QUESTTEL
Broadcast Systems

HDMI 2.0 Pattern Generator/ Analyzer

USER MANUAL

Safety and Notice

The **1B-HDMI-PTG-ALZ** **HDMI 2.0 Generator / Analyzer** has been tested for conformance to safety regulations and requirements, and has been certified for international use. However, like all electronic equipments, the **1B-HDMI-PTG-ALZ** should be used with care. Please read and follow the safety instructions to protect yourself from possible injury and to minimize the risk of damage to the unit.

- Follow all instructions and warnings marked on this unit.
- Do not attempt to service this unit yourself, except where explained in this manual.
- Provide proper ventilation and air circulation and do not use near water.
- Keep away the objects that might damage the device and assure that the placement of this unit is on a stable surface.
- Use only the power adapter, power cords and connection cables designed for this unit.
- Do not use liquid or aerosol cleaners to clean this unit. Always unplug the power to the device before cleaning.

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INTRODUCTION

QuestTel **1B-HDMI-PTG-ALZ** HDMI 2.0 Generator / Analyzer is a versatile toolbox with full bandwidth HDMI 2.0 and HDCP 2.2 support. For ease of HDMI 2.0 installations, **1B-HDMI-PTG-ALZ** is equipped with both HDMI pattern generator and analyzer. With this handy and portable gadget, users will appreciate at the built-in long hour operation chargeable battery, touch panel control and firmware upgrade access and many other features such as HDCP analyzer or loop test in one unit. QuestTel's **1B-HDMI-PTG-ALZ** supports 8 channels of LPCM audio with selectable sample rate. One more attractive feature of **1B-HDMI-PTG-ALZ** comes from bypassing HDMI input to the connected display or built-in 4.3" touch screen to verify HDMI sources instantly. QuestTel's **1B-HDMI-PTG-ALZ** is the most cost effective HDMI analyzer tool in the market to make HDMI installation much easier than ever.

FEATURES

4K2K60 4:4:4 8bit or 4:2:0 16bit HDR pattern generator

4.3" touch screen

Supports mouse control

Ethernet port for device control

Firmware update through USB Flash Drive

User defined patterns up to 2GB

LINUX KERNEL OS system with limitless extension

Scrambler supported for videos over 340MHz output wise

Loop test for statistics analysis of connection stability

HDMI loop through

HDCP test - verify HDCP of HDMI source

Qualified physical layer performance for the best compatibility

Portable battery powered device for operation time up to 4 hours

Short charging time about 2 hours.

PACKAGE CONTENTS

- 1x 1B-HDMI-PTG-ALZ
- 1x DC 12V 5A power supply
- 1x User Manual

Before using the 1B-HDMI-PTG-ALZ, please plugging the power adapter to switch off the shipping mode.

SPECIFICATIONS

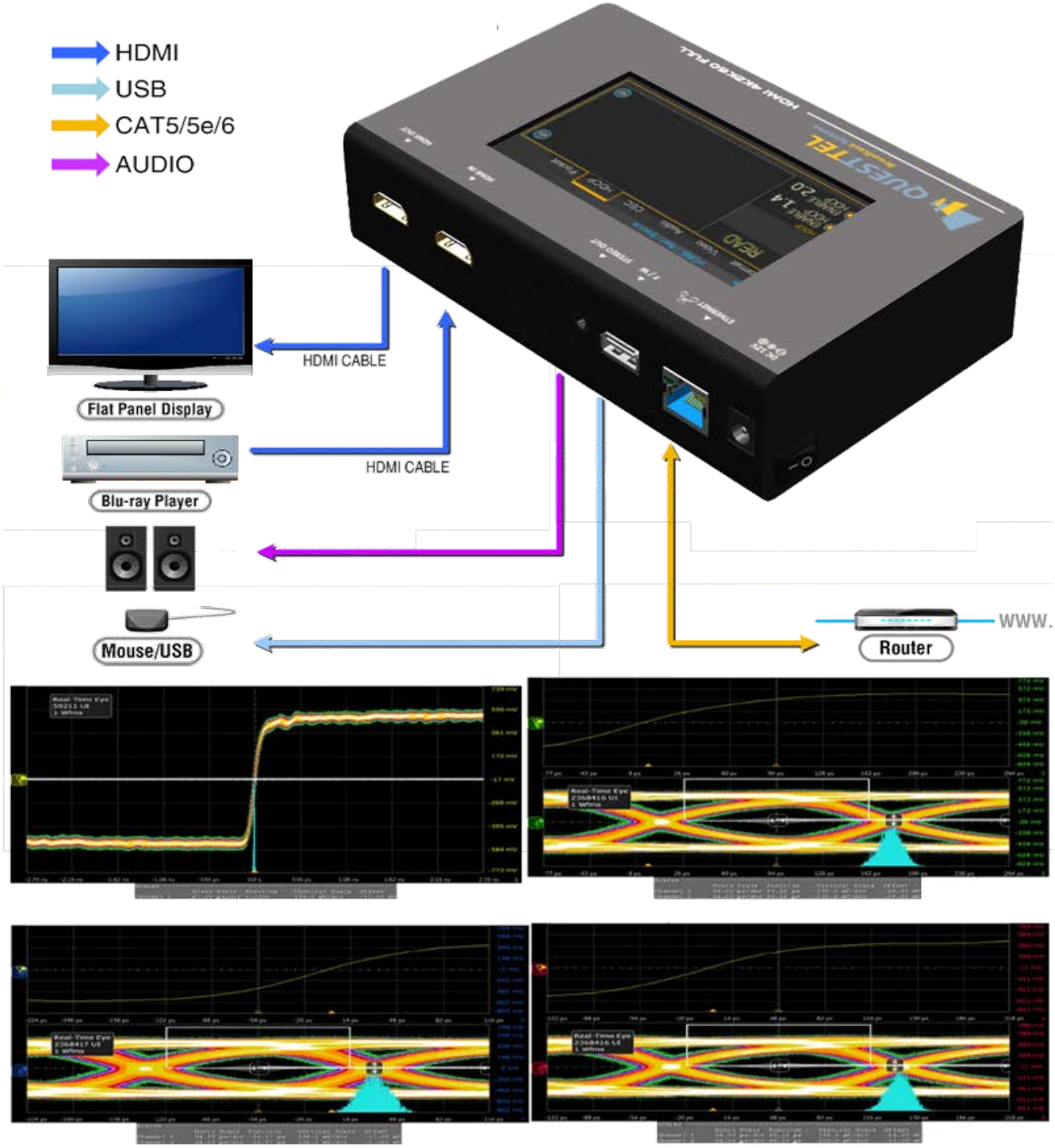
Model Name		1B-HDMI-PTG-ALZ
Technical		
Role of usage		Generator / Analyzer
Video bandwidth		Single link 600MHz [18Gbps]
HDMI compliance		HDMI 2.0 and below
HDCP compliance		HDCP 2.2 and below
Video Support		Up to 4K2K60 4:4:4 8bit, 4K2K60 4:2:0 16bit (HDR)
Video Format Support		HDMI
Audio support		8ch LPCM up to 192K
Control		USB mouse / touch panel / Ethernet
ESD protection		Human body model — ±15kV [air-gap discharge] & ±8kV [contact discharge]
Input		1x HDMI + 1xUSB + 1x RJ-45(Ethernet)
Output		1x HDMI + 1x 3.5mm(Stereo)
USB Support		USB 2.0
HDMI connector		Type A [19-pin female]
USB Connector		Type A
RJ-45 connector		WE/SS 8P8C with 2 LED indicators
Mechanical		
Housing		Metal enclosure
Dimensions (L x W x H)	Model	105 x 166 x 42mm[4.1" x 6.6" x 1.7"]
	Package	371 x 170 x 77mm[1'5" x 6.7" x 3"]
	Carton	410 x 368 x 393mm[1'3" x 1'4" x 1'5"]
Weight	Model	765g [27oz]
	Package	1294g [2.8 lbs]
Power supply		12V 5A DC / Battrery
Power Consumption		15 Watts
Operation temperature		0~40°C [32~104°F]
Storage temperature		-20~60°C [-4~140°F]
Relative humidity		20~90% RH [no condensation]

PANEL DESCRIPTIONS

1B-HDMI-PTG-ALZ

1. **OUTPUT:** HDMI output
2. **INPUT:** HDMI input
3. **Stereo Out:** Analog audio output
4. **USB:** Connect to USB device for control or firmware update
5. **Ethernet:** Ethernet control
6. **+12V DC:** 12V 5A DC power jack
7. **Power Switch:** Power ON/OFF switch
8. **Touch Panel:** Touch screen for control

APPLICATION DIAGRAM



MENU OPERATION

The major functions of the device are listed below

- HDMI Generator
- HDMI Receiver
- HDCP Test
- EDID Test
- Loop Test

Please refer the table below and the following section to know how to operate these functions.

OUTPUT SETTING

Menu	Items	Remark
Signal Format	TYPE	select the HDMI/DVI signal type information (color space and color depth)
	RESOLUTION	setting the TV/PC resolution and frequency
VIDEO Pattern	DEFAULT	multiple patterns to test HDMI device, it also provides user to set the timer and moving squares
	ALBUM	
PCM Audio Tone	MUTE	mute / unmute the PCM audio
	TONE	for user setting the audio information to test audio on HDTV or other A/V receivers
Setting	SCRAMBLER	for user to understand the signal encode a message situation

TEST SETTING

Menu	Items	Remark
Source	Format	read format information from source
	Video	provide small screen for user to check the video information and also provide video pass through to the display
	Audio	read audio information
	Packet	read packet
	HDCP	enable HDCP function (1.4/2.0)
Sink	EDID	EDID analyzer or learn EDID from RX
	HDCP	HDCP test
Loop		evaluate the quality of cables or EUT

SYSTEM SETTING

Menu	Items	
Preference	Screen Brightness	adjust the screen brightness
	BEEP	ON/OFF system sound
Ethernet	DHCP	
	Static IP	
Firmware	upgrade the firmware	
Battery	battery status	

***MEMU ITEMS SUBJECT TO CHANGE WITHOUT NOTIFICATION.**

GENERATOR

1B-HDMI-PTG-ALZ as HDMI Generator

After making the physical connections between 1B-HDMI-PTG-ALZ and the display device. User can select different generator function to display on the sink device under test.

1. **Selecting the Signal Format**
   1B-HDMI-PTG-ALZ provides different signal resolution and signal types for user to select. User can touch the Signal Format Tab to select the signal type (HDMI / DVI) and signal resolution (HDTV / PC). The HDTV resolution is up to 4K2K 60Hz and PC resolution is up to 1920x1200 60Hz.

2. **Rendering Test Patterns on an HDTV**
   1B-HDMI-PTG-ALZ provides multiple test patterns for user select to test HDTV. User can select the desired test pattern from the video pattern menu.

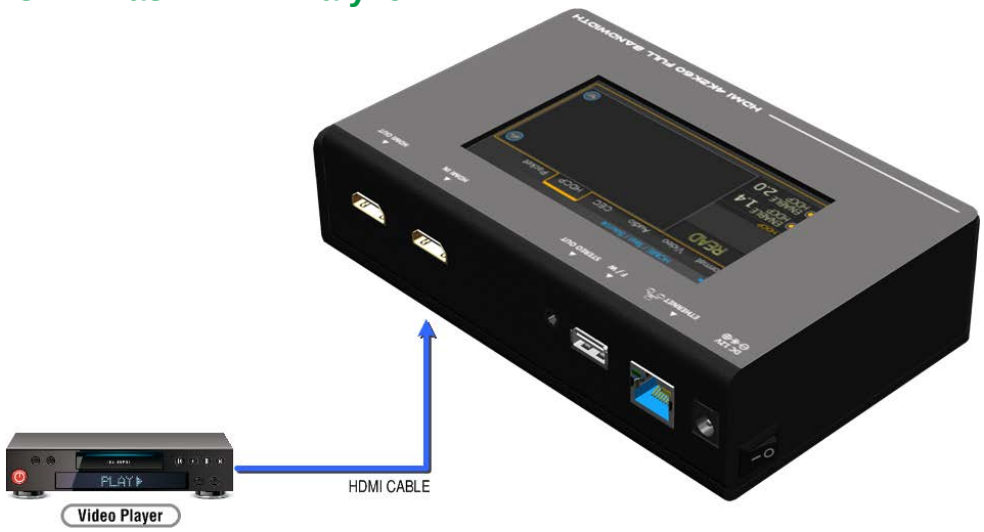
3. **User Defined Pattern**
   Besides the embedded test patterns, 1B-HDMI-PTG-ALZ also provides user defined patterns function for user to use custom test image. More details please see the Upgrade 1B-HDMI-PTG-ALZ section.

4. **Testing Digital Audio on an HDTV or A/V Receiver**
   The PCM Audio Tone menu provides user for test audio on HDTV or other A/V receivers. In the PCM SINE WAVE menu, user can set up the bits per sample, sample rate, level and audio channel.

5. **Testing HDCP on an HDMI TV or HDMI device**
   1B-HDMI-PTG-ALZ provides user to test HDCP on an HDMI equipped HDTV. For more details please see the HDCP test section.

RECEIVER

1B-HDMI-PTG-ALZ as HDMI Analyzer



1. **Source Information from the HDMI source**
   In the Test/Source menu, user can touch the read/refresh button to get the video format, source audio and packet information from the HDMI source device.

2. **Testing the Video from the HDMI source**
   1B-HDMI-PTG-ALZ supports the incoming video from HDMI source/device to ensure user is receiving a valid video signal by displaying the information of incoming signal. The video information also will inform user whether the HDCP is encrypted or not. Return to Video menu by touching the touch panel (please stay at least 5 seconds).

HDCP TEST

1B-HDMI-PTG-ALZ as HDCP Receiver

When 1B-HDMI-PTG-ALZ set as receiver, it can verify HDCP of video player or other DUT (Device Under Test). 1B-HDMI-PTG-ALZ provides three options (HDCP 1.4 / HDCP 2.2 / no HDCP) for users to select and confirm the HDCP authentication of DUT.

1B-HDMI-PTG-ALZ as HDCP Transmitter

When 1B-HDMI-PTG-ALZ set as transmitter, it can transmit HDCP encrypted video. 1B-HDMI-PTG-ALZ also provides three modes (HDCP 1.4 / HDCP 2.2 / no HDCP) for you to select. If user wants to transmit HDCP encrypted video again, please select the Auto-Restart button.

Procedure for Testing HDCP:

- Make the connection between the 1B-HDMI-PTG-ALZ HDMI output port and the display.
- Select **HDCP** Test from the Sink Test Menu.
- Touch **Enable HDCP 1.4** or **Enable HDCP 2.2** button.

EDID ANALYSIS

1B-HDMI-PTG-ALZ offers the most convenient way for user to analyze the EDID. You can verify, view and learn the EDID of an HDMI HDTV or other devices.

Procedure of EDID Analyze:

- Make sure the connections between the 1B-HDMI-PTG-ALZ HDMI output port and the device.
- Select **EDID** Analyze from the Sink Test Menu.
- Touch the **Read** button to get the EDID information of DUT.

Procedure of learning EDID from RX:

- Make sure the connections between the 1B-HDMI-PTG-ALZ HDMI output port and the device.
- Select **EDID** Analyze from the Sink Test Menu.
- Touch the **Learn from RX** button to learn the EDID. The EDID will be saved in the 1B-HDMI-PTG-ALZ input port.

LOOP TEST

1B-HDMI-PTG-ALZ offers the unique estimator for evaluating the quality of cables or DUT. Users can simply connect the cable or DUT to 1B-HDMI-PTG-ALZ to form a loop, the monitor will examine the HDMI bitstream pixel by pixel. The measurement statistics will be displayed on screen and offer useful information for building up robust A/V system.

Application illustration:

Procedure of Loop Test: *only support 1080p@60, 4K2K 30Hz and 4K2K 60Hz resolution

- Make sure the connection between the 1B-HDMI-PTG-ALZ and the DUT or cables.
- Select **Loop Test** from the Loop Test Menu.
- Set the test time and touch the **START** button. The 1B-HDMI-PTG-ALZ will capture the signal from its transmitter through the loop and evaluate the transmission quality.
- The user interface of 1B-HDMI-PTG-ALZ will be locked until testing terminated. Unless user wants to break off the test.
- Judgement criteria:

Test Result	Definition
Pass	The value of Bit Error Rate is less than 1
Fail	The Bit Error Rate is more than 1

***PLUGGING HDMI CABLE WILL INFLUNCE THE TESTING RESULT, SO PLEASE SETTLE DOWN THE CONNECTION BEFORE STARTING RUNNING TEST.**

ETHERNET CONTROL (TCP/IP)

1B-HDMI-PTG-ALZ also provides user control through Ethernet. The Ethernet control includes many major functions, it can offer user develop software to do advance setting. (**TCP Port:** 6133)

Reply Format:

Received = ACK + Feedback Date

ACK: 0xaa 0xbb 0xcc

Feedback Date: Data0 Data1 Data2….

Command Set:

***Bold word part please refer to corresponding table**

COMMAND	ACTION	RAMARK
0x4d 0x53 0x5 0x0 0x0 0x5 0x1 **Res**	Set output resolution	Hexadecimal
0x4d 0x53 0x5 0x0 0x0 0x5 0x2	Get output resolution	
0x4d 0x53 0x5 0x0 0x0 0x5 0x3 **Mode**	Set output mode	
0x4d 0x53 0x5 0x0 0x0 0x5 0x4	Get output mode	
0x4d 0x53 0x5 0x0 0x0 0x5 0x5 **Depth**	Set output color depth	
0x4d 0x53 0x5 0x0 0x0 0x5 0x6	Get output color depth	
0x4d 0x53 0x5 0x0 0x0 0x5 0x7 **Pattern**	Set default pattern	Hexadecimal
0x4d 0x53 0x5 0x0 0x0 0x5 0x8 **Pattern**	Set user pattern	Hexadecimal
0x4d 0x53 0x5 0x0 0x0 0x5 0x9 **Mute**	Set audio mute	
0x4d 0x53 0x5 0x0 0x0 0x5 0xa	Get audio mute status	
0x4d 0x53 0x5 0x0 0x0 0x5 0xb **Length**	Set audio length	
0x4d 0x53 0x5 0x0 0x0 0x5 0xc	Get audio length	
0x4d 0x53 0x5 0x0 0x0 0x5 0xd **Level**	Set audio level	
0x4d 0x53 0x5 0x0 0x0 0x5 0xe	Get audio level	
0x4d 0x53 0x5 0x0 0x0 0x5 0xf **Rate**	Set audio sample rate	
0x4d 0x53 0x5 0x0 0x0 0x5 0x10	Get audio sample rate	
0x4d 0x53 0x5 0x0 0x0 0x5 0x11 **Number**	Set audio channel number	
0x4d 0x53 0x5 0x0 0x0 0x5 0x12	Get audio channel number	
0x4d 0x53 0x5 0x0 0x0 0x5 0x13 **HDCP**	Set TX HDCP on/off	
0x4d 0x53 0x5 0x0 0x0 0x5 0x14	Get TX HDCP on/off	
0x4d 0x53 0x5 0x0 0x0 0x5 0x15 **HDCP**	Set RX HDCP on/off	
0x4d 0x53 0x5 0x0 0x0 0x5 0x16	Get RX HDCP on/off	

Resolution:

Index	Resolution	Index	Resolution	Index	Resolution
0x0	720x480i@60	0x13	1920x1080p@24	0x26	1920x1200pRB
0x1	720x576i@50	0x14	1920x1080p@23.976	0x27	3840x2160p@60
0x2	720x480p@60	0x15	640x480p@60	0x28	3840x2160p@59.94
0x3	720x576p@50	0x16	640x480p@75	0x29	3840x2160p@50
0x4	1280x720p@60	0x17	800x600p@60	0x2a	3840x2160p@30
0x5	1280x720p@59.94	0x18	800x600p@75	0x2b	3840x2160p@29.97
0x6	1280x720p@50	0x19	1024x768p@60	0x2c	3840x2160p@25
0x7	1280x720p@30	0x1a	1024x768p@75	0x2d	3840x2160p@24
0x8	1280x720p@29.97	0x1b	1280x1024p@60	0x2e	3840x2160p@23.976
0x9	1280x720p@25	0x1c	1280x1024p@75	0x2f	1920x1080p@60
0xa	1920x1080i@60	0x1d	1360x768p@60	0x30	4096x2160p@60
0xb	1920x1080i@59.94	0x1e	1366x768p@60	0x31	4096x2160p@59.94
0xc	1920x1080i@50	0x1f	1400x1050p@60	0x32	4096x2160p@50
0xd	N/a	0x20	1600x1200p@60	0x33	4096x2160p@30
0xe	1920x1080p@59.94	0x21	1440x900p@60	0x34	4096x2160p@29.97
0xf	1920x1080p@50	0x22	1440x900p@75	0x35	4096x2160p@25
0x10	1920x1080p@30	0x23	1680x1050p@60	0x36	4096x2160p@24
0x11	1920x1080p@29.97	0x24	1680x1050pRB	0x37	4096x2160p@23.976
0x12	1920x1080p@25	0x25	1920x1080pRB		

Mode

Index	0x0	0x1	0x2	0x3	0x4
Mode	DVI	RGB	YCbCr444	YCbCr422	YCbCr420

Depth

Index	0x0	0x1	0x2	0x3
Depth	8 Bit	10 Bit	12 Bit	16 Bit

Default Pattern:

Index	Default Pattern	Index	Default Pattern	Index	Default Pattern
0x0	SMPTE BAR	0x10	Ramp Green V 2	0x20	Black
0x1	TV Bar 100%	0x11	Ramp Blue V 2	0x21	Noise
0x2	TV Bar 75%	0x12	Stair Red 1	0x22	Circle 1
0x3	Checkfield	0x13	Stair Red 2	0x23	Circle 2
0x4	EQ	0x14	Stair Green 1	0x24	Moire
0x5	PLL	0x15	Stair Green 2	0x25	V Stripe Red
0x6	Ramp Red H 1	0x16	Stair Blue 1	0x26	V Stripe Green

Default Pattern:

Index	Default Pattern	Index	Default Pattern	Index	Default Pattern
0x7	Ramp Green H 1	0x17	Stair Blue 2	0x27	V Stripe Blue
0x8	Ramp Blue H 1	0x18	Stair White 1	0x28	H Stripe Red
0x9	Ramp Red H 2	0x19	Stair White 2	0x29	H Stripe Green
0xa	Ramp Green H 2	0x1a	Red 100	0x2a	H Stripe Blue
0xb	Ramp Blue H 2	0x1b	Green 100	0x2b	Chess 1
0xc	Ramp Black to Red V	0x1c	Blue 100	0x2c	Chess 2
0xd	Ramp Green V 1	0x1d	White 100	0x2d	Multi Burst
0xe	Ramp Blue V 1	0x1e	Gray 70	0x2e	CZP
0xf	Ramp Red V 2	0x1f	Gray 40	0x2f	Overscan

User Pattern:

Index	User Pattern	Index	User Pattern	Index	User Pattern
0x0	Philips	0xa	Ramp W-4	0x14	Graybar64 G-1
0x1	Checker 3x3	0xb	Graybar32 R-1	0x15	Graybar64 B-1
0x2	Checker 6x6-1	0xc	Graybar32 G-1	0x16	Graybar64 W-1
0x3	Checker 6x6-2	0xd	Graybar32 B-1	0x17	Graybar64 R-2
0x4	White 75	0xe	Graybar32 W-1	0x18	Graybar64 G-2
0x5	White 50	0xf	Graybar32 R-2	0x19	Graybar64 B-2
0x6	White 25	0x10	Graybar32 G-2	0x1a	Graybar64 W-2
0x7	Ramp W-1	0x11	Graybar32 B-2	0x1b	User Add..
0x8	Ramp W-2	0x12	Graybar32 W-2	0x1c	User Add..
0x9	Ramp W-3	0x13	Graybar64 R-1	0x1d	....

Mute

Index	0X0	0X1
Mute	OFF	ON

Length

Index	0x0	0x1	0x2
Length	24 bits	20 bits	16 bits

Level

Index	0x0	0x1	0x2	0x3	0x4	0x5	0x6	0x7
Level	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7

Rate

Index	0x0	0x1	0x2	0x3	0x4
Rate	48 KHz	96 KHz	192 KHz	32 KHz	44.1 KHz

Number

Index	0x0	0x1	0x2	0x3	0x4
Number	2 Ch	2.1 Ch	5.1 Ch	6.1 Ch	7.1 Ch

TX HDCP

Index	0x0	0x1	0x2	0x3
TX HDCP	off	HDCP 1.4	HDCP 2.2 Type0	HDCP 2.2 Type 1

RX HDCP

Index	0x0	0x1	0x2	0x3
RX HDCP	off	HDCP 1.4	HDCP 2.2	HDCP 1.4 & HDCP 2.2

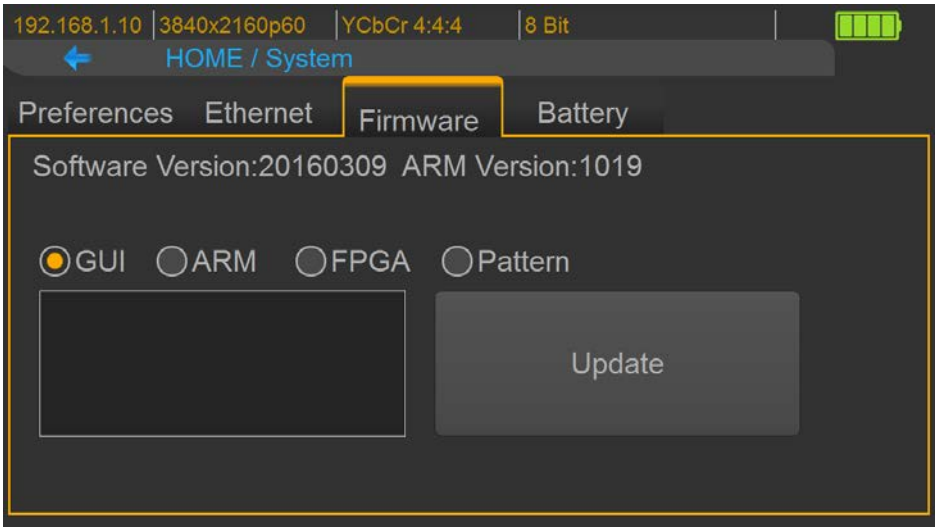
UPGRADE 1B-HDMI-PTG-ALZ

User can upgrade the firmware and pattern on the 1B-HDMI-PTG-ALZ through the USB interface. If user encounters a problem with the upgrade, please contact the supplier of 1B-HDMI-PTG-ALZ.

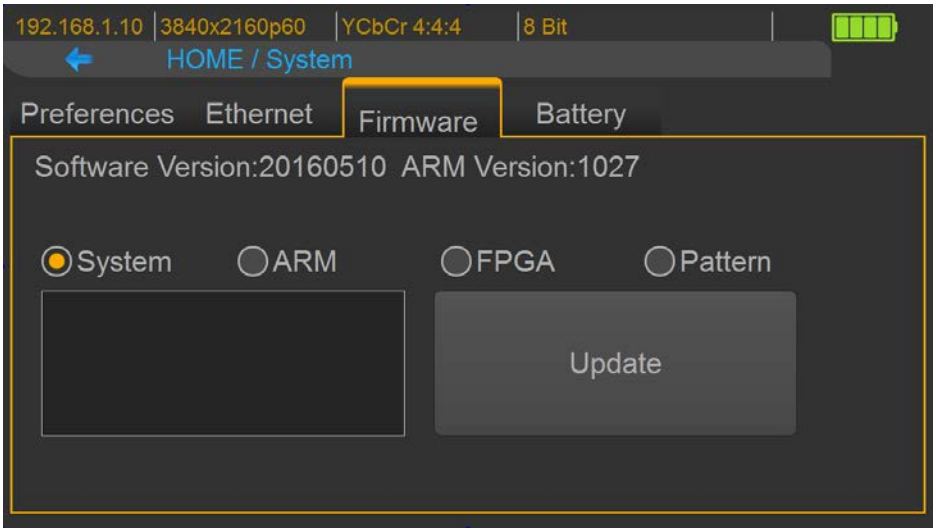
Procedure of Firmware Upgrade:

Before updating the firmware of 1B-HDMI-PTG-ALZ, please ensure the file of new firmware files are in the root directory of USB Flash Drive. The file suffix is **.dat**.

- System



- Make sure the **gui.dat** and **sysyem.dat** files are in the root directory of USB.
- Connect the USB Flash Drive on 1B-HDMI-PTG-ALZ USB interface.
- Select **Firmware** button from the System Menu and choose the **GUI** button.
- Touch the **Update** button to do firmware update. The process of firmware update will take about 3~5 seconds. While updating, please do not remove the USB Flash Drive.
- After completing the firmware update, please reboot the 1B-HDMI-PTG-ALZ.
- Select **Firmware** from the system Menu and choose the **System** button.

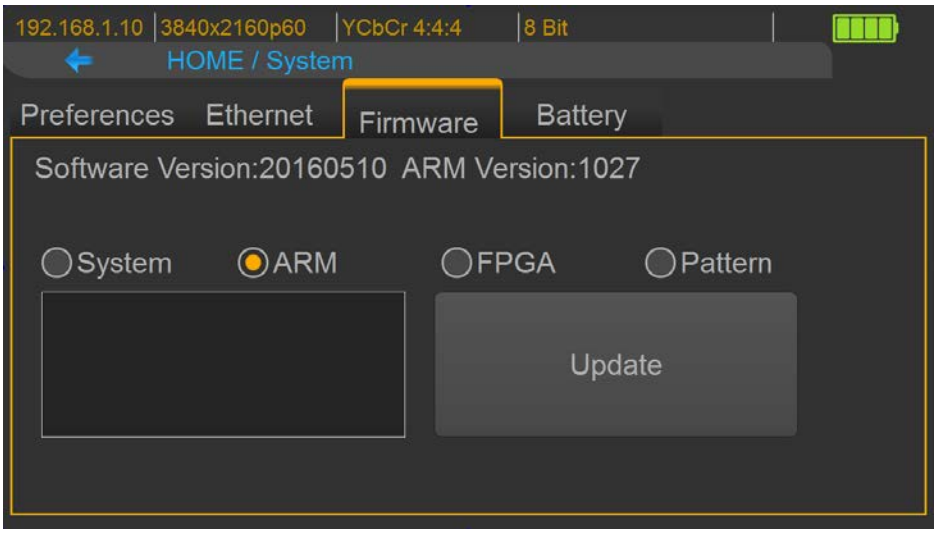


- Touch the **Update** button to do firmware update. The process of firmware update will take about

3~5 seconds. While updating, please do not remove the USB Flash Drive.

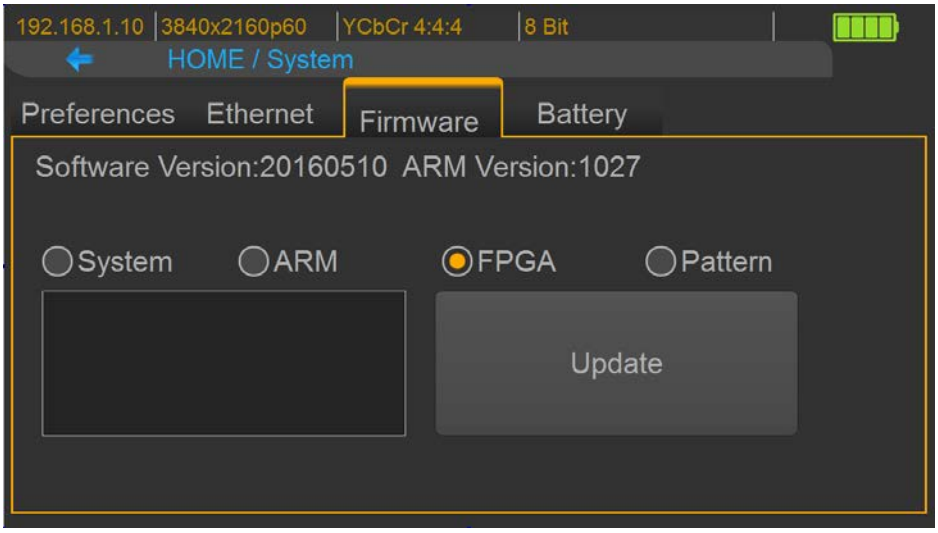
- ✧ After completing the firmware update, please reboot the 1B-HDMI-PTG-ALZ.

➢ ARM



- ✧ Make sure the **arm.dat** file is in the root directory of USB.
- ✧ Connect the USB Flash Drive on 1B-HDMI-PTG-ALZ USB interface.
- ✧ Select **Firmware** from the System Menu and choose the **ARM** button.
- ✧ Touch the **Update** button to do firmware update. The process of firmware update will take about 5~10 seconds. While updating, please do not remove the USB Flash Drive.

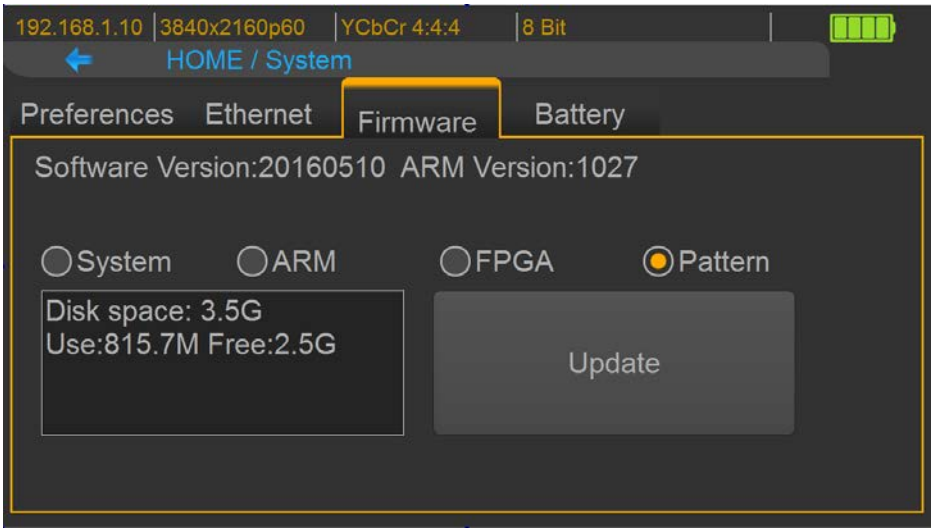
➢ FPGA



- ✧ Make sure the **fpga.dat** file is in the root directory of USB.
- ✧ Connect the USB Flash Drive on 1B-HDMI-PTG-ALZ USB interface.
- ✧ Select **Firmware** from the System Menu and choose the **FPGA** button.
- ✧ Touch the **Update** button to do firmware update. The process of firmware update will take about 5~10 seconds. While updating, please do not remove the USB Flash Drive.

Procedure of user defined pattern upgrade

- Pattern



- Create a folder (folder name is **usr_pic**) on USB Flash Drive.
- Ensure the file of pattern which user desire to update on the 1B-HDMI-PTG-ALZ is in the **usr_pic** directory of USB Flash Drive. The file suffix is **.jpg**.
- Before updating the user defined pattern, please confirm the capacity of the 1B-HDMI-PTG-ALZ.
- Select **Firmware** from the System Menu and choose the **Pattern** button.
- Touch the **Update** button to upgrade the user defined pattern. The process running time will depend on the file size, please wait patiently.

EYE PATTERN

The device had been approved and supported by high performance oscilloscope (MSOX92004A) to make sure quality. The test result of this device (with Simplo battery) is shown as below:

This result is representative of the 1B-HDMI-PTG-ALZ. Each 1B-HDMI-PTG-ALZ's performance is closed to these results but not exactly the same.

Summary of Results

Test Statistics	
Failed	0
Passed	29
Total	29

Margin Thresholds	
Warning	< 2 %
Critical	< 0 %

Pass	# Failed	# Trials	Test Name	Actual Value	Margin	Pass Limits
✓	0	1	HF1-2: Clock Rise Time	105.981 ps	41.3 %	VALUE >= 75.000 ps
✓	0	1	HF1-2: Clock Fall Time	98.823 ps	31.8 %	VALUE >= 75.000 ps
✓	0	1	HF1-6: Clock Duty Cycle(Minimum)	49.870	24.7 %	>=40%
✓	0	1	HF1-6: Clock Duty Cycle(Maximum)	50.300	16.2 %	<=60%
✓	0	1	HF1-6: Clock Rate	148.427200000 MHz	2.4 %	85.000000000 MHz <= VALUE <= 150.000000000 MHz
✓	0	1	HF1-7: Differential Clock Voltage Swing, Vs (TP1)	1.023 V	22.1 %	400 mV < VALUE < 1.200 V
✓	0	1	HF1-7: Clock Jitter (TP2_EQ with Worst Case Positive Skew)	175 mTbit	41.7 %	VALUE <= 300 mTbit
✓	0	1	HF1-7: Clock Jitter (TP2_EQ with Worst Case Negative Skew)	200 mTbit	33.3 %	VALUE <= 300 mTbit
✓	0	1	HF1-5: D0 Maximum Differential Voltage	558 m	28.5 %	VALUE <= 780 m
✓	0	1	HF1-5: D0 Minimum Differential Voltage	-623 m	20.1 %	VALUE >= -780 m
✓	0	1	HF1-2: D0 Rise Time	91.503 ps	115.3 %	VALUE >= 42.500 ps
✓	0	1	HF1-2: D0 Fall Time	92.436 ps	117.5 %	VALUE >= 42.500 ps
✓	0	1	HF1-8: D0 Mask Test (TP2_EQ with Worst Case Positive Skew)	0.000	50.0 %	No Mask Failures
✓	0	1	HF1-8: D0 Mask Test (TP2_EQ with Worst Case Negative Skew)	0.000	50.0 %	No Mask Failures
✓	0	1	HF1-5: D1 Maximum Differential Voltage	593 m	24.0 %	VALUE <= 780 m
✓	0	1	HF1-5: D1 Minimum Differential Voltage	-597 m	23.5 %	VALUE >= -780 m
✓	0	1	HF1-2: D1 Rise Time	102.347 ps	140.8 %	VALUE >= 42.500 ps
✓	0	1	HF1-2: D1 Fall Time	100.664 ps	136.9 %	VALUE >= 42.500 ps
✓	0	1	HF1-8: D1 Mask Test (TP2_EQ with Worst Case Positive Skew)	0.000	50.0 %	No Mask Failures
✓	0	1	HF1-8: D1 Mask Test (TP2_EQ with Worst Case Negative Skew)	0.000	50.0 %	No Mask Failures
✓	0	1	HF1-5: D2 Maximum Differential Voltage	586 m	24.9 %	VALUE <= 780 m
✓	0	1	HF1-5: D2 Minimum Differential Voltage	-603 m	22.7 %	VALUE >= -780 m
✓	0	1	HF1-2: D2 Rise Time	93.095 ps	119.0 %	VALUE >= 42.500 ps
✓	0	1	HF1-2: D2 Fall Time	92.460 ps	117.6 %	VALUE >= 42.500 ps
✓	0	1	HF1-8: D2 Mask Test (TP2_EQ with Worst Case Postive Skew)	0.000	50.0 %	No Mask Failures
✓	0	1	HF1-8: D2 Mask Test (TP2_EQ with Worst Case Negative Skew)	0.000	50.0 %	No Mask Failures
✓	0	1	HF1-3: Inter-Pair Skew - D0/D1	1 mTpixel	49.8 %	-200 mTpixel <= VALUE <= 200 mTpixel
✓	0	1	HF1-3: Inter-Pair Skew - D1/D2	31 mTpixel	42.3 %	-200 mTpixel <= VALUE <= 200 mTpixel
✓	0	1	HF1-3: Inter-Pair Skew - D0/D2	28 mTpixel	43.0 %	-200 mTpixel <= VALUE <= 200 mTpixel

Clock Jitter and eye pattern