Gefen TOOLBOX

HD Pattern
Signal Generator

GTB-HD-SIGGEN

User Manual

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INTRODUCTION

Congratulations on your purchase of the GefenToolBox HD Pattern Signal Generator. Your complete satisfaction is very important to us.

About Gefen

Gefen delivers innovative, progressive computer and electronics add-on solutions that harness integration, extension, distribution, and conversion technologies. Gefen's reliable, plug-and-play products supplement cross-platform computer systems, professional audio/video environments, and HDTV systems of all sizes, with hard-working solutions that are easy to implement and simple to operate.

GefenToolBox

The GefenToolBox line offers portable and easy-to-install solutions for common A/V system integration setups using HDMI connectivity. GefenToolBox products are wall-mountable and small in size. GefenToolBox products are easily transported in the field and are ready for immediate and simple installations in working environments.

The GefenToolBox HD Pattern Signal Generator

The GefenToolbox HD Pattern Signal Generator is the most advanced testing device for your audio and video equipment. 39 built-in timings, 41 patterns, and four (4) data analysis patterns provide over a thousand testing combinations for both analog and digital devices. The front panel LCD screen provides easy viewing of functions and features for each timing / pattern. This device can be conveniently controlled via the front panel buttons, the IR remote or the downloadable software from the Gefen Web site. In addition to its portability, this signal generator is wall-mountable and field-upgradeable.

How It Works

Connect the HDMI output port of the GefenToolbox HD Pattern Signal Generator to your HDTV display. Power-on all equipment. The front panel LCD will display all features and options of the active timing and pattern. You can feed digital or analog audio into the generator's rear panel and hear multi-channel digital audio or use the built-in sine wave test tone.

**READ THESE NOTES BEFORE INSTALLING OR OPERATING
THE GEFENTOOLBOX HD PATTERN SIGNAL GENERATOR**

- The GefenToolBox HD Pattern Signal Generator can be controlled using a software application and RS-232. Download this application from the Gefen Web site at: http://www.gefen.com/kvm/support/download.jsp

Features

- Multi-format video output for SD and HD video up to 1080p
- PC/HD resolutions up to UXGA / WUXGA (1920 x 1200)
- 39 timings, 41 patterns, and 4 data analysis patterns
- Supports RGB 4:4:4, YCbCr 4:4:4, and YCbCr 4:4:2 color spaces
- Supports NTSC and PAL frame rates
- 2 CH, 5.1 CH, and 7.1 CH LPCM internal sine wave generator
- RS-232 control via the downloadable software from the Gefen Web site.
- Small form factor; easy to transport
- Supports HD timings for VGA output
- HDCP Pattern
- Supports reading and copying EDID functionality.
- User Friendly Interface - LCD Display, LED indicators and Software.
- Deep Color support up to 12-bit
- HDMI 1.3 and DVI 1.0 Compliant
- HDCP Compliant

Sample Applications

- Apparatus Testing and Troubleshooting
- Equipment Adjustment
- EDID checking
- Source / Sink definition
- HDCP Verification

Package Includes

- (1) GefenToolBox HD Pattern Signal Generator
- (1) 6ft. HDMI cable (M-M)
- (1) IR Remote
- (1) 5 V DC Power Supply
- (1) User Manual

Top Panel

Top Panel

1   LCD Display
Displays pattern and timing information in addition to other functions used by the Signal Generator.

2   IR Window
Receives signals from the IR Remote Control unit.

3   Control Panel
See pages 8 - 10 for detailed information on the Control Panel.

Back Panel
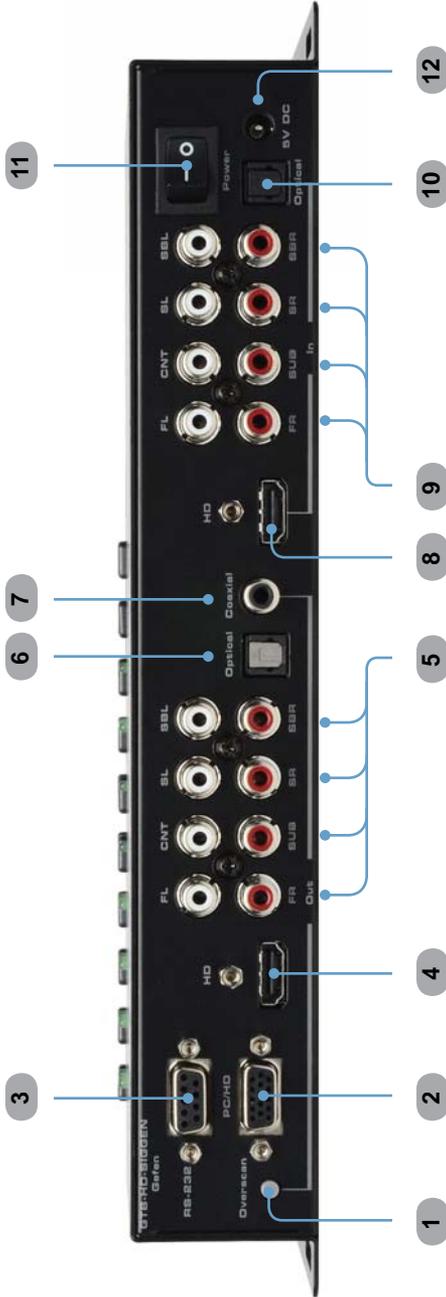
Back Panel

1   Overscan Button
By default, the GefenToolBox HD Pattern Signal Generator is set to underscan mode. If the video signal does not fill the entire display, press this button once to switch to overscan mode. Press the Overscan button a second time to return to underscan mode.

2   VGA Output
Connect a VGA monitor to this port.

3   RS-232 Serial Port
Connect an RS-232 cable from this port to the computer running the HD Pattern Signal Generator software.

4   HD Out
Connect an HDTV display to this HDMI port. DVI displays can be connected using an HDMI to DVI cable or adapter.

5   Analog Audio Outputs
8 RCA type audio outputs (FL, FR, C, SUB, SL, SR, SSL, and SSR) are available for connection to a separate amplifier. Up to 6 discrete channels can be utilized.

6   TOSLink Output Connector
Connect an optical cable from this output to an amplifier or other audio output device.

7   S/PDIF Output Connector
Connect a coax cable from this output to an amplifier or other audio output device.

8   HD In
Used to connect a Hi-Def source to the Signal Generator using an HDMI cable. DVI displays can be connected using an HDMI to DVI cable or adapter.

9   Analog Audio Inputs
8 RCA type audio outputs (FL, FR, C, SUB, SL, SR, SSL, and SSR) are available for connection from a source device.

10   TOSLink Input Connector
Connect an optical cable from the audio source device to this connector.

11   Power Switch
Turns the Signal Generator power ON or OFF.

12   5 V DC Power Connector
Connect the included 5 V DC power supply to this connector.

Control Panel
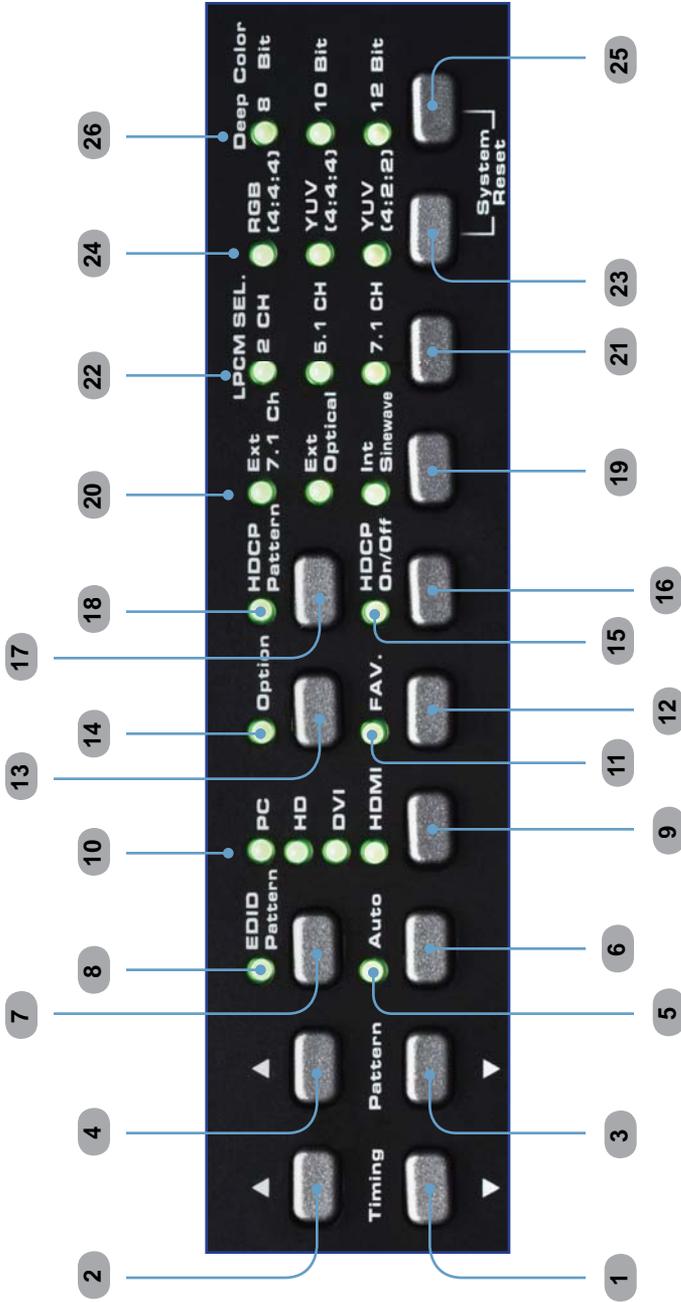
Control Panel

1   Timing (Down)
Cycles backward through the list of timings.

2   Timing (Up)
Cycles forward through the list of timings.

3   Pattern (Down)
Cycles backward through the list of patterns.

4   Pattern (Up)
Cycles forward through the list of patterns.

5   Auto Indicator
This LED will glow bright green when the Signal Generator is placed in Auto mode.

6   Auto
Automatically cycles through a specified list of timing / pattern sets. The Autorun Demonstration mode is configured through the HD Pattern Signal Generator software. See page 72 for details.

7   EDID Pattern
Press this button to jump directly to the EDID Pattern (P38). See page 21 for more information on using the EDID Pattern.

8   EDID Pattern Indicator
This LED will glow bright green when the Signal Generator is placed in EDID mode.

9   Output Signal Button
Selects between PC / HD (VGA), DVI, or HDMI signal types. Consecutively press this button to cycle through each of the signal types.

10   Output Signal Indicators
These LED indicators will glow bright green to indicate the current video output mode (PC, HD, DVI, or HDMI)*.*

11   Fav. Button
Configures the generator to show only the patterns selected using the HD Pattern Signal Generator software (see page 51 for details). This button is also used to change parameters when using certain patterns.

12   Fav. Indicator
This LED will glow bright green when the [Fav] button is pressed.

13   Option Button
The option button provides access to sub-functions within certain patterns.

14 Option Indicator
This LED will glow bright green when the Signal Generator is in Option mode.

15 HDCP On / Off Indicator
This LED will glow bright green when HDCP content is being sent from the Signal Generator.

16 HDCP Button
Enables / disables HDCP on the output. See page 29 for more information on using HDCP.

17 HDCP Pattern Button
Press this button to jump directly to the HDCP Pattern (P40).

18 HDCP Pattern Indicator
This LED will glow bright green when the HDCP Pattern (P40) is enabled.

19 Audio Selection Button
Pressing this button consecutively will cycle through the different audio output options (see page 25 for details)*.*

20 Audio Selection Indicator
These LED indicators will glow bright green to indicate the current audio output mode*.*

21 Audio Channel Button
Pressing this button consecutively will cycle through the different output audio channels (see page 25 for details)*.*

22 Audio Channel Indicator
These LED indicators will glow bright green to indicate the current audio channel selection.

23 Color Space Selection Button
Pressing this button consecutively will cycle through the available output color spaces.

24 Color Space Selection Indicator
These LED indicators will glow bright green to indicate the current color space.

25 Bit Depth Selection Button
Selects between 8-bit, 10-bit, or 12-bit color.

26 Bit Depth Indicator
These LED indicators will glow bright green to indicate the current color bit depth selection on the output.

How to Connect the GefenToolBox HD Pattern Signal Generator

1. Connect an HDMI cable from the GefenToolBox HD Pattern Signal Generator to the HDTV Display.

2. Connect an optional external audio source to the HD Pattern Signal Generator using an optical cable or RCA cables.

3. Connect the included 5V DC power supply to the power receptacle on the HD Pattern Signal Generator and connect the power cord to an available electrical outlet.

4. Turn on the HDTV display first, then turn on the HD Pattern Signal Generator.

Wiring Diagram for the GefenToolbox HD Pattern Signal Generator
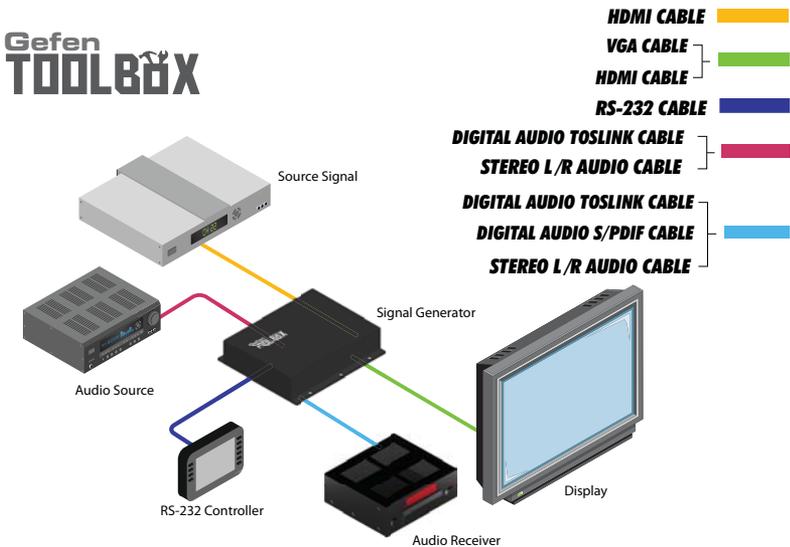
IR Remote Layout and Descriptions (RMT-HD-SIGGEN)
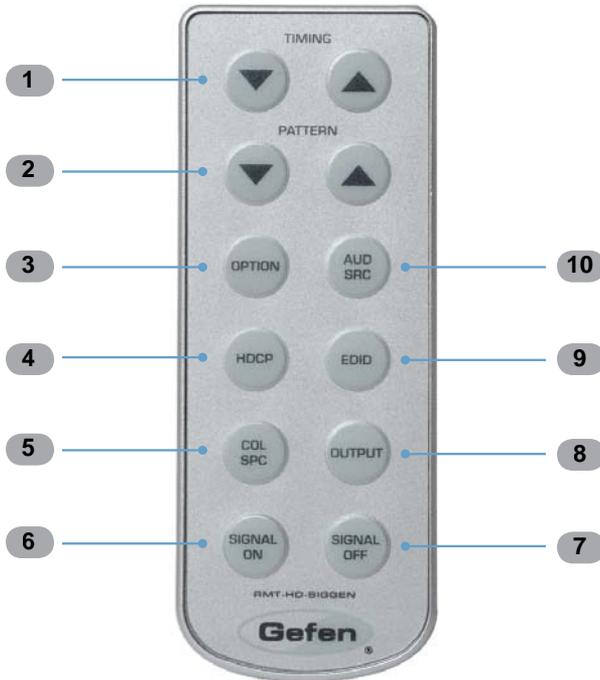
1 **▼ / ▲ *(Timing)***
Cycles forward (▲) and backward (▼) through the list of timings.

2 **▼ / ▲ *(Pattern)***
Cycles forward (▲) and backward (▼) through the list of patterns.

3 **Option**
The Option button provides access to sub-functions within certain patterns.

4 **HDCP**
Enables / disables HDCP on the output. See page 29 for more information on using HDCP.

5 **Col Spc**
Pressing this button consecutively will cycle through the available output color spaces.

6   Signal On
Turns the signal ON after it has been turned off (A/V mute) using the Signal Off button.

7   Signal Off
Turns the signal OFF (A/V mute).

8   Output
Selects between PC / HD (VGA), DVI, or HDMI signal types. Consecutively press this button to cycle through each of the signal types.

9   EDID
Press this button to jump directly to the EDID Pattern (P38). See page 21 for more information on using the EDID Pattern.

10 Aud Src
Pressing this button consecutively will cycle through the different audio output options (see page 25 for details).

Installing the Battery

1. Hold the IR remote control unit facing down and gently pull the battery tab with your thumb to reveal the battery slot.

2. Insert the included battery into the battery slot. The battery slot indicates that the positive (+) side of the battery must be facing up as shown below:
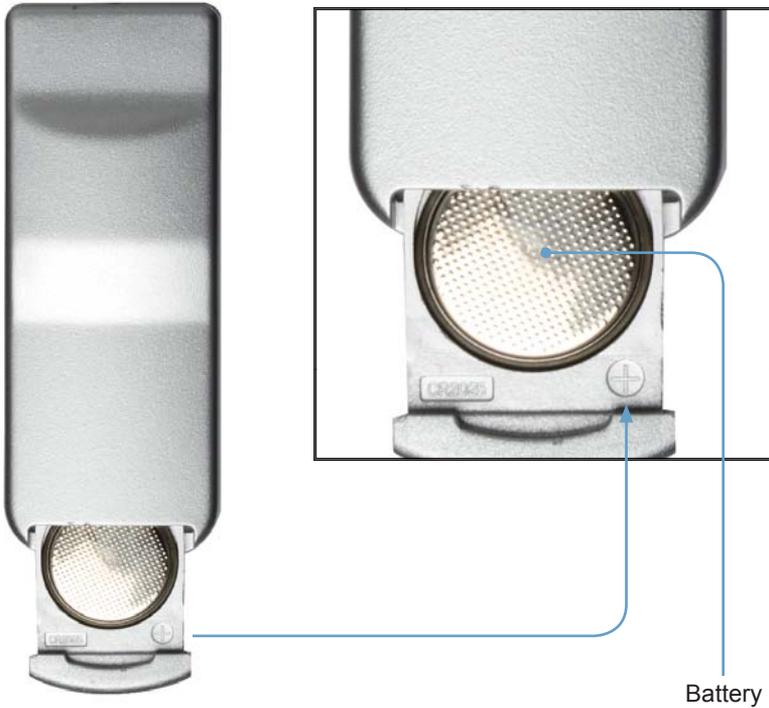
Battery

3. Close the battery slot by sliding it closed.

Display Window

The **Display Window** of the GefenToolBox HD Pattern Signal Generator is a 16-character, 2-line display. This display will show the currently selected timing and pattern on the output. In addition, this display is also used for providing information or messages about the connected devices. When the unit is powered on, a screen similar to the following will be displayed:

Currently selected timing

Currently selected pattern

Timing Buttons

To change the timing, use the ▲ and ▼ Timing buttons. The ▲ button will move forward through the timings. Use the ▼ button will move backward through the timings. See pages 36 - 37 for a list of supported timings.

Cycles forward through the timings

Cycles backward through the timings
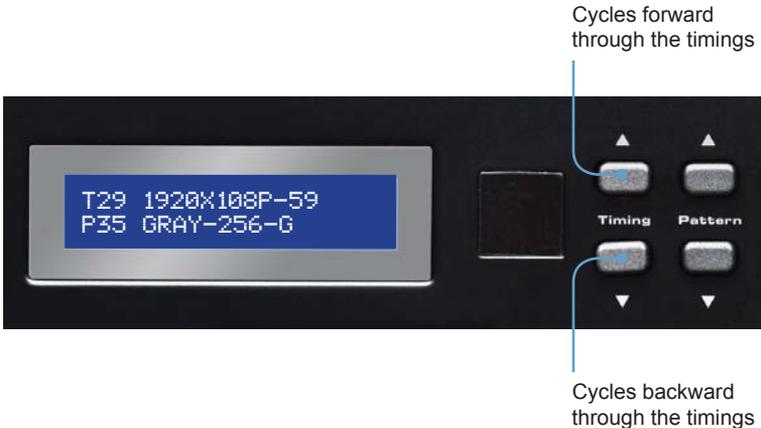
Pattern Buttons

To change the pattern, use the ▲ and ▼ Pattern buttons. The ▲ button will move forward through the patterns (see the pages 14 - 35 for a list of available patterns). Use the ▼ button to move backward through the patterns.

Cycles forward
through the timings

T29 1920X108P-59
P35 GRAY-256-G

Timing   Pattern

Cycles backward
through the timings

TIP: Press and hold the ▲ or ▼ buttons to rapidly cycle through either the timings or patterns.

Resetting the HD Pattern Signal Generator

To reset the HD Pattern Signal Generator to factory default settings, simultaneously hold down the Color Space Selection button and the Bit Depth Selection button. During the reset sequence, the LCD display will show the message: `System Reset`

SYSTEM RESET

SEL.
CH   RGB   Deep Color
        (4:4:4)   8 Bit

CH   YUV   10 Bit
        (4:4:4)

CH   YUV   12 Bit
        (4:2:2)

System
Reset

System Reset
message

Press to reset
the Generator
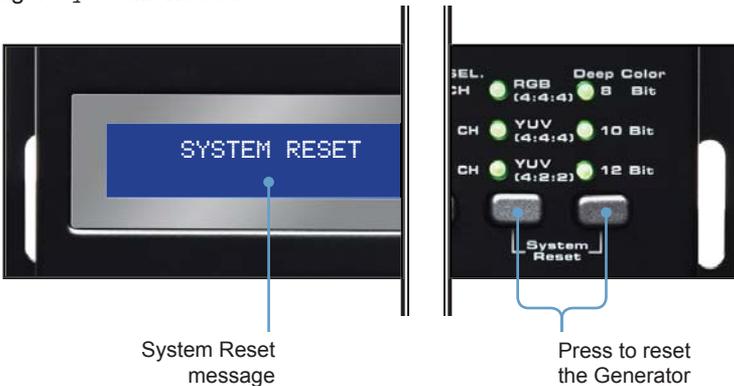
Purity

Pattern 01 - Pattern 08 (P01 - P08)
Press the [OPTION] button to switch between Full Screen and Windowed format.

P01	White		
P02	Blue		
P03	Red		
P04	Magenta		
P05	Green		
P06	Cyan		
P07	Yellow		
P08	Black		

Red (P03) and Green (P05) are often used to check color purity. When using the Red pattern, no other color should be present on the screen. If the Red pattern appears tinted, then this is an indication that the color purity should be adjusted. The Red pattern can also be used to ensure that there is no interference between the sound and the chroma carrier, in addition to adjusting the long play delay level to minimum flicker.

Green (P05) provides a color purity check for display devices that use three in-line guns. The in-line configuration defines guns which are positioned horizontally with the green gun located in the center (R-G-B).

Blue (P02) is a complementary color. This pattern is frequently used to test color performance.

Color Settings

Pattern 09 - Pattern 13 (P09 - P13)
Press the [OPTION] button to enter the pattern options. Use the Pattern [UP] and [DOWN] buttons to adjust the color level. Press the [FAV] button to switch between full and limited color range.

Enter pattern options

Adjusts color level

T01 640X480-60
P11 BLUE SETTING

Adjusts color level
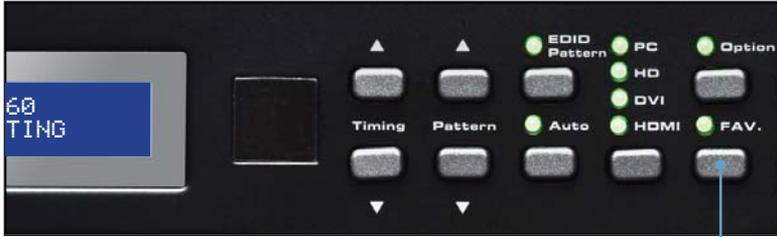
Switch between full
and limited color range

When using Pattern 09 - Pattern 12, a black screen will be displayed, first. Use the [OPTION] to enable to the pattern. The Blue Pattern (P11) is illustrated below:

Press [OPTION] to do BLUE setting
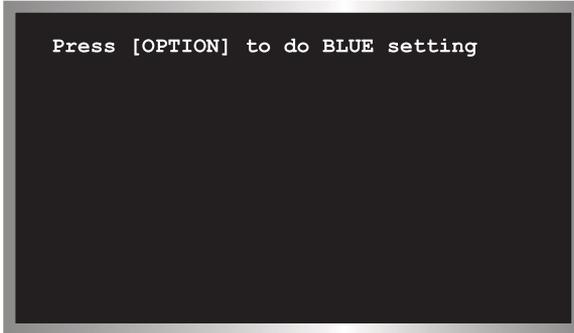
The BLUE Setting pattern (P11) with blue level at 203 and set to the Full color range setting using the [FAV] button:

Blue. 203   Full
[FAV.]. ColorRange
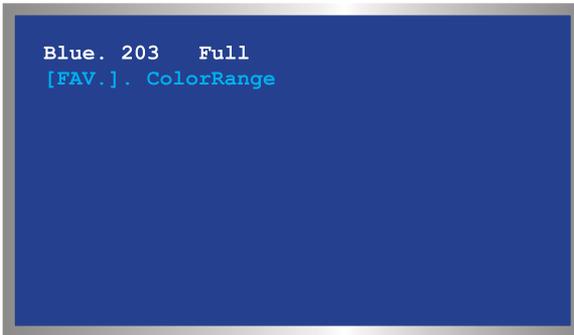
Pattern 13 (P13) will appear as a white screen and can only be controlled using RS-232. See page 46 for more information.

Color Bars

Pattern 14 - Pattern 17 (P14 - P17)

There are four different color bar patterns. Use the [OPTION] button on Pattern 14 (P14) and Pattern 16 (P16) to switch between 75 IRE (Option LED indicator OFF) and 100 IRE (Option LED indicator ON).

P14	Color Bar
P15	SMPTE Color Bar
P16	Split Bar
P17	RGB Delay

Gray Scale

Pattern 18 - Pattern 22 (P18 - P22)

Gray scale patterns can be used to locate faulty linearity of the video amplifier or gray scale settings. Use the [OPTION] button on Gray-11 (P19) to alternate between the two patterns. Option LED indicator OFF = Vertical Pattern, ON = Cross Pattern.

P18	Gray-8
P19	Gray-11
P20	Gray-32
P21	Gray-256
P22	H.Gray-11
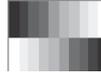
Black White Line

Pattern 23 -Pattern 26 (P23 - P26)
The vertical pattern serves as a test for the horizontal bandwidth and phase behavior of a color monitor. This pattern can also be used to verify the video amplifier and color temperature.

The horizontal pattern can check the vertical bandwidth and phase behavior, in addition to verifying the video amplifier integrity and color temperature.

P23   V Line ONOFF

P24   H Line ONOFF

P25   MULTI-BURST

P26   Dual Needle

Pluge

Pattern 27 - Pattern 31 (P27 - P31)

Pluge (Picture line up) patterns are used to perform accurate and consistent line-up of the output signal (video). The concept behind Pluge patterns is to adjust the brightness control so that the first bar is invisible, while the second bar remains visible.

Use the [OPTION] button on PLUGE-5 (P31) to cycle through each of the Pluge variations.

P27	PLUGE-1	

P28	PLUGE-2	
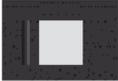
P29	PLUGE-3	

P30	PLUGE-4	
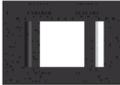
P31	PLUGE-5	

By default, Pattern 31 (P31) is set to the first pluge pattern. During this state, the Option LED indicator will be OFF.

Press the [OPTION] button to display the second Pluge-5 variation pattern. The Option LED indicator will glow bright green.

Press the [OPTION] button a third time to display the third Pluge-5 variation pattern. The Option LED indicator will glow bright green.

Pressing the [OPTION] button a fourth time will display the original Pluge-5 pattern. The Option LED indicator will turn OFF.

Grid

Pattern 32 - Pattern 33 (P32 - P33)
Grid and cross patch patterns are mainly used for detecting corner convergence ("pin cushions").

P32   GRID

P33   Cross Hatch
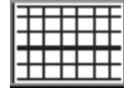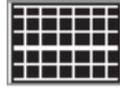
Press the [OPTION] button on Pattern 33 (P33) to toggle between the black/white (Option LED indicator is OFF) and white/black (Option LED indicator is ON) cross hatch patterns.

Gradient

Pattern 34 - Pattern 36 (P34 - P36)
Gradient patterns are used to detect linearity faults in the video amplifier. Non-linearities will usually result in color level compression.

P34   GRAY-256-R

P35   GRAY-256-G

P36   GRAY-256-B

Circles

Pattern 37 (P37)
Produces a pattern with large circles on the screen. This pattern is primarily used for checking the overall geometry and linearity of the display.

P37   CIRCLES

EDID

Pattern 38 (P38)
Displays the EDID pattern screen. This pattern is used to analyze the EDID data of the connected sink (display, A/V receiver, etc).

P38   EDID Analysis

> **TIP:** The EDID pattern (P38) can also be directly accessed by pressing the [EDID] button on the top panel.

Jump directly to the EDID pattern (P38) from any pattern

The EDID pattern supports up to two (2) blocks (Block0 and Block1).

When the EDID pattern is selected, the display will appear as follows:

```
Press [OPTION] to do EDID analysis
```

To use the EDID pattern, follow the instructions below:

1   Press the [OPTION] button.

2   The EDID Analysis Menu will be displayed. The first line of the menu will be
      highlighted in blue.

EDID Source Select
is highlighted in blue.

```
EDID Analysis Menu

EDID Source Select: HDMI / DVI Out
Block0. Binary List
Block0. Vendor / Product Id
Block0. Basic Display Parameters
Block0. Color Characteristics
Block0. Established Timings
Block0. Standard Timings
Block0. Detail Timings
Block1. Binary List
Block1. DTV Monitor Support
Block1. Video Data Block
Block1. Audio Data Block
Block1. Vendor Specific Data Block
Block1. Other Data Block
Block1. Detail Timings
```

3   Press the [OPTION] button to select between HDMI / DVI Out, HDMI / DVI In, or
      VGA PC / HD Out.

- **HDMI / DVI Out**
  Reads the EDID of the sink (display, A/V receiver, etc) connected to the HD Pattern Signal Generator.

- **HDMI / DVI In**
  Reads the built-in EDID of the HD Pattern Signal Generator.

- **VGA PC / HD Out**
  Reads the EDID of the display connected to the VGA port of the HD Pattern Signal Generator.

4   In this example, the HDMI / DVI Out option will be used. An HDMI cable is connected between the sink and the HD Out port of the HD Pattern Signal Generator. Any of the three options (mentioned above) could be used, depending upon the application.

5   Press the ▼ Pattern button twice to scroll down to the Block0. Vendor / Product Id option.

Block0. Vendor / Product Id is highlighted in blue.
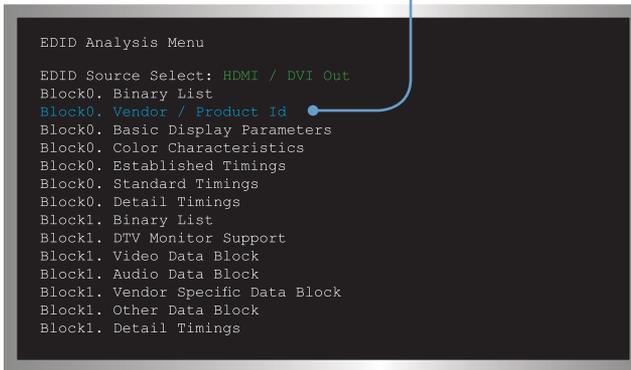
```
EDID Analysis Menu

EDID Source Select: HDMI / DVI Out
Block0. Binary List
Block0. Vendor / Product Id
Block0. Basic Display Parameters
Block0. Color Characteristics
Block0. Established Timings
Block0. Standard Timings
Block0. Detail Timings
Block1. Binary List
Block1. DTV Monitor Support
Block1. Video Data Block
Block1. Audio Data Block
Block1. Vendor Specific Data Block
Block1. Other Data Block
Block1. Detail Timings
```

6   Press the [OPTION] button on the top panel to display this section of the EDID data structure.

The HD Pattern Signal Generator will display the Vendor / Product Id EDID information on the screen.

Your Vendor / Product Id EDID information will most likely differ from the example below:
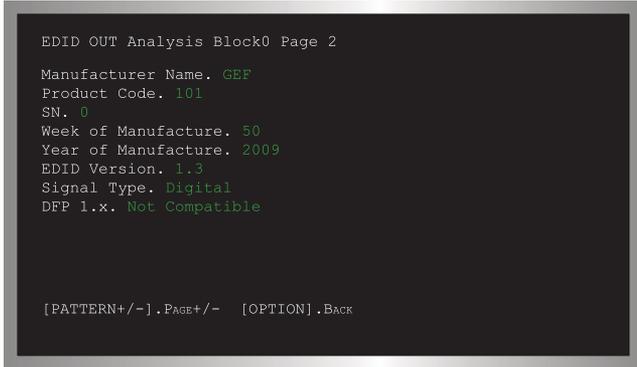
```
EDID OUT Analysis Block0 Page 2

Manufacturer Name. GEF
Product Code. 101
SN. 0
Week of Manufacture. 50
Year of Manufacture. 2009
EDID Version. 1.3
Signal Type. Digital
DFP 1.x. Not Compatible




[PATTERN+/-].PAGE+/-  [OPTION].BACK
```

In this example, the HD Pattern Signal Generator reported the following EDID information for the Vendor / Product Id in Block 0:

```
EDID OUT Analysis Block0 Page 2

Manufacturer Name. GEF
Product Code. 101
SN. 0
Week of Manufacture. 50
Year of Manufacture. 2009
EDID Version. 1.3
Signal Type. Digital
DFP 1.x. Not Compatible
```

7   Press the [OPTION] button to return to the EDID Analysis Menu or press the ▲ or ▼ Pattern buttons to display each section of the EDID data structure, without having to return to the EDID Analysis Menu.

8   To exit the EDID pattern, return to the EDID Analysis Menu (press the [OPTION] button if required) to return to the EDID Analysis Menu, then press the [EDID] button on the top panel. Press the ▲ or ▼ Pattern buttons to select another pattern.

Audio

Pattern 39 (P39)
This pattern displays the audio information of the connected source device, such as the number of audio channels, sampling rate, and I²S (Intergrated Interchip Sound) bus data.

P39   AUDIO

The table below provides a listing of the audio input and audio output combinations when using the Audio Pattern (P39).

		Output		
		Analog 7.1 Ch	Optical / Coax	HDMI
Input	Ext. 7.1 Ch	Bypass	LPCM 2CH @ 48 kHz	Ext. 7.1 Ch
	Ext. Optical	2 CH	Bypass	Bypass
	Int. Sinewave	2CH, 6CH, 8CH	LPCM 2 CH @ 48 kHz	Ext. Optical

External 7.1 Channel Audio Input

In the example below, the Audio Pattern is shown using the external 7.1 channel audio input.

Current Audio input
selection.

```
Audio Pattern

INPUT: Ext. 7.1CH

____ OUTPUT ____
Analog 7.1CH: Bypass
OPTICAL/COAX: LPCM 2CH 48KHz
HDMI: LPCM 2/6CH 48KHz


[2CH/5.1CH]. HDMI-OUT Audio Channels

[EXT. 7.1CH/OPTICAL/SINEWAVE]. Audio Source
```

In the example above, the Audio Pattern is shown using the external 7.1 channel audio input. The Audio Input Selection button is used to change the audio input type.

Audio Input
Selection button

Text that is highlighted in yellow indicates that the value may be changed. In the illustration above, the HDMI output can be toggled between 2 channel LPCM and 6 channel (5.1) channel LPCM audio using the Audio Channel selection button.

Audio channel
selection button

Note that HDMI does not support 8 channels (7.1) of audio. Therefore, the 7.1 CH option cannot be selected.

External Optical Audio Input

Changing the audio input to EXT OPTICAL, using the Audio Input Selection button will produce the following screen:

```
Audio Pattern

INPUT: Ext. OPTICAL


_____ OUTPUT _____
Analog 7.1CH: 2CH
OPTICAL/COAX: Bypass
HDMI: Bypass


_____ Source Format Detection _____
App Type: None
Audio Coding: None
Sampling Rate(kHz): None


[EXT. 7.1CH/OPTICAL/SINEWAVE]. Audio Source
```

In the example above, since no optical input was used, the Source Format Detection displays None.

> **NOTE:** The External Optical Audio Input does *not* support bitstream decoding.

Internal Sinewave Generator

The third option (INT SINEWAVE) uses the internal sine wave generator:

```
Audio Pattern

INPUT: Int. Sinewave

_____ OUTPUT _____
Analog 7.1CH: 2/6/8CH
OPTICAL/COAX: LPCM 2CH 48KHz
HDMI: LPCM 2/6/8CH  48/96/192KHz
I2S Bus: On/Mute

[FAV.].I2S Bus

[OPTION]. HDMI-OUT Sampling Rate
[2CH/5.1CJ/7.1CH].
    Analog/HDMI-OUT Audio Channels

[EXT. 7.1CH/OPTICAL/SINEWAVE]. Audio Source
```

Changes the
Sampling Rate

Selects the serial
data line

Audio channel
selection button
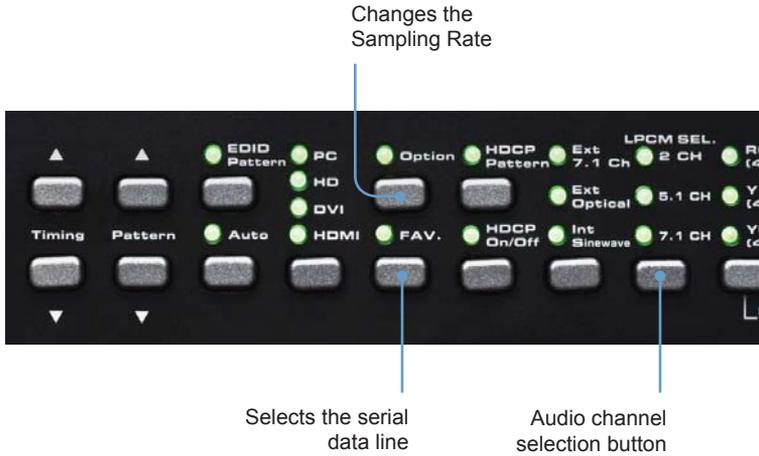
The I²S data line option is only present when the HD Pattern Signal Generator is set to 5.1 CH or 7.1 CH audio. In 2 CH mode, the I²S bus can only be enabled or disabled (muted). Use the [FAV] button to change the I²S bus options.

When the output is set to 5.1 (6 channel) audio, the I²S options are:

```
I2S Bus: On, Mute, SD0, SD1, and SD2
```

When the output is set to 7.1 (8 channel) audio, the I²S options are:

```
I2S Bus: On, Mute, SD0, SD1, SD2, and SD3
```

HDCP

Pattern 40 (P40)
This pattern displays HDCP information such as handshaking and link integrity test.
If the sink (output device) is a repeater, both the B_{KSV} and $B_{KSV'}$ are displayed.

P40   HDCP

When the HDCP pattern is selected, the display will appear as follows:

```
HDCP Pattern
HDCP is off
```

> **TIP:** The HDCP pattern (P40) can also be directly accessed by press-
> ing the [HDCP] button on the top panel.

By default, HDCP is disabled. Press the [HDCP] button on the front panel to enable
HDCP. HDCP can be enabled or disabled for any pattern, except for the EDID
pattern (P38).

Enables or disables
HDCP

Once HDCP has been enabled, the screen will appear similar to the following:

```
HDCP Pattern

1. Sink HDCP port detects: PASS

2. Source writes An to Sink: PASS
   An: F8 0C 74 A2 24 4F 08 19

3. Source writes Aksv to Sink: PASS
   Aksv: 3B D1 6C 90 AD

4. Read and Verify Sink Bksv: PASS
   Bksv: 1B C3 0D 59 E9

5. Compare R0Tx / R0Rx: PASS

6. Authentication Process: PASS

_____ Link Integrity _____
    RiTx: 306B
    RiRx: 306B  Sink is not a repeater
   Count: 161
```

The HDCP pattern provides a full three phase authentication:

Phase 1:

a   The HD Pattern Signal Generator writes a 64-bit random number (A_N) to the sink / receiver (Rx).

b   The receiver responds by sending its own KSV (B_{KSV}) to the transmitter (Tx). The Receiver also sends the repeater bit, used to determine if the sink / receiver acts as a repeater. During this step, the transmitter also verifies that B_{KSV} has not been revoked and has the proper format

c   If A_{KSV} and B_{KSV} are deemed to be valid, then the receiver (sink) and transmitter (source) each generate R0 (the receiver generates R_{0^*}. R_{0^*} is read by the transmitter and compared with R_0. If $R_0 = R_{0^*}$ then the authentication phase is successful. If they are not equal, HDCP authentication will fail.

Phase 2:

d   As long as R0 = R0', the transmitter will begin sending encrypted video.

Phase 3:

e   Every 128 frames (2 sec), the Tx and Rx generate a value *RI* which is similar to the R_0 values. Comparing these values between the Tx and Rx verifies that the link is synchronized.

In the example above, the HDCP authentication process is successful. Note that the sink (Rx) was not identified as a *repeater.* For a display, this is normal.

> **NOTE:** A repeater is defined as an active device which has one or more HDMI inputs and one or more HDMI outputs that work with HDCP. A repeater is an active device because it decrypts HDCP content on the input (Rx) and re-encrypts on the output (Tx).

Motion

Pattern 41 (P41)
This pattern produces a 10x10 pixel block that moves horizontally across the screen, from right to left. See page 48 for details on modifying this pattern.

P41   Motion

Data Analysis

Pattern 42 - Pattern 44 (P42 - P44)
These patterns are used to detect HDMI / DVI timings, input video packets, and infoframe analysis.

P42   In Timing

The In Timing pattern will display timing information about an incoming video signal. Connect the source signal to the HDMI or VGA input connector.

If no input signal is detected (or is not connected), the top line will display No Signal.

No input signal
detected

```
IN Timing Detection   No Signal

Pixel Rate: MHz
Scan Type:
Timing:

Hori.Total:      Pixels/Line
     Active:
     Front Porch:
     Sync Width:
```

When a valid video input signal is detected, the In Timing pattern will display information similar to the following:

```
IN Timing Detection  No Signal

Pixel Rate:148 MHz PR:x1
Scan Type:Progressive
Timing:1920x1080P60

Hori.Total:2200 Pixels/Line
      Active:1920
      Front Porch:88
      Sync Width:44
      Sync Polarity:Positive
      Freq.:67 KHz

Vert.Total:1125 Lines/Field
      Active:1080
      Front Porch:4
      Vs Width+Back Porch:41
      Sync Polarity:Positive
      Freq.:60 Hz

[OPTION].Pull Hot-Plug
```

Press the [OPTION] button to perform a hot-plug (HPD) event. Triggering an HPD event is the similar to disconnecting and reconnecting the input source.

P43   In Video

The In Video pattern provides information about color space, color depth, extended colorimetry (if applicable), HDCP, and AVI infoframe information.

```
IN Timing Detection  No Signal

Signal Type:HDMI AVMUTE:OFF
HDCP Encryption:No
Timing:1920x1080P60
Color Depth:24 bits

___ AVI Infoframe ___
Color Space:RGB
Colorimetry:No Data
Aspect Ratio:No Data
Extended Colorimetry:No Data
RGB Color Range:Default
Video Id. Code:16 1920x1080p59/60 16:9
Pixel Repitition:x1

SPD Vendor Name:None
SPD Product Description:None
SPD Device Information:None

[OPTION].Pull Hot-Plug
```

As with the In Timing pattern (P42), if a valid signal is not detected on the input, the top line will display No Signal.

No input signal
detected

```
IN Video Detection  No Signal

Signal Type:    AVMUTE:
HDCP Encryption:
Timing:
Color Depth:

___ AVI InfoFrame ___
Color Space:
Colorimetry:
```
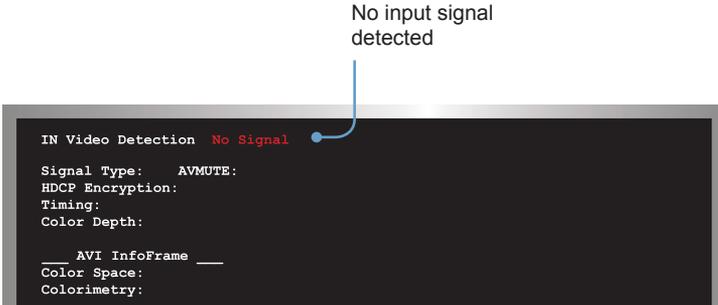
Press the [OPTION] button to trigger an HPD event.

P44   In Audio
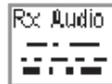
The In Audio pattern provides audio information, including sampling rate, bit depth, audio encoding, and the number of audio channels.

```
IN Audio Detection

ACR N:6144
ACR CTS:148487
Packet Layout:Layout 0
High Bit Rate:No

_____ Channel Status __ Infoframe ___
Audio Coding: LPCM        Stream Header
Channel Count: 1          2
Sampling Rate.KHz:48      Stream Header
Sampling Size.Bit:24      Stream Header

CHS.App Type:Consumer
CHS.Source Number:8

Info.Level Shift Value.dB:0
Info.Down-mix:Permitted
Info.Speaker Placement:
    -  -  -  -  -  -  FR FL
[OPTION].Pull Hot-Plug
```
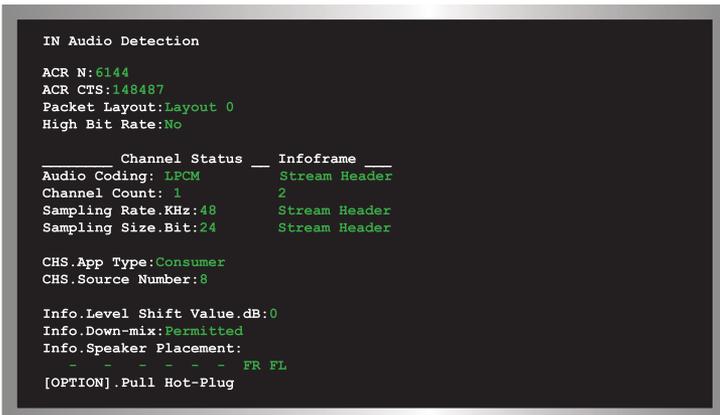
If an audio signal is not detected on the input, the In Audio Detection will indicate No Signal.

Use the [OPTION] button to trigger an HPD event.

System Setup

Pattern 45 (P45)
Built-in Rx EDID setup, IR remote address setup.

P45   System Setup

```
Sys Setup
```

When the System Setup pattern is selected, the display will appear as follows:

```
Press [OPTION] to do system setup
```
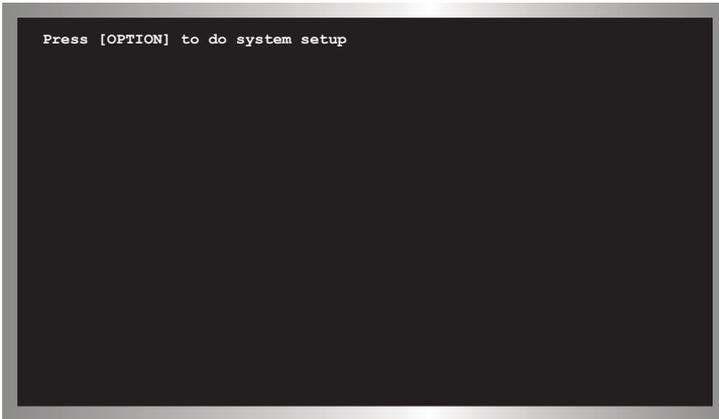
Press the [OPTION] button to bring up the following screen:

```
System Setup
▶Copy OUT EDID to IN EDID...
 Copy IN EDID to OUT EDID...
 IR Remote Address:0
 Exit



 [PATTERN+/-].Select  [OPTION].Enter
```
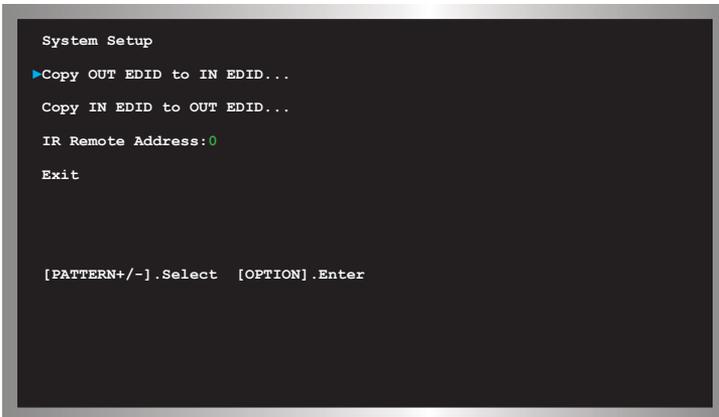
There are four options under the System Setup pattern. Use the ▲ or ▼ buttons to select the desired option. Press the [OPTION] button to accept the selection.

1   Copy OUT EDID to IN EDID

Copies the EDID from the device/display connected to the HD Pattern Signal Generator and stores it in a local buffer on the unit. The EDID can be uploaded to another output device.

> ⚠ **WARNING:** The EDID data is stored in volatile memory. Any power disruption will erase the contents of the buffer.

2   Copy IN EDID to OUT EDID

Copies the EDID data stored in the local buffer (using the Copy OUT EDID to IN EDID option), to the device connected to the output of the HD Pattern Signal Generator.

3   IR Remote Address

Changes the IR channel of the HD Pattern Signal Generator, when used with the IR Remote Control Unit. An IR Remote Control Unit is not included with this product at this time.

4   Exit

Returns to the first screen of the System Setup pattern.

The following table lists the available graphic and video timings used by the HD Pattern Signal Generator.

Timing Number	Timing
T01	640 x 480 @ 60 Hz
T02	640 x 480 @ 72 Hz
T03	640 x 480 @ 75 Hz
T04	640 x 480 @ 85 Hz
T05	800 x 600 @ 56 Hz
T06	800 x 600 @ 60 Hz
T07	800 x 600 @ 72 Hz
T08	800 x 600 @ 75 Hz
T09	800 x 600 @ 85 Hz
T10	1024 x 768 @ 60 Hz
T11	1024 x 768 @ 70 Hz
T12	1024 x 768 @ 75 Hz
T13	1024 x 768 @ 85 Hz
T14	1280 x 960 @ 60 Hz
T15	1280 x 960 @ 85 Hz
T16	1280 x 1024 @ 60 Hz
T17	1280 x 1024 @ 75 Hz
T18	1280 x 1024 @ 85 Hz
T19	1600 x 1200 @ 60 Hz
T20	1920 x 1200 @ 60 Hz
T21	720 x 480i @ 59 Hz
T22	720 x 480i @ 60 Hz
T23	720 x 480p @ 59 Hz
T24	720 x 480p @ 60 Hz
T25	1280 x 720p @ 59 Hz
T26	1280 x 720p @ 60 Hz
T27	1920 x 1080i @ 59 Hz
T28	1920 x 1080i @ 60 Hz
T29	1920 x 1080p @ 59 Hz
T30	1920 x 1080p @ 60 Hz

Timing Number	Timing
T31	720 x 576i @ 50 Hz
T32	720 x 576p @ 50 Hz
T33	1280 x 720p @ 50 Hz
T34	1920 x 1080i @ 50 Hz
T35	1920 x 1080p @ 50 Hz
T36	1920 x 1080p @ 23 Hz
T37	1920 x 1080p @ 24 Hz
T38	1366 x 768 @ 60 Hz
T39	1366 x 768 @ 50 Hz

NOTE: Analog PC output (VGA) only supports VESA (VGA through WUXGA) timings. Analog HD output only supports SD / HD (480i, 480p, 576i, and 576p) timings. HDMI / DVI output supports all timings. Timings cannot be edited.

HD-SIGGEN Software

The HD Pattern Signal Generator can be controlled via RS-232 on a PC running Windows®, using the HD-SIGGEN software. The program is available for download on the Gefen Web site: http://www.gefen.com/kvm/support/download.jsp

Installing the Software

1. Unzip the archive file, containing setup.exe, SETUP.LST, and version.txt.

2. Run the setup.exe file by double-clicking on it.

3. If the installer is running under Windows 7®, the following dialog may appear:

Click Yes to allow the installer to continue.

4. The installer will begin by copying the required installation files, to the hard drive:

5. After the required files have been copied to the hard drive, the installer Welcome screen will appear:

Click the OK button to continue with the installation.

Click the Exit Setup button to exit the installer.

> **NOTE:** If the installer is cancelled, the installer will remove the files that were copied, earlier in the installation process.

6. The destination directory can be changed. The default installation directory for Windows 7® is `C:\Program Files(x86)\HD-SIGGEN`. For other versions of the Windows® operating system, the default installation location will be `C:\Program Files\HD-SIGGEN`.

Click to install to the
default directory

HD-SIGGEN Setup

Begin the installation by clicking the button below.

Click this button to install HD-SIGGEN software to the specified destination directory.

Directory:
C:\Program Files (x86)\HD-SIGGEN\   Change Directory

Exit Setup

Click to change the
default directory

7. During the installation process, the following message will be displayed:

Setup is updating your system...
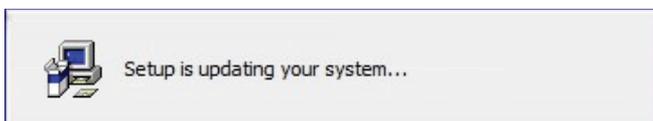
8. After the installer has successfully completed the installation process, the following message box will be displayed:
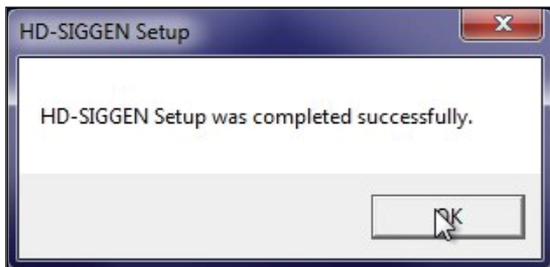
Click the OK button to dismiss the message box and exit the installer.

Connecting the RS-232 cable

Before launching the HD Pattern Signal Generator software, an RS-232 cable must be connected from the back of the HD Pattern Signal Generator to the computer which has the HD Pattern Signal Generator software installed.

RS-232 port on the
back of the HD Pattern
Signal Generator

Running the HD Pattern Signal Generator Software

1. Launch the HD Pattern Signal Generator Software by clicking on the application icon in the Windows® Start Menu:

    The example below, shows the HD-SIGGEN application icon as it appears in the Windows 7® Start Menu:

After the HD Pattern Signal Generator is launched, the following screen will be displayed:

2. Select the COM port from the pull-down list. COM port 1 is selected by default.

3. Click the Connect button to initialize the connection between the software and the HD Pattern Signal Generator.

If you are unable to connect to the HD Pattern Signal Generator, make sure that the correct COM port is selected in the software. The Disconnect button will turn red if the connection between the software and the HD Pattern Signal Generator cannot be established.

The Connect button will turn green to indicate a successful connection

The Disconnect button will turn red to indicate no connection.

Selects the COM port

Selecting the Timing

1. Use the Timing Select button to select the timing / resolution of the output signal.

2. Press the SET button to set the timing.

Select the timing
in the Timings window
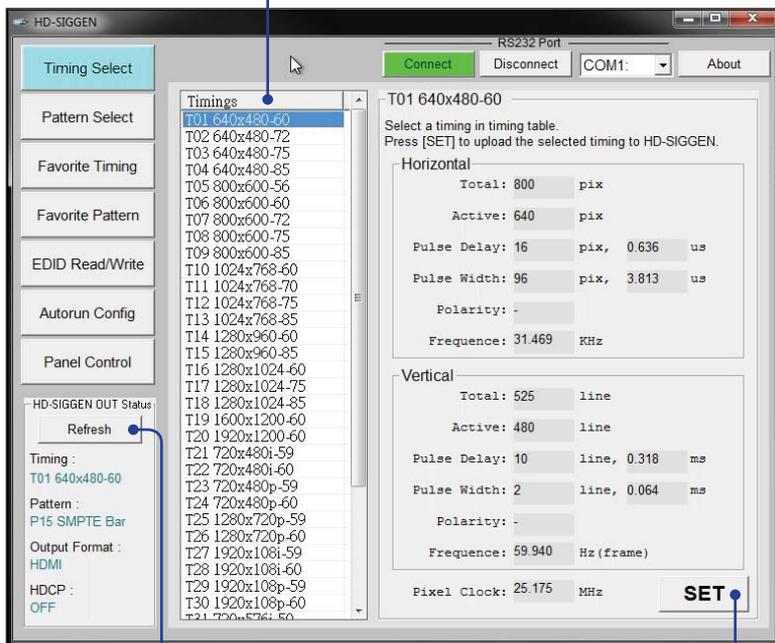
Retrieves the current
settings

Click the SET button
to enable the timing

> **NOTE:** After changing a timing, pattern, the output format, or toggling HDCP, make sure to press the Refresh button on the left side of the window. The HD-SIGGEN Status window is not automatically updated, even if a change has been made through the software or using the front panel. Clicking the Refresh button will retrieve the current settings from the HD Pattern Signal Generator. Otherwise HD-SIGGEN Status window will display "Link Error".

Selecting the Pattern

1. Use the Pattern Select button to select the desired pattern.

2. Press the SET button to enable the pattern.

Select the pattern
in the Patterns window
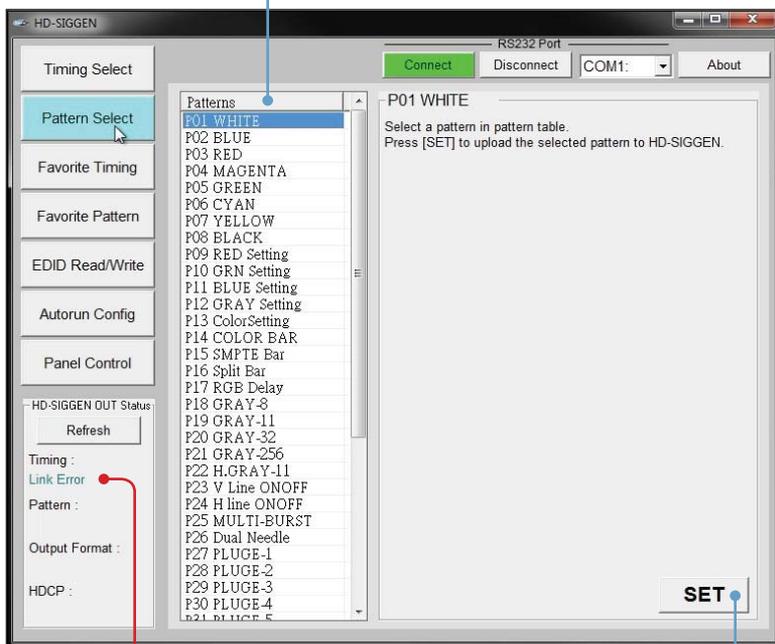
Click the SET button
to enable the pattern

A "Link Error" message caused by the Refresh
button not being pressed after connecting to the
HD Pattern Signal Generator. Click Refresh to
update the information.

Unique Patterns

Pattern 13 (ColorSetting) and Pattern 41 (Motion) can be selected from the top panel buttons on the HD Pattern Signal Generator. However, they provide addition parameters which can only be modified using the HD-SIGGEN software.

Color Setting

1.   Select the ColorSetting pattern (P13).

2.   Press the Download button to retrieve current color settings of the ColorSetting pattern.

Click the Download
button to retrieve the
current color settings
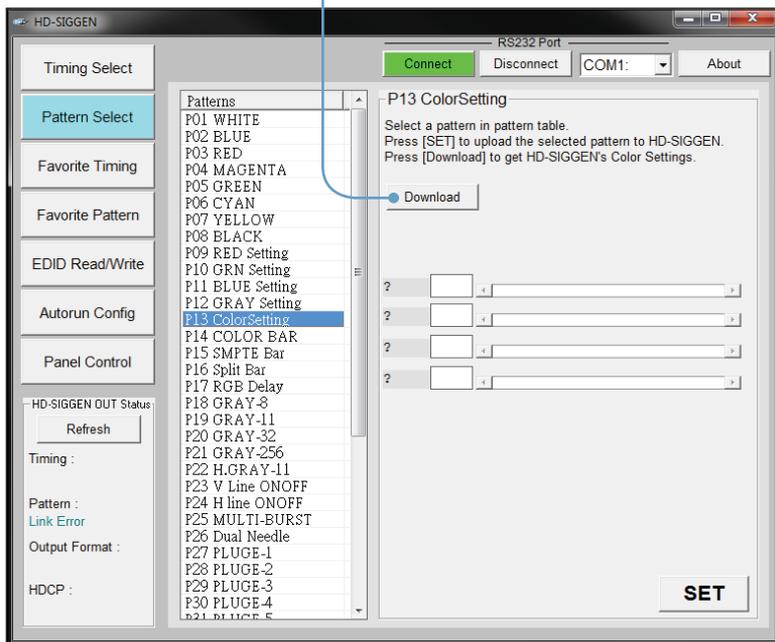
3.   Adjust the Red, Green, Blue, and Grey sliders to render the desired color.

4.   Press the SET button to upload the current settings to the ColorSetting
      pattern.
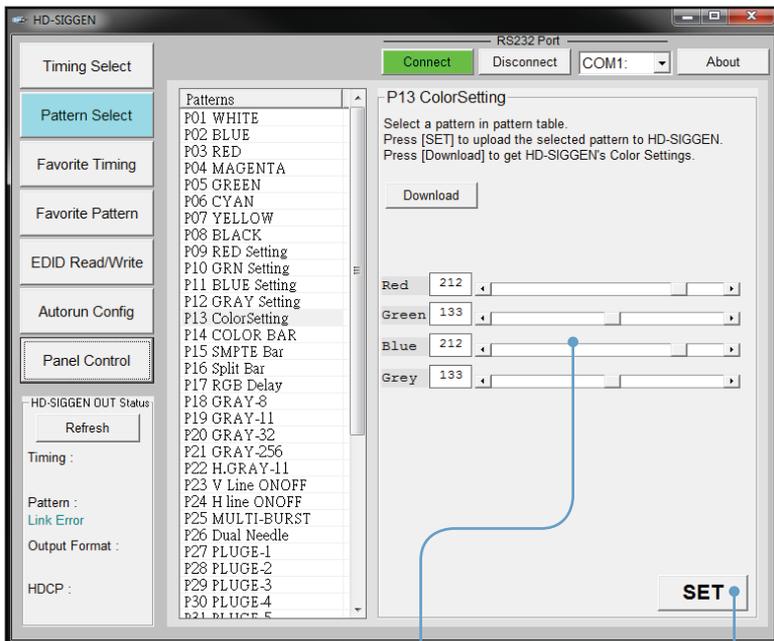
Use the sliders to adjust the color

Click the SET button to upload the new color settings

Unique Patterns

Pattern 13 (ColorSetting) and Pattern 41 (Motion) can be selected from the top panel buttons on the HD Pattern Signal Generator. However, they provide addition parameters which can only be modified using the HD-SIGGEN software.

Motion

1. Select the Motion pattern (P41).

2. Press the Download button to retrieve current color settings of the Motion pattern.

    By default, the Motion pattern uses a block shape for the pattern.

Click the Download button to retrieve the current Motion pattern settings
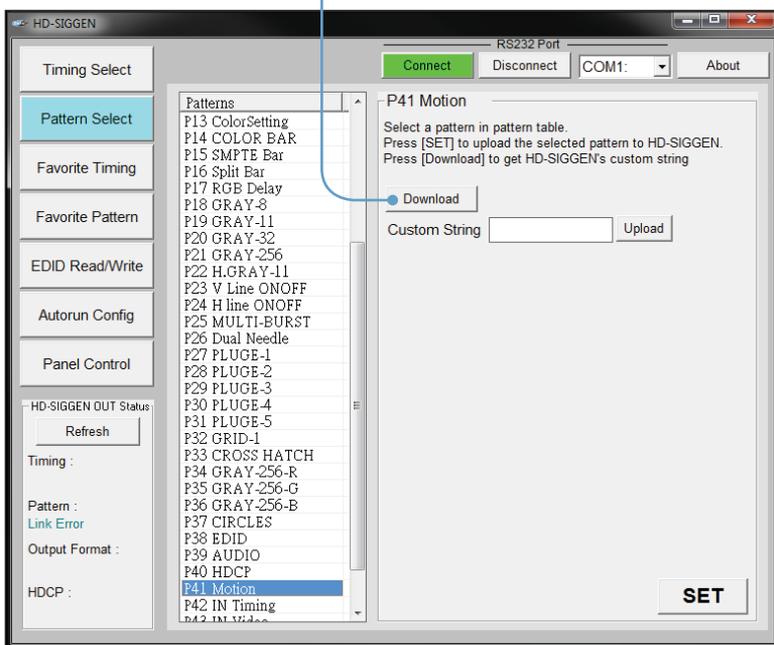
3. A custom string, up to 12 characters in length, can be entered in the Custom String field.

4. Click the Upload button to update the HD Pattern Signal Generator with the new pattern.
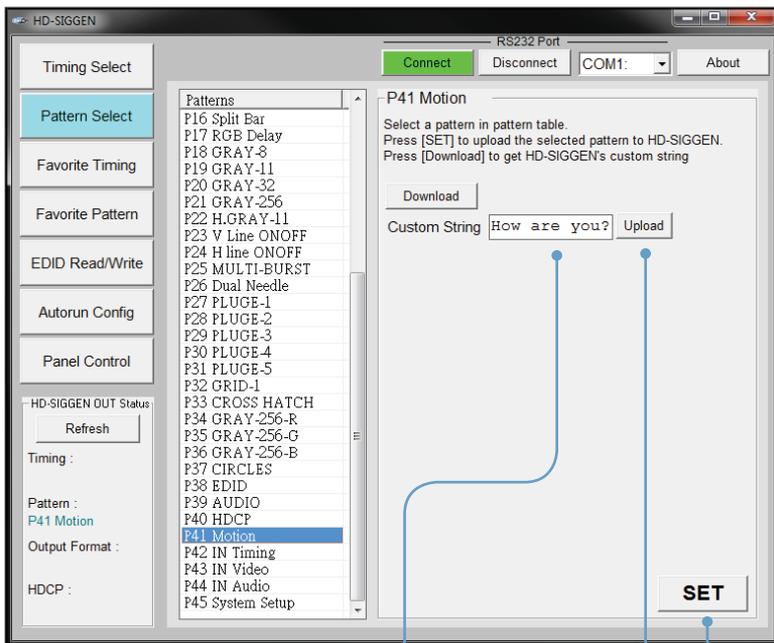
Use the sliders to adjust the color

A custom message can be added here

A custom message can be added here

5. Click the SET button to save the existing settings to the Motion pattern.

Favorite Timing

A list of favorite timings can be assembled and stored in the HD Pattern Signal Generator. The [FAV] button, on the front panel, can then be used to cycle through the list of timings that is created.

1. In the Timings window, place a check mark in the boxes of the timings to be added to the Favorites list.

    Use the Check All button to select all the timings in the Timings window. Use the Check None button to deselect any or all currently selected timings.

2. Press the SET button to upload the selected Timings to the HD Pattern Signal Generator. The list of Favorite will be available using the [FAV] button on the front panel of the HD Pattern Signal Generator.

    Use the Download button to download and edit the Favorite timings on the HD Pattern Signal Generator.

Place a check mark by the timings to be added to Favorites

Press this button to download (and edit) the current Favorite list
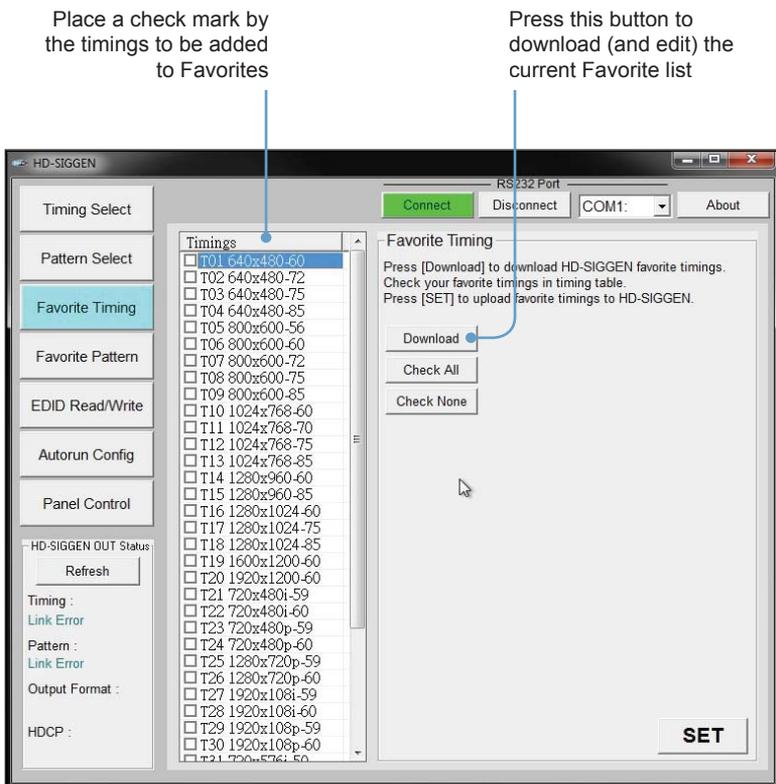
Favorite Pattern

A list of favorite patterns can be assembled and stored in the HD Pattern Signal Generator. The [FAV] button, on the front panel, can then be used to cycle through the pattern list that is created.

In the Patterns window, place a check mark in the boxes, next to the timings to be added to the Favorites list.

Use the Check All button to select all the timings in the Patterns window. Use the Check None button to deselect any or all selected patterns.

1. Press the SET button to upload the selected Patterns to the HD Pattern Signal Generator. The list of Favorite will be available using the [FAV] button on the front panel of the HD Pattern Signal Generator.

    Use the Download button to download and edit the Favorite patterns on the HD Pattern Signal Generator.

Place a check mark by the patterns to be added to the Favorites

Press this button to download (and edit) the current Favorite list
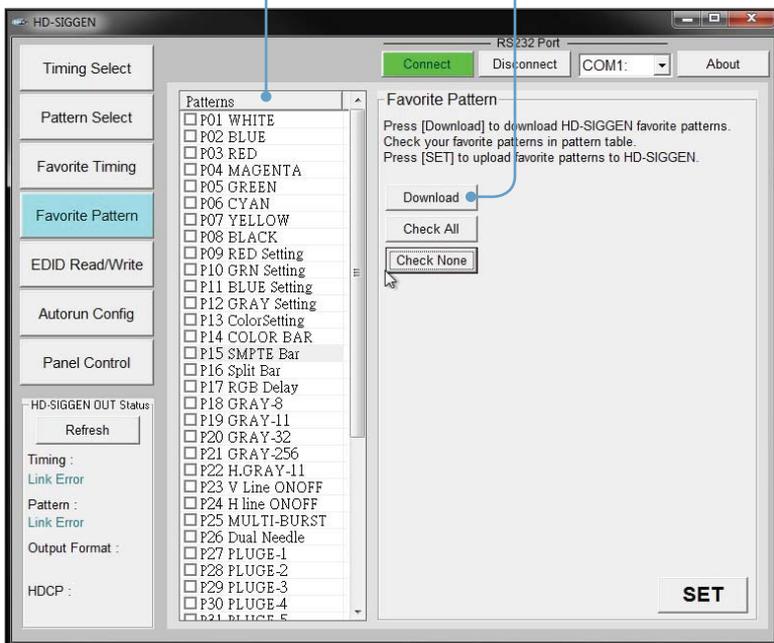
EDID Read / Write

The HD Pattern Signal Generator has the ability to read EDID data. EDID data can also be saved, loaded, written, erased, compared, interpreted, and summed. Each of these features will be covered in this section. Clicking the EDID Read / Write button will display the following screen:
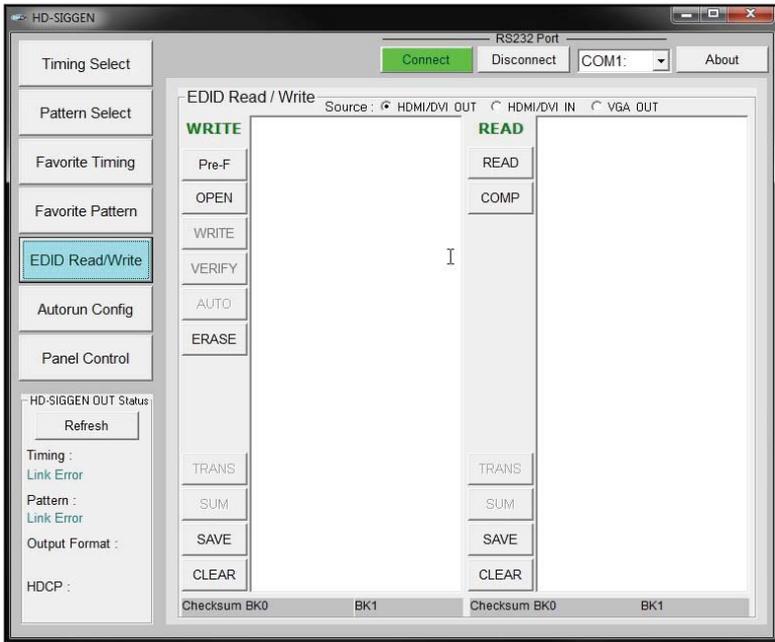
Reading EDID

1. Select the Source by clicking one of the three radio buttons at the top portion of the screen.

Source selection buttons
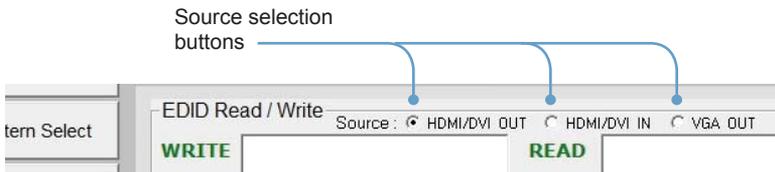
EDID can be read from a downstream sink (display, etc) or from the EDID stored in the HD Pattern Signal Generator. Click HDMI/DVI Out or VGA Out to read the downstream EDID. Click the HDMI / DVI In radio button to read the EDID stored in the HD Pattern Signal Generator.

In this example, the EDID is being read from the display connected to the HD Pattern Signal Generator.

1. Click the READ button on the READ Panel.

READ button

WRITE Panel   READ Panel
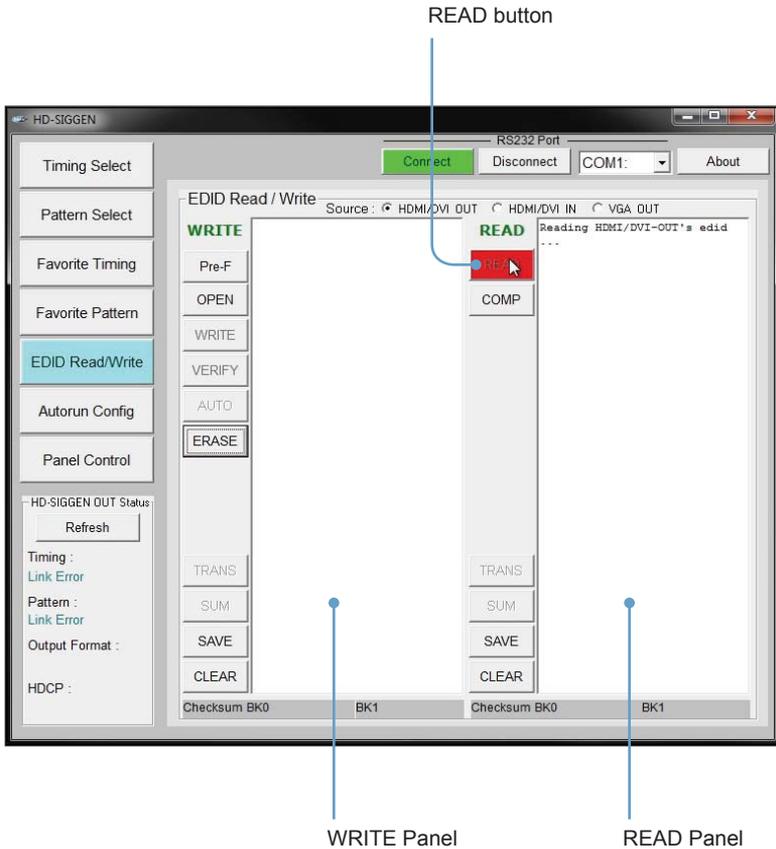
The READ and COMP (compare) functions are only available under the READ panel. The Pre-F, OPEN, WRITE, VERIFY, AUTO, and ERASE function are only available under the WRITE panel.

The TRANS, SUM, SAVE, and CLEAR functions are available under both the WRITE and READ panels.

NOTE: Disabled buttons, under the WRITE or READ panel, will become active when EDID data is loaded into the associated panel.

2. If the EDID is read successfully, the EDID will appear in the READ Panel:
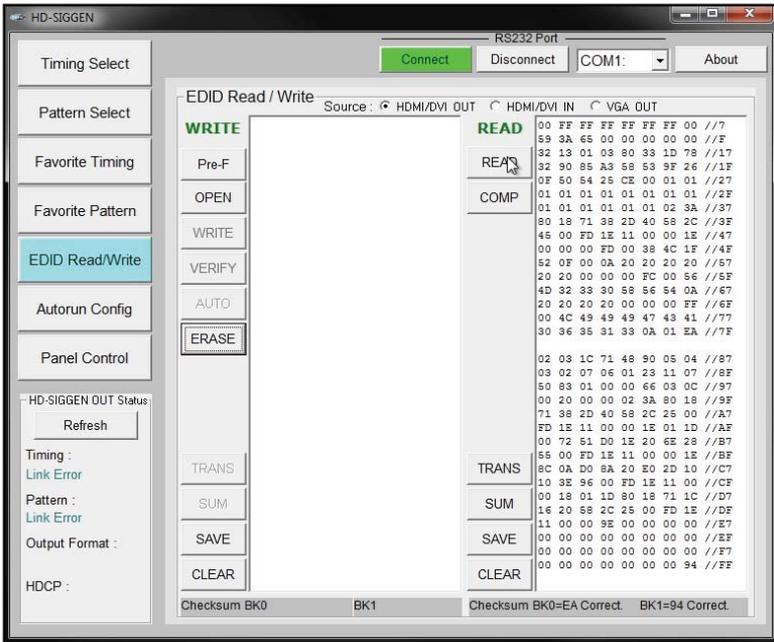
Translating the EDID

After the EDID has been read, it can be translated into verbose form by clicking the TRANS (Translate) button in the READ panel:

Click the TRANS button to display the EDID in verbose form
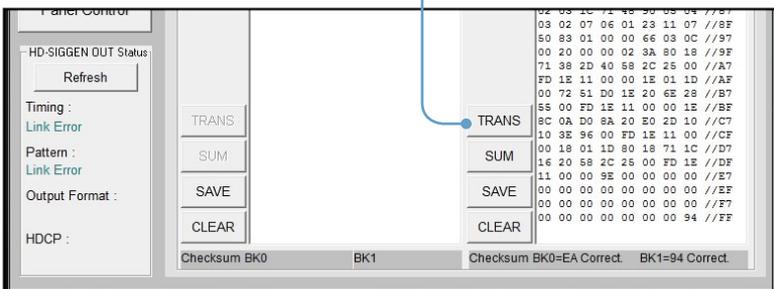
The Translate [Read] EDID screen:
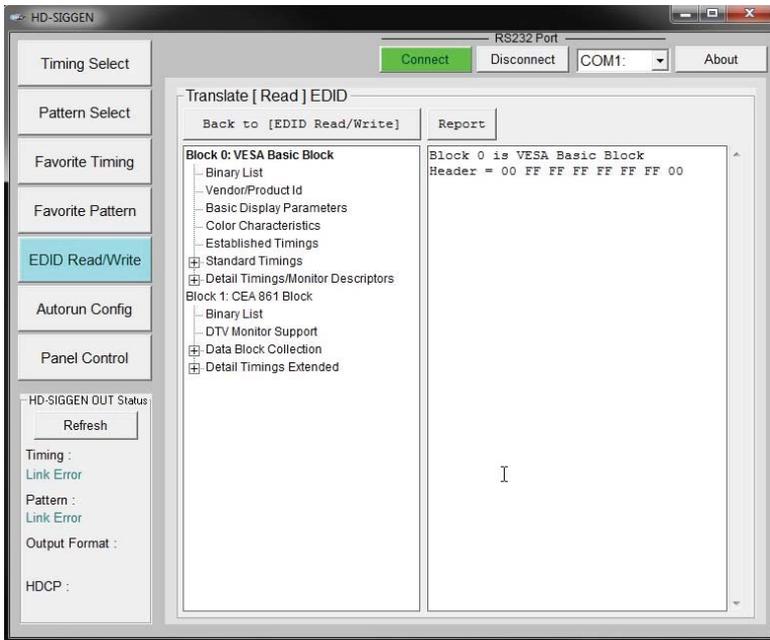
Clicking on the one of the items in the panel on the left, will display the information in the panel on the right. Some items will have a [+] symbol next to them, indicating that additional information is available for that section:
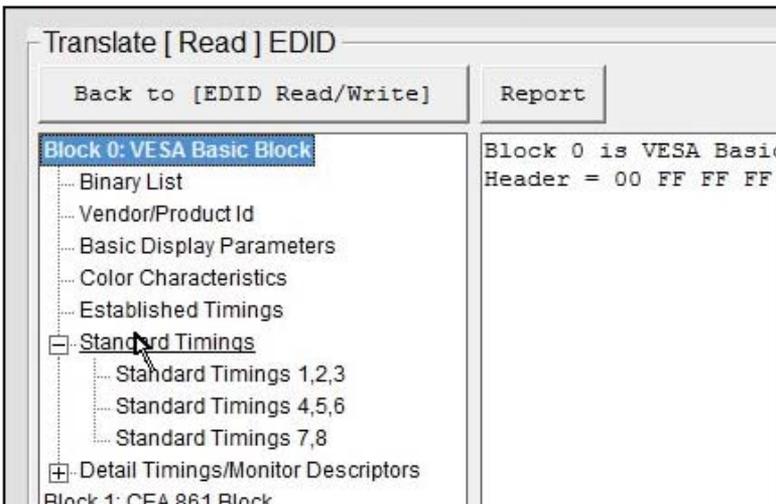
Click the [+] button to expand any section where additional information is present. In the example below, the [+] button has changed to a [-] symbol after the Standard Timings section has been expanded:
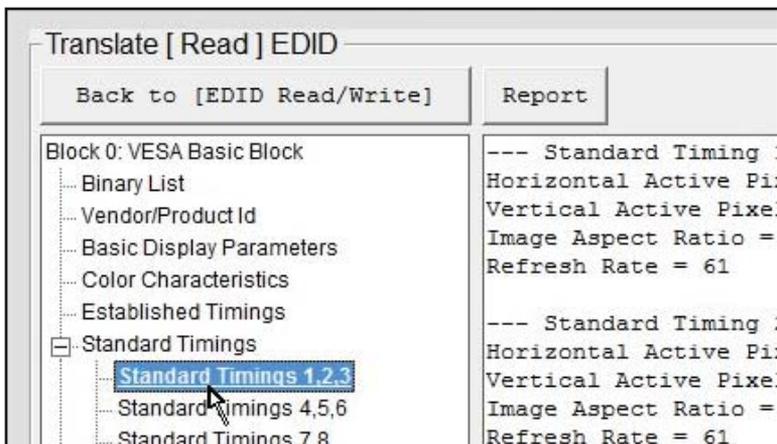
The information about the Standard Timing 1, Standard Timing 2, and Standard Timing 3 is listed in the panel on the right.

Generating an EDID Report

Clicking the Report button can be used to save the verbose form of the EDID to a file:

Click the Report button
to view a complete listing
of the EDID
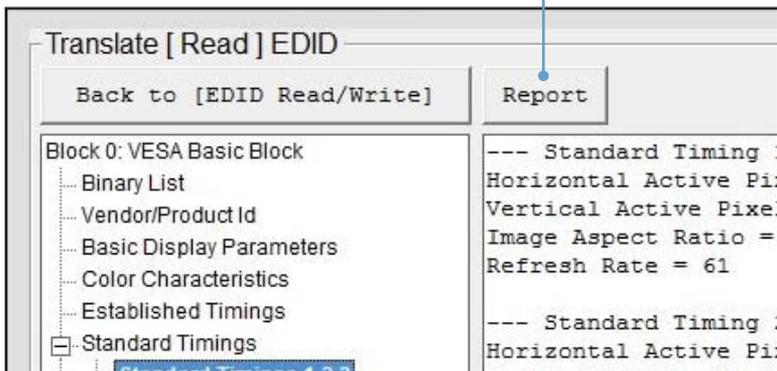
The EDID Report window is shown below. Click the Save button to save the file in .TXT format. Click the Exit button to return to the Translate EDID screen.
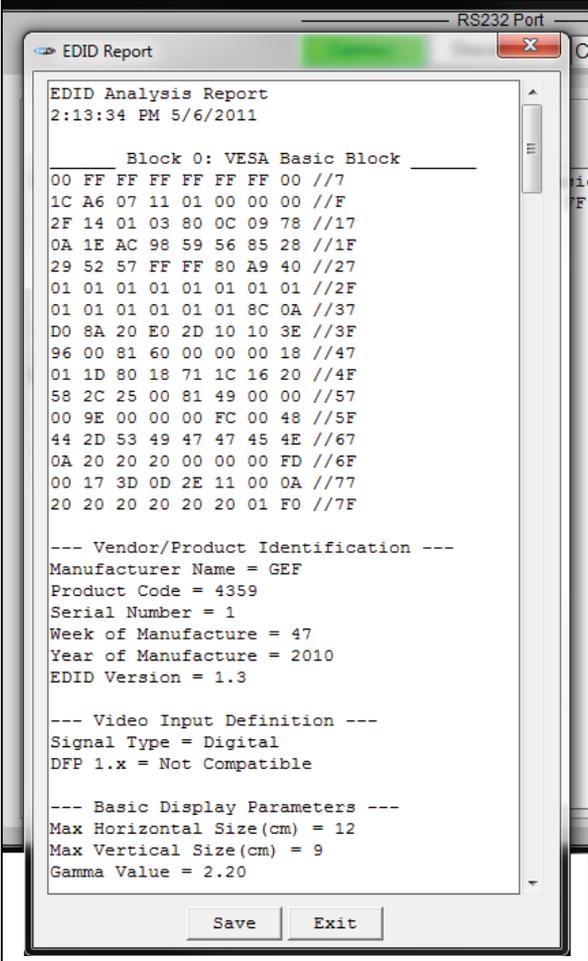
RS232 Port

EDID Report

```
EDID Analysis Report
2:13:34 PM 5/6/2011


_____ Block 0: VESA Basic Block _____
00 FF FF FF FF FF FF 00 //7
1C A6 07 11 01 00 00 00 //F
2F 14 01 03 80 0C 09 78 //17
0A 1E AC 98 59 56 85 28 //1F
29 52 57 FF FF 80 A9 40 //27
01 01 01 01 01 01 01 01 //2F
01 01 01 01 01 01 8C 0A //37
D0 8A 20 E0 2D 10 10 3E //3F
96 00 81 60 00 00 00 18 //47
01 1D 80 18 71 1C 16 20 //4F
58 2C 25 00 81 49 00 00 //57
00 9E 00 00 00 FC 00 48 //5F
44 2D 53 49 47 47 45 4E //67
0A 20 20 20 00 00 00 FD //6F
00 17 3D 0D 2E 11 00 0A //77
20 20 20 20 20 20 01 F0 //7F


--- Vendor/Product Identification ---
Manufacturer Name = GEF
Product Code = 4359
Serial Number = 1
Week of Manufacture = 47
Year of Manufacture = 2010
EDID Version = 1.3

--- Video Input Definition ---
Signal Type = Digital
DFP 1.x = Not Compatible

--- Basic Display Parameters ---
Max Horizontal Size(cm) = 12
Max Vertical Size(cm) = 9
Gamma Value = 2.20
```

Save   Exit

Generating the EDID Checksum

Once an EDID has been read or loaded into the HD Pattern Signal Generator, a checksum can be generated.

1. Read or load an EDID file into the HD Pattern Signal Generator.

2. Click the SUM button under the READ panel.
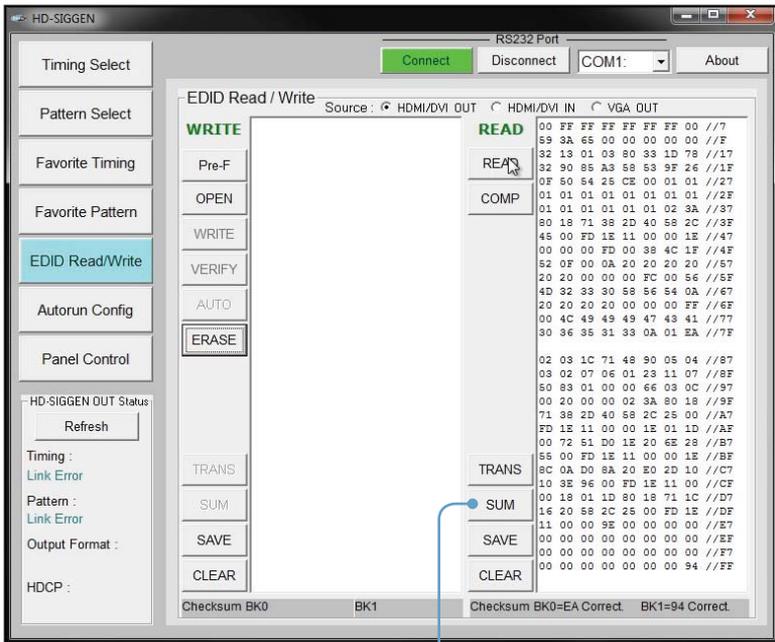
Click the SUM button to generate the EDID checksum

3. The EDID Checksum dialog will be displayed. Select the method of how unused bytes will be calculated into the checksum by clicking either the 0x00 or 0xFF radio button.

Select how unused bytes will be used in calculating the checksum
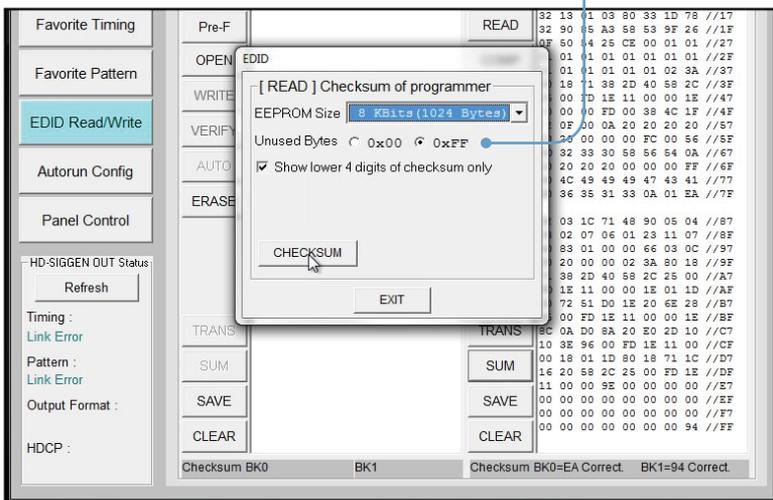
4. Adjust the EEPROM size, if necessary, by selecting it from the EEPROM Size drop-down list: 256, 512, 1024, or 2048 bytes.
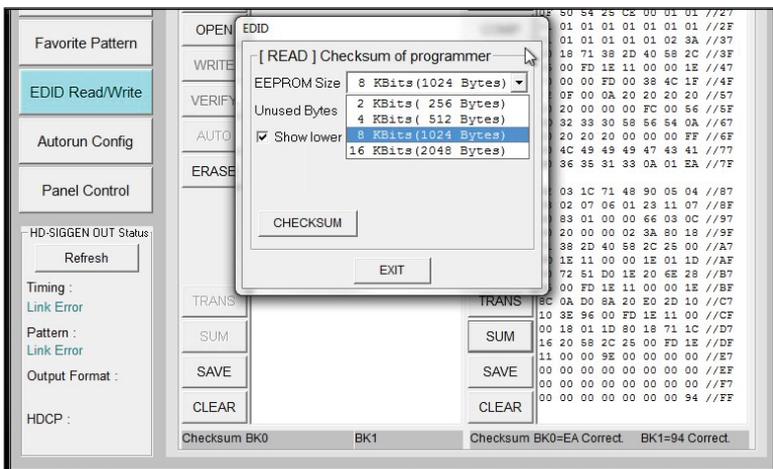
5.   Click the CHECKSUM button to generate the EDID checksum.
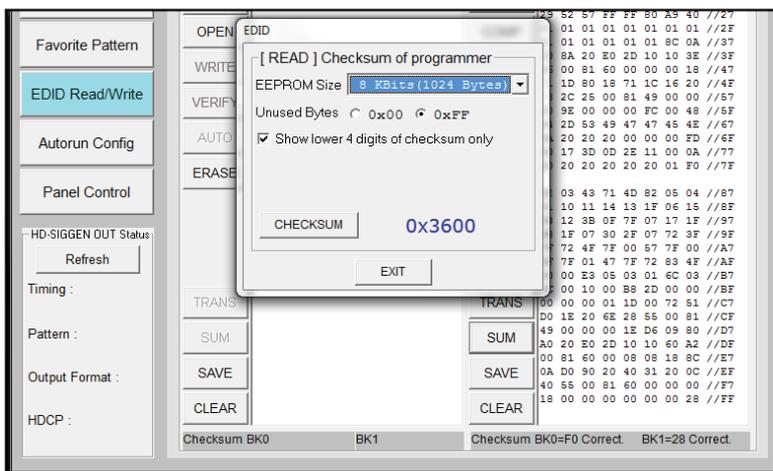
By default, the checksum will be restricted to the lower 4 digits. This feature can be disabled unchecking the *Show lower 4 digits of checksum only* box.

Uncheck to disable
truncation of checksum
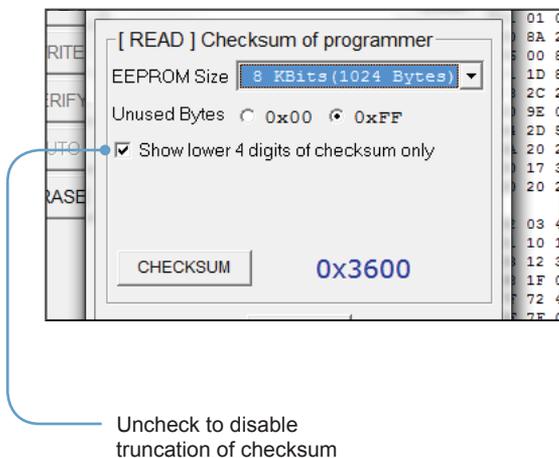
In the example above, if the checksum were calculated by disabling the *Show lower 4 digits of checksum only* feature, the result would be 0x33600.

Saving an EDID to a File

Any EDID can be saved to a file, once it has been read into the HD Pattern Signal Generator.

1. Once an EDID has been read, click the SAVE button.
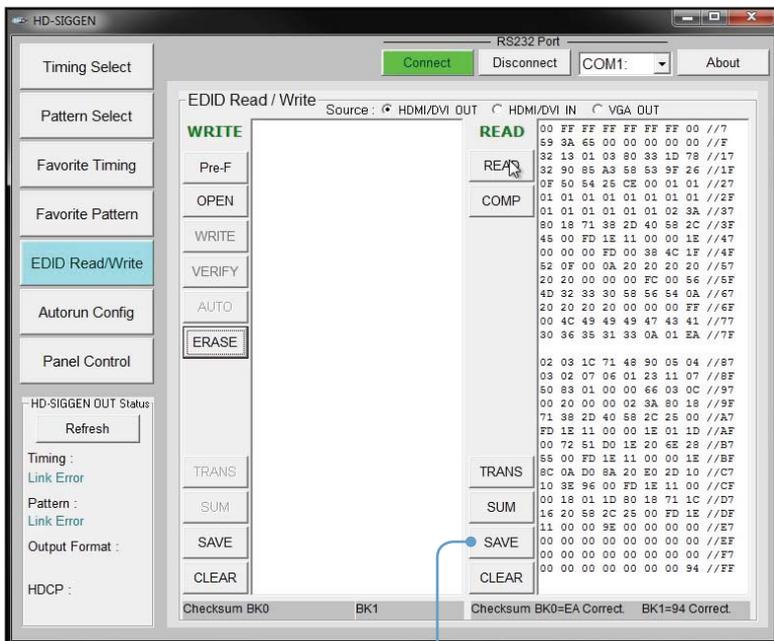
Click the SAVE button to save the EDID to a file.

2. The Save EDID file dialog box will be displayed:
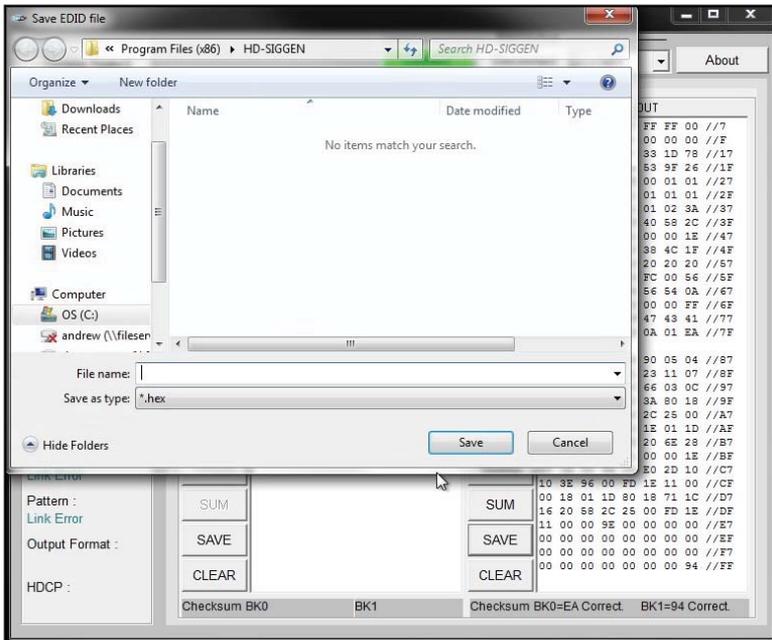
3. Select a name for the EDID file and type it in the *File name* box.

The file can be saved as either a .hex file or a .bin file.

Select the file type from the *Save as type* pull-down list.

4. Select the directory where the EDID file will be saved and click the Save button on the dialog box.

    By default, the EDID file will be saved in the working directory of the HD Pattern Signal Generator software directory.
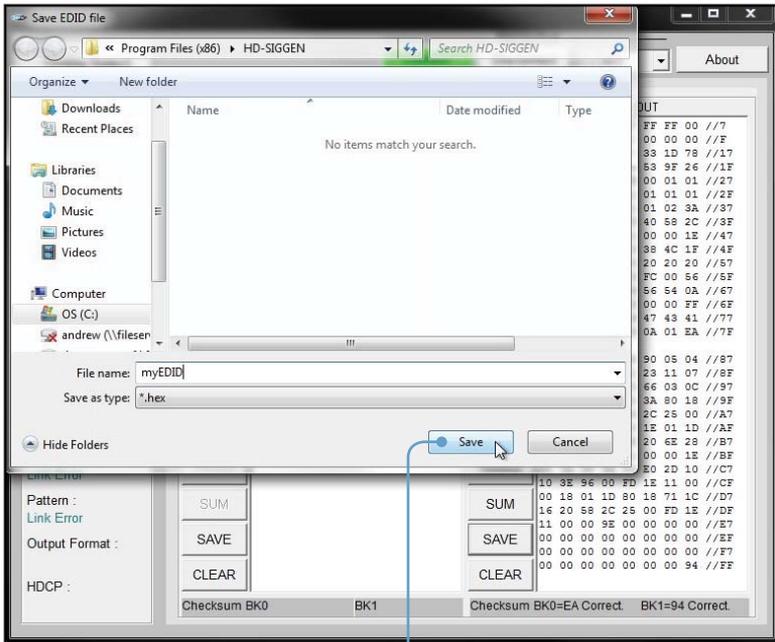
Click to save the EDID

Clearing the EDID from Memory

1.   Click the Clear button to clear the EDID from memory.
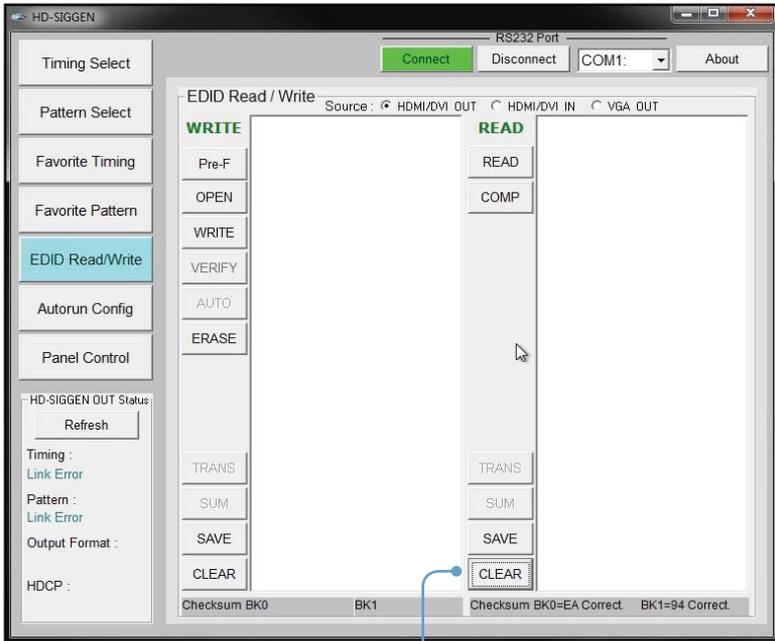
Clears the EDID from
memory

If an EDID is loaded (OPEN) under the WRITE panel, use the CLEAR button
to clear it from memory.

Loading an EDID from a File

An EDID file in binary (.bin) format or in text format (.hex) can be loaded into the HD Pattern Signal Generator.

1. Click the OPEN button under the WRITE panel. If necessary, refer to page 61 on how to save an EDID to a file.

Click to open an EDID file
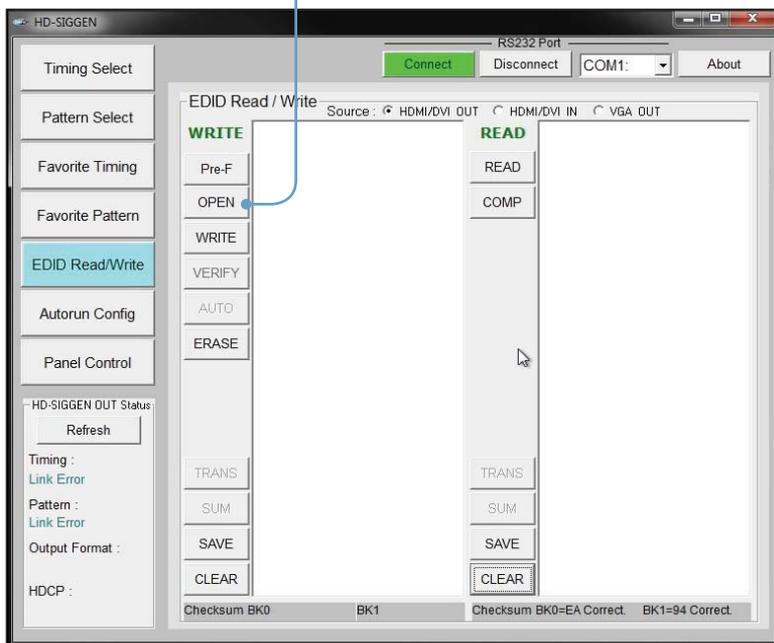
2. Select the EDID file to be opened.

3.   The EDID file will be loaded into the HD Pattern Signal Generator and dis-
     played in the WRITE panel.

     In the example below, an EDID has been read using the HD Pattern Sig-
     nal Generator software (using the READ function) and an EDID has been
     loaded from a file using the OPEN function.
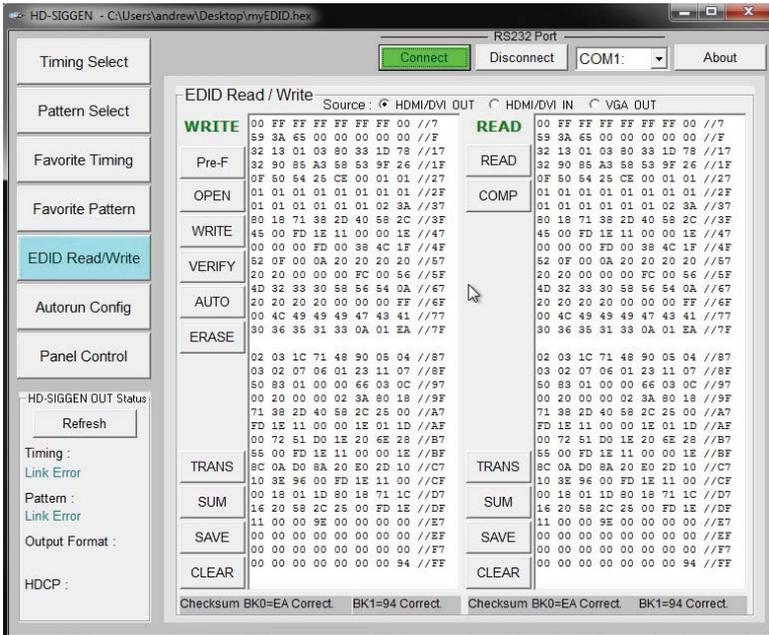
Comparing EDID Data

The HD Pattern Signal Generator software can compare two EDID data structures. One EDID is read from a sink (display, A/V receiver, etc) and the other is loaded into the HD Pattern Signal Generator software using the OPEN function.

1.   Read the source EDID by following the instructions starting on page 52.

2.   Load an EDID into the HD Pattern Signal Generator by following the instructions starting on page 65.

3.   Click the COMP button under the READ panel.

Click the COMP button
to compare the two
EDID data structures
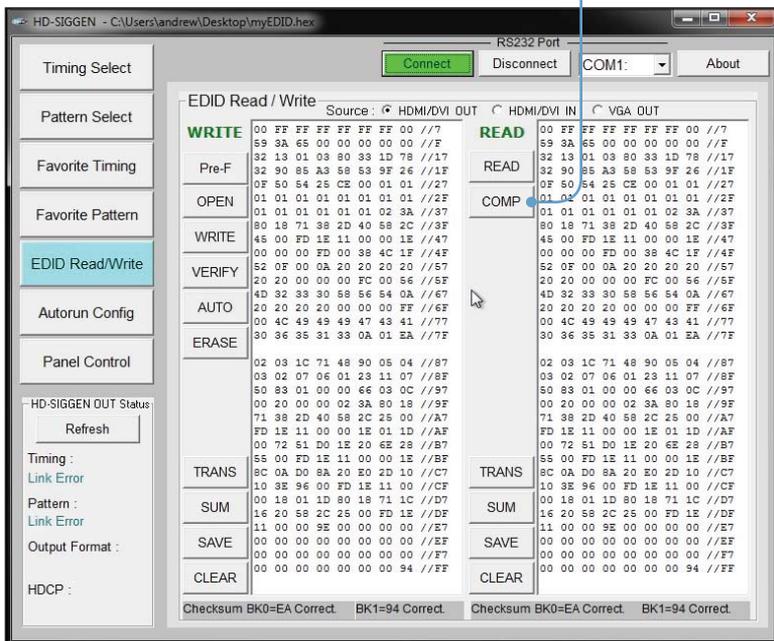
If the two EDID data structures are identical, then a message will be displayed indicating that the compare process has passed:
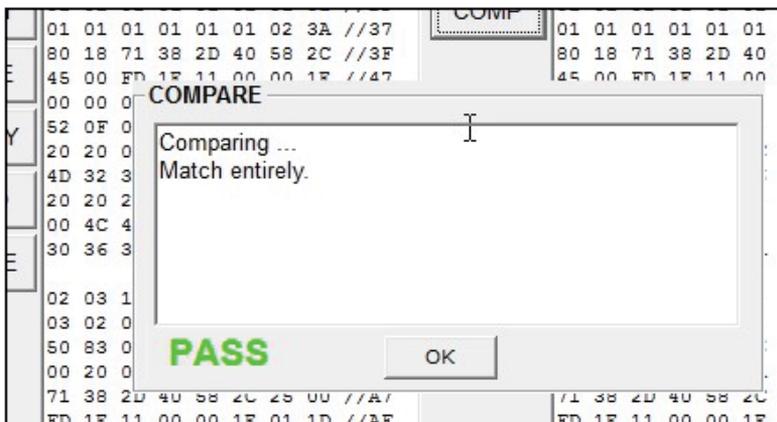
Click the OK button to return to the EDID Read / Write screen.

If there are differences in the two EDID data structures, then the compare process will fail. The number of reported comparison errors will also be displayed.
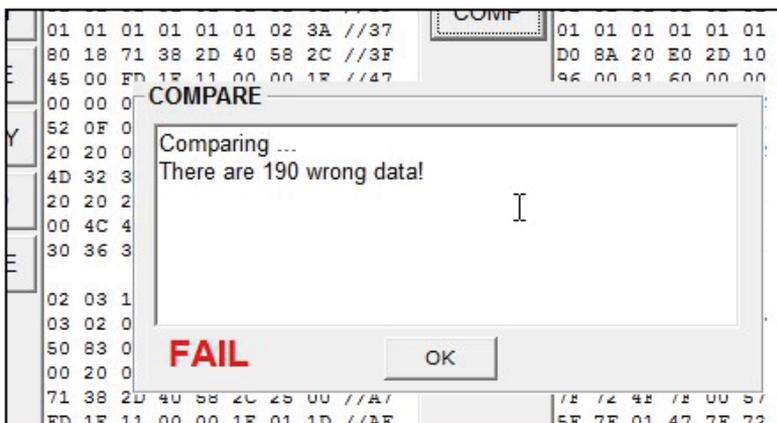
Click the OK button to return to the EDID Read / Write screen.

Writing EDID to a Sink

After an EDID has been read from another source or loaded from a file, the EDID can be written to the sink connected to the output of the HD Pattern Signal Generator.

> ⚠ **WARNING:** Overwriting the EDID of a sink device may cause unwanted results. Be sure to save a copy of the EDID. This will allow the sink's EDID to be restored if necessary. Also note that not all device EDID data structures can be overwritten. If the sink cannot be programmed with a new EDID, the WRITE process will fail.

1.   Load an EDID into the HD Pattern Signal Generator by following the instructions starting on page 65.

2.   Click the WRITE button to write the EDID to the sink device.

Click to write the EDID
data to the sink device

Erasing the EDID from a Sink

The ERASE function will erase the EDID of a sink device.

> ⚠️ **WARNING:** Be sure to save a copy of the sink's EDID before performing the ERASE function. This will allow the sink's EDID to be restored if necessary. Also note that not all device EDID data structures can be erased. If the sink's EDID cannot be erased, then the ERASE procedure will fail.

1. Make sure that the sink device is connected to the HD Pattern Signal Generator.

2. Click the ERASE button.

3. The HD Pattern Signal Generator software will prompt you before erasing the sink's EDID. Click the Yes button to continue with the erasure. Click No to return to the EDID Read / Write screen.

Click to erase
the sink's EDID

Opening Recent EDID Files

The HD Pattern Signal Generator software keeps a record of the last ten files which were opened or saved. To access the most recently used files, do the following:

1.   Click the Pre-F button in the WRITE panel.

2.   A list of the most recently used EDID files will appear in a drop-down window.

3.   Highlight and click the EDID file to be loaded.

The Pre-F button quickly accesses the most recently used EDID files
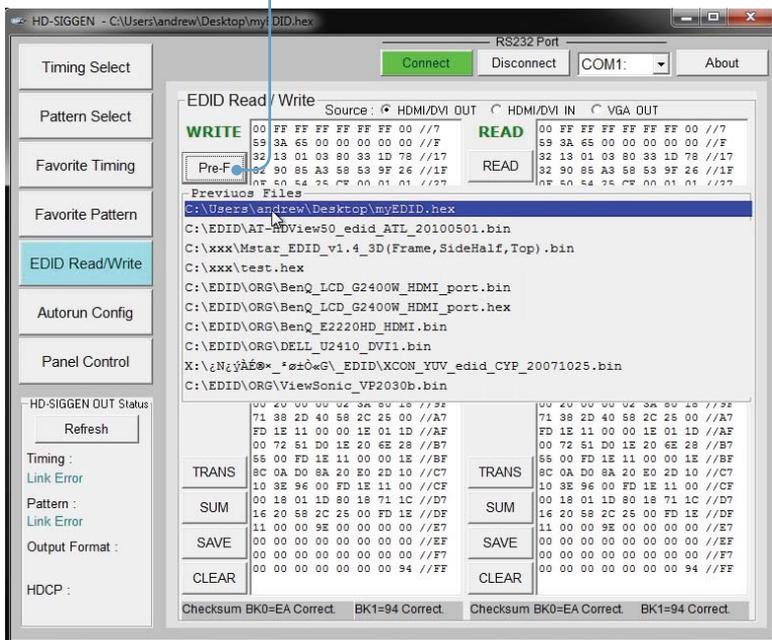
Autorun Configuration

The Autorun Configuration option allows custom programming of timings and patterns used by the Autorun Demonstration mode (pressing the AUTO button on the front panel):

1. Click the Autorun Config button.

2. If necessary, you can press the Download button to read the current Autorun settings from the HD Pattern Signal Generator.

3. Select the Timing and/or Pattern from the timing drop-down list boxes.

4. Select the Duration (in seconds), from the interval drop-down box.

5. Click the Add / Replace button to add the current timing and pattern to the Autorun Configuration list.

Downloads current Autorun list

Adds or replaces the current timing / pattern

Deletes a timing / pattern from list

Timing selection

Pattern selection

Duration selection

Autorun Configuration list

Uploads current Autorun list

An existing timing and pattern set can be replaced by clicking (highlighting) the set, selecting the new timing and new pattern from the drop-down list boxes, then pressing the Add / Replace button.

Use the Delete button to remove a timing / pattern set from the Autorun Configuration llist.

6.   Click the SET button to write the changes to the HD Pattern Signal Generator.

Panel Control

The Panel Control screen allows remote control of the front panel buttons on the HD Pattern Signal Generator. The current settings will be indicated by green buttons.

The Download button is used to retrieve the current settings from the HD Pattern Signal Generator.

Downloads current
Autorun list
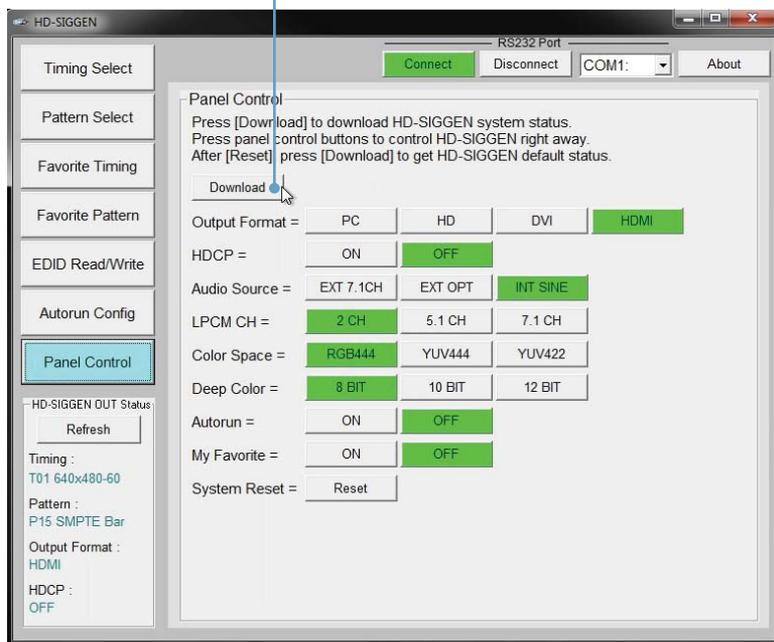
Getting the Hardware and Firmware Version

Press About button on the top portion of the HD Pattern Signal Generator software.
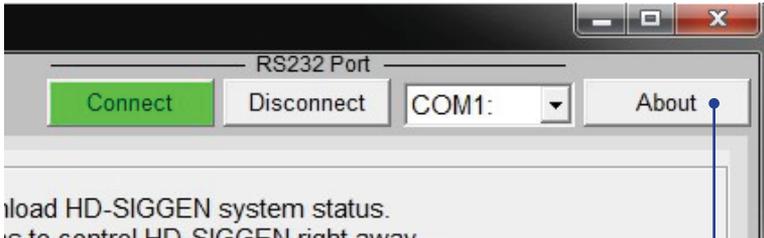
Press to display
hardware and software
information

The About screen will be displayed, showing the software and firmware versions:
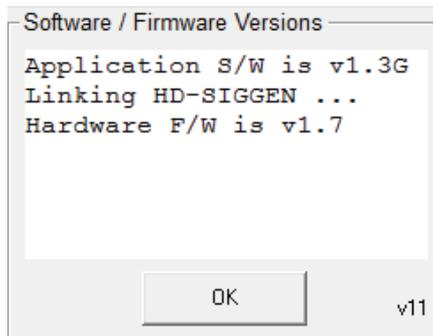
2. Press the OK button to dismiss the About box and return to the HD Pattern Signal Generator software window.

Only Pins 2 (RX), 3 (TX), and 5 (Ground) are used on the RS-232 serial interface

RS232 Settings

Bits per second 19200
Data bits 8
Parity .... None
Stop bits 1
Flow Control .... None

NOTE: The return value will be displayed when using a terminal-based application, indicating the current value after executing the command.

Commands

Command	Description
ASC001	Audio source is from external L/R
ASC002	Audio source is from external OPTICAL
ASC003	Audio source is from internal Sinewave
ASC999	Query audio source status
ATO000	Set Autorun Off
ATO001	Set Autorun On
ATO999	Query Autorun Action status
ATNnnn	Autorun Number, nnn = 001 ~ 032 (see note 2 on page 81)
ATTnnn	Autorun Timing, nnn = 001 ~ 039
ATPnnn	Autorun Pattern, nnn = 001 ~ 050
ATInnn	Autorun time Interval, nnn = 005 ~ 600 (seconds)
ATS999	Query Autorun Configuration status
CRRnnn	Set the Red (Cr) ColorSetting value, nnn = 000 ~ 255
CRGnnn	Set the Green (Y) ColorSetting value, nnn = 000 ~ 255
CRBnnn	Set the Blue (Cb) ColorSetting value, nnn = 000 ~ 255
CRYnnn	Set the Gray ColorSetting value, nnn = 000 ~ 255
CRR999	Query Red (Cr) ColorSetting status (see note 3 on page 81)
CRG999	Query Green (Y) ColorSetting status
CRB999	Query Blue (Cb) ColorSetting status
CRY999	Query Gray ColorSetting status
CSC001	Set color space to RGB:444
CSC002	Set color space to YUV:444
CSC003	Set color space to YUV:422
CSC999	Query color space status
DEE001	Set deep color to 8-bit
DEE002	Set deep color to 10-bit
DEE003	Set deep color to 12-bit
DEE999	Query deep color status
ESC001	EDID source is from Tx (HDMI / DVI Out)
ESC002	EDID source is from Rx (built-in active EDID)
ESC003	EDID source is from Rx1 (built-in EDID1)
ESC004	EDID source is from Rx2 (built-in EDID2)

Command	Description
ESC005	EDID source is from Rx3 (built-in EDID3)
ESC006	EDID source is from VGA (PC / HD out)
ERD001	Read EDID from sink (see note 4 on page 81)
ERS001	Erase sink's EDID and fill all bytes with FF (see note 5 on page 81)
EWR001	Write EDID to sink (see note 6 on page 81)
FAV000	Set My Favorite OFF
FAV001	Set My Favorite ON
FAV999	Query My Favorite action status
FP+nnn	Add Pattern to Favorites, nnn = 001 ~ 050
FP-nnn	Drop Pattern from Favorites, nnn = 001 ~ 050
FP+999	Query Favorite Pattern status (*FP-999* can also be used)
FT+nnn	Add Timing to Favorites, nnn = 001 ~ 039
FT-nnn	Drop Timing from Favorites, nnn = 001 ~ 039
FT+999	Query Favorite Timing status (*FT-999* can also be used)
HDC000	Set HDCP OFF
HDC001	Set HDCP ON
HDC999	Query HDCP status
MOT001	Set custom string for Pattern 46 (see note 7 on page 81)
MOT999	Query string from Pattern 46
OUT001	Select output format [PC]
OUT002	Select output format [HD]
OUT003	Select output format [DVI]
OUT004	Select output format [HDMI]
OUT999	Query output format status
PATnnn	Select Pattern, nnn = 001 ~ 050
PAT999	Query Pattern status
PCM001	Set PCM 2CH
PCM002	Set PCM 5.1CH
PCM003	Set PCM 7.1CH
PCM999	Query PCM status
RST001	Reset Signal Generator
TIMnnn	Select Timing, nnn = 001 ~ 039
TIM999	Query Timing status
VER999	Query firmware version

Notes

1. After the RS-232 device sends commands to the HD Pattern Signal Generator, the RS-232 device must wait for the HD Pattern Signal Generator to responds. Although the RS-232 device can send another command without waiting for a response, the communication may fail if the HD Pattern Signal Generator is in Auto mode.

2. To configure the HD Pattern Signal Generator to follow a sequence of commands in Auto mode, the following syntax is used: `ATNxxx + ATTxxx + ATPxxx + ATIxxx...`

3. If the HD Pattern Signal Generator is not set to Pattern 47, running a query for the ColorSetting pattern will return: `CRR300, CRG300, CRB300 or CRY300`.

4. After sending the `ERD001` response, the HD Pattern Signal Generator reads the sink's EDID and transmits the data to the remote terminal. If the EDID cannot be read, then the HD Pattern Signal Generator sends `0xFE` and stops the datastream. The HD Pattern Signal Generator supports a 256-byte EDID (block0 + block1).

5. After sending the `ERS001` response, the HD Pattern Signal Generator erases the sink's EDID and fills all bytes with `FF`. After the EDID is erased, the HD Pattern Signal Generator returns `ERS002`. If the process fails, then `ERS003` is returned.

6. After sending the `EWR001` response, the HD Pattern Signal Generator waits for the EDID datastream (256 bytes) from the RS-232 device. After receiving the datastream, the HD Pattern Signal Generator writes the EDID to the sink. If the write-process is successful, then `EWR002` is returned. If the write-process fails, then `EWR003` is returned.

7. Send `MOT001` and wait for the `MOT001` response from the HD Pattern Signal Generator. Send the custom string and wait for the `MOT002` response. The maximum length for a string is 12 bytes. Any unused bytes must be filled with `0x00`. Only English characters are supported.
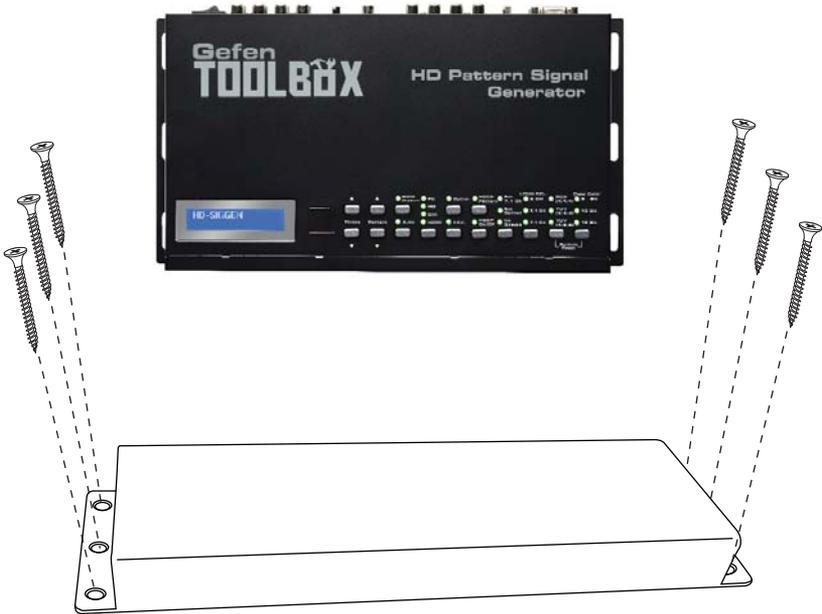
The GefenToolBox HD Pattern Signal Generator should be mounted vertically in a wall or cabinet with wood/drywall screws as shown in the diagram above. There should be an inch or two of clearance between the edges of the unit and any walls or vertical surfaces to allow for enough clearance for insertion and removal of cables on the back of the unit.

For installation on a drywall surface, use a #6 drywall screw. It is recommended when installing on a drywall surface that studs be used to secure the Splitter should undue stress be applied when connecting and disconnecting HDMI cables.

SPECIFICATIONS

Maximum Pixel Clock.. 165 MHz

Input Video Signal .... 1.2V p-p

Input DDC Signal .... 5V p-p (TTL)

Video Input... (1) HDMI Type A ,19-pin, female

Video Output... (1) HDMI, Type A, 19-pin, female

Video Output...(1) HD15, female

Analog Audio Inputs...................... FL, FR, C, LFE, SL, SR, SSL, SSR (RCA type)

Analog Audio Outputs....................FL, FR, C, LFE, SL, SR, SSL, SSR (RCA type)

Digital Audio Input.. (1) TOSLink

Digital Audio Outputs... (1) TOSLink, (1) S/PDIF

Input Impedance... 10 kΩ

Frequency Response.. 20 Hz - 20 kHz (± 0.5 dB)

SNR..> 90 dB

THD... < 0.001% at 1 kHz or 2 V rms

Crosstalk.. > 90 dB

RS-232 Serial Port... DB-9, female

Power Supply .... 5V DC

Power Consumption .... 10W (max.)

Operating Temperature .... 0 - 40 °C

Dimensions .... 12.0" W x 1.75" H x 6.5" D

Shipping Weight .... 6 lbs.

WARRANTY

Gefen warrants the equipment it manufactures to be free from defects in material and workmanship.

If equipment fails because of such defects and Gefen is notified within two (2) years from the date of shipment, Gefen will, at its option, repair or replace the equipment, provided that the equipment has not been subjected to mechanical, electrical, or other abuse or modifications. Equipment that fails under conditions other than those covered will be repaired at the current price of parts and labor in effect at the time of repair. Such repairs are warranted for ninety (90) days from the day of reshipment to the Buyer.

This warranty is in lieu of all other warranties expressed or implied, including without limitation, any implied warranty or merchantability or fitness for any particular purpose, all of which are expressly disclaimed.

1. Proof of sale may be required in order to claim warranty.

2. Customers outside the US are responsible for shipping charges to and from Gefen.

3. Copper cables are limited to a 30 day warranty and cables must be in their original condition.

The information in this manual has been carefully checked and is believed to be accurate. However, Gefen assumes no responsibility for any inaccuracies that may be contained in this manual. In no event will Gefen be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect or omission in this manual, even if advised of the possibility of such damages. The technical information contained herein regarding the features and specifications is subject to change without notice.

For the latest warranty coverage information, refer to the Warranty and Return Policy under the Support section of the Gefen Web site at www.gefen.com.

PRODUCT REGISTRATION

Please register your product online by visiting the Register Product page under the Support section of the Gefen Web site.
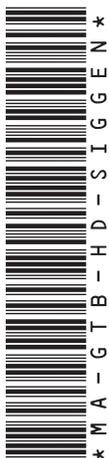
MA-GTB-HD-SIGGEN

This product uses UL or CE listed power supplies.