### Marshall Electronics Broadcas

# Model No. V-SG4K-HDI

# 4K HDMI portable signal generator

### HDMI 2.0 with 4K x 2K 60Hz 4:2:0



# **Operating Instructions**

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#### **IMPORTANT SAFETY INSTRUCTIONS:**

- Please read User Guide before using this product.
- Please keep User Guide for future reference. ۲
- Please read the cautions to prevent possible danger and loss of property. •

### 1. Introduction

V-SG4K-HDI is a programmable UHD (Ultra High Definition) capable Test Pattern Generator, packed with features for video and audio testing of HDMI® sources, sinks and extenders. V-SG4K-HDI Generates standard format signals up to 4K x 2K 60Hz 4:2:0 which is recently defined as part of the HDMI® 2.0 specification (UHD).

Thanks to its small size and low power consumption (only 0.4A) the VSG4K-HDI can be powered from practically any USB power source. It is highly portable and can easily fit into a toolbox or be used in an array of daisy chained devices for product development/testing. Several can fit on a 19" Rack shelf.

The V-SG4K-HDI has a built in 0.95-inch AMOLED display, which shows the generated pattern and format setting parameters.

A professional programmable sine wave generator is integrated for performing audio tests and when needed, an external analog audio source can be used via a 3.5 mm stereo socket on the rear panel. This input accepts an unbalanced 1V/pp stereo analog audio source. V-SG4K-HDI is programmable via the USB connector or via the RS-232 3-pin Phoenix connector. Advanced control is available through the included Windows® compatible software application.

For purposes of creating large test systems or multi-device measurement protocol functionality, customers can use the serial Loop-Out port via second Phoenix 3 pin terminal. Through this functionality, users can set up a large test system by "daisy chaining" multiple V-SG4K-HDI generators. This can be useful to test UHD distribution devices or complex UHD networks for example.

### 2. Product Overview



1. A 0.95-inch AMOLED displays the generated signal and menu settings.

- present from the device being tested, the LED will be off. When there is an EDID error, the LED will blink.
- 3. Quick Access Push Buttons.

2. Status LED. Shows HDMI link status. When the link is lost or HPD (Hot Plug Detect) is not



- 1. HDMI test signal output port.
- 2. HDMI retention screw / grounding screw
- 3. RS-232 control port Phoenix connector (serial control in)
- 4. RS-232 loop-out port Phoenix connector (serial control to next Generator)
- 5. USB control port. Used to operate a single unit from a computer. Can also be used to supply power to the V-SG4K-HDI.
- 6. 5-Volt DC socket for use with the included power supply
- 7. 3.5 mm stereo jack for connecting audio from external unbalanced audio sources. This analog audio is embedded into HDMI digital test signal. (This function is selectred via the Control Application Software.)

### 3. Features

- Designed for R&D engineers, video engineers and AV integrator / installers.
- Supports latest 4K x 2K, HD, SD and 3D at multiple frame rates
- Supports multiple sample structures including: RGB4:4:4, YUV4:4:4, YUV4:2:2,YUV4:2:0 (HDMI 2.0)
- Small size 3.25" x 3.8" (83mm x 97mm) and lightweight.
- Very low power consumption (less than 0.4A at 5V)
- 34 preset video test patterns.
- 32 preset resolutions, 10 user-defined resolutions plus auto resolution mode based on the EDID from the connected device.
- OLED display for Output Pattern preview and Menu settings display.
- Supports 7 audio sample rates plus auto mode based on the EDID data of the connected device.
- Supports standard functionality such as HDMI/DVI, Deep color, HDCP (on/off), selectable color sampling, etc.
- Supports EDID read functionality (stores10 EDID sets of different device parameters). Stored EDID data can be written to external devices via the USB port.

- generator functionality.
- extenders, etc.
- Link multiple units together to create complex test systems for manufacturing, QC and QA applications.
- AV professionals.

### 4. Specifications

Product	HDMI 2.0 com
HDMI Version	HDMI2.0 / DVI
HDCP on/off	Yes
Video Bandwidth	Up to 9.0GHz
Color Depth	24bits, 30bits,
Preset Video Formats	<b>32 presets inc</b> 4K(30/29), 4K( plus fixed timir
User Defined Timing	Up to 10 User
Test Patterns	34 (33 2D and
Color Sampling	RGB444, YUV
Audio Bit Depths	26, 24, 20-bits
Audio Sample Rates	32, 44.1, 48, 8
Vertical Frequency Range	Supports fram
Power Consumption	2 Watts (max)
Housing	Metal
Dimension W/H/D	3.25" x 1.25" x
Weight	0.6lbs (280 gm

### 5. Package Contents

- 1. Main unit: V-SG4K-HDI
- 2. 5VDC 1A Power Supply
- 3. Mounting ears (x2)
- 4. 1.2m USB A-to-A cable (x1).
- 5. Phoenix plug (x2)
- 6. Disk with Control Application

### V-SG4K-HDI / FEATURES

Control Software SGCS-ver.01.8 supplied with V-SG4K-HDI adds easy operation and extended

Test many types of HDMI devices including matrix routers, switchers, splitters, TV sets, monitors,

The Pattern Generator's sophisticated functionality and small size make it virtually irreplaceable for

### 6. Quick Access Keys

The front panel Up/Down, Left/Right, Enter and Cancel keys provide quick access to the most common functions in the V-SG4K-HDI signal generator. (Detailed computer control is available through the USB or RS-232 ports.)

#### Up / Down:

Use the Up/Down keys to quickly cycle through the 33 preset standard test patterns plus one additional 3D pattern.

#### Left / Right:

Use the Left/Right keys to quickly cycle through 32 preset video formats. (Additional formats are available through the PC application).

#### Enter / Cancel:

Pressing the Enter key opens the system menu. Use the Left/Right keys to select different menu categories. Use the Up/Down keys to modify items in the selected category.

Press Enter a second time to accept a selection. Press Cancel to exit out of the category or menu.

#### Menu categories:

- Timing (Format)
- Color Space (Sampling)
- Color Depth (Bits per Color)
- HDCP (On/Off)
- HDMI/DVI (Feature Set)
- Audio Sample Rate (KHz)
- Audio resolution (Bit per Sample)
- External audio (On/Off)
- Audio channel (Number of Channels generated up to 8)
- Output standby (Output On/Off) (Standby ON turns output OFF)
- Save EDID (Save EDID information from connected Device)
- EDID Info (Display EDID data from connected Device)
- Address Info (Display RS-232 Group and Device Address) changed via PC application

## 7. Computer Control

Provided with the V-SG4K-HDI is a Windows application which allows very detailed operation from a computer. Perhaps the easiest connection method is via a standard USB cable. Once the application is installed on a PC, simply connect a USB (A-to-A) cable between the computer and the signal generator and open the application. The V-SG4K-HDI can receive power over this same cable so an external power supply will likely not be necessary. See section 8 "Installing the Control Application Software".

The same application may be used to control the test generator via an RS-232 "serial" connection. Select the active serial "Com" port the computer is using in the application to complete the connection. The RS-232 serial connection does not supply power. The unit will need to be either connected to a USB source or powered by the included 5-volt power supply.

All functions can be controlled either via the USB or RS-232 interface. The primary difference is that RS-232 can be used to control several devices in a chain while USB controls just a single device.

#### **Basic Operations**

- the PC has control of the Signal Generator.
- test.
- be testing.
- Select the Pattern tab to choose an appropriate test pattern

Timing Training Data I Data Louis ( Trenton)
Turn On or Off HDMI Signal Output (Not intended to turn off
Activating or Closing actually available PC COM port connec Generator via USB. When PC COM port connected to Signal Generator, port ac will light up in red.
Click to initiate search for Signal Genarator connected via US
To chose Signal Generator(s) ID Address, to be managed vi
To open Signal Generator chain Serial port Address Manage
HDMI "Hot Plug Detect" (HPD) status indicator
Video Output status report
HDCP On or Off
Mode of actual digital connection: HDMI or DVI
Actually selected Color Space (RGB or YUV). In 4K mode res
Staus on selected Color depth report
Selected Timing status
<ul> <li>Audio Output status report</li> </ul>
Audio Sample rate indicator
Audio Bit depth Indicator
Selected number of Audio Channels (from 2 -8)
Audio mode

- Connect the PC to the Signal Generator using USB or RS-232. Click the "Search Device" button in the Main Menu. Within a few seconds, the Comm Port Activity light will turn red indicating that

- Connect an HDMI cable from the Generator to the device (monitor, recorder, etc.) that you want to

- Select the Timing tab to set the Generator to the appropriate video format for the device you will



#### Main menu:

The Main menu runs down the left side of the screen. Sub-menus are accessed through Tabs

along the top of the screen.

#### Main Menu Functions:

- Output On/Off
- Serial "Comm" port selection (a USB connection will also have a port number)
- Search for attached device (starts control whether connected via USB or RS-232)
- Device address management
- HDP (Hot Plug Detect) Indicator
- Video Output Status Display
- Audio Output Status Display

#### Sub-Menu Tabs:

Timing Menu (video format) page:

HDMI2.0 Signal Generator P	Pro V1.0
Signal Ouput © Power On © Power Off	Timing         Timing Details         Pattern         Setting         TV EDID           VESA         (PC)Timing
Comm Port Activity Close Port COM6	○ 1280×960(60)       ○ 1280×1024(60)       ○ 1400×1050(60)       ○ 1600×1200(60)       ○ 1920×1200(60)         Video Standards with 60(59.94), 30(29.97), 24(23.98) fps         ○ 480i(59.94)       ○ 480P(59.94)       ○ 720P(60)       ○ 720P(59.94)       ○ 1080i(60)       ○ 1080i(59.94)
Search Device Address Management	C 1080P(30)       C 1080P(29.97)       C 1080P(24)       C 1080P(23.98)       Image: 1080P(60)       C 1080P(59.94)         Video Standards with 50, 25 fps         C 576i(50)       C 576P(50)       C 720P(50)       C 1080P(25)       C 1080P(50)
All: 0000(with ACT)	4K Timing         4K(30)       4K(29.97)         4K(25)       4K(24)         5MPTE4K(24)       4K(4:2:0)(60)         4K(4:2:0)(59.94)       4K(4:2:0)(50)
Hot Plug: ON Video Output	3D Video (Fame Packing) C 720P_3D(60) C 720P_3D(59.94) C 1080P_3D(24) C 1080P_3D(23.98) C 720P_3D(50)
HDCP: ON HDMI/DVI: HDMI Color Space: RGB4:4:4	3D Video (Side by Side) C 720P_3D(59.94) C 1080i_3D(59.94) C 1080P_3D(59.94) C 1080P_3D(23.97) C 720P_3D(50) C 1080i_3D(50) C 1080P_3D(50)
Color Depth: 24bit Timing: 1080P(60)	3D Video (Top-bottom) C 720P_3D(59.94) C 1080P_3D(59.94) C 1080P_3D(23.97) C 720P_3D(50) C 1080P_3D(50)
Sample rate: 32K	C Auto (Output timing based on EDID of sink device)
Audio bit: 16bit Channels: 2ch Audio Type: PCM	5. C 720x480(60)       6. C 720x480(60)       7. C 720x480(60)       8. C 720x480(60)         9. C 720x480(60)       10. C 720x480(60)       7. C 720x480(60)       8. C 720x480(60)

#### **Timing Menu - Applications**

- The timing page allows selection of a very wide range of video and computer display formats.
- Select the appropriate format for the device under test.
- Check and confirm the range of different formats a device will accept
- Force error conditions in a device to confirm how it displays error messages
- Use the generator as a substitute for another source that is suspected of malfunctioning
- Check HDMI cables and connections

#### Timing Details Menu page

HDMI2.0 Signal Generator I	Pro V1.0
Signal Ouput	Timing Timing Details
Power On	
O Power Off	Video 74.25 M
Comm Port	Н 1920
Activity Close Port	V active: 540
COM1 V	
	H total: 2200
	V total: 562
Search Device	н 280
Address Management	V 22
All: 0000(with ACT)	
Address Setting	
Hot Plug: ON	
Video Output	HS <del>K_3K_3K_3K_3K</del> 745_747_745_74
	VS
Color RGB4:4:4	×
Color 24bit	Date Enable
, Timing: 1080i(60)	H blank Hs Hs width
Audio Output	
Status	
Sample 48K	
Audio bit: J16bit	
Channels: J2ch	

#### **Timing Details Menu - Applications**

The Timing Details page is useful for testing the limits of a particular device. This can be particularly useful for product development

- Adjust H & V timings and frequencies to determine the acceptance range of the device - Create special timing parameters for new devices and formats not already included in the Signal
- Generator.
- Force error conditions in a device to understand how it will react to non-standard inputs

### V-SG4K-HDI / COMPUTER CONTROL



#### **Pattern Menu - Applications** The Pattern page is probably the most frequently used section of the Signal Generator.

Audio Type: PCM

Channels:

2ch

A wide variety of standard and unique patterns are available. Each of these patterns can be output at any of the selected timings/formats including UHD/4K (3840 x 2160).

- Color bars are useful for checking monitors, wavform monitors and vectorscopes as well as checking luma and chroma levels through switchers, scalers and other system components.
- Solid color screens can be used to check purity in displays and projectors.
- Ramp patterns are good for checking bit depth by observing the degree of "stepping" in the image.
- Multiburst is useful for checking the bandwidth of a device as well as its tendency to create alias patterns.
- Lines and checkerboards are particularly useful when setting up projection systems and video walls.

#### Setting Menu page

X

	Audio bit: Channels: Audio Type:	16bit 2ch PCM	
Sett	ing Menu -	Applicatio	ons
The	Setting pag	ge is a colle	ction of the basic sig
Gen	erator can	output.	
- Mo	st of the se	ttings are u	sed for checking the
incl	udes color	space, colo	or depth, audio sam
- Ext	ernal audic	(stereo) ca	an be selected also
into	the HDMI	output from	n other sources.
- HD	CP On/Off	provides a	quick check for HD
the	HDCP test	t ON will ca	use the picture to di
dis	olay device	. Complian	t display devices (m
HD	CP turned	ON.	

Signal Ouput	Timing Timing Details
Power On     Off	HDMI/DVI
Power Off	C DVI
Comm Port	1 HDCP
Close Port	
COM6	Color Space
	• RGB4:4:4
Search Device	
Search Device	NOTE: YUV4:2:01
Address Management	Color Depth
All: 0000(with ACT)	<b>-</b>
Address Setting	- Audio Source Sele
Hot Plug: ON	Interr
Video Output	
Status	Audio Sample Rat
HDCP: ON	
HDMI/DVI: HDMI	
Color Space:  RGB4:4:4	- Audio Bit
Color Depth:  24bit	-
Timing:   1080P(60)	- Audio channel
Audio Output Status	© 2CH C 3
Sample rate: 32K	
Audio bit: 16bit	
Channels: 2ch	
Audio Type: PCM	

HDM12.0 Signal Generator P	ro V1.0	
Signal Ouput	Timing   Timing Details   Pattern   Setting   TV EDID	
Comm Port	⊂ 100%ColorBar ⊂ 75%ColorBar ⊂ 8 StepGrayBar ⊂ RedScreen	C GreenScreen
COM6 -	C BlueScreen C YellowScreen C CyanScreen C MagentaScre	en C 16 StepGrayBar
Search Device	C WhiteScreen C RGB Ramp C Cross Black C Cross Red	C Cross Geeen
All: 0000(with ACT)	C Cross Blue C Square C White dots C AlternateWB	C White HScrool
Hot Plug: ON Video Output	C White VScroll C Multiburst C Ver-split C Hor-split	C Red Ramp
HDCP: ON HDMI/DVI: HDMI	Green Ramp C Blue Ramp C W/B Bounce C Border lines	C Window
Color Space:  KGB4:4:4 Color Depth: 24bit Timing: 1080P(60)	C Target Circle C Moving Ball C SMPTE ColorBar	
Audio Output Sample rate: 32K	C 3D boxes	

Pattern Menu page

### V-SG4K-HDI / COMPUTER CONTROL

	2
tern Setting TV EDID	
HDCP OFF   HDCP ON	
YUV4:4:4 C YUV4:2:2 C AUTO C YUV4:2:0	
available in 4K 50/60Hz mode (HDMI2.0)	
C 30bit C 36bit C 48bit C AUTO	
nerated C External Stereo Input	
•	
48K C 88K C 96K C 176K C 192K C AUTO	
t C 20bit C 24bit C AUTO	
Reset to Default Setting	

ignal parameters, both video and audio, that the Signal

at a device conforms to the stated specifications. This ple rate, bit depth and number of channels.

so that specialized audio signals may be embedded

DCP (copy protection) compliance of a device. Turning lisappear on recorders, switchers and any other nonnonitors, TV's, projectors) should display a picture with

#### EDID Menu page

HDMI2.0 Signal Generator	r Pro V1.0
EDID data.	Timing Timing Details       Pattern       Setting       TV EDID         00       00       FF FF FF FF FF 00 36 81 30 00 01 00 00 00       10 0A 16 01 03 80 73 41 78 0A CF 74 A3 57 4C B0 23       EDID read From:         20       09       48 4C 21 08 00 81 80 45 40 61 40 95 00 01 01       Image: Comparison of the second
Read TV EDID or saved in SG1H 10 sets of EDID data that read and saved before.	30       01       01       01       01       01       01       01       01       01       01       02       3A       80       18       71       38       2D       40       58       2C       40       45       90       C4       8E       21       00       00       1E       66       21       50       BO       51       00       1B       30         50       40       70       36       00       C4       8E       21       00       00       1E       00       00       00       00       44       60       65       61       67       0A       20 <t< td=""></t<>
Save EDID data on —— computer.	b0       60       61       62       20       62       01       62       03       04       01       61       63       64       06       64       06       64       06       64       06       64       06       64       64       06       20       10       10       10       32       96       00       60       64 <td< td=""></td<>
Open a EDID file from computer.	General Info: Manufacture's Name:MTA Product Code:48 Video Signal Interface:Digtal Color Bit Depth:Reserved Display Product Name:Demo Vertical Rate:50Hz=-75Hz Video Information: Andio Information:
	Preferred Timing: 1920x1080@60Hz       Audio Format: LPCM.         Detailed Timing: 1360x768@60Hz       Audio Channel (s): 2         Short Video Descripter       Sample Frequency:         640x480p@60Hz 4:3       44. 1KHz         720x480p@60Hz 16:9       32KHz         1920x1080i@60Hz 16:9       Sample Bit:         24Bit       -

#### **EDID Menu - Applications**

The EDID page has a variety of uses and is useful for checking the capabilities of a given device.

- Simply click the EDID Read button and the EDID data will appear on screen. (If that does not occur, please check that the HDMI cable is firmly connected on both ends).
- The EDID page displays information about the manufacturer and basic characteristics in the General Information window.
- Details about Video and Audio formats supported by the device are displayed in the Video Information and Audio Information windows.
- The raw EDID data is also presented in hexadecimal format for detailed analysis. This data is primarily useful for device manufacturers.
- The V-SG4K-HDI Signal Generator can save up to 10 sets of EDID data to a PC for analysis and comparison.

#### Address Setting Button (in Main Menu)

Device Address Management	<u></u>							<b>—</b>
Original Address	Addre	ss Table	(Everye	dit box is 2 hex	digital mode,	max numb	per of cha	ar in Description is 10) –
Group Address: Device Address:	Index	Group Address	Device Address	Description	Index	Group Address	Device Address	Description
Read Address from device	1:	22	01	BC Same G	17:	00	00	
- New Address	2:	22	DF	BC Same G	18:	00	00	
	3:	22	22	device	19:	00	00	
Group Address: Device Address:	4:	01	01	test 1	20:	00	00	
Write Address to device	5:	21	21		21:	00	00	
Note: When read or write address, there	6:	00	00		22:	00	00	
should be only one device is connected.	7:	00	00		23:	00	00	
	8:	00	00		24:	00	00	
Save	9:	00	00		25:	00	00	
	10:	00	00		26:	00	00	
	11:	00	00		27:	00	00	
Help	12:	00	00		28:	00	00	
you close the address mangement	13:	00	00		29:	00	00	
dialog. Otherwise the data will be	14:	00	00		, 30:	00	00	
ignorea.	15:	00	00		31:	00	00	
	16:	00	00		32:	00	00	

#### **Address Setting Menu - Applications**

The Address Setting button in the Main Menu area (left side of screen) opens the Address Setting menu. This section is used when it is desired to link together several Signal Generators to perform multiple tests at the same time. This is a particularly useful feature for manufacturing, QC and QA applications. As shown below, Signal Generators may be connected to each other in a "cascade" or "daisy chain" fashion linking the RS-232 output from one unit to the RS-232 input of another. For this method to operate correctly, each Generator needs to be given an Address number (and optionally, a Group number). Also, a Generator can be given a text name.

- Control Application.
- Click on the Address Setting button.
- number (a common Group number like 01 will be fine for most applications).
- Click on the Write Address to Device button to set this Address.
- Click on the Save button before exiting the Address Setting page.

Once each Generator has been assigned a unique Address and all the Generators are connected together, it is simple to select each generator from the Main Menu.

- Main Menu area. A list of all connected devices will appear.
- through the various menu tabs.

- To create an Address, each Generator should be connected, one-at-a-time to a PC running the

- In the Address Setting menu, in the New Address area, type in a two-digit Address and Group

- First, click the Search Device button. Within a few seconds all of the Generators will be detected. - Next, click on the pulldown window located just below the words "Address Management" in the

- Simply click on the Address of the Generator you wish to control and make the desired settings



#### **RS-232 Connection Method:**

DB-9 Serial Connector (PC)	Phoenix 3-pin Connector
Pin 2 (TX)	Pin 1 (RX)
Pin 3 (RX)	Pin 2 (TX)
Pin 5 (Ground)	Pin 3 (Ground)

8. RS-232 pass through port Phoenix connector.

#### **Connection Method:**

Phoenix 3-pin Loop Out	Phoenix 3-pin Next Unit
Pin 1 (RX)	Pin 2 (TX)
Pin 2 (TX)	Pin 1 (RX)
Pin 3 (Ground)	Pin 1 (Ground)

### V-SG4K-HDI / INSTALLING THE CONTROL APPLICATION SOFTWARE



### 8.Installing the Control Application software

#### **Computer requirements:**

- Recent version of Windows® operating system
- Available USB 2.0 or 3.0 port
- Optionally: Available RS-232 9-pin serial port (or USB-to-RS-232 adapter)
- CD Drive for the install disk (or copy the disk files to a thumb drive)
- Place the included CD in the computer
- Run the file "V-SG4K-HDI setup.exe"

The following screen should appear:



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Click button #1 to install the control application. Follow the prompts. When the installation successfully completes, this icon will appear on the desktop.



Next, click button #2 and follow the prompts to install the USB port driver. Click the Exit button to exit the install window after installation is complete.

Double-click on the desktop icon to run the control application. The application works with either a USB or an RS-232 serial connection to V-SG4K-HDI.

### 8. Warranty -

Marshall Electronics warranties to the first consumer that this V-SG4K-HDI, Test Pattern Generator will, under normal use, be free from defects in workmanship and materials, when received in its original container, for a period of one year from the purchase date. This warranty is extended to the first consumer only, and proof of purchase is necessary to honor the warranty. If there is no proof of purchase provided with a warranty claim, Marshall Electronics reserves the right not to honor the warranty set forth above. Therefore, labor and parts may be charged to the consumer.

This warranty does not apply to the product exterior or cosmetics. Misuse, abnormal handling, alterations or modifications in design or construction void this warranty. No sales personnel of the seller or any other person is authorized to make any warranties other than those described above, or to extend the duration of any warranties on behalf of Marshall Electronics, beyond the time period described above.

Note: Due to constant effort to improve products and product features, specifications may change without prior notice.

### **Marshall Electronics, Inc.**

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