780 HANDHELD TEST INSTRUMENT

The 780 Handheld Test Instrument is a battery-powered, portable multimedia pattern generator that enables you to conduct quick, on-site verification testing of your HDMI® system and analog video displays. The 780 is equipped with both a reference source and a reference sink HDMI interface allowing you to test audio, video and perform basic verification of protocols, HDCP, EDID, CEC and infoframes, of any type of HDMI device: sources, repeaters and sinks. You can test and calibrate your high definition TVs with a variety of standard patterns and formats including deep color and 3D. Its portability makes it ideal for your bench and for use in the field. A color touch display makes the 780 easy and convenient to use. You can view the incoming HDMI video image and video metadata on the built-in display even when content protected by HDCP. You can also verify the incoming audio by examining the decoded IEC audio headers, audio infoframes and channel status blocks.

Because the 780 has both an HDMI output and an HDMI input, you can test your HDMI cables and distribution systems with splitters, extenders and switches with the optional Cable Test feature. You can prequalify cables and distribution systems prior to installation or once they are installed with the Frame Compare (Pixel Error) test feature.

With the Auxiliary Channel Analyzer (ACA) options, you can monitor the HDMI hot plug related events and DDC transactions, EDID and HDCP, between HDMI devices and the 780 while the 780 is emulating a known-good HDMI source or sink device. The second ACA option enables you to passively monitor the HDMI hot plug-related events and DDC transactions on three HDMI connected devices.

KEY FEATURES + BENEFITS

HDMI Video/Audio Output
Pattern testing—including deep color—for HDMI inputs on HDTVs 24/30/36 bit at 1080p.

HDMI 3D Pattern Generation
Supports Side-by-Side, Top-and-Bottom and Frame Packing 3D format structure.

Analog Component Video Output
Pattern testing for analog component inputs on HDTVs.

Custom Formats and Bitmap Patterns
Create custom formats using Format Editor tool. Import your bitmaps for pattern testing.

Test Pattern Scrolling
Animated test pattern for testing motion artifacts.

Licensed Bitmap Images (optional)
Image packs w/ bitmap test images. Current pattern packs: THX, China Res

Multichannel Digital Audio
Test multichannel audio over HDMI, SPDIF, and Optical with audio patterns at sampling rates up to 192kHz. Test HDMI audio formats such as Dolby and DTS.

Color Touch Screen - View Incoming Video
User friendly color touch screen enables you to operate the instrument and view incoming video and metadata from an HDMI source.

Installer Utility
Diagnose HDMI interoperability problems with simplified test interface. Verify sources, sinks, repeaters with “one button” tests. Pass/fail results provided.

HDCP Sink Test (Network Analyzer option)
Verify that an HDMI display properly responds to HDCP content protection.

HDCP Source Test (Network Analyzer option)
Check max HDMI devices supported by source.

EDID Verification (Network Analyzer option)
Verify the HDMI display’s EDID for checksum and header errors. View the display’s entire EDID content. Compare two EDIDs. Run portions of the EDID compliance test.

HDMI Sink Emulator (Network Analyzer option)
Emulate an HDMI sink device to test HDCP an HDMI source device or test a source response to an EDID. Select from a variety of stored EDIDs for emulation.

HDMI Source Video Testing (Network Analyzer option)
View the video timing data and video infoframe data from an HDMI source device including 3D metadata. View various data island packet contents.

HDMI Source Audio Testing (Network Analyzer option)
Verify incoming audio (format, sampling rate, bit depth) by viewing the decoded IEC audio headers, audio infoframes and channel status bits.

HDMI Cable & Network Test (Cable & Link test option)
Prequalify or verify your HDMI cable and HDMI distribution network (extenders, splitters, switchers, etc) prior to installation using a pseudo random noise test pattern.

HDMI Frame Compare test (Cable & Link test option)
Verify your HDMI cable and HDMI distribution network (extenders, splitters, switchers, etc) once installed using the Frame Compare test.

Aux channel analyzer (ACA optional)
Monitor the CEC HDMI hot plug related events and DDC transactions, EDID and HDCP, either while emulating a known-good HDMI device or while passively monitoring between multiple HDMI connected devices. Note: Passive monitoring requires optional hardware configuration.

Battery powered
Provide portability with rechargeable batteries. Can also be powered from AC through power adapter.

Command Line Control
Run automated tests through command line interface via USB.
### Application Tests

#### Standard Features

**Video Pattern Testing**
- **Formats**:
  - Number of formats: 126
  - Standards: CEA-861E, VESA
  - Deep Color: 1080p60 30/36 bit

**Patterns**
- **Number of patterns**: More than 25 patterns
- **Gray levels**: 256
- **Imported bitmaps**: Fixed resolution 24 bit
- **Image weights**: Scroll bitmap images

**HDMI 3D Testing**
- **Test pattern**: 3D bitmap test images and NEW rendered images
- **3D Formats**: Top-and-Bottom, Side-by-Side (half), Frame Packing

**Audio Pattern Tests**
- **Test**: Pattern
- **Sound Pressure & Main Speaker**: 500-20kHz
- **Frequency Response**: 20-20kHz
- **Speaker Distortion**: Sinewave 63 Hz, 125Hz, 1kHz, 4kHz
- **Early Reflections**: Impulse
- **Polarity of Speaker Wires**: Polarity
- **Sound Convergence**: Autotune Delay

**View incoming video**
- **HDMI Source Test**: View incoming video image and video metadata from HDMI source even when content is protected with HDCP.

### Optional Features

**HDMI Network Analyzer Option**
- **HDMI Source Test**: View the HDMI video timing data and video infolmage data (including 3D metadata) from an HDMI source device.
- **HDMI Source Audio Test**: View the audio format, sampling rate, Bit depth of the decoded audio IEC headers, audio inforframes, and channel status bits of an HDMI audio source.
- **CEC Ping test**: Ping HDMI devices in a network to discover CEC devices.
- **HDCP**: Verifies DTVS’s and repeater’s handling of HDCP encrypted video.
- **HDMI Source Test**: Check a sources max HDCP device capabilities.
- **EDID**: View entire EDID contents and check for errors. Run portions of the EDID compliance test.
- **HDMI Source Test**: Emulate any EDID and test a source’s response. Store/Load EDIDs.
- **HDMI Cable & Link Test Option**: Run pixel error and Frame Compare test on HDMI cable networks comprised of cables, extenders, repeaters, switches, processors, etc. Tests for pixel errors on video using pseudo random noise. Tests continuity of 5V, hot plug, CEC bus and DDC lines.

**HDMI Cable & Link Test Option**
- **1 - Emulation Monitoring**: Monitor the CEC hot plug events and the DDC transactions during a connection sequence between the 780 and another HDMI device while emulating either a known-good HDMI device or a known-good display device, or both.
- **2 - Passive Monitoring (includes option 1)**: Passively monitor the CEC 5V and hot plug events and the DDC transactions during a connection sequence between HDMI devices (source, repeater and display device).

**HDMI Link (network) Test**: Run pixel error and Frame Compare test on HDMI cable networks comprised of cables, extenders, repeaters, switches, processors, etc. Tests for pixel errors on video using pseudo random noise. Tests continuity of 5V, hot plug, CEC bus and DDC lines.

### Specification

#### Video/Audio Outputs

**HDMI / DVI Video**
- **Connector type**: (1) one HDMI Type A
- **TMDS protocols**: HDMI, DVI
- **Number of links**: single
- **Colorimetry**: ITU-R BT.709-5
- **Color depth (HDMI)**:
  - 24/30/36bit
  - 4:4:4 RGB/YCbCr
  - 4/4:2:2 16/24-bit
- **Color depth (DVI)**: 24-bits per pixel
- **Encoding**: RGB, YCbCr
- **Sampling modes**: 4:4:4, 4:2:2
- **Pixel rate (MHz)**: 165
- **TMDS check rate (Gbps)**: 2.56
- **Timing**: up to 1080p60
- **Scan types**: Progressive, Interlaced

**Analog Video - VGA & Component**
- **Connector type**: VGA (HD15F), RCA adapter provided
- **Color encoding**: RGB, YPbPrP
- **Pixel rate (MHz)**: 80 pixel/res for higher resolutions
- **Syncs**: Separate, Composite

**HDMI Input**
- **Connector type**: (1) one HDMI Type A
- **TMDS protocols**: HDMI, DVI
- **Number of links**: single
- **Pixel rate (MHz)**: 150

**Digital Audio (HDMI)**
- **Connector**: RCA
- **Bits per sample**: 16, 20, 24
- **Sampling rates (kHz)**:
  - Programable LPCM 24/30/36 bit
  - Dolby Digital (iec 61976.1)
  - Dolby Digital Plus (iec 61976.3)
  - Dolby True-HD
  - DTS-ES (iec 61976.7)
  - DTS-HD Master Audio
- **Audio stream types**:
  - Noise patterns, 5.1
  - Sine wave clips 192kHz, 2.0, 5.1 & 7.1
  - High Bit Rate Audio

**Digital Audio (SPDIF, OPTICAL)**
- **Connector**: JIS FOS, OPTICAL
- **Bits per sample**: 16, 20, 24
- **Sampling rates (kHz)**:
  - Programable LPCM 24/30/36 bit
  - Dolby Digital (iec 61976.7)
  - DTS-ES (iec 61976.7)
- **Audio stream types**:
  - Noise patterns, 5.1

**Environment**
- **Humidity**: 30% to 85% RH non condensing
- **Operating temp**: 0 to 40 Fahrenheit
- **FCC class B**
- **RoHS**
- **Power**
  - DC: 6AA NiMh batteries
  - Battery life: 4 hours between charge
  - Battery recharge: Overnight charge
  - AC charger/converter: 100 to 240 VAC
  - Current (amps): 0.4
  - Frequency (Hz): 47 to 63
  - Power (VA): 30

**Weight**
- **LBS**: 3.25 LBS
- **Kg**: 1.47 Kg

**Size (dimensions)**
- **Height**: 480H x 27200
- **Color**: 24 bit RGB
- **Backlight**:
- **Screen size (inches)**: 15.24
- **Infinity (inches)**: 2.7
- **Width (cm)**: 6.98
- **Height (inches)**: 9.75
- **Thickness (cm)**: 2.7
- **Battery**
- **Battery life**: 4 hours between charge
- **Battery recharge**: Overnight charge
- **AC charger/converter**: 100 to 240 VAC
- **Current (amps)**: 0.4
- **Frequency (Hz)**: 47 to 63
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STANDARD TESTS

Video Pattern Testing – Test a DTV to ensure that it can render a video test pattern. Scroll a pattern to test for motion artifacts.

Configurations:

Step 1. Select Format

Operation:
Step 1. Select Format

Step 2. Select Video Pattern

Step 3. Select Image

Step 4. Select Pattern Options

3D Video Pattern Testing – Test a DTV to ensure that it can render a video test pattern.

Configurations:

Step 1. Select 3D Output

Operation:
Step 1. Select 3D Output

Step 2. Select 3D Test Options

Step 3. Select 3D Test pattern
Audio Pattern Testing – Test an HDTV or A/V Receiver to ensure that it can render LPCM basic and multichannel audio and multichannel compressed audio and HDMI high bit rate audio formats.

Configurations:

**Operation:**
Step 1. Select Audio Test Tones

Step 2. Select HDMI Audio Pattern DD+ 7.1

Step 3. Select Pattern Options

**Audio Pattern**
- **Interface:** HDMI
- **Mix:** Optical, SPDIF
- **Dolby:** LD, 5.1
- **Interlace:** True-HD

**Audio Pattern Testing – Test an HDTV or A/V Receiver to ensure that it can render LPCM basic and multichannel audio and multichannel compressed audio and HDMI high bit rate audio formats.**

Viewing HDMI Video from Source – Test an HDMI source device directly or through a repeater. View incoming HDMI video including 3D video on the built-in display.

Configurations:

**Operation:**
Step 1. Select Test Source (DVD/STB)

Step 2. Select Video Display

Step 3. Select Fullscreen or Detailed

**Step 4. View incoming HDMI video on built-in display**
Installer Test Utility – Test an HDMI sink device directly.

Configurations:

**Operation:**

**Step 1. Select Installer Test**

- Video Pattern
- Audio Test Tone
- Test Sink (Display/TV)
- Test Source (DVDS:TS)
- 3D Output
- Aux Channel Analyzer
- CableRepeater Test
- Installer Tests

**Step 2. Select Sink Test**

- Device Testing
- Network Testing
- Sink Test
- Source Test
- Signal Validation
- Repeater Test
- Cable Test

**Step 3. Select OK**

**Step 4. View video and verify if it is correct**

- HPD: Assorted
- EDD: HDMI-PASS
- HDCP: Authentication: OK
- HDCP Video/Audio (preferred): OK
- 720p Video: 60Hz: OK
- 1080i Video: 60Hz: OK
- Video (YCC4:4:4): OK

Video is HDMI 4:4:4. Is video and audio being presented as expected?

**Step 5. View Results**

- Testing complete.

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Installer Test Utility – Test an HDMI source device directly.

Configurations:

**Operation:**

**Step 1. Select Installer Test**

- Video Pattern
- Audio Test Tone
- Test Sink (Display/TV)
- Test Source (DVDS:TS)
- 3D Output
- Aux Channel Analyzer
- CableRepeater Test
- Installer Tests

**Step 2. Select Source Test**

- Device Testing
- Network Testing
- Sink Test
- Source Test
- Signal Validation
- Repeater Test
- Cable Test

**Step 3. Select OK**

**Step 4. View video and verify if it is correct**

- HPD: Assorted
- EDD: HDMI-PASS
- HDCP: Authentication: OK
- HDCP Video/Audio (preferred): OK
- 1080p Video: 60Hz: OK
- 1080i Video: 60Hz: OK
- Video (YCC4:4:4): OK

Testing complete.
Installer Test Utility – Test an HDMI repeater device directly.

Configurations:

Operation:

Step 1. Select Installer Test

Step 2. Select Repeater Test

Step 3. Select OK

Step 4. View video and verify if it is correct

Installer Test Utility – Test HDMI Links.

Configurations:

Operation:

Step 1. Select Installer Test

Step 2. Select Link Test

Step 3. Select OK

Step 4. View video and verify if it is correct
HDMI NETWORK ANALYZER FEATURES (OPTIONAL)

HDCP Testing – Run an HDCP functional test connected directly to an HDMI HDTV or through a repeater to verify that it can render HDCP protected video content.

**Configurations:**

**Operation:**
- **Step 1. Select Test Sink (DVD/STB)**
- **Step 2. Select HDCP Test**
- **Step 3. Select Enable and View results**

HDMI CEC Verification – Run an HDMI CEC verification test on an HDMI system.

**Configurations:**

**Operation:**
- **Step 1. Select Test Sink (DVD/STB)**
- **Step 2. Select CEC Test**
- **Step 3. View Results**
HDMI Source and Repeater Video Test – Test an HDMI source device directly or through a repeater. Verify timing, AVI Infoframes and HDCP authentication for standard video, deep color and 3D.

Configurations:

Operation:
Step 1. Select Test Source (DVD/STB)

Step 2. Select Format Analyzer

Step 3. View Results

HDMI Source Audio Test – Run an audio test on an HDMI source device or A/V receiver to verify audio headers, audio infoframe and channel status bits.

Configurations:

Operation:
Step 1. Select Test Source (DVD/STB)

Step 2. Select Audio Analyzer

Step 3. View Results
Packet Viewer Test – View HDMI infoframe and selected data island metadata

Configurations:

Step 2. Select Packet Viewer

Step 3. View Results

Operation:
Step 1. Select Test Source (DVD/STB)

Testing Source’s Response to an EDID – Provision 780’s HDMI Input port with EDID from any display. Verify source responds properly to EDID. Load EDID from multiple stored EDIDs.

Configurations:

Step 2. Select EDID Test

Step 3. Load EDID

Step 3. Verify EDID has been assigned

Operation:
Step 1. Select Test Sink (DVD/STB)
EDID Sink Testing – Run an EDID functional test on an HDMI HDTV and/or an A/V receiver to verify EDID checksum, header, and HDMI video and audio support. View entire EDID contents. Run portions of the EDID compliance test.

Configurations:

Step 2. Select EDID Test

Step 3. Select Read and View Results (Page 1)

Step 4. View multiple pages (Page 25)

HDMI Cable & Link Test (Optional)

HDMI Cable or HDMI Link Test – Run a pixel error test on an HDMI cable or an HDMI system with splitters, switches and extenders using pseudo random noise.

Configurations:

Step 2. Select Test Wire or Test Repeater

Step 3. View Results (Cable Test)
HDMI FRAME COMPARE TEST (OPTIONAL)

HDMI Frame Compare Test – Run a pixel error test on video frames.

Configurations:

Step 3. Select Frame Compare

Step 4. Select Frame Capture

HDMI AUXILIARY CHANNEL ANALYZER TEST (EMULATION OPTION)

Emulation Monitoring – Monitor HDCP and EDID transactions and hot plug events while emulating either an HDMI source, HDMI sink or both an HDMI source and sink.

Configurations:

Operation:

Step 1. Select Aux Channel Analyzer

Step 2. Select Configuration: Capture Data

Step 3. View Results (Downstream)

Step 4. View Details (Bcaps)
HDMI AUXILIARY CHANNEL ANALYZER TEST (PASSIVE OPTION)
Passive Monitoring – Passively monitor hot plug-related events, HDCP and EDID transactions between HDMI connected devices.

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