User Manual

SY-SE-10

18G HDMI 2.0 Up/Down Scaler (with image Enhancer), EDID Manager, HDCP controller & Audio De-embedder

The SY-SE-10 provides HDMI image scaling for both 2K to 4k (upscaling) and 4K to 2K (downscaling), with image enhancement settings in the upscaling mode. The SE-10 has a wide range of EDID settings that should cater for most situations, including a programmable EDID setting for those more troublesome times. It also provides two test patterns at 1080p and 4K30 that can be very useful for commissioning and system test.

The EDID management provides the installer/integrator with 14 fixed EDID settings (including HDR and Audio modes), an EDID bypass mode and one programmable EDID location. This make the SE-10 extremely versatile in being able to cope with any HDMI EDID related issues.

The SE-10 also De-embeds the incoming audio to stereo L/R analogue audio that may be used for either checking the audio signal or connection to a stereo power amplifier system.

All these powerful features are provided in a small package that can be discretely located.

Features

- HDMI 2.0 (4K 4:4:4 @ 60Hz), 1080p…., 3D, HDR,…. capable
- HDCP 1.4 and HDCP 2.2 compatible
- HDCP conversion and control
- Comprehensive EDID modes
    - EDID Bypass mode
    - 14 fixed EDID settings with HDR modes
    - 1 user programmable
- Upscaling – 1080p to 4K with three image enhancement modes
- Downscaling – 4K to 1080p
- Two HDBaseT operating modes
- Two test patterns – 1080p and 4K30
- CEC Pass-through
- 5V PSU and USB cable are provided

Panel Descriptions

Front
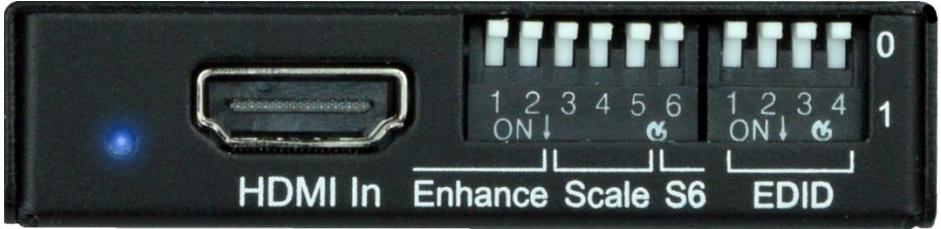
Name	Description
LED	HDMI Signal In LED
HDMI IN	HDMI signal from source device
Enhance Switches (1,2)	Set the enhancement mode when using 2K→4K upscaling
Scale Switches (3,4,5)	Set the scaling mode, or enable the test pattern modes
S6 (6)	Selection switch for Special modes
EDID Switches (1-4)	Used to set the desired EDID mode

Rear

Name	Description
USB	Mini USB connector for 5V DC power input
L/R Out	Analogue stereo de-embedded audio output
HDMI Output	HDMI output to display device
LED	HDMI Signal Out LED

Using the SY-SE-10

The SE-10 is placed in between the HDMI output device (Source) and the HDMI display device (Sink) and powered via the mini USB connector by the supplied PSU - see Figure 3.

The switches provide the various options for EDID settings, Scaling mode and Scaling Enhancement options. These are detailed on the top of the SE-10, but are also reproduced in the following tables. For each of the tables, arrow up (↑) means that the switch is in the UP (0) position and arrow down (↓) means that the switch is in the DOWN (1) position.

EDID Settings

The choice of EDID setting should always be determined by the requirements of the installation as some setting are not compatible with the HDMI display device being used in a specific situation. The following table applies only to the 4-way EDID switch.

SW1	SW2	SW3	SW4	EDID Setting	Description
↑	↑	↑	↑	EDID Bypass	The display EDID is presented to the HDMI IN connector
↑	↑	↑	↓	1080p 2CH	1080p with stereo audio
↑	↑	↓	↑	1080p 3D 2CH	1080p with 3D support and stereo audio
↑	↑	↓	↓	4K30Hz 3D 2CH	4K @ 30Hz with 3D support and stereo audio
↑	↓	↑	↑	4K30Hz 3D 6CH	4K @ 30Hz with 3D support and 5.1 audio
↑	↓	↑	↓	4K60Hz 3D 2CH	4K @ 60Hz with 3D support and stereo audio
↑	↓	↓	↑	4K60Hz 3D 6CH	4K @ 60Hz with 3D support and 5.1 audio
↑	↓	↓	↓	4K60Hz 3D 8CH	4K @ 60Hz with 3D support and 7.1 audio
↓	↑	↑	↑	1080p 2CH HDR	1080p with High Dynamic Range support and stereo audio
↓	↑	↑	↓	1080p 3D 2CH HDR	1080p with support for 3D and High Dynamic Range and stereo audio
↓	↑	↓	↑	4K30Hz 3D 2CH HDR	4K @ 30Hz with support for 3D and High Dynamic Range and stereo audio
↓	↑	↓	↓	4K30Hz 3D 6CH HDR	4K @ 30Hz with support for 3D and High Dynamic Range and 5.1 audio
↓	↓	↑	↑	4K30Hz 3D 2CH HDR	4K @ 30Hz with support for 3D and High Dynamic Range and stereo audio
↓	↓	↑	↓	4K60Hz 3D 6CH HDR	4K @ 60Hz with support for 3D and High Dynamic Range and 5.1 audio
↓	↓	↓	↑	4K60Hz 3D 8CH HDR	4K @ 60Hz with support for 3D and High Dynamic Range and 7.1 audio
↓	↓	↓	↓	User EDID	User programmable EDID memory

Programming USER EDID memory Using S6

S6 switch can be used to program the USER EDID memory location as follows:

1. Set all four EDID switches to ON (↓), and ensure S6 is set to OFF (↑).
2. Ensure there is an HDMI sink device connected to the HDMI OUT connector.
3. Set S6 to ON (↓).
4. Within 2 seconds set S6 to OFF (↑), the USER EDID memory is now programmed with the EDID data read from the HDMI sink device and is ready for use.

Using the Scaler and Enhancement Modes

The Scale and Enhance switch settings are used together to provide either image upscaling (2K→4K) or downscaling (4K→2K). The upscaling mode may also employ one of three enhancement modes.

Note: The scaler function only affects the number of pixels and scan lines, the refresh rate remains unaffected by the scaler setting.

Enhancement Mode Settings

Care should be used to determine the amount of image enhancement is required when using the 2K→ 4K scaling mode, as too high a setting could make the image quality seem worse. Always start with the Weak setting and move up from that setting until the desired image quality is achieved.

SW1	SW2	Scaler Mode	Description
↑	↑	Off	Image enhancement mode is inactive
↑	↓	Weak	A minimal amount of enhancement is applied
↓	↑	Medium	A moderate amount of enhancement is applied
↓	↓	Strong	A maximal amount of enhancement is applied

Scaler Mode Settings

SW3	SW4	SW5	Scaler Mode	Description
↑	↑	↑	Bypass	Scaler function is inactive
↑	↑	↓	4K → 2K	Downscale from 4K to 1080p
↑	↓	↑	2K → 4K	Upscale from 1080p to 4K

Other Settings

Also available are two HDBaseT mode settings and a test pattern in two resolutions.

SW3	SW4	SW5	Scaler Mode	Description
↑	↓	↓	HDBT Mode 1	HDBaseT Mode 1 – See below
↓	↑	↑	HDBT Mode 2	HDBaseT Mode 2 – See below Output bandwidth limited to 9Gbps
↓	↑	↓	TP 1 – 1080p	1080p60 Test Pattern mode
↓	↓	↑	TP 2 – 4K30	4K30Hz Test Pattern mode

HDBT Modes

The two HDBT modes are used to optimally limit the bandwidth when using HDBaseT extenders, these two modes provide the following options:

HDBT Mode 1 – See Figure 4

4K30 resolutions with colour bit depths of 10 or 12 bits are reduced to 8 bits to keep the bandwidth below 10.2Gbps. This resolution can be connected directly to the HDMI sink device. Since this mode outputs a reduced colour specification there will be some loss of information.

HDBT Mode 2 – See Figure 5

Any 4K30 resolution with colour bit depths of 10 or 12 bits are maintained with the same colour bit depth but the sub-sampling is reduced to 4:2:0 to keep the bandwidth below 10.2Gbps. With these settings the HDMI signal is non-standard and cannot be directly connected to the HDMI sink device. A second SE-10, also set to HDBT Mode 2, is required after the HDBaseT receiver to restore the video to a standard HDMI mode that can be connected to the HDMI sink device.
In this mode, with certain resolutions and settings, there will be NO loss of image quality.

Test Patterns TP1 and TP2

The SE-10 also provides two test patterns at either 1080p60 or 4K30 (3840x2160 @ 30Hz). Note that for 1080P the White to black stripes are repeated twice; whilst in the 4K30 mode they are repeated 5 times. The following two images and the table below illustrate the differences between the patterns:
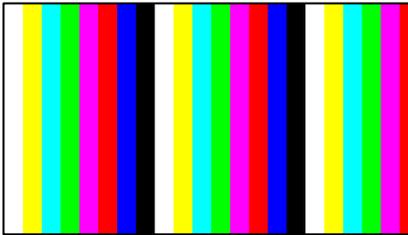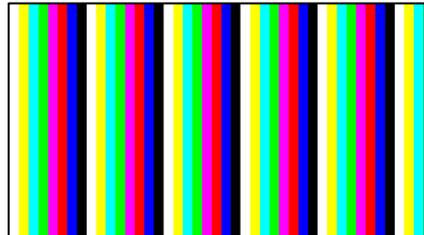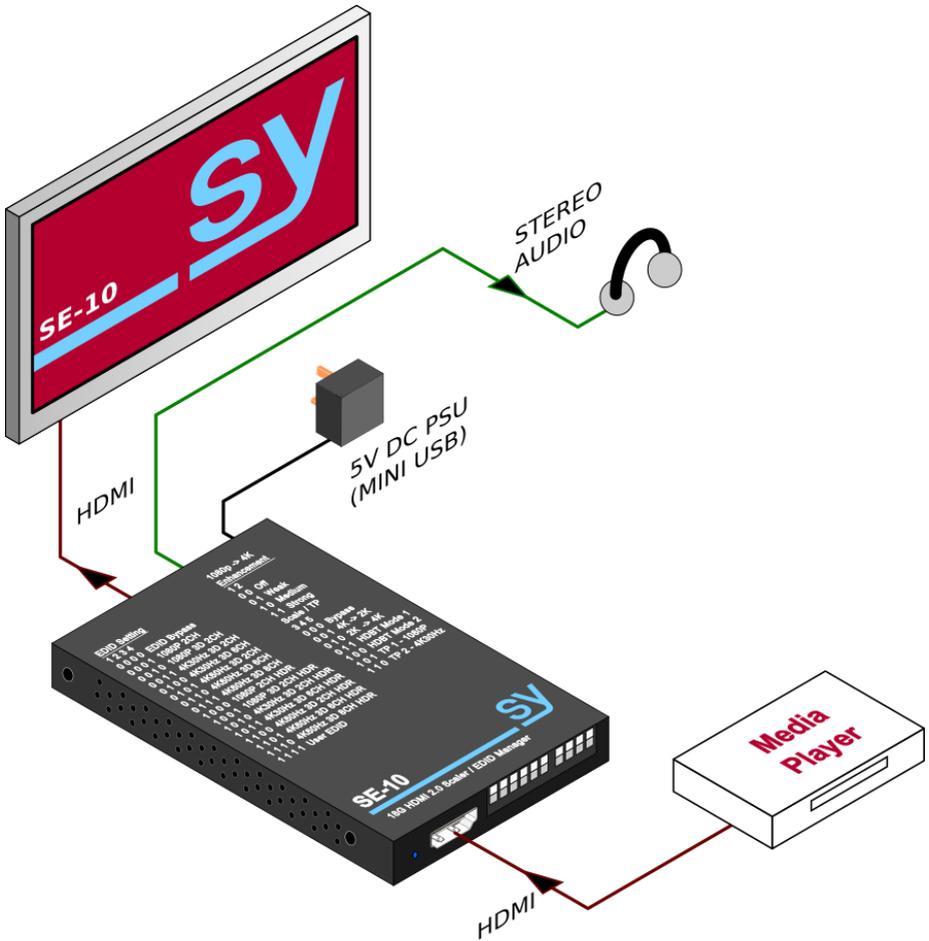

Figure 1 – 1080p60 Test Pattern

Figure 2 - 4K30 Test Pattern

Test Pattern Resolution Settings

Setting	Resolution Details	bpp	Sub sampling	Rate (Gbps)	Clock (MHz)
1080p60	1920 x 1080p @ 60Hz	24	4:4:4	4.46	148.5
4K30	3840 x 2160p @ 30Hz	24	4:4:4	8.91	297.0

System Configuration

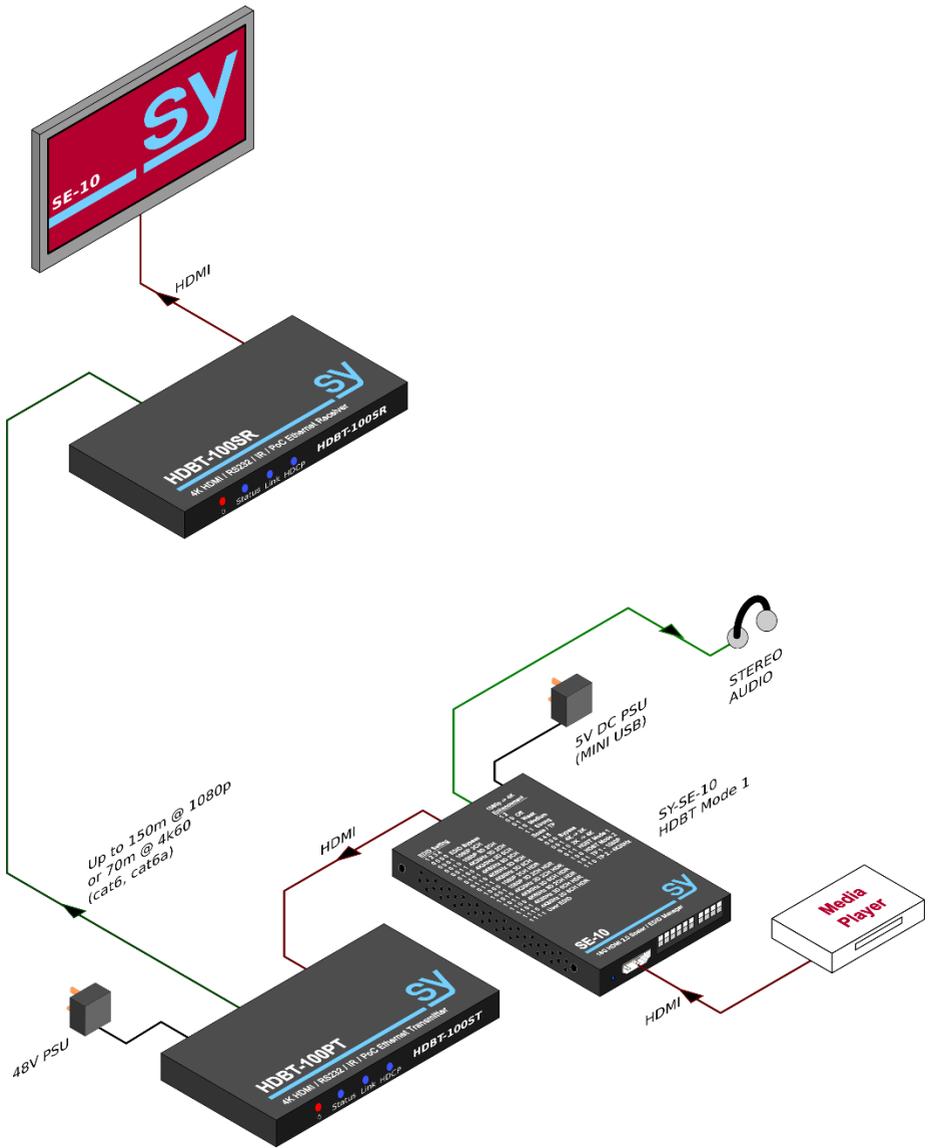*Figure 3 - SE-10 as an EDID Manager or Image Scaler*

Figure 4 – Example of SE-10 with Extenders, in HDBT Mode 1 Setting
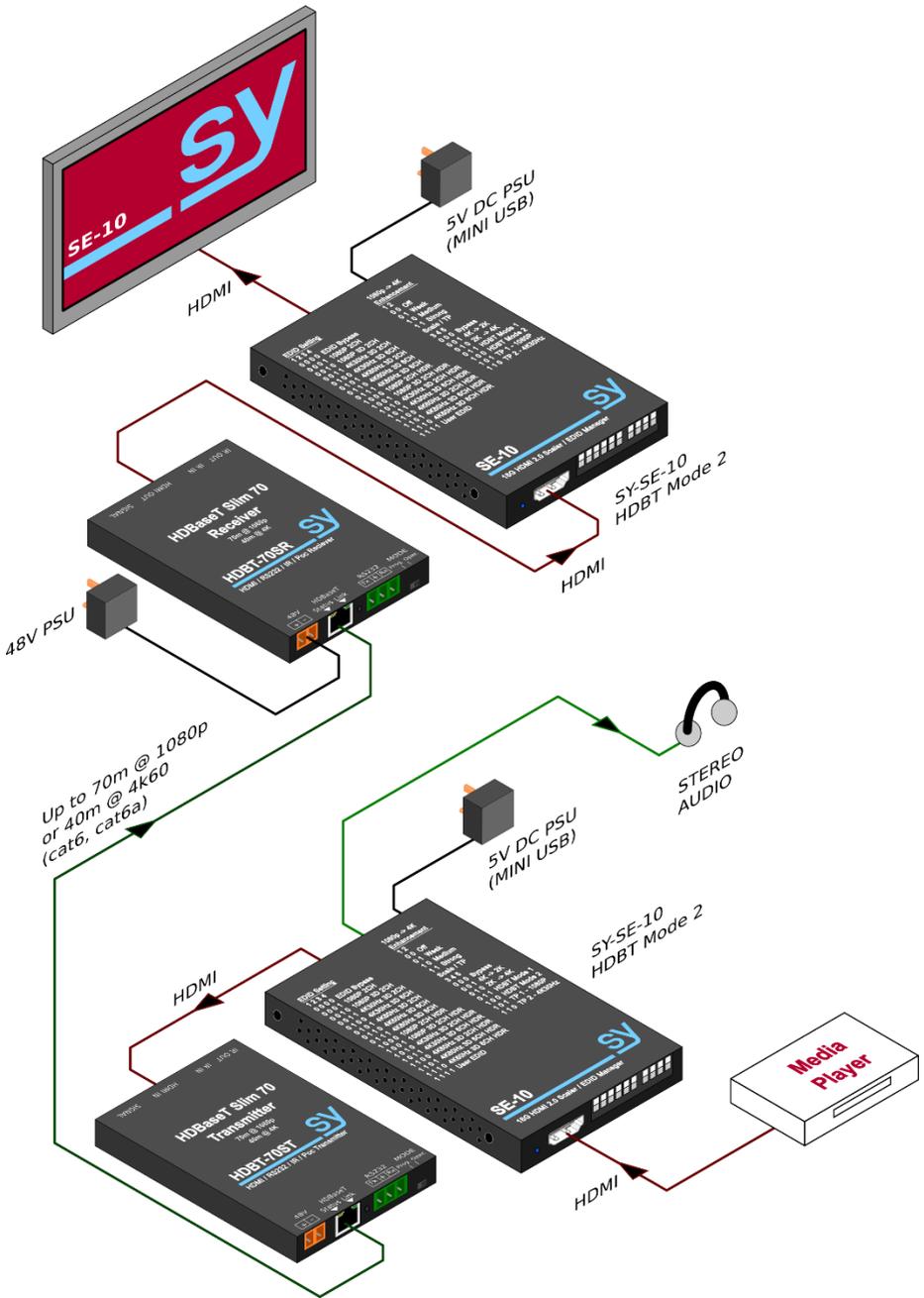
Figure 5 – Example of SE-10 with Extenders, in HDBT Mode 2 Setting

RS232 Control

When the SE-10 is powered from a PC USB port, the PC will also recognise the SE-10 as having a serial port. Use the following settings to send commands to the SE-10:

Baud Rate:	57600
Data Bits:	8
Parity Mode:	None
Stop Bits:	1

Commands are not case-sensitive, but must always be terminated with a carriage-return <0x0d> character. Any command may be typed manually using any terminal emulation software or from the RS232 serial output port of some other control equipment.

All response messages are always in uppercase and are also terminated by a carriage-return and line-feed character pair, <0x0d> + <0x0a>. Command response messages are also transmitted whenever the front panel switches change, thus keeping other systems up to date on any recent changes.

The following sections detail the available commands for the SE-10:

H – (Help)

Purpose:	Get the command help text
Command:	H
Response:	A text listing of all available commands.

STA and GET STA – (Status)

Purpose:	Get the current status info in either a detailed or simplified format.
Command:	STA
Response:	A text file detailing the current status of the SE-10. The output from this command contains textual descriptions of the SE-10 status.
Command:	GET STA
Response:	A simpler listing of the current status of the SE-10. The output from this command lists normal command response messages as follows:

Response Text	Description
ADDR 00	The current address of the SE-10
OUT HDCP 0	The current output HDCP mode
OUT1 VIDEO 0	The current scaler mode
OUT1 IMAGE ENH 0	The current image enhancement mode
OUT1 EXA EN	The current External Audio mode
OUT1 SGM DIS	The current test pattern signal generator mode
OUT1 SGMT 0	The current test pattern signal generator resolution setting
IN1 EDID 0	The current EDID setting for HDMI IN

The values shown above are those given when all the option switches are OFF. The actual values will depend on the current settings of the SE-10 before the GET STA command is sent.

Note: The status information may be updated either by RS232 commands or by changing the switches on the front panel. The status information will always be from the last change of state that occurred before the get status request was made.

SET RST – (Reset)

Purpose:	Reset the SE-10 to factory default values.
Command:	`SET RST`
Response:	`RST` (followed by the same responses as from the `GET STA` command).

SET ADDR and GET ADDR

Purpose:	Set or Get the current command address of the SE-10.
Set Command:	`SET ADDR xx`
Get Command:	`GET ADDR`
Response:	`ADDR xx`
Factory Default:	`00`

When the address `xx` is in the range `01` to `99`, then all the commands must be preceded by the current address number as two digits. This command modifier is not needed when the address is at the factory default value of `00`.

SET OUT1 HDCP and GET OUT1 HDCP – (HDCP)

Purpose:	Set or Get output HDCP mode.
Set Command:	`SET OUT1 HDCP y`
Get Command:	`GET OUT1 HDCP`
Response:	`OUT1 HDCP y`
Factory Default:	`0`

Valid values for `y` are:

0	AUTO	Set the HDCP output mode as required by the HDMI sink device
1	BYPASS	HDMI OUT HDCP setting is the same as the HDMI IN HDCP
2	DISABLE	HDCP output is turned off
3	HDCP 1.4	HDCP output is forced to V1.4
4	HDCP 2.2	HDCP output is forced to V2.2

SET OUT1 VIDEO and GET OUT1 VIDEO – (4K - 2K, Mode)

Purpose:	Set or Get output video scaler setting.
Set Command:	`SET OUT1 VIDEO y`
Get Command:	`GET OUT1 VIDEO`
Response:	`OUT1 VIDEO y`
Actual Value:	The value of `y` depends on the last change that occurred either by the RS232 SET command or the front panel switches.

Valid values for `y` are:

1	BYPASS	Scaler mode is off, output resolution is the same as the input
2	4K → 2K	Downscale from 4K@30 to 1080p@30
3	2K → 4K	Upscale from 1080p to 4K, refresh rate is the same as the input
4	HDBT Mode 1	Limit the output bandwidth to 10.2G for any input signal above 10.2G
5	HDBT Mode 2	Limit the output bandwidth to 10.2G for any input signal above 10.2G

See **HDBT Modes** above for more details about how the two HDBT Modes operate.

SET OUT1 IMAGE ENH and GET OUT1 IMAGE ENH – (Enhance)

Important:	Image enhancement only has effect when using the 2K → 4K scaler setting.
Purpose:	Set or Get the image enhancement mode.
Set Command:	`SET OUT1 IMAGE ENH y`
Get Command:	`GET OUT1 IMAGE ENH`
Response:	`OUT1 IMAGE ENH y`
Actual Value:	The value of y depends on the last change that occurred either by the RS232 SET command or the front panel **1080p → 4K Enhancement** switches.

Valid values for y are:

0	OFF	Image enhancement is turned off
1	WEAK	The minimum amount of enhancement is applied
2	MEDIUM	A moderate amount of enhancement is applied
3	STRONG	The maximum amount of image enhancement is applied

The amount of image enhancement required should always be judged by the quality of the displayed image. Incorrect use of image enhancement can make the image seem worse.

SET OUT1 EXA EN/DIS and GET OUT1 EXA – (Audio)

Purpose:	Enable, Disable or Get the mode of the external audio output.
Enable Command:	`SET OUT1 EXA EN`
Disable Command:	`SET OUT1 EXA DIS`
Get Command:	`GET OUT1 EXA`
Enable response:	`OUT1 EXA EN`
Disable response:	`OUT1 EXA DIS`
Factory Default:	Enabled

SET OUT1 SGMT EN/DIS and GET OUT1 SGM – (Test Pattern)

Purpose:	Set or Get the condition of the internal test pattern generator.
Enable Command:	`SET OUT1 SGM EN`
Disable Command:	`SET OUT1 SGM DIS`
Get Command:	`GET OUT1 SGM`
Enable response:	`OUT1 EXA EN`
Disable response:	`OUT1 EXA DIS`
Actual Value:	The actual response returned depends on the last change that occurred either by the RS232 SET command or the front panel **Scale/TP** switches.

SET OUT1 SGMT and GET OUT1 SGMT – (Test Pattern Resolution)

Purpose:	Set or Get the resolution setting of the internal test pattern generator.
Set Command:	`SET OUT1 SGMT x`
Get Command:	`GET OUT1 SGMT`
Response:	`OUT1 SGMT x`
Valid x Values:	**0** – for the 1080p60 pattern, or
	1 – for the 4K30 pattern.
Actual Value:	The returned value of x depends on the last change that occurred either by the RS232 SET command or the front panel **Scale/TP** switches.

GET OUT1 EDID DATA

Purpose:	Get the EDID data of the HDMI sink connected to the HDMI OUT connector.
Get Command:	`GET OUT1 EDID DATA`
Response:	`OUT1 EDID DATA`
Actual Value:	The command response will be followed by either 128 (DVI) or 256 (HDMI) values given in hexadecimal notation that represents the EDID data of the connected sink device.

GET IN1 EDID y DATA

Purpose:	Get the EDID data for the specified EDID memory location.
Get Command:	`GET IN1 EDID y DATA`
Response:	`IN1 EDID DATA`
Actual Value:	The command response will be followed by 256 values given in hexadecimal notation that represents the EDID data of the requested EDID memory location.

Valid values for y are: 1 to 15

Note: EDID location 0 is the Bypass mode and does not have a memory location. Using this command with y = 0 will give the response `CMR ERR`.

SET IN1 EDID y and GET IN1 EDID

Purpose:	Set or Get the EDID setting for the HDMI IN connector.
Set Command:	`SET IN1 EDID y`
Get Command:	`GET IN1 EDID`
Response:	`IN1 EDID y`
Actual Value:	The value of y depends on the last change that occurred either by the RS232 SET command or the front panel **EDID Setting** switches.

Valid y values for the **GET IN1 EDID y DATA** and **SET IN1 EDID y** commands are:

y	EDID Setting	Description
0	EDID Bypass	The display EDID is presented directly to the HDMI IN connector
1	1080p 2CH	1080p with stereo audio
2	1080p 3D 2CH	1080p with 3D support and stereo audio
3	4K30Hz 3D 2CH	4K @ 30Hz with 3D support and stereo audio
4	4K30Hz 3D 6CH	4K @ 30Hz with 3D support and 5.1 audio
5	4K30Hz 3D 2CH	4K @ 30Hz with 3D support and stereo audio
6	4K60Hz 3D 6CH	4K @ 60Hz with 3D support and 5.1 audio
7	4K60Hz 3D 8CH	4K @ 60Hz with 3D support and 7.1 audio
8	1080p 2CH HDR	1080p with High Dynamic Range support and stereo audio
9	1080p 3D 2CH HDR	1080p with support for 3D and HDR and stereo audio
10	4K30Hz 3D 2CH HDR	4K @ 30Hz with support for 3D and HDR and stereo audio
11	4K30Hz 3D 6CH HDR	4K @ 30Hz with support for 3D and HDR and 5.1 audio
12	4K30Hz 3D 2CH HDR	4K @ 30Hz with support for 3D and HDR and stereo audio
13	4K60Hz 3D 6CH HDR	4K @ 60Hz with support for 3D and HDR and 5.1 audio
14	4K60Hz 3D 8CH HDR	4K @ 60Hz with support for 3D and HDR and 7.1 audio
15	User EDID	User programmable EDID memory

SET IN1 EDID CY OUT1

Purpose:	Copy the EDID values from the sink device connected to the HDMI OUT connector to the USER memory associated with the HDMI IN connector.
Command:	`SET IN1 EDID CY OUT1`
Response:	`IN1 EDID CY OUT1`

SET IN1 EDID U1 DATA z

Purpose:	Write the EDID values given with the command to the USER memory associated with the HDMI IN connector.
Command:	`SET IN1 EDID U1 DATA z`
Response:	`IN1 EDID CY OUT1`

z represents values up to 256 hexadecimal values of valid EDID data that will be stored in the USER memory location. To use that data the USER memory must be selected either from the front panel or by the RS232 command: **SET IN1 EDID 15**.

Care must be taken to ensure that the EDID given with the command is valid, as incorrect data will produce unexpected results or may even stop the HDMI source from outputting a picture.

Specifications

Video Input / Output	
Input / Output Connector	2 x Female HDMI Type A
HDMI Standard	Support HDMI 2.0 up to 4K@60 4:4:4 & HDCP2.2, backward compatible with all previous standards.

Video General	
Video Signal	HDMI (or DVI-D)
HDMI In/Out cable length	10m HDMI cable (4K 60Hz 4:4:4) maximum
Transmission Distance Using HDBaseT (cat6a)	Up to 100m (4K 60Hz 4:2:0, 8 bpc), or 150m @ 1080p
Resolution	VESA and SMPTE 480p to 2160p (4K UHD) with 3D. (All resolutions to: 4096x2160p @60Hz 4:4:4 8bit, 3840x2160p @30Hz 4:4:4 8bit) All PC resolutions to 1920x1200
Color depth	8, 10, 12, 16 bit per color per pixel
Chroma Subsampling	4:4:4, 4:2:2, 4:2:0
HDCP	All versions up to HDCP 2.2
EDID Management	In-built EDID data and manual EDID management
CEC	Pass through
Bandwidth	18 Gbps maximum

Audio General	
Digital Audio	Supports all audio including PCM, Dolby True HD, DTS, DTS-HD
Analogue Output	Stereo audio output
Frequency Response	20Hz ~ 20KHz
Output Connector	1 x 3.5mm stereo jack (L/R)

Controls	
Option Mode Switches	Piano-Style switches for setting various modes
USB (RS232 Comm port)	USB RS232 port (@ 57.6Kb) when connected to a PC/laptop

General	
Power Supply	5V DC 1.0A
Power Consumption	1.2W
Temperature	0 ~ +45℃
Reference Humidity	10 ~ 90%
Dimension (W*H*D)	66.0 mm x 16.0 mm x 93.0 mm
Net weight	145 g

Safety Instructions

To ensure reliable operation of this product as well as protecting the safety of any person using or handling these devices while powered, please observe the following instructions.

1. Use the power supplies provided. If an alternate supply is required, check Voltage, polarity and that it has sufficient power to supply the device it is connected to.

2. Do not operate either of these products outside the specified temperature and humidity range given in the above specifications.

3. Ensure there is adequate ventilation to allow this product to operate efficiently.

4. Repair of this equipment should only be carried out by qualified professionals as this product contains sensitive devices that may be damaged by any mistreatment.

5. Only use this product in a dry environment. Do not allow any liquids or harmful chemicals to come into contact with this product.

After Sales Service

1. Should you experience any problems while using this product, firstly refer to the Troubleshooting section in this manual before contacting SY Technical Support.

2. When calling SY Technical Support, the following information should be provided:

   - Product name and model number
   - Product serial number
   - Details of the fault and any conditions under which the fault occurs.

3. This product has a two year standard warranty, beginning from the date of purchase as stated on the sales invoice. For full details please refer to our Terms and Conditions.

4. SY Product warranty is automatically void under any of the following conditions:

   - The product is already outside of its warranty period
   - Damage to the product due to incorrect usage or storage
   - Damage caused by unauthorised repairs
   - Damage caused by mistreatment of the product

5. Please direct any questions or problems you may have to your local dealer before contacting SY Electronics.

NOTES