



280 Test Set Video Generator / Analyzer

Quick Start Guide

Rev: 6



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1 Overview of the 280G & 280A Test Set

Important Note: Please check the [quantumdata 280 webpage](#) for updates to this Quick Start Guide.

The 280 Test Set is a battery-powered, portable Video Generator and Analyzer set that enables you to conduct quick, on-site verification testing of your HDMI and HDBaseT devices, cables and entire distribution networks. The 280 Test Set is comprised of:

- 280G Video Generator - Provides HDMI Tx port operating up to 18Gbps (600MHz) and an HDBaseT Tx port operating up to 300MHz pixel rate.
- 280A Video Analyzer - Provides HDMI Rx port operating up to 18Gbps (600MHz) and an HDBaseT Rx port operating up to 300MHz pixel rate.

Because the 280 instruments have both HDMI and HDBaseT outputs and HDMI and HDBaseT inputs, you can test your HDMI and HDBaseT cables and systems with splitters, extenders and switches whether in your lab or installed on-site.



280G Video Generator



280A Video Analyzer



280G/A Bottom Edge



280G/A Top Edge

1.1 Updates to This Guide

This 280 Test Set Quick Start Guide has been updated to correct a few miscellaneous items.

1.2 What is in the 280 Test Set Shipping Box

The 280 Test Set shipping container includes the items listed in Table 1-1 below:

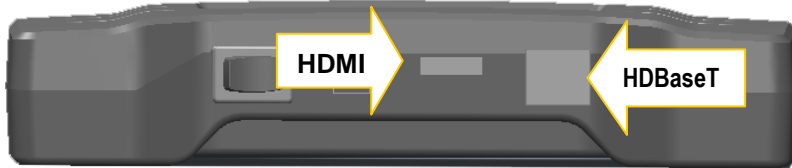
Table 1-1: 280 Test Set Shipping Box Contents	
Item Description	
280 Test Set for HDMI and HDBaseT:	
-	280G Video Generator (can be ordered separately)
-	280A Video Analyzer (can be ordered separately)
12V DC (5 amp) Power Supply / Adapter / Charger.	
Line cord for 12V Power Supply. (Qty Two (2) one for each 280 device)	
Quick Start Guide.	

2 Physical Interfaces of the 280 Test Set for HDMI & HDBaseT

This Chapter describes the administration, video and audio interfaces on the 280 Test Set units.

2.1 Video Interfaces

Tables 2-1 and 2-2 below describes the video interfaces on the 280 Test Set, these interfaces are used to test consumer electronic devices.



280G/A Top Edge

Table 2-1: 280G Video Interfaces

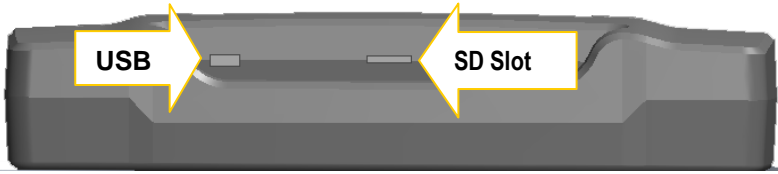
Video Interface	Description
HDMI (1) Output Type A	Single HDMI output connector. Supports HDMI 2.0: <ul style="list-style-type: none"> ▪ Bit Depth: 24/30/36 bit. ▪ Colorimetry: RGB, YCbCr. ▪ Sampling: 4:4:4, 4:2:2, 4:2:0 ▪ Pixel rate: 600MHz; Limited set of Timings up to 4K@60 with 4:4:4.
HDBaseT (1) Output RJ45	Single HDBaseT output connector: <ul style="list-style-type: none"> ▪ Bit Depth: 24/30/36 bit. ▪ Colorimetry: RGB, YCbCr. ▪ Sampling: 4:4:4, 4:2:2, 4:2:0 ▪ Pixel rate: 300MHz; Limited set of Timings up to 4K@60 with 4:2:0.

Table 2-2: 280A Video Interfaces

Video Interface	Description
HDMI (1) Input Type A	Single HDMI input connector. Supports HDMI 2.0: <ul style="list-style-type: none"> ▪ Bit Depth: 24/30/36 bit. ▪ Colorimetry: RGB, YCbCr. ▪ Sampling: 4:4:4, 4:2:2, 4:2:0 ▪ Pixel rate: 600MHz Timings up to 4K@60 with 4:4:4.
HDBaseT (1) Input RJ45	Single HDBaseT input connector. Supports HDMI 2.0: <ul style="list-style-type: none"> ▪ Bit Depth: 24/30/36 bit. ▪ Colorimetry: RGB, YCbCr. ▪ Sampling: 4:4:4, 4:2:2, 4:2:0 ▪ Pixel rate: 300MHz Timings up to 4K@60 with 4:2:0.

2.2 Administrative Interfaces

Each 280 unit is equipped with a micro USB interface and a micro SD card slot. These interfaces are located on the bottom edge of the 280G and the 280A as indicated in the illustration below:



The functions of the micro USB and the Micro SD card slot are described in the table below.

Table 2-3: 280G Administrative Interfaces	
USB (micro) – Located on bottom edge	Used for command line interface.
Micro SD slot – Located on bottom edge Uses a micro SD or micro SDHC card	Used for file transfer: <ul style="list-style-type: none"> - Upgrading the 280 - Transferring files such as EDID and Reports
Table 2-4: 280A Administrative Interfaces	
USB (micro) – Located on bottom edge	Used for command line interface.
Micro SD slot – Located on bottom edge Uses a micro SD or micro SDHC card	Used for file transfer: <ul style="list-style-type: none"> - Upgrading the 280 - Transferring files such as EDID and Reports

IMPORTANT NOTE ON MICRO SD CARD USAGE: The micro SD Card has to be inserted with the connector foils up as shown below.



2.3 Audio Jacks

There is a 3.5 mm analog audio jack on both the 280G and the 280A units. These audio jacks are located on the same place on the bottom edge of the 280G and 280A chassis as shown below. The description and function of these jacks are provided in the table below.

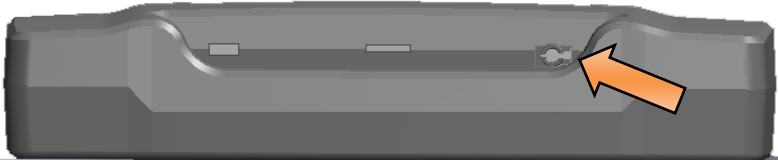


Table 2-4: 280G Audio Input Jack

Bottom Edge Panel	Description
3.5 mm analog audio input jack	Used for injecting audio into the outgoing HDMI or HDBaseT stream.

Table 2-5: 280A Audio Output Jack

Bottom Edge Panel	Description
3.5 mm analog audio output jack	Used for extracting audio to a speaker, headphone or ear buds.

3 General Operation

This section describes power up, power usage and general operation.

3.1 Power Considerations

The 280 Test Set has a rocker style power switch on the back panel. Refer to the photo below.



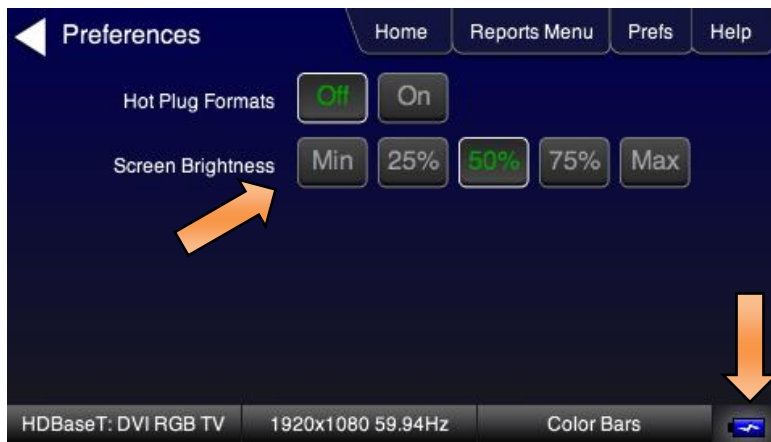
The 280G and 280A are portable battery powered test instruments. They are equipped with rechargeable batteries. Typically, you can use the 280 instruments on batteries for about 4-6 hours after a full charge. Teledyne LeCroy recommends that you set the screen brightness to the minimum level required. Turn the unit off when not in use.

The 280G and 280A Test Set is supplied with a 12V DC power supply and charger with an associated line cord.

Important Notes about power usage and status:

- Monitor the battery meter on the lower right.
- A green indication or partial green indication shows the battery is being charged.
- A blue color with an electrical charge icon indicates that the device is being powered through the wall charger.
- Fully charge the 280 units overnight.
- Do not continue using the 280 units from battery power when the battery meter indicates that the batteries are exhausted.

The following screen shows a charging battery condition.



The following example shows a nearly charged battery condition while the unit is running on batteries.



The following example shows a low battery condition.



3.2 Convenient Handle

The 280 units have a handle for convenient carrying. This is depicted in the illustration below.



3.3 Touch Screen User Interface

The 280G and 280A have color touch screen user interface with a screen display resolution of 480 by 272. A single touch will activate an item on the screen or take you down to a lower level menu. A + indicates that you have to double touch to navigate down to a lower level menu.

Note: Teledyne LeCroy recommends using a stylus or suitable plastic item with a blunt end to activate the buttons on the 280 screen. Selecting with your finger is sufficient however a stylus is preferable. You should not expect a similar touch response that you have with a mobile phone.

280G User Interface

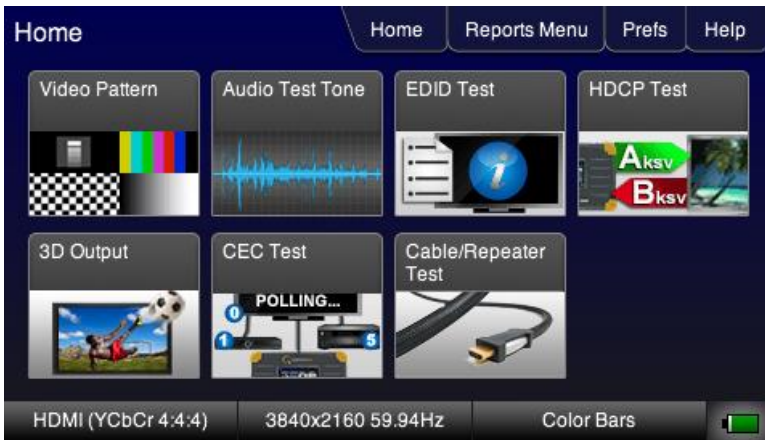








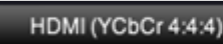









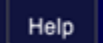


Table 3-1: 280G GUI Component

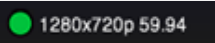
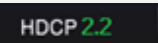


Top Panel	Description
   	
Home 	Activation button that returns to the Home screen.
Reports Menu 	Activation button that provides access to the Reporting function.
Prefs (Preferences) 	Activation button that provides access to control the screen brightness.
Help 	Activation button that provides current version information and firmware upgrades.
Lower Status Panel	Description
  	
Signal Type 	Provides status of the selected Signal Type being transmitted. The signal type (HDMI or HDBaseT) are given along with the colorimetry and sampling. This also serves as an activation button that will navigate you to the Signal Type screen to set the signal type.

<p>Format</p> <p>3840x2160 59.94Hz</p>	<p>Provides the status of the current format being transmitted. The active horizontal and vertical pixels, progressive or interlaces (p or i) and the frame rate, e.g. 59.94, 30, 24, etc. are given. This is also an activation button that will navigate to the Signal Type screen to enable you to set the format resolution.</p>
<p>Test Pattern</p> <p>Color Bars</p>	<p>Indicates the active test pattern/. Also serves as an activation button and navigates you to the Test Pattern selection screen to choose a test pattern.</p>

280A User Interface



Table 3-2: 280A GUI Components	
<p>Top Panel</p> 	<p>Description</p>
<p>Home</p> 	<p>Activation button that returns to the Home screen.</p>
<p>Reports Menu</p> 	<p>Activation button that provides access to the Reporting function.</p>
<p>Prefs (Preferences)</p> 	<p>Activation button that provides access to control the screen brightness.</p>
<p>Help</p> 	<p>Activation button that provides current version information and firmware upgrades.</p>
<p>Lower Status Panel</p> 	<p>Description</p>
<p>+5V</p> 	<p>+5V Status indicator. The green LED indicates that +5V is being received. No light when insufficient +5V.</p>

Resolution 	The active horizontal and vertical pixels, progressive or interlaces (p or i) and the frame rate, e.g. 59.94, 30, 24, etc.
HDCP Status 	Either Off, 1.x or 2.2
Active Interface 	Either HDMI or HDBaseT
HPD 	Hot Plug toggle. Operation: Press and release to put in depressed state, and then press and release again to cause a hot plug toward the upstream source.

4 Using the 280G to Run Video and Audio Tests on Displays and TVs

This Chapter provides procedures for using the 280G to run video and audio tests on high definition sink devices such as HDTVs and projectors but you can also run tests downstream on entire distribution networks. The following signal types are supported.

- HDMI
- HDBaseT

4.1 Making Physical Connections

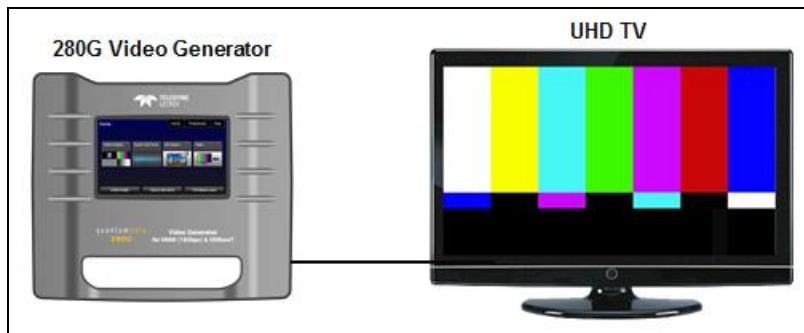
The first step in testing a sink device is to make the physical connections between the 280G and the device(s) under test.

Connecting the 280G to the Display Device

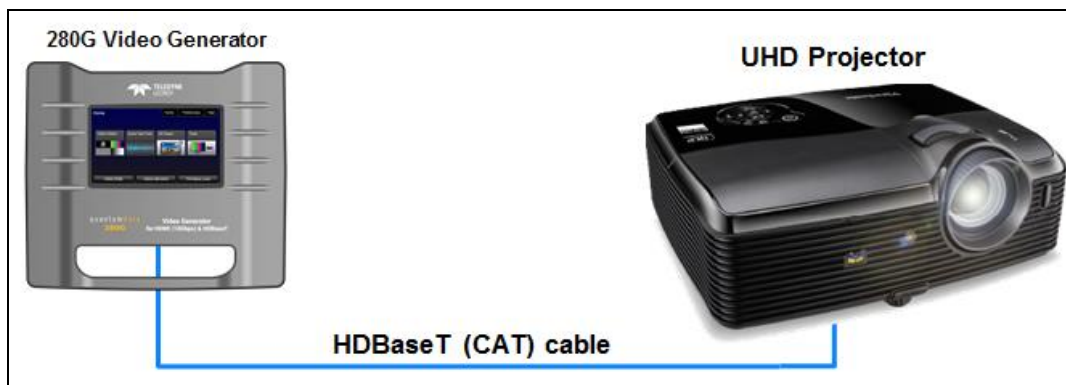
Use the following procedures to make the physical connections from the 280G to the display device under test.

1. Make the cable connection between the 280G video output connector (e.g. **HDMI OUT** or **HDBaseT OUT**) and the input connector of the sink device under test.

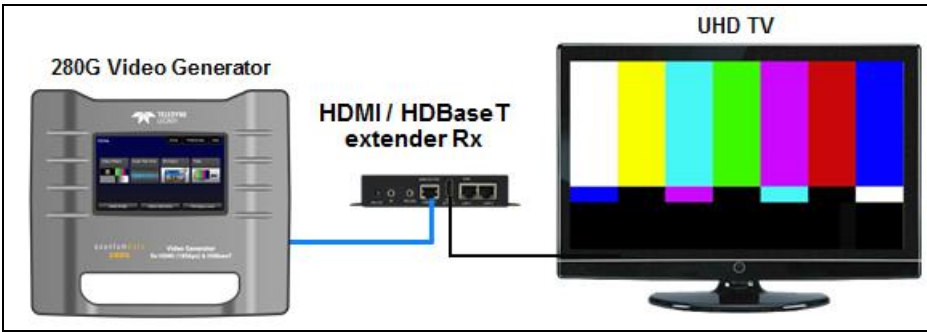
The following illustrations depict typical test configurations.



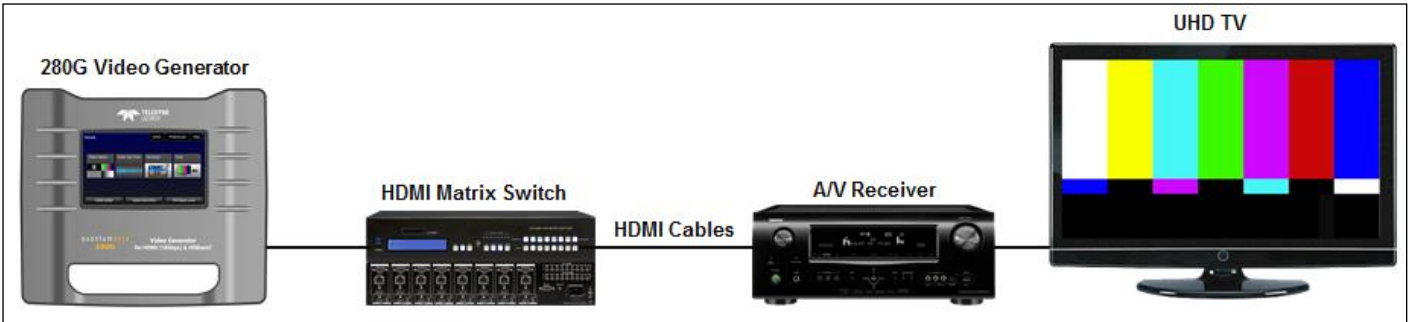
280G connected to an UHD TV via an HDMI cable



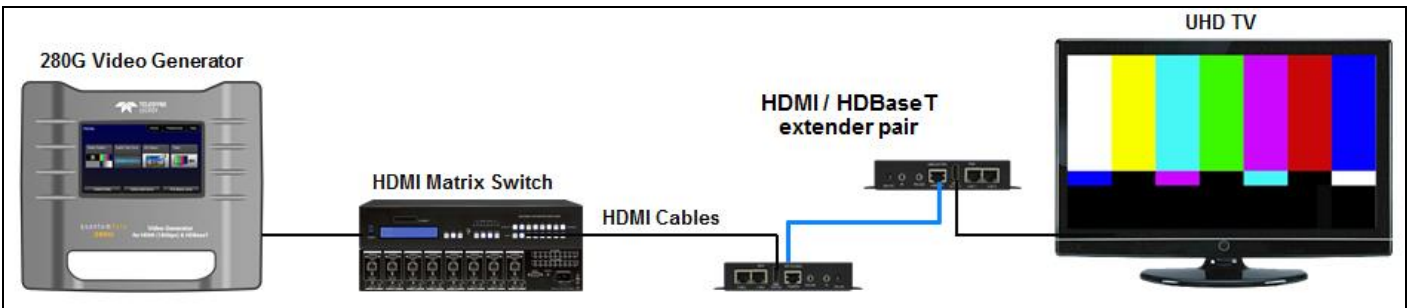
280G connected to a projector via HDBaseT



280G connected to an HDBaseT Extender via HDBaseT then to a UHD TV



280G connected to an HDMI network of devices



280G connected to an HDMI/HDBaseT distribution network

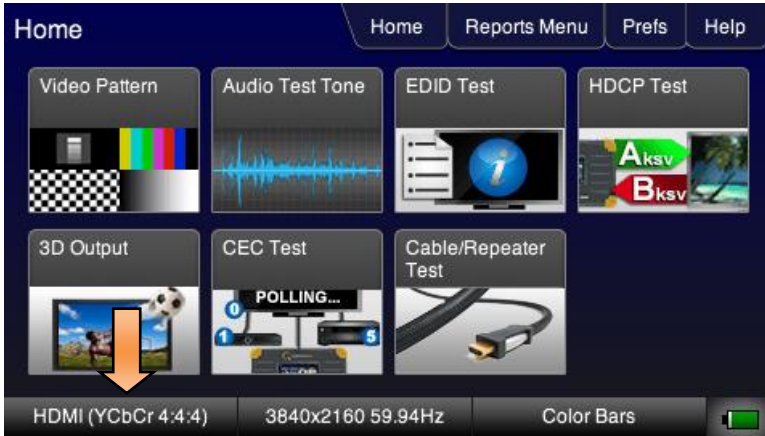
4.2 Selecting a Signal Type and Resolution

After making the physical connections between the 280G and the display device under test you will need to select the Signal Type, Resolution and Frame Rate for the sink device under test.

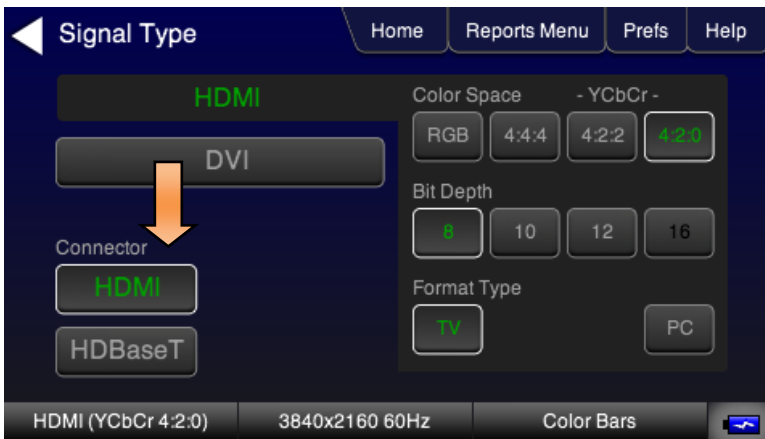
Selecting Video Formats

The procedures below describe how to select the active signal type.

1. Power up the 280G using the rocker switch on the top edge. Review the guidelines for battery usage above.
2. From the **Home** page touch select the **Signal Type** activation button on the bottom status panel as indicated below.

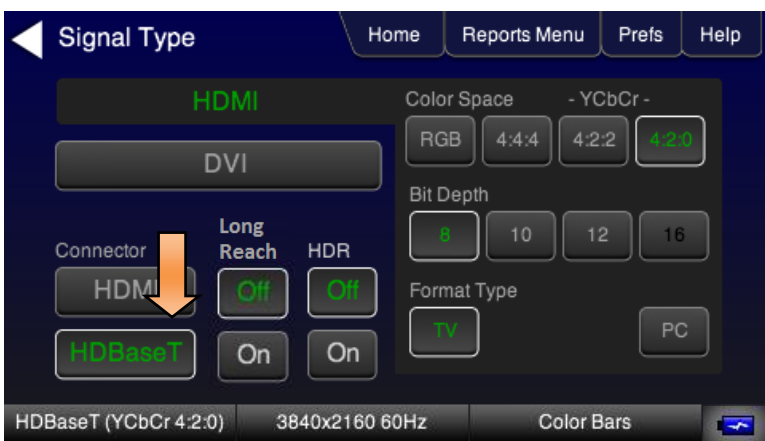


3. Touch select the interface type (Connector), HDMI or HDBaseT.
Example shows HDMI being selected. You can also select DVI once HDMI is selected.





Example shows HDBaseT being selected.



HDBaseT has “Long Reach” mode which enables transmission of a 1080p60 signal to go 170 meters on Cat7 cabling.

4. Touch select the options for the Signal Type such as the **Color Space**, **Sampling**, **Bit Depth** and **Format Type** in accordance with your requirements.
5. Touch select the options for the Signal Type such as the **HDR** in accordance with your requirements. Example below shows HDR selected.



Selecting an HDMI Resolution and Frame Rate

The procedures below describe how to select the resolution.

When you make a physical connection to an HDMI HDTV (or an HDBaseT input port), a hot plug event will occur. There are two modes the 280G can be set in when testing HDMI sink devices that determine how the 280G responds to this hot plug event:

- Hot plug formats On – This mode will cause the 280G to select a preferred timing in the EDID of the connected sink device. Supported formats will be indicated in white text. You can select formats that are not supported but the frame rates of unsupported frame rates will be shown with red text. You will be able to select other formats that are not supported by the sink device.
- Hot plug formats Off – This mode will show all supported formats on the 280G in white text.

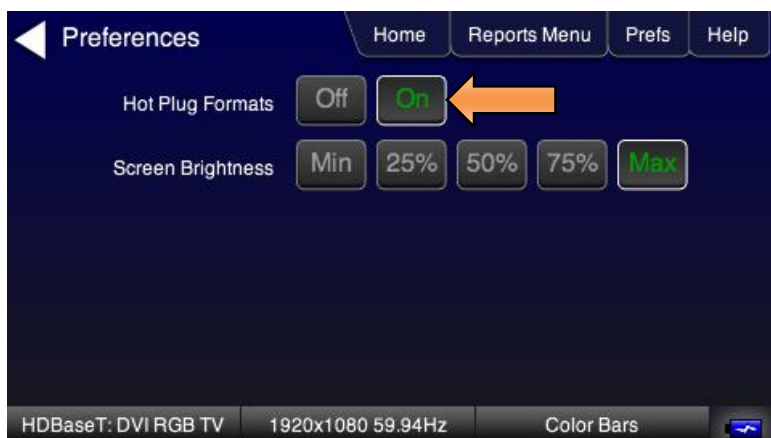
For the HDMI and HDBaseT formats, there are color codes that are applied to the Resolution and Frame Rate selections. The following is a summary of their meaning:

- A Resolution or Frame Rate with **white** lettering but with **no outline** – a Resolution or Frame Rate that appears in the EDID and has a short video descriptor associated with it.
- A Frame Rate with **green** lettering and with **white outline** – The Frame Rate that is currently selected.
- A Frame Rate with **red** lettering but with **no outline** – The Frame Rate is not supported by the EDID for that Resolution.
- A Frame Rate(s) with **green** lettering and with **white outline** – The Frame Rate along with the currently selected Resolution that is the “preferred” timing.
- A Frame Rate with **black** lettering but with **no outline** – The Frame Rate is not supported by the standard for the selected resolution.

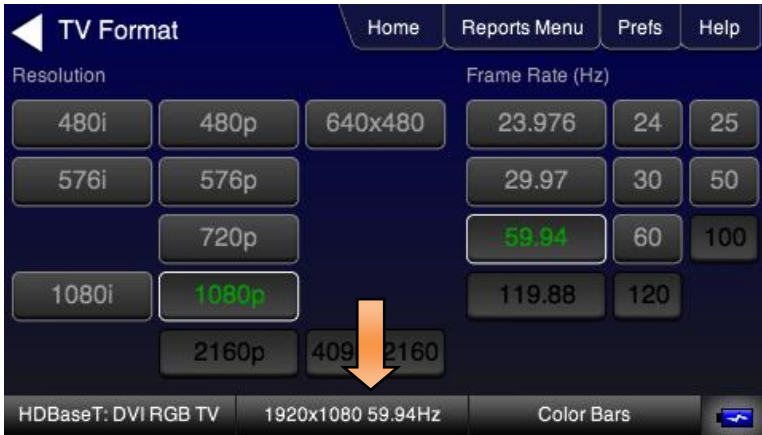
1. Select the **Preferences** from the 280G top level menu.



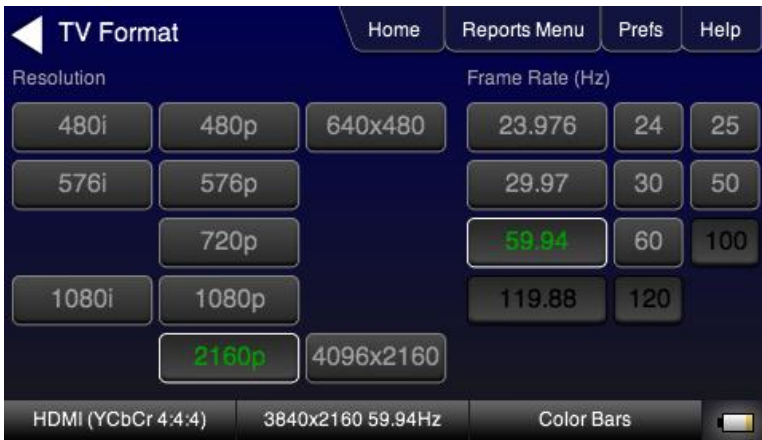
2. Select the **Hot Plug Formats** mode to On or Off as desired. Refer to the screen below.



3. Touch select the resolution and frame rate (middle button on the bottom panel). Refer to the figures below.



The following is an example with a 4K format selected.



The following is an example when Hot Plug formats is turned on for 720p formats.



The following screen shows red text where a format is not supported in the EDID received at the 280G. Note that you can select these other formats.



4.3 Rendering Test Patterns on a UHDTV

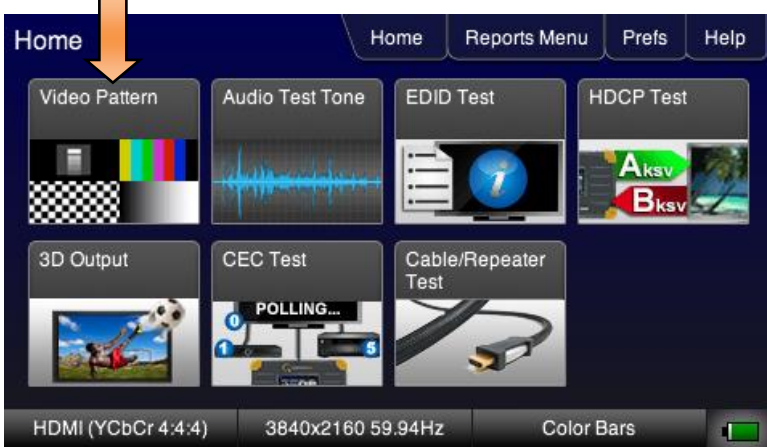
This section describes how to render test patterns on an HDTV.

Rendering Test Patterns on an HDTV

After you have set the Signal Type and Resolution, you use the procedure below to select a test pattern.

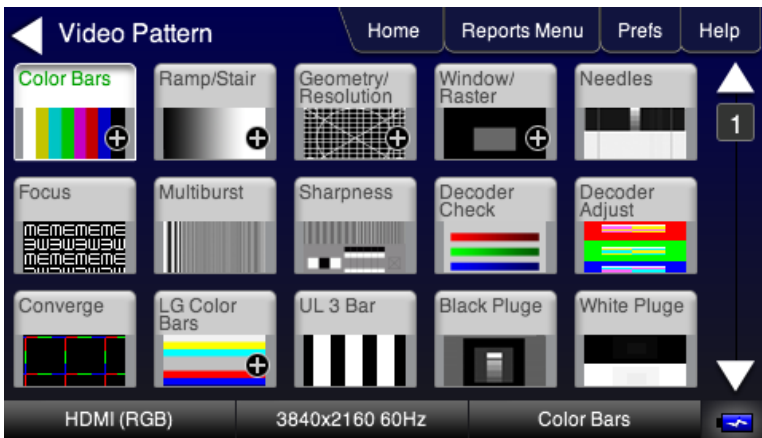
1. From the **Home** screen on the 280G display, touch select **Video Pattern** as shown below.

Note: Your Home screen may appear somewhat different depending on what options you have.



2. Touch select the desired test pattern from the menu shown below.

Note: A “+” on the lower right portion of the pattern indicates that there are options related to the specific pattern. In these cases you double touch select to access the lower level menu.



3. (If applicable) Specify the test pattern options. An example is shown below with SMPTEBar pattern options.



4.4 Testing Digital Audio on an HDTV or A/V Receiver

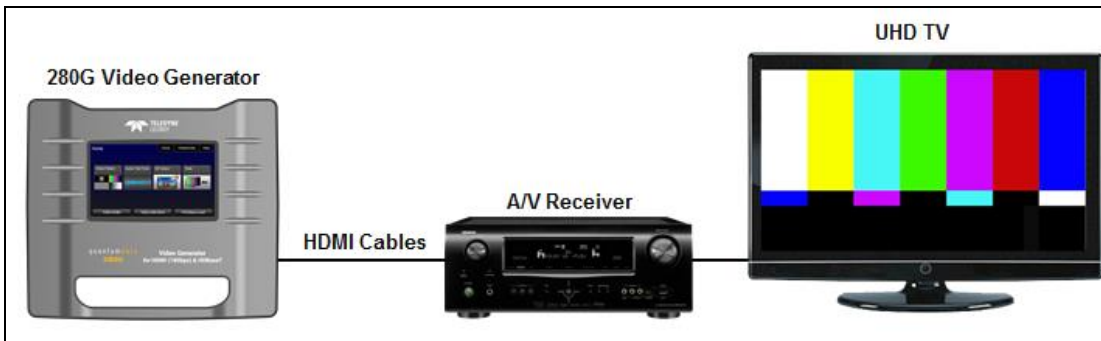
This section provides procedures for testing digital audio on an HDTV or A/V Receiver.

Connecting the 280G to the Audio Rendering Device

Use the following procedures to make the physical connections from the 280G to the audio rendering device under test.

1. Make the cable connection between the 280G HDMI output to the A/V Receiver input.

The following illustration depicts a typical test setup for the HDMI audio.

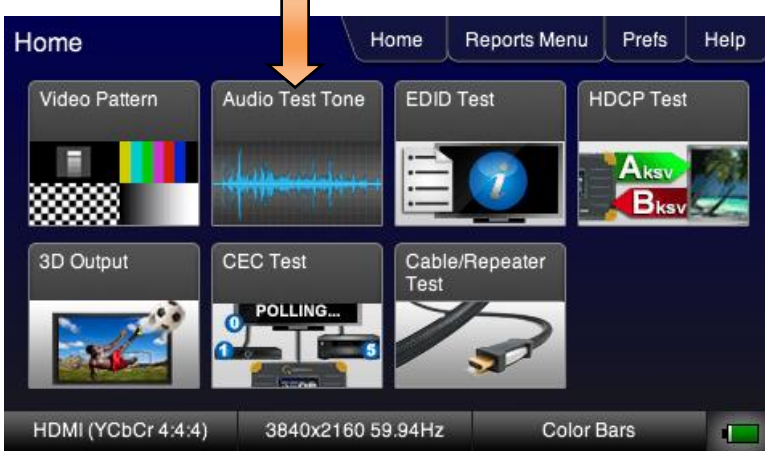


280G connected to an Audio Receiver then to a UHD TV

Testing with Programmable Sine Waves

Use the procedures below for testing with programmable sine waves.

1. From the top level menu (shown in the figure below), select **Audio Test Tone**.



The **Audio Pattern** menu appears as shown below:

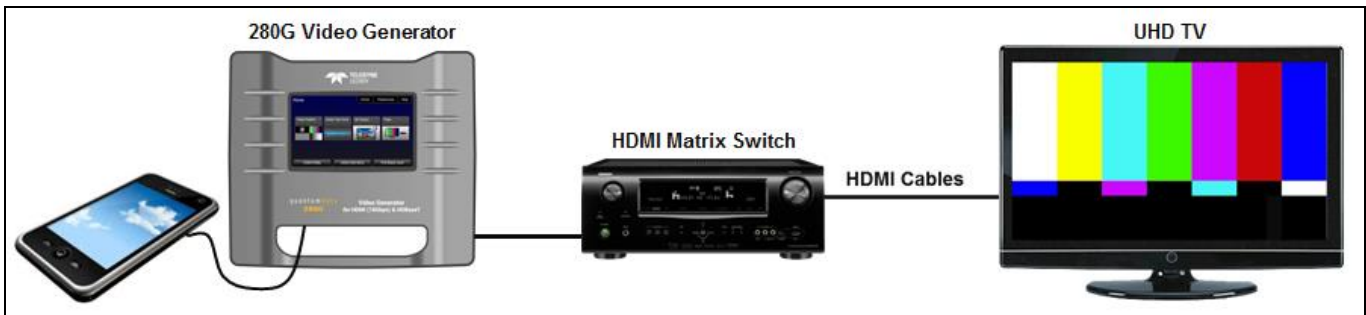


2. Touch select the **PCM Sine Wave** item (shown in the screen above).
The **PCM Sine Wave Options** menu appears as shown below:



3. Touch select the values for the **Bits per Sample** using the three buttons provided. (24 bits is selected in the example above.)
4. Touch select the **Sample Rate** by incrementing the associated arrows adjacent to the current value. (Refer to the screen shot above which shows 32 kHz selected.)
5. Touch select the **Channels** by incrementing the associated arrows adjacent to the current value. (Refer to the screen shot above which shows 7.1 selected.)
6. Optionally to use the external analog audio function, connect an audio source device such as a mobile phone to the 280G at the 3.5 mm analog audio input jack (indicated below) using a suitable audio cable with 3.5 mm audio jacks on each end.





7. Select external audio as shown in the screen shot example below.



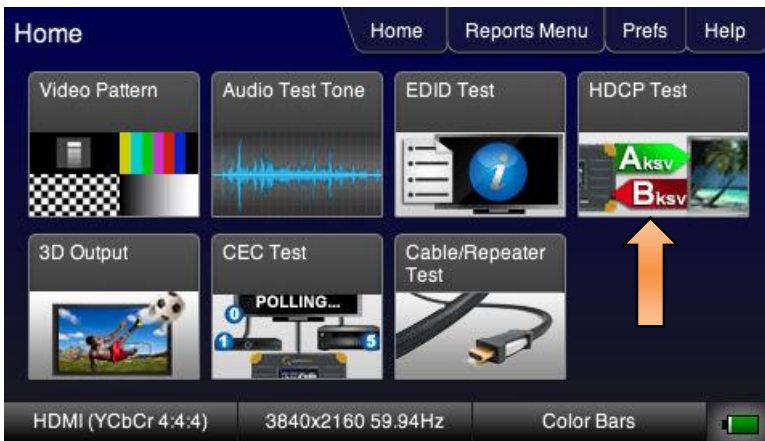
4.5 Testing HDCP on an HDMI HDTV or HDMI Repeater Device

This section provides procedures for testing HDCP on an HDMI equipped HDTVs or HDBaseT devices. The HDCP authentication test initiates and HDCP authentication with the sink device (with or without a repeater) and displays certain HDCP register values and provides a pass/fail indication.

Testing HDCP on an HDMI Sink Device

Use the procedures below to run an HDCP test on an HDMI sink.

1. Make the physical connections between the 280G HDMI OUT connector and the display device under test.
2. Enable the HDMI or HDBaseT signal type and select the resolution using the procedures provided earlier in this guide.
3. Touch select **HDCP Test** from the top level menu shown below.



4. Touch select **Enable** from the **HDCP Output Tests** menu shown below.



Select either HDCP 1.4 or HDCP 2.2.

The following example shows HDCP 1.4 test results:



The following example shows HDCP 2.2 test results:



5. Touch select **Auto-Restart** to restart HDCP authentication.

The Pass/Fail results and the key values exchanged during the authentication are presented on the display as shown below.

4.6 Verifying the EDID on an HDMI HDTV or HDMI Repeater Device

This section provides procedures for verifying and viewing the EDID of an HDMI HDTV or an HDMI repeater device such as an A/V receiver or an HDBaseT sink device such as a projector.

Testing and Viewing the EDID on an HDMI Sink Device

Use the procedures below to run an EDID test on an HDMI sink.

1. Make the physical connections between the 280G HDMI OUT connector and the display device under test.
2. Enable the HDMI or HDBaseT signal type and select the resolution using the procedures provided earlier in this guide.
3. Touch select **EDID Test** from the **Home** menu shown below.



4. Touch select the **Read** activation button from the EDID Test menu shown below.

The EDID information is presented on multiple pages on the display. An example of a few of the pages of an EDID listing is shown below. You scroll through all the pages using the scroll bar at the right side of the listing. In addition, the EDID test runs a check on the EDID header and checksum to determine if the EDID is valid.



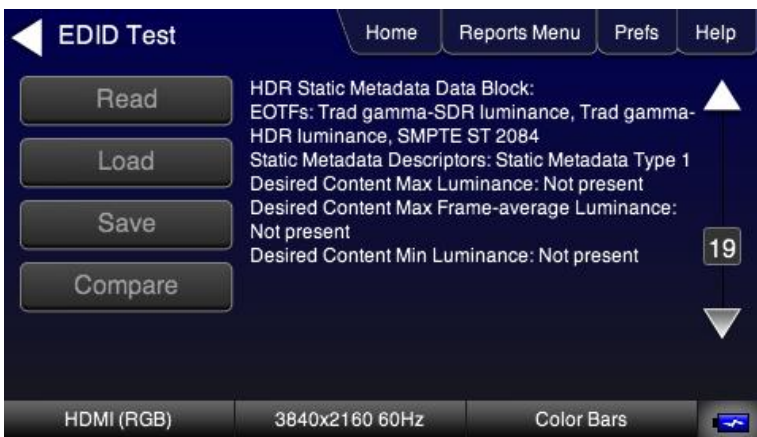
The following screens show some of the EDID report pages. The first screen example shows the HDMI VSDB of the EDID.



The screen example below shows the colorimetry supported in the CEA block.



The following example shows the HDR data in the HDR Static Metadata Data Block.



- Run a comparison between a two EDIDs by touch selecting the **Compare** activation button. This feature will compare the last EDID read with the current EDID of the connected sink.



5 Using the 280A Video Analyzer to Test HDMI and HDBaseT Source Devices

This Chapter provides procedures for testing HDMI and HDBaseT source devices such as DVD players, set top boxes and outputs on repeater devices with the 280A Video Analyzer.

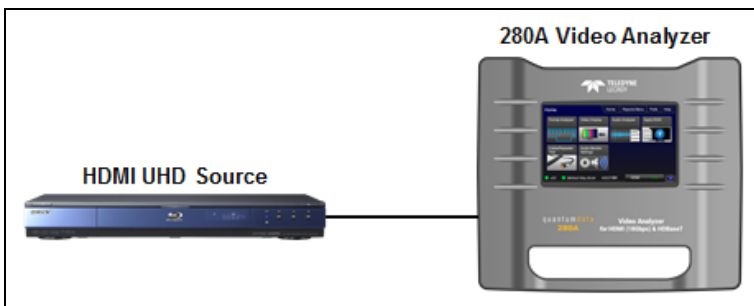
5.1 Testing Video from an HDMI or HDBaseT Source Device

This subsection describes how to test the video on HDMI source devices.

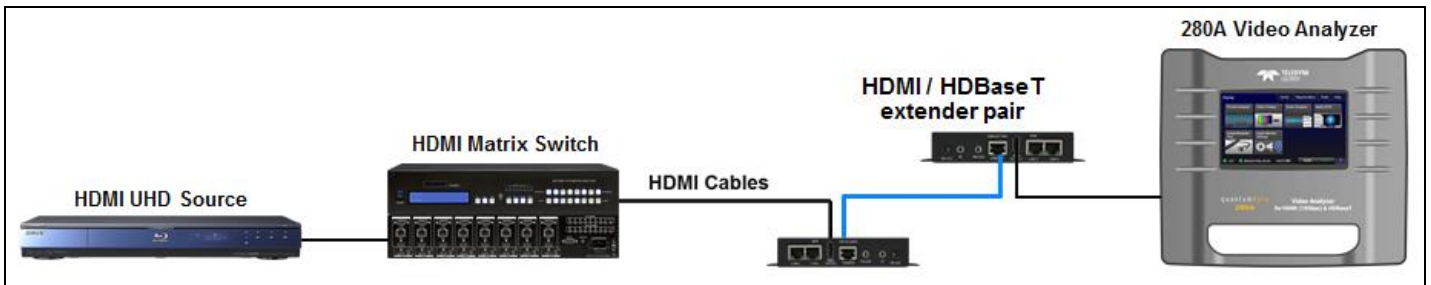
Connection Configurations for Testing HDMI Source Devices

The 280A HDMI and HDBaseT input ports are used for testing source devices or upstream networks and to run a basic confidence test of an HDMI or HDBaseT source device or an entire upstream video distribution network. This test ensures that you are receiving a valid HDMI or HDBaseT video signal by displaying the timing of the incoming signal and informing you whether it is HDCP encrypted or not.

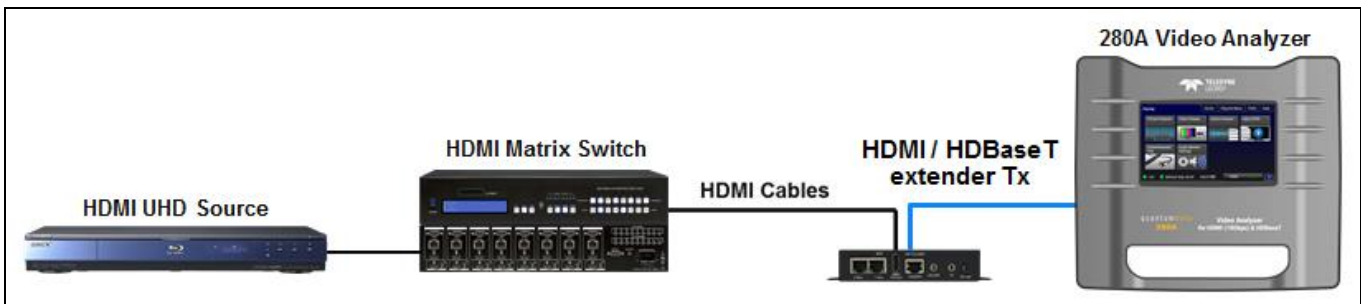
Sample test configurations are shown below.



280A connected to an HDMI UHD source device



280A connected to an HDMI UHD upstream video distribution network



280A connected to an HDBaseT device and a UHD upstream video distribution network

5.2 Viewing the Video and Video Parameters from an HDMI or HDBaseT Source Device

Use the following procedures to view the incoming video from an HDMI source device.

1. Connect the HDMI source device under test to the 280G **HDMI IN** (or **HDBaseT IN**) connector.
2. Touch select **Video Display** from the top level menu shown below.



3. Touch select **Video Display** from the **Source Tests** menu shown below.
4. Touch select the **Start Fullscreen** activation button on the **Video Display** menu to view the incoming video without viewing the metadata from the source device under test.



The video from the source is shown on the 280 Test Set LCD as depicted below.



5. Touch select **Format Analyzer** from the **Home** menu shown below.
6. Touch select the **Refresh** activation button to view the results (below).



The following example shows a 4K format coming in without HDCP active.



The **Format Analyzer** screen shows the essential video parameters such as the format resolution, timing parameters, bits per component, colorimetry, etc. as well as whether HDCP authentication is active. Although not shown, *If HDR is being received, this will be indicated as well as shown below:*



Timing errors will be indicated in the space under the **Refresh** button. If the timing does not match a standard timing in the 280A format library, a message is shown: "Unknown format".

5.3 Testing Audio of an HDMI Source Device

This subsection describes how to test the audio from an HDMI source device. You can view the audio metadata and also **connect a speaker or earphone set** to the audio jack on the bottom edge of the 280A.



With the 280A you can run a test on the HDMI audio from a source device. This test shows you the audio metadata from the channel status bits and the audio infoframe transmitted from the connected source device which could be a DVD, set top box or the output of an A/V Receiver.

280A connected to an HDMI audio system

Use the following procedures to test the audio from an HDMI or HDBaseT source device.

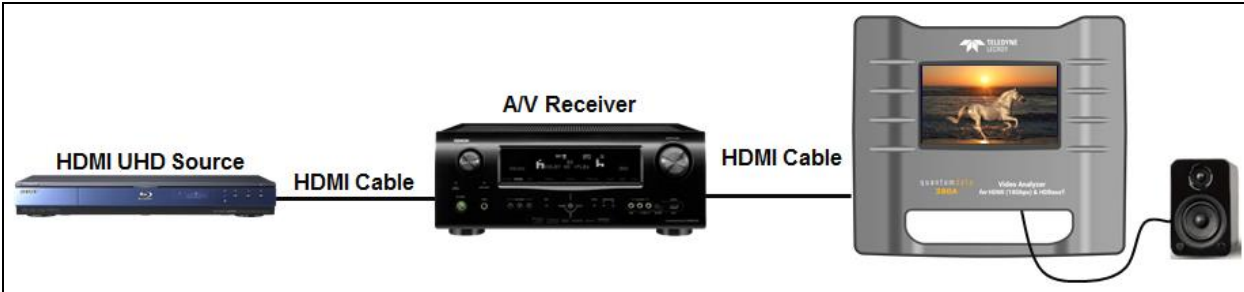
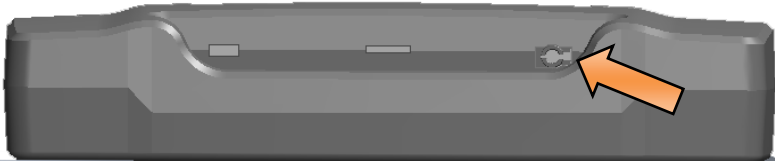
1. Make the physical connection between the 280A **HDMI or HDBaseT IN** port and the source device under test using the configuration instructions above.
2. Select **Audio Analyzer** from the top level menu shown below.



3. Touch select the **Refresh** activation button to view the audio metadata as shown below.



4. Optionally to use the external analog audio function, connect a speaker or ear buds to the 280A at the 3.5 mm analog audio output jack (indicated below) using a cable with a 3.5 mm jack.



5. Select the **Audio Monitor Settings** from the **Home** menu as shown below.



6. Configure the audio volume to your preference on the screen below.



5.4 Testing an HDMI Source’s Response to an EDID

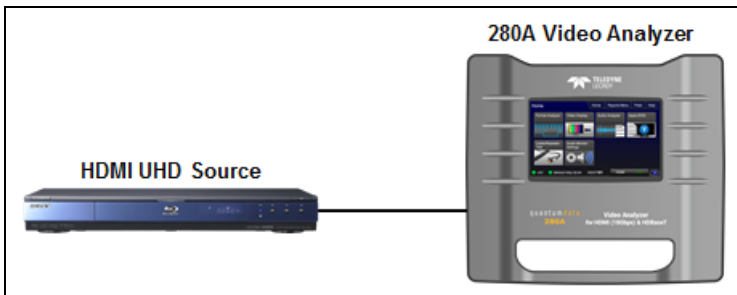
The 280A HDMI or HDBaseT IN ports emulate an HDMI or HDBaseT sink device. Part of that emulation function is presenting an EDID to a source or an entire upstream distribution network to verify proper response to specific EDIDs.

The 280A is provisioned with a default EDID from the factory. There are five (5) standard EDIDs available with the 280A as provided: 1) 480p, 2) 720p, 1080p and 4k@60p. There is also an EDID from an Audio Receiver.

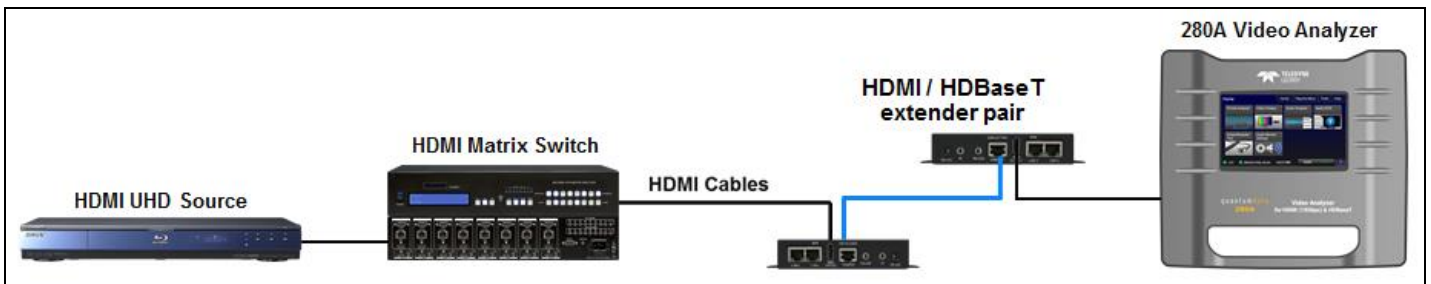
You can add additional EDIDs through the micro SDHC or micro SD card interface. These additional EDIDs can be obtained either by extracting them from an HDMI sink device (e.g. HDTV or AVR) or by importing EDID .xml files created using Quantum Data EDID Editor tools or residing on a quantumdata 780. These procedures are provided below.

Configurations for Testing an HDMI Source Devices Response to an EDID

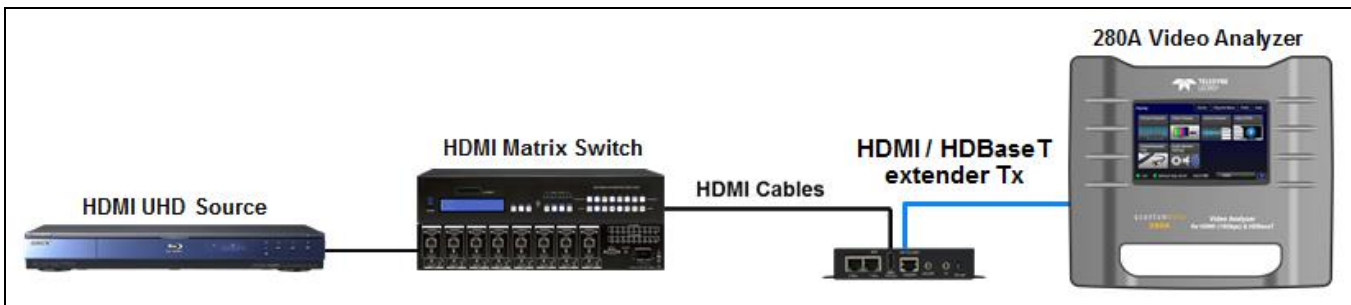
The following are typical test configurations.



280A connected to an HDMI UHD source device



280A connected to an HDMI UHD upstream video distribution network



280A connected to an HDBaseT device and a UHD upstream video distribution network

Testing an HDMI Source Devices Response to an EDID

Use the following procedures to test the EDID response from an HDMI source device.

1. Touch select **Apply EDID** to access the EDID selection screen.



The following menu appears.



2. Touch select the desired EDID.
3. Alternatively touch select **Load File** and select the desired custom EDID (example myedid on the screen below).



A summary page of the selected EDID will appear as shown below.



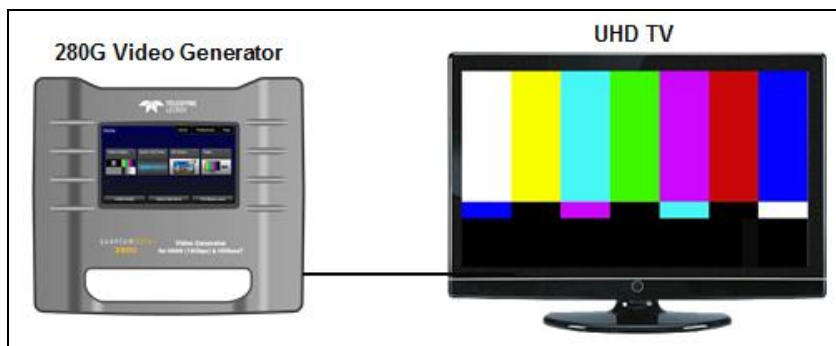
The selected EDID is then applied to the 280A HDMI or HDBaseT Rx port.

Loading additional EDIDs for testing

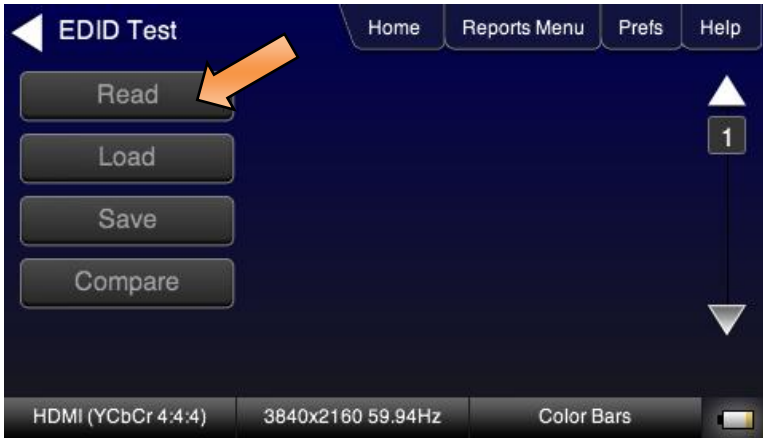
You can add additional EDIDs through the micro SDHC or micro SD card interface. These additional EDIDs can be obtained either by extracting them from an HDMI sink device (e.g. HDTV or AVR) or by importing EDID .xml files created using Quantum Data EDID Editor tools. These procedures are provided below.

These procedures are provided below.

1. Connect the 280G **HDMI OUT** port to the HDMI input of the sink device whose EDID you wish to access for testing. This configuration is depicted below.



2. Navigate to the 280G **EDID Test** menu shown below.



3. Touch select the **Read** activation button from the **EDID Test** menu shown above.
The EDID is listed as shown below.



4. Verify that there is a micro SD card in the 280G SD card slot. If there is no card in the slot insert a micro SD card into the 280G micro SD card slot.

Be sure to insert the micro SD card in the 280G as shown below.



5. Touch select the **Save** (indicated above) activation button to store the EDID on the micro SD card in the 280G. You will be prompted to enter a name for the new EDID. Enter a suitable name.
6. Remove the micro SD card from the 280G.

- 7. Insert the micro SD card into the 280A SD card slot.

Be sure to insert the micro SD card in the 280A as shown below.



- 8. From the 280A, load the EDID stored on the 280A from the **Load File** button.



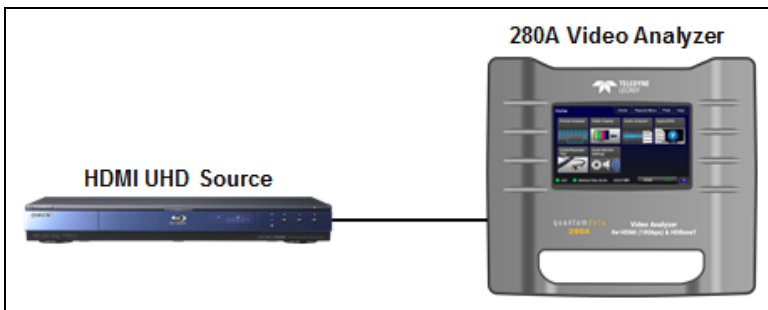
Select the EDID you wish to test with.



The selected EDID is applied to the HDMI (or HDBaseT) Rx port.

9. Connect the 280A **HDMI IN** port to the HDMI output of a source device you wish to test with the new EDID as shown in the illustration below.

This will cause a hot plug event and the source device under test should read the EDID of the 280A **HDMI IN** port.



6 Using the 280 Test Set to Verify a Video Distribution Network End to End

This Chapter provides procedures for testing an HDMI/HDBaseT video distribution network end to end. For these tests you will use both the 280G and 280A. The 280G will be at the source end emulating an HDMI source and the 280A will be at the far end emulating an HDMI or HDBaseT sink or display.

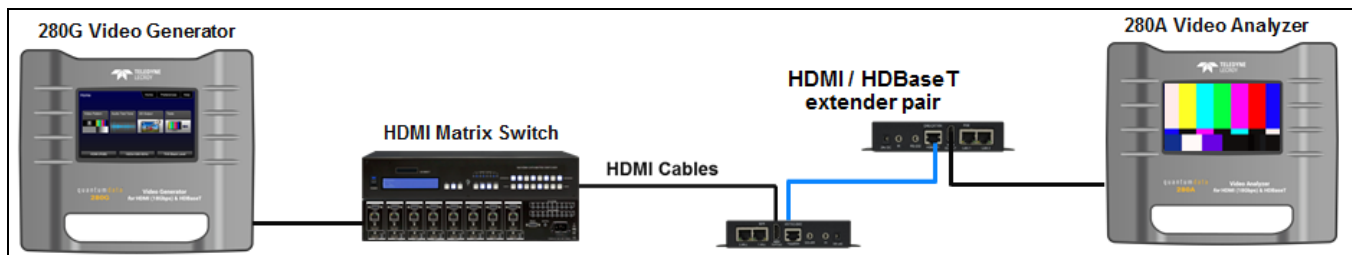
Procedures are provided for testing the entire network, distinct devices such as cable extenders, splitters, repeaters, switches as well as the HDMI and HDBaseT cable runs within the network.

6.1 End to End Verification Testing

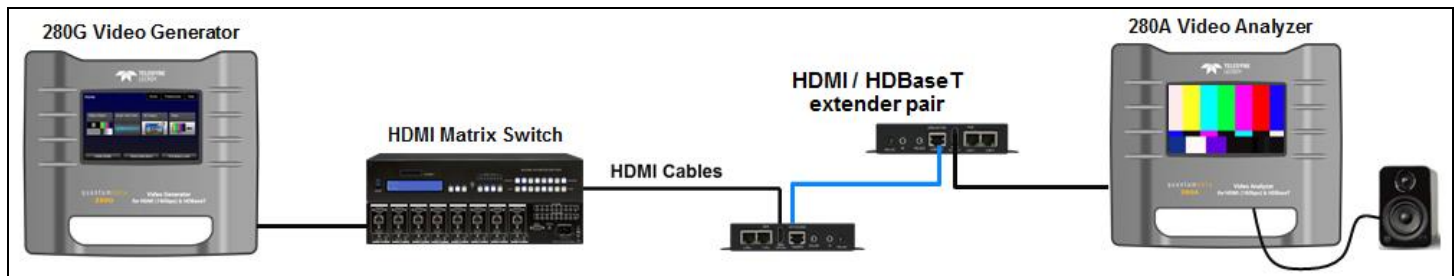
The end to end verification test uses various tests to verify the video distribution network. You can send multiple video formats and color depths through the network with and without HDCP authentication. You can use the cable test to verify distinct segments of cables.

Configurations for Running an End to End Network Verification Test

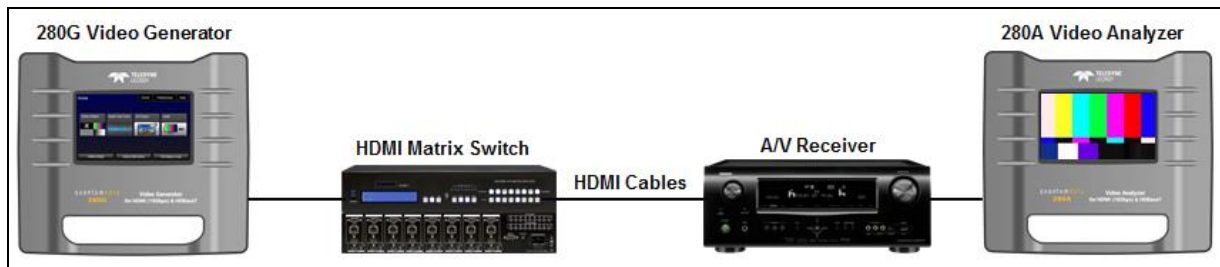
The following illustrations depict sample, although simplified video distribution networks. Regardless of how complex the network is, the same types of tests are run.



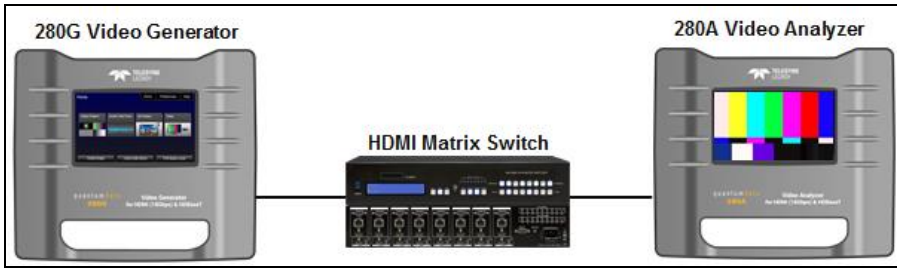
End to end video verification test through a video distribution network



End to end audio verification test through a video distribution network



End to end video verification test through a HDMI components

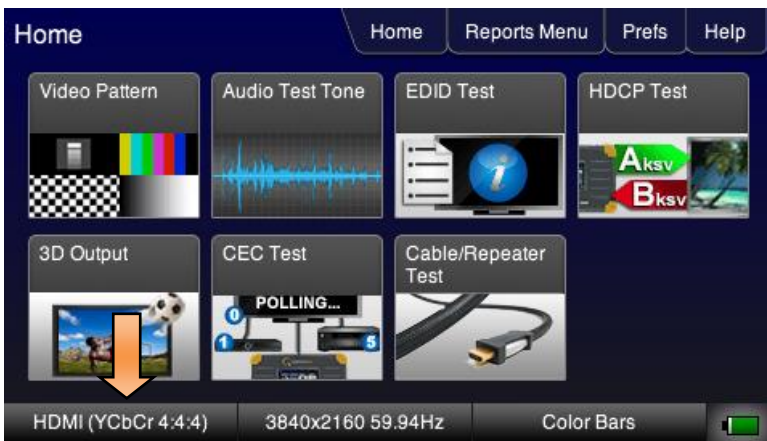


Testing distinct HDMI components

Selecting Video Formats

The procedures below describe how to run an end to end test.

1. Power up the 280G and 280A units using the rocker switches on the back panels.
2. Connect the 280G at the source end of the distribution network.
3. Connect the 280A at the far end of the distribution network.
4. From the 280G **Home** page touch select the **Signal Type** activation button on the bottom status panel as indicated below.

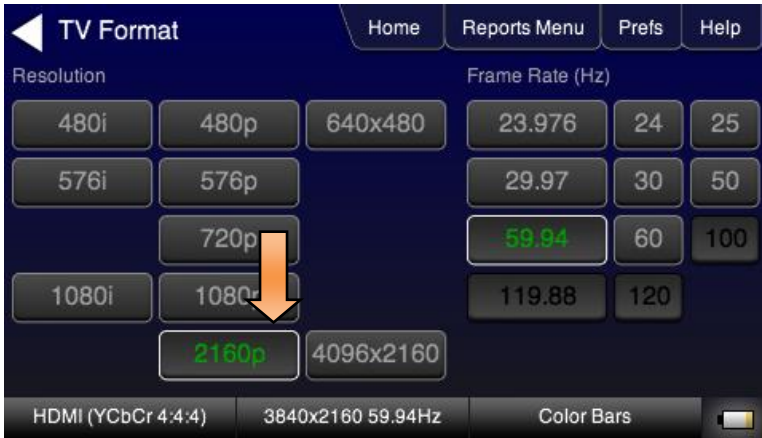


5. Touch select the interface type (Connector), HDMI.



4. Touch select the resolution and frame rate (middle button on the bottom panel). Typically you will want to run the test at the highest pixel rate. Refer to the figures below.

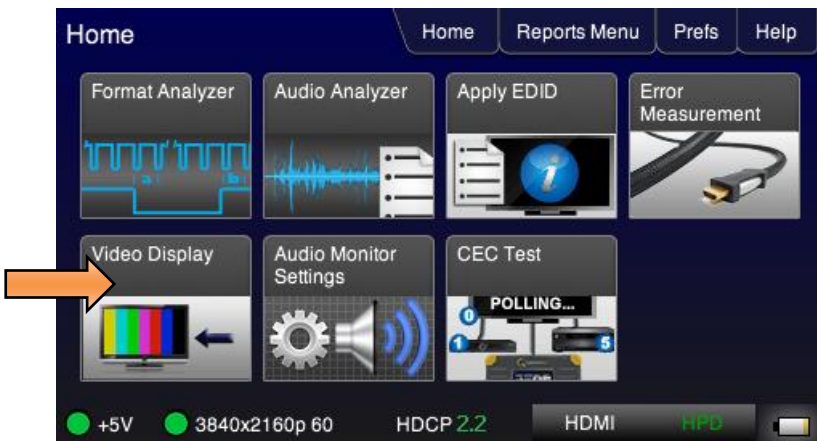
The following is an example with a 4K format selected.



Verifying the video through the network

Use the procedures below to verify the video and audio through the distribution network.

1. Verify the +5V and the format resolution on the **280A** lower status bar.



2. With the **280G** transmitting a format and test pattern, touch select **Video Display** button on the **280A** shown above.
3. Touch select the **Start Fullscreen** activation button on the **280A Video Display** menu.



The video from the 280G through the network is shown on the 280A LCD as depicted below.



4. Touch select **Format Analyzer** from on the **280A Home** menu shown below.



5. Touch select the **Refresh** activation button (shown on the screen below) to view the results.

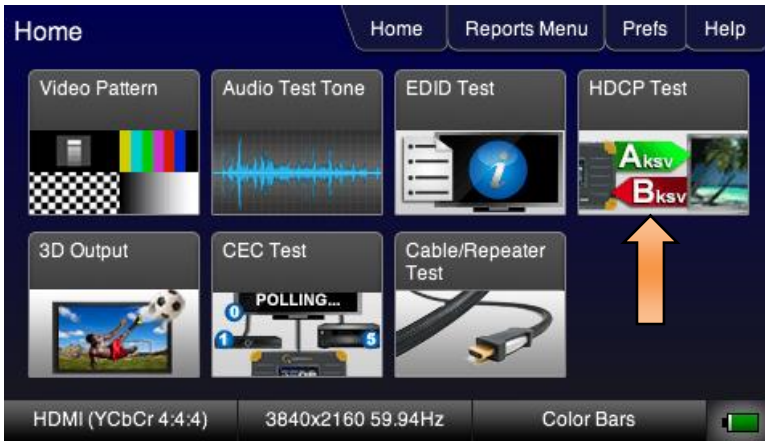


The **Format Analyzer** screen shows the essential video parameters such as the format resolution, timing parameters, bits per component, colorimetry, etc. as well as whether HDCP authentication is active.

Verifying HDCP through the network

Optionally you can run an end to end HDCP test through the network.

1. Select **HDCP Test** from the **280G Home page** shown below.



2. Touch select **Enable** from the **HDCP Output Tests** menu shown below.

Select either HDCP 1.4 or HDCP 2.2. The following example shows HDCP 2.2 test results:

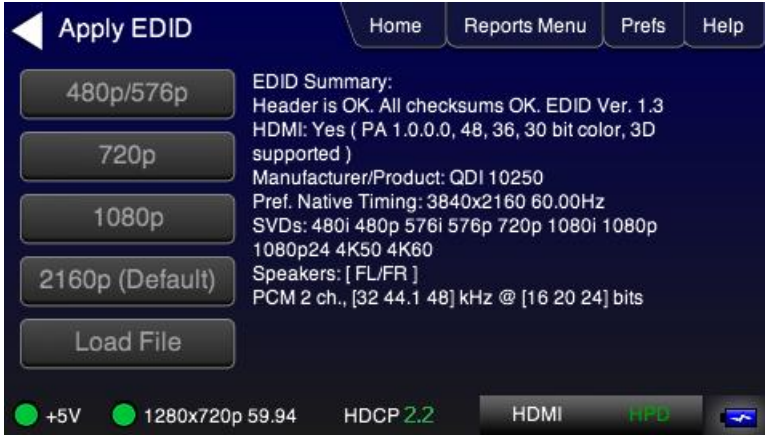


Note: You do not need to verify the HDCP on the **280A** at the far end. Verify the results of the HDCP authentication at the **280G** is sufficient.

Verifying the EDID through the network

You can also run an end to end EDID test through the network.

1. Select the EDID file from the **280A Apply EDID** screen. The EDID summary page will appear as shown below.



2. Touch select **EDID Test** from the **Home** menu of the **280G** as shown below.



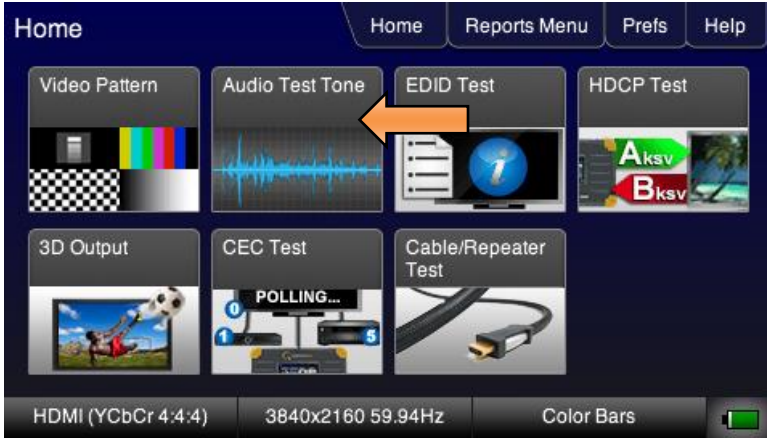
3. Touch select the **Read** activation button from the **280G EDID Test** menu shown below. Check the summary page and verify there are no header or checksum errors.



Verifying audio through the distribution network

You can also run an end to end audio test through the network. This enables you to monitor the HDMI stream remotely by connecting a speaker to the **280A** audio output jack.

1. Touch select **Audio Test Tone** to access the audio selection menu.



2. Touch select the **PCM Sine Wave** item (shown in the screen below).



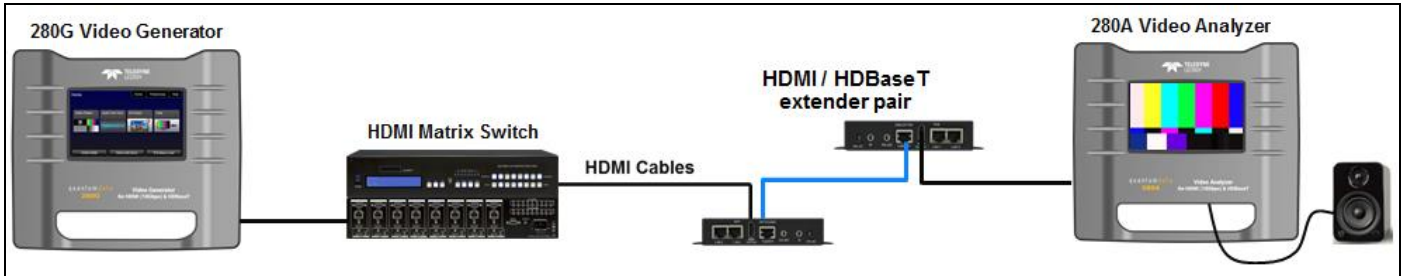
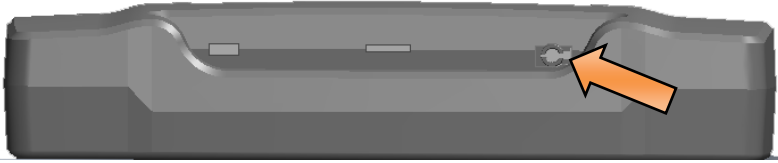
The **PCM Sine Wave Options** menu appears as shown below:

3. Select the LPCM audio bit depth, sampling rate and number of channels.

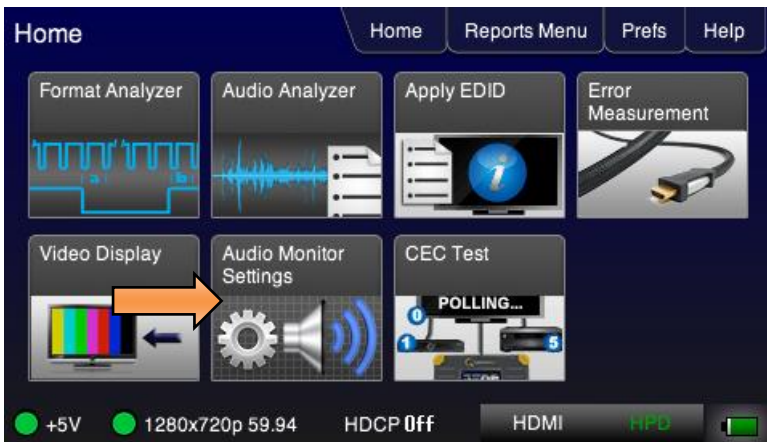


Optionally use a speaker or ear phone at the **280A** to audibly monitor the incoming LPCM sine wave.

- 7. Optionally to use the **280A** audio input jack to monitor audibly. Use a cable with a 3.5 mm analog audio jack connected to the speaker.



- 8. Touch select **Audio Monitor Setting** on the **280A** screen below.

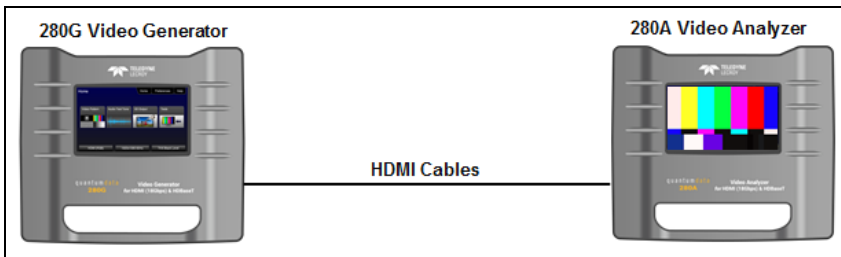


- 9. Configure the audio volume on the 280A to your preference on the screen below.



6.2 Running an HDMI Cable Test

This subsection provides procedures for performing an HDMI cable test. Use the configuration below.

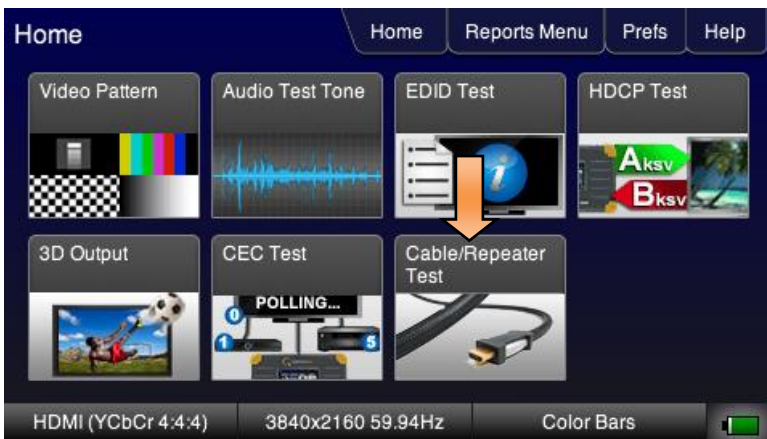


Testing an HDMI cable segment

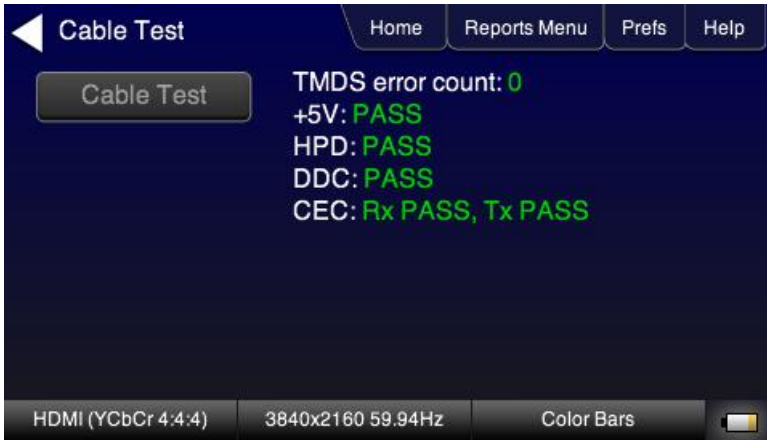
1. Connect one end of the HDMI cable to the 280 Test Set **HDMI OUT** connect and the other end to the 280 Test Set **HDMI IN** connector.
2. Select a video format resolution. Typically you will want to run the test at the highest pixel rate.



3. Access the **Cable/Repeater Test** option.



4. Touch select **Cable Test** activation button.



The TMDS errors are displayed at the current video format. Continuity tests are also run on the +5V, HPD, DDC and CEC.

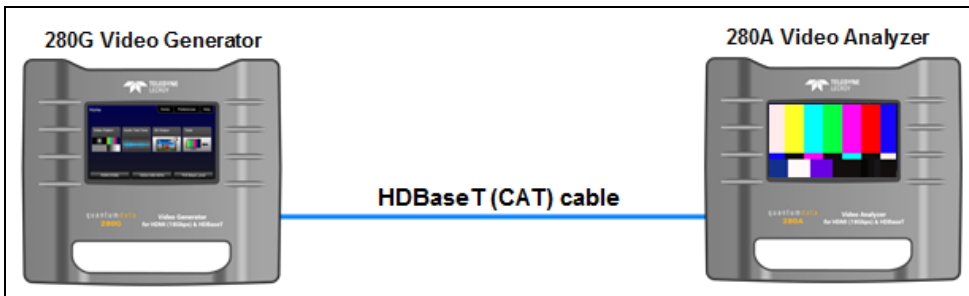
5. Repeat the test at other format resolutions.

6.3 HDBaseT Cable Test

The HDBaseT Cable Test runs a test on all the leads in the HDBaseT cable. The test runs a quality check of the cable and also tests for +5V and hot plug detect.

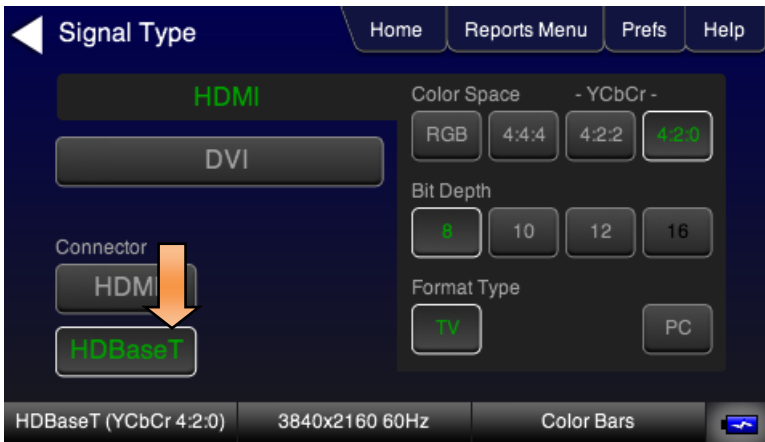
Configuration for Running an HDBaseT Cable Test

This section provides configurations supported when performing an HDBaseT cable test. This test is ideal for testing HDBaseT cables that have been installed in a facility.

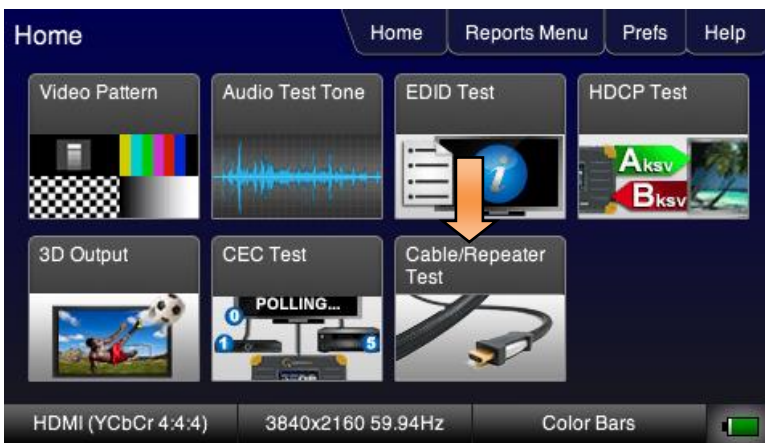


Testing an HDBaseT cable segment

1. Connect one end of the HDMI cable to the 280 Test Set **HDMI OUT** connect and the other end to the 280 Test Set **HDMI IN** connector.
2. Select a video format resolution. Typically you will want to run the test at the highest pixel rate.



3. Access the **Cable/Repeater Test** option.



4. Touch select **Cable Test** activation button.



The HDBaseT cable test provides quality measurements of the cable run. Refer to the table below.

Measurement (Main Channel)	
Main Channel Mean Squared Error - MSE)	Tests quality of the Main channel (per pair) -20dB and greater: excellent up to 300MHz (green) -15.5dB: good for 225MHz (yellow); acceptable for 300MHz (yellow) -10dB: acceptable for 148.5MHz (yellow); poor for 225MHz (red)
Main Channel Maximum Errors (MaxErr)	0-30: excellent (green) 31-55: good (yellow) 56-64: acceptable (yellow) greater than 64: poor (red)
Measurements (Aux Channel)	
Aux Channel Errors Maximum Errors (MaxErr)	Tests quality of the Aux Channel 0-30: excellent (green) 31-55: good (yellow) 56-64: acceptable (yellow) greater than 64: poor (red)

- Repeat the test at other format resolutions.

7 Generating Reports with the Reports File Creation Feature

This Chapter provides procedures for running the Reports File Creation feature.

7.1 Report File Creation Feature Description

Enables residential installers, professional A/V integrators and test engineers in R&D to produce a record of the tests they perform. Reports can be run on HDCP, Format Analyzer, Audio Analyzer, Cable tests for any interface type. The reports can be provided to customers, colleagues or to the contracting agent to verify and demonstrate project completion. The reports can be run on a single test or aggregated for a series of tests. The reports can be transferred by micro SD card and viewed in a standard browser or any text editor.

The following tests are supported by the Reports File Creation feature:

Source Tests supported:

- Format Analyzer

Sink Tests supported:

- EDID
- Cable Test

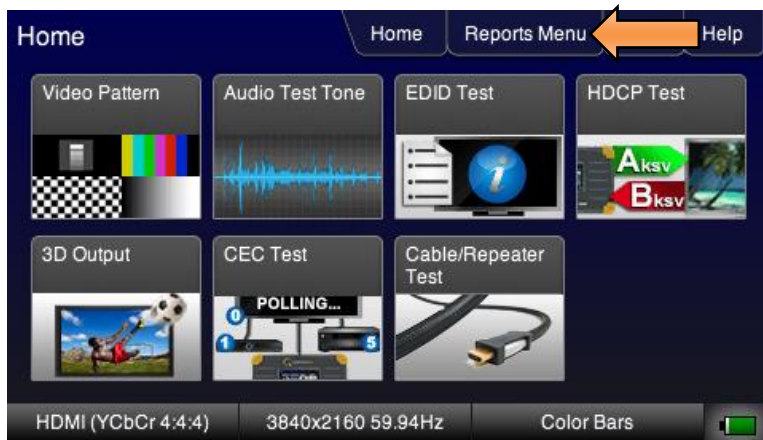
7.2 Procedures for Creating Reports

This subsection provides procedures for generating reports. You can aggregate any set of tests, source, sink or repeater into any report you wish. The example below depicts a scenario where you run a series of source tests. The examples given in this subsection will use the tests for the HDMI interface on the 280G but the reports can be run on any interface (HDBaseT) and reports can be generated from the 280A.

Creating a report for source testing

Use the procedure below to run a report on a series source tests. This procedure assumes that you have powered up the source device(s) and connected it (them) to the 280 HDMI In port.

1. From the **Main** screen, touch select the **Reports Menu** item from the top menu. Refer to the screen example below.



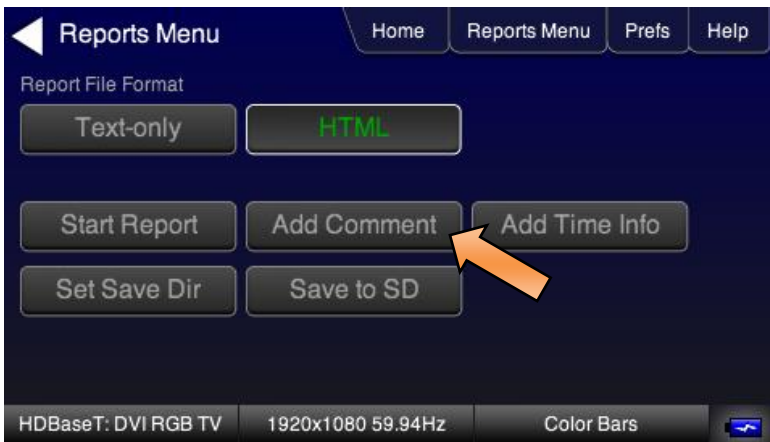
2. Select either **Text Only** or **HTML** file depending on whether you want the report to be formatted for viewing in a standard text editor or browser. Refer to the screen example below which uses HTML.



3. Touch select **Start Report** to initiate the report as shown below.



The other selections will become visible as shown below.



4. Touch select the **Add Comment** button to enter a comment about the report such as a project number. You will be prompted with a keyboard to enter comments to the report as shown below.



The **Reports Menu** screen will again appear.

5. Touch select **Add Time Info** to set the time the report was initiated.



The following screen will appear.

6. Set the time and date with the arrow buttons and then touch select the **Enter** key.



The Reports menu screen will again appear.



The **Reports Menu** screen will again appear.

7. Touch select the **Set Save Dir** button (below) to create a directory for the report.



8. Enter the directory name when prompted with the keyboard and touch select the **Enter** key.



The **Reports Menu** screen will again appear.

9. Run a series of tests.

Important: When you run a test choose **Add to Reports** on the top menu.

10. When you are done adding reports, return to the **Reports Menu** and touch select the **Set to SD** button (below) to save the report.



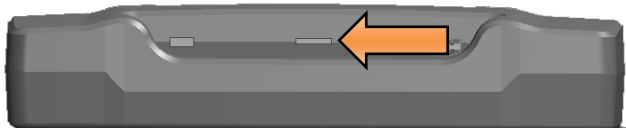
11. Enter the name for the report when prompted with the keyboard and touch select the **Enter** key.



The report is now saved on the micro SD card.

Procedures for Accessing Reports

Once you have run the tests and added them to a report you can access the report from the micro SD card where you saved them.



Bottom Edge

Use the following procedures to access the report files.

1. Remove the micro SD card from the 280G or 280A slot and install it into your PC.
2. Navigate to the Reports directory as shown below.

Name	Date modified	Type	Size
AUTOEDID	11/8/2017 3:00 PM	File folder	
EDID	11/8/2017 3:00 PM	File folder	
FMT	11/8/2017 3:00 PM	File folder	
MYRPTDIR	11/21/2017 2:00 PM	File folder	
PACKS	11/8/2017 3:00 PM	File folder	
REPORTS	11/8/2017 3:00 PM	File folder	
RESOURCE	11/8/2017 3:00 PM	File folder	
boot.bin	9/5/2017 12:44 PM	BIN File	43 KB
bootstrp.bin	10/16/2017 2:34 PM	BIN File	38 KB
CBLT55		Bitmap image	0 KB
CBLT53	11/21/2017 2:00 PM	Bitmap image	383 KB
CBLT54	11/21/2017 2:00 PM	Bitmap image	383 KB
fpga280.bin	11/20/2017 10:13 ...	BIN File	508 KB
MAIN40		Bitmap image	0 KB
MAIN41	11/21/2017 2:00 PM	Bitmap image	383 KB
MAIN42		Bitmap image	0 KB
MAIN50	11/21/2017 2:00 PM	Bitmap image	383 KB
MAIN51		Bitmap image	0 KB
TVED1	11/21/2017 2:00 PM	Bitmap image	383 KB
TVED2	11/21/2017 2:00 PM	Bitmap image	383 KB
TVED3	11/21/2017 2:00 PM	Bitmap image	383 KB
TVED4		Bitmap image	0 KB
VP500app.bin	11/21/2017 2:56 PM	BIN File	2,985 KB

3. Select User to access the reports created by the Report File Creation feature.

Name	Date modified	Type	Size
MYRPT2	11/21/2017 2:00 PM	HTML Document	7 KB

4. Open the report in a standard browser.

An example of the composite source report is shown below.



Test Report

Test Equipment Model Number: quantumdata 280G
Unit Serial Number: 4294967295
Firmware Version: 17112143
FPGA Version: 17112001

User Comment

my site1

Date and Time

2017/12/15 12:00

EDID Report

EDID Summary:

Header is OK. All checksums OK. EDID Ver. 1.3

HDMI

Yes (PA 1.0.0.0, 48, 36, 30 bit color, 3D supported)

Manufacturer/Product

QDI 10250

Pref. Native Timing

3840x2160 60.00Hz

SVDs

480i 480p 576i 576p 720p 1080i 1080p 1080p24 4K50 4K60

Speakers

[FL/FR]

PCM 2 ch., [32 44.1 48] kHz @ [16 20 24] bits

Cable Test Results

TMDS error count

0

+5V

PASS

HPD

PASS

DDC

PASS

CEC

Rx PASS, Tx PASS

Test performed by _____

You can print the reports or disseminated them as a series of files to your customer or contracting agency.

8 Upgrading the Software on Your 280 Units

Please refer to the release notes on the quantumdata website downloads page for instructions on upgrading the 280G and 280A: www.quantumdata.com/downloads.html.

END OF USER GUIDE

X-ON Electronics

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