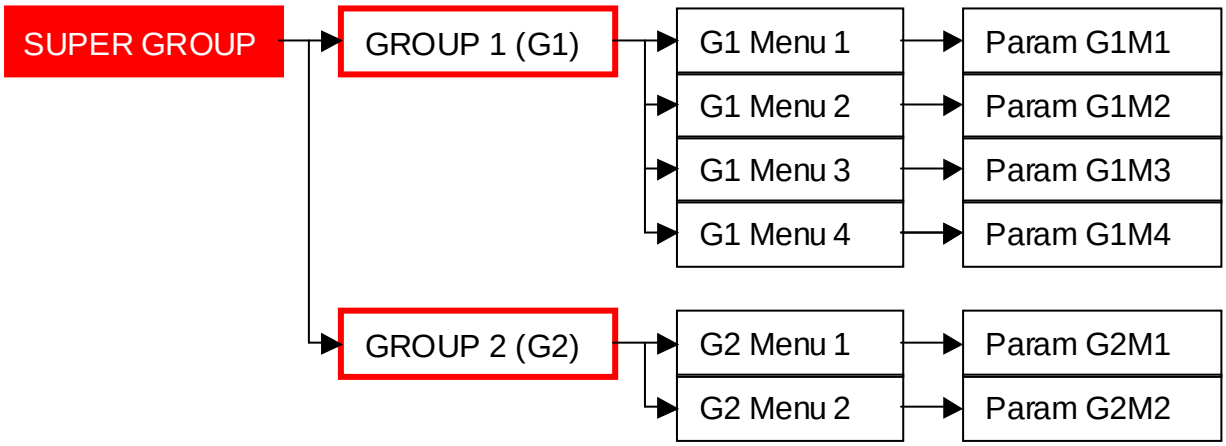


Figure 7 Hierarchical organization of super-groups, groups and menus

A **super-group** consists of a set of groups related to an application function of the device (example the group ***SYNC*** consists of all menus related to the SYNCHRONIZER function of the device.)

Super groups are identified by **icons** (on first row) and text description on second row

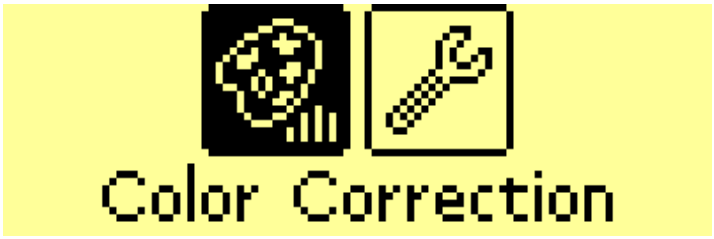


Figure 8 Icons of super-groups

Navigating in the super-groups, groups and menus

Navigation is achieved with **GROUP** button, **WHEEL ROTATE** and **WHEEL PUSH**

If device is in Status Mode, exit by pressing on STATUS before any other action.

In the groups

1. Press GROUP button,
2. use WHEEL ROTATE to navigate within the different groups.

Current group is displayed in inverted video on the GRAPHICS SCREEN

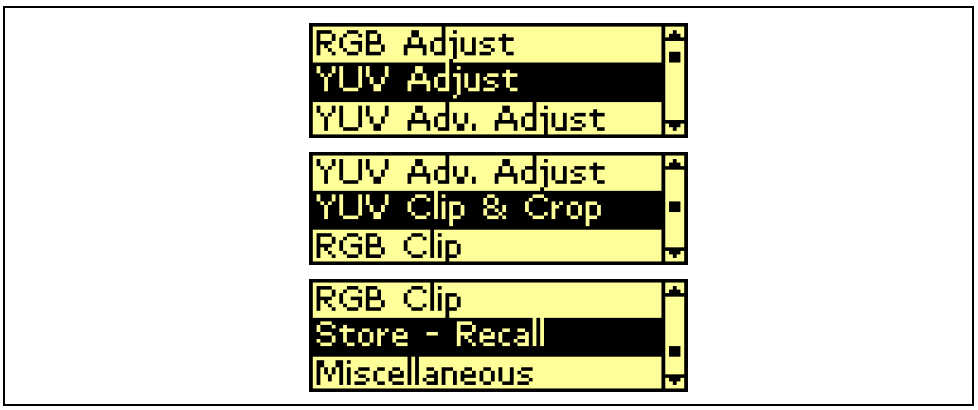


Figure 9 Examples of graphics screen display when navigating within groups

Note that **Group** button is in **direct access** mode and it will supersede current action (i.e. press Group will make the device **jump directly** to Group selection mode of current Super group)

To go to Super-Group, push **GROUP** once more.

Select one group and navigate within a group

1. When inverted video shows desired group, press WHEEL PUSH,
2. use WHEEL ROTATE to navigate within the group to see the different menus.

Select one super group and navigate within a super group

3. When inverted video shows desired super group, press WHEEL PUSH,
4. use WHEEL ROTATE to navigate within the group to see the different menus.

Accessing a parameter and adjusting it

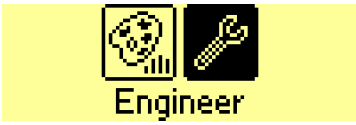
1. When inverted video shows desired menu, press WHEEL PUSH,
2. use WHEEL ROTATE to adjust the parameter.
3. when OK, press WHEEL PUSH to return to '*navigate within a group*'

CO500/509 groups and super-groups

COLOR CORRECTOR Super Group

1. **RGB Adjust**: (adjusts RGB black, peak and gamma levels)
2. **YUV Adjust**: (adjusts Y level and contour, Sat level)
3. **YUV Adv. Adjust**: (adjusts Cb Cr levels, Y-C timing)
4. **YUV Clip & Crop** (adjusts max levels of YUV, defines crop window)
5. **RGB Clip** (adjusts max levels of RGB)
6. **Illegal Colors** (displays position of Illegal Colors)
7. **Miscellaneous**
8. **Save/Recall**
9. **Engineer**

ENGINEER Super Group



1. **Options (Color corrector)**
2. **Miscellaneous**

RGB Adjust group (COLOR CORRECTOR super group)

This group of menus concerns the RGB input interface. It has the following menus:

Menu name	Action	Preset value
RGB Black	changes RGB black levels simultaneously	0mV/0 IRE
RGB Peak	changes RGB peak levels simultaneously	700mV/100 IRE
RGB Gamma	changes RGB 'gammas' simultaneously	0.00
Red Black	changes Red black level	0mV/0 IRE
Green Black	changes Green black level	0mV/0 IRE
Blue Black	changes Blue black level	0mV/0 IRE
Red Peak	changes Red peak level	700mV/100 IRE
Green Peak	changes Green peak level	700mV/100 IRE
Blue Peak	changes Blue peak level	700mV/100 IRE
Red Gamma	changes Red gamma	0.00
Green Gamma	changes Green gamma	0.00
Blue Gamma	changes Blue gamma	0.00

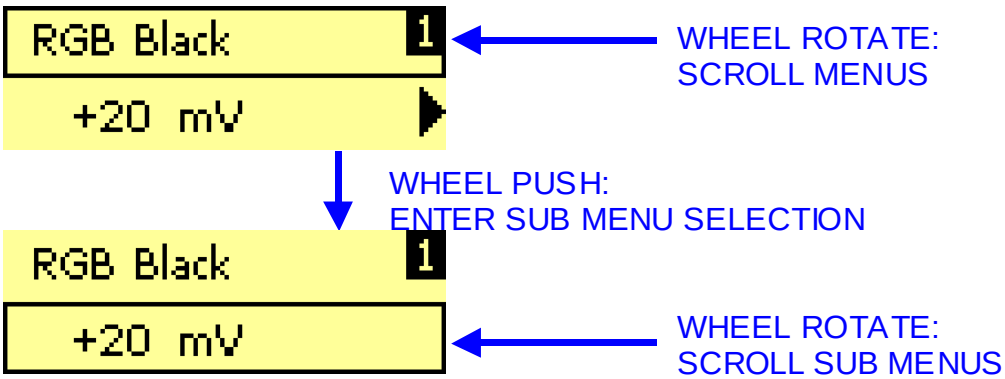


Figure 10 Example of adjusting RGB Black levels (on channel 1, see 1 in the top right)

DO NOT MISINTERPRET GAMMA VALUE DISPLAY.

A value of 0 for Gamma corresponds to nominal gamma (or more exactly input gamma is not changed, theoretically 0.45)

Positive value increase gamma upto approx. 0.80, negative value decrease gamma downto approx. 0.25.

YUV adjust group (COLOR CORRECTOR super group)

This group of menus concerns the YUV input processor (ahead of RGB processor). It has the following menus:

Menu name	Action	Preset value
Y Black	Changes Y black level	0 mV/0 IRE
Y Gain	Changes Y peak level	1.00
SAT (Cb/Cr) Level	Changes simultaneously Cb and Cr gains	1.00/1.00
Y Contour	Adjusts additional level of H contour	0.00
Contour Frequency	Selects contour center frequency	5.50MHz (SD)
Hue	Rotates Cb/Cr	0°

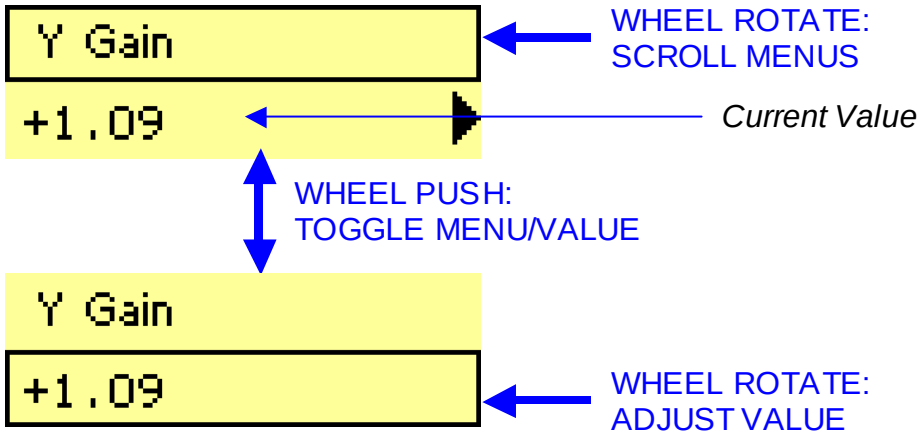


Figure 11 Example of Menu Selection and Value Adjust

Contour process is simply adding or subtracting more or less of the High frequency portion of Y signal to the incoming Y.
A value of 0.00 will pass Y unchanged
Center frequency is SD/HD dependant

Excessive contour may lead to ringing effects on sharp pictures.

Use of Hue with saturated colors will force the legalizer to limit saturation.
Though definitely not a problem in itself but a real protection, it might confuse the user.

YUV adv'd adjust group (COLOR CORRECTOR super group)

This group of menus concerns the YUV input processor (ahead of RGB processor).

It provides additional functionalities that are reserved to skilled users only, properly equipped with measurement apparatus.

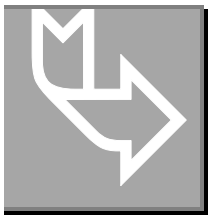
It has the following menus:

Menu name	Action	Preset value
Cb Gain	changes only Cb gain	1.00
Cr Gain	changes only Cr gain	1.00
Cb Offset	changes achromatic Cb level	0 mV/0 IRE
Cr Offset	changes achromatic Cb level	0 mV/0 IRE

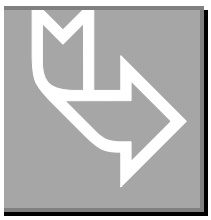
YUV Clip & Crop group (COLOR CORRECTOR super group)

This group of menus concerns the downstream YUV clipper. It has the following menus:

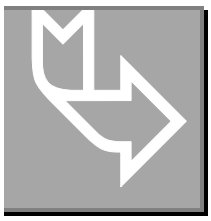
Menu name	Action	Preset value
Clip Black YUV	Defines Y minimum value	-25mV/-3.5 IRE
Stretch Black YUV	Defines stretch value (differential) before clipping to black	0 mV/0 IRE
Clip White YUV	Defines Y maximum value	+725mV+101 IRE
Stretch White YUV	Defines stretch value (differential) before clipping to white	0mV
SAT Clip	Defines SAT maximum value	SAT Clip Setup
Crop Top	Defines 1st active line for non cropping	Standard related
Crop Bottom	Defines last active line for non cropping	Standard related
Crop Left	Defines 1st active pixel for non cropping	0
Crop Right	Defines last active pixel for non cropping	0
SAT Clip Setup	defines Preset value of SAT Clip	108%



Even if YUV clipping provides some form of legalization, absolute legalization is only achieved by proper settings of RGB Clip menus.



SAT clipping is done in a circular manner (UV diagram). Observation of SAT clipping on a line sequential YUV waveform monitor is not easy.



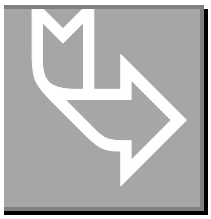
Left and Right Crops have a linear slope to avoid aliasing

Values of 0 for Left and Right crops corresponds to 720 pixels per active line (digital blanking). To obtain an analogue blanking it is necessary to change these values.

RGB Clip group (COLOR CORRECTOR super group)

This group of menus concerns the RGB clipper and **legalizer**. It has the following menus:

Menu name	Action	Preset value
Clip Black RGB	Defines RGB minimum value	-35mV/-5 IRE
Stretch Black RGB	Defines stretch value (differential) before clipping to black	0 mV/0 IRE
Clip White RGB	Defines RGB maximum value	+725mV+101 IRE
Stretch White RGB	Defines stretch value (differential) before clipping to white	0 mV/0 IRE



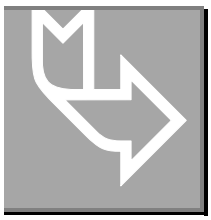
It has been noted that fast transient were passing through Legalizer insufficiently clipped and reported as errors by some measuring equipment.

Legalizing is guaranteed when more than 4 consecutive pixels in a line are over-exceeding clipping levels

Illegal colors display group (COLOR CORRECTOR super group)

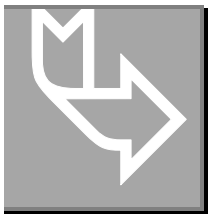
This group of menus concerns the display of illegal (false) colors. It has the following menus:

Menu name	Action		Preset value
FC Filter	Selects which illegal errors are shown		None
	None	No Display of Illegal Colors	
	RGB	All illegal colors appear as blinking white	
	Red only	Illegal colors generated from red component appear as blinking red	
	Green only	Illegal colors generated from Green component appear as blinking green	
	Blue only	Illegal colors generated from blue component appear as blinking blue	
FC Display Mode	Selects display mode		FC on Video
	FC on Video	Illegal colors are blinking, superimposed on video	
	FC on Black	Illegal colors are blinking, superimposed on black	



Illegal colors depend on RGB Clip and Stretch values.

It has been noticed that tight adjustments of RGB Clip values (e.g. 0-700mV) triggered the FC display more often than (e.g.) Tektronix WFM601 analyzer.



Independently of illegal color display mode, illegal colors are **always clipped (legalized)**, so do not try to check outputs to see illegal color values.

Miscellaneous group (COLOR CORRECTOR super group)

Menu name	Action	Preset value
Blanking	**Off** **Pass** H & V blanking information **Blanking H** **Blanks** data in the horizontal blanking interval (embedded audio), **passes** V information **Blanking V** **Passes** data in the horizontal blanking interval (embedded audio), **blanks** V information **Blanking H+V** **Blanks** data in the horizontal blanking interval (embedded audio), **blanks** V information	Off
Bypass	**Off** Shows processed picture (nominal) **Full** Shows input picture	Off
Split	**Off** Shows processed picture (nominal) **Split H (+/-X)** Shows input picture on left side, processed picture on right side. X is used to adjust split position **Split V (+/-X)** Shows input picture on top, processed picture on bottom. X is used to adjust split position **Split H' (+/-X)** Shows input picture on right side, processed picture on left side. X is used to adjust split position **Split V' (+/-X)** Shows input picture on bottom, processed picture on top. X is used to adjust split position	Off

Save - Recall group (COLOR CORRECTOR super group)

This group is used to store and recall configurations of each channel. A maximum of 60 configurations (per channel) plus Preset are available.

2 properties, **LOCK** and **USER PRESET**, can be assigned to each configuration (except Preset). These properties forbid SAVE and ERASE actions. Setting USER PRESET property is achieved in the Engineer/User Preset group of menu, while LOCK/UNLOCK is achievable from the Store Recall Group.

When entering the Group select (WHEEL.PUSH from Group or GROUP BUTTON.PUSH), comes the list:

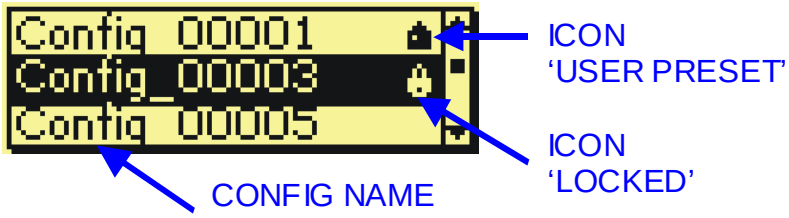


Figure 12 List of Configurations

Using WHEEL.PUSH will display a pop up menu. Available options of the pop up depend on the status of the configuration (see examples and table below)

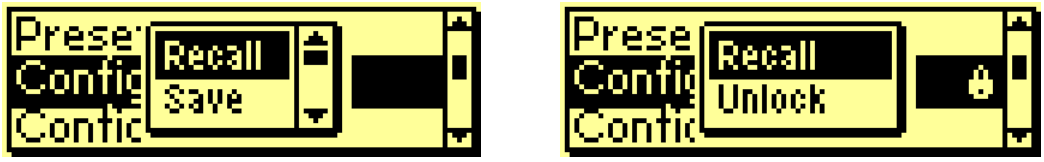


Figure 13 Different examples of Pop up menus

	Save	Recall	Rename	Lock Unlock	Erase	Copy to CF	Copy from CF	Delete from CF
PRESET or USER PRESET CONFIGx		✔						
CONFIGx (not locked)	✔	✔	✔	✔	✔	✔	✔	✔
CONFIGx (locked)		✔		✔		✔		
NEW	✔						✔	

Saving on an EMPTY configuration will create CONFIGx (first not used index))

Using the rename option

When pushing Rename, **Config name** is displayed on graphics screen with one character in inverted video.

PUSHING WHEEL will toggle **TURN WHEEL** action between **text scrolling** and **character edit**

To save and exit, press **STATUS**, to exit without saving, press **GROUP**.

Engineer group (COLOR CORRECTOR super group)

This group concerns additional settings devoted to advanced users . It has the following menu:s

Protect Config.

Protect Config is used to transform an ordinary configuration into a USER PRESET or vice versa

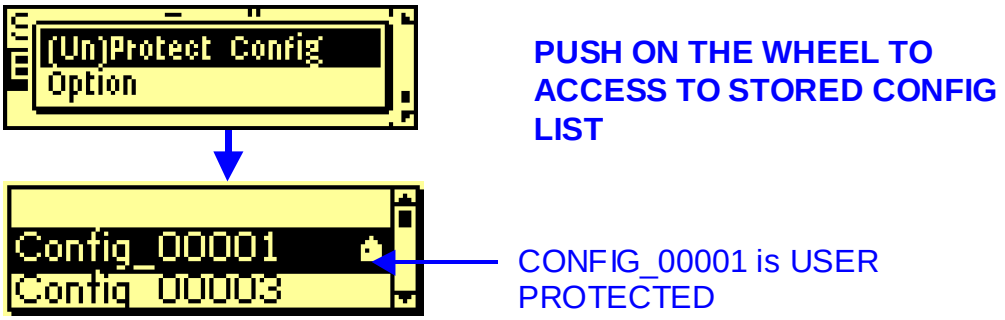


Figure 14 Engineer group operation

Option.

When **OPTION** is selected, pushing Wheel gives access to the following menus:

Content of the Option sub menu

Menu name	Options	Default
525L unit	Selects display in IRE or mV	IRE
Operation	**Post** Amplitudes of color correction are not limited **Live** Amplitudes of color correction are limited to avoid severe mistakes during live events	Post

Engineer super group

This super group concerns additional settings devoted to advanced users . It has the following menu:s

Option

When **OPTION** is selected, pushing Wheel gives access to the following menus:

Menu name	Options	Default
525L unit	Selects display in IRE or mV	IRE
Operation	**Post** Amplitudes of color correction are not limited **Live** Amplitudes of color correction are limited to avoid severe mistakes during live events	Post

Miscellaneous

When **Miscellaneous** is selected, pushing Wheel gives access to the following menu

Menu name	Options	Default
RGB Wheel X'er	**1q (0.8mV) – …- 16q (13mV)** Defines quantum multiplier range on RGB wheels. 16q for very fast process, 1q for very accurate.	4 q (3,2mV)

Other options are not relevant for this application

Chapter

3

Maintenance

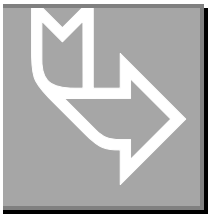
Current section will
- explain how to make an update from a compact flash,

Update from a compact flash

FIG is a programmable device taking data from a compact flash.

Once content of compact flash is transferred into the FIG., compact flash becomes useless and FIG will boot up and operate from internal flash memory until user decides to update software.

This method is also used for replacing current running application of a FIG (example, CO500/509 application running on a FIG Hardware can be replaced by CO510/519, the color corector)



An application note on how to download an application and its license can be found on the web at
www.VT3.tv/download

Transfer of files on the compact flash

Unless you received an already programmed compact flash, this is the first step of the procedure.

A software update consists of 1 package (with pak extension). It will come to you compressed in a single zip file. Before proceeding, you need to decompress this .pak file.

Step 1.1: format compact flash.

Compact flash must be formatted as FAT.

Step 1.2: copy files on compact flash.

Using drag and drop or any other means like copy and paste, transfer the pak file on the compact flash.

Make sure that the file is effectively copied (experience has shown that computer cache may fool user) by closing compact flash explorer and reopening it.

Then remove compact flash from reader.

Updating CO500/509 from compact flash

Step 2.1: Insert Compact flash into slot on front of the FIG,

Step 2.2: push on the Reset button (do not confuse Reset and Preset) or turn FIG power supply off and on

Step 2.3: Wait until graphics shows

Download completed

Then

Remove compact flash

Step 2.4: After removing compact flash, FIG will reboot and update is finished;