



quantumdata

## VIDEO TEST INSTRUMENTS

The Quantum Data 882E is programmable test instrument packed with features for video and audio testing of HDMI® sources, sinks and repeaters. The 882E can be equipped with an HDMI 1.3 transmitter that provides 1.3 12-bit/component deep color, x.v.Color, high bit rate audio formats and 1.4a 3D testing features. An analog option with 250MHz analog output and composite analog for NTSC and PAL testing is available as well with the HDMI transmitter only configuration.

The HDMI transmitter configuration also supports an HDMI analyzer option for testing timing and video on source devices. Industry approved compliance test tools such as HDCP, CEC and EDID are also available with the analyzers.

The 882E also features an auxiliary channel monitoring utility for viewing the HDCP, EDID and CEC transactions in real time.

**Now an Approved HDCP Compliance Test TOOL!**



Note: 882EA shown in photo.

## KEY FEATURES + BENEFITS

### HDMI 1.3 Deep Color™

Up to 36-bit/pixel (12-bit/component) Deep Color at 1080p; TMDs link up to 2.25 GB/s.

### HDMI 1.4a 3D Testing

3D test patterns and support for custom bitmaps  
Supports mandatory and optional 3D formats

### x.v.Color

Supports wide gamut color generation with test images and metadata.

### High Bit Rate Audio

Generates Dolby® formats Plus & TrueHD lossless compressed audio format.

### Image Control Tool (882E)

Web-based Image Control Tool for fine tuning Deep Color images.

### central administration/network control

Update and configure all networked instruments from a single computer. Fully control instrument from any network location with web browser or Telnet client.

### HDMI + DVI Analyzer (882E with analyzer)

Single link analyzer (up to 150 MHz) for measuring source timing & pixel errors and emulated EDIDs. Include formatted reports.

### HDCP including compliance test

Production keys included with HDMI and DVI signals. Runs HDCP compliance test (optional with 882EA).

**Now approved by DCP**

### Script SDK

API for developing custom images and applications for automated control..

### analog video (optional, not available with 882E with analyzer)

Up to 250 MHz.

### CEC

Interactive Troubleshooting Environment (ITE) for CEC development (optional with 882E and 882EA). Test Management Environment (TME) for CEC compliance (optional with 882EA).

### Auxiliary Channel Analyzer (ACA) (882E/EA only)

Monitor DDC, HDCP, CEC and EDID transactions

### comprehensive timing + patterns

Includes extensive library of standard timings and patterns. Add your own custom timings and patterns.

### local pattern storage

Store multiple custom images (.bmp, .jpg and .png) images in instrument.

### easy to use

Access powerful features easily using intuitive user interface.

### DUT-based setup

Specify device under test to automatically set up instrument.

### multiple configurations

Save and restore different instrument configurations for different users or applications.

### EDID compliance test

Run basic EDID testing on sink devices.

Supports HDMI-approved EDID compliance test for CTS 1.4

# 882E/882EA HDMI

**STANDARD FEATURES****Video Pattern testing****Formats**

Number of formats	Over 580 formats for testing IT, CE, military and other display test applications
Standards	CEA-861E; VESA
Deep Color	24/30/36-bit/pixel 4:4:4 RGB / YCbCr

**Patterns**

Number of patterns	More than 320 patterns
Pattern file type	Custom object (.o) files, BMP, JPEG, PNG
Internal data storage	15 MB

**Audio pattern tests**

Test	Pattern
Sound Pressure & Main Speaker	Pink noise 500-2KHz
Frequency Response	20-20KHz
Speaker Distortion	Sine wave 63 Hz, 125Hz, 1kHz, 4kHz
Early Reflections	Impulse
Polarity of speaker wires	Polarity
Sound Convergence	Autotime Delay

**OPTIONAL OUTPUTS****HDMI 1.3 Transmitter (Tx)**

Pixel rate	165MHz, 225MHz TMDS rate with deep color
Deep color	8, 10, 12 bit/component
HDMI 1.4a 3D Testing	Standard test patterns and 3D custom bitmaps. Frame Packing, Side-by-side, Top-and Bottom, Line Alternative, L+Depth
x.v. Color	wide gamut color
High bit rate audio	Dolby & DTS lossless compressed formats
Programmability	timing, patterns, automation
EDID 1.4 Compliance Test	for HDMI sinks approved test tool for HDMI ATCs

**Analog Transmitter**

Component	up to 250MHz
Composite	NTSC and PAL

**OPTIONAL HDMI TRANSMITTER FEATURES**

CEC debug utility	Integrated Troubleshooting Environment (ITE)
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**HDMI Analyzer (2 HDMI Tx ports and 2 HDMI Rx ports)**

HDMI Sink Test	Analyze deep color sources Measure source timing Test for pixel errors Test HDMI cables
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**OPTIONAL HDMI ANALYZER FEATURES**

CEC debug utility	Integrated Troubleshooting Environment (ITE)
CEC 1.4 Compliance Test	Test Management Environment (TME) (includes ITE) approved test tool for HDMI ATCs
HDCP CTS 1.2 Compliance Test	For sources, sinks and repeaters approved test tool by DCP

**General Specifications**

Size (mm)	330 W, 87 H, 284 D
Humidity	30 to 80% RH (non-condensing)
Operating temp.	0 to 40° C
AC Mains	
Frequency	47 to 63 Hz
Voltage	90-264 VAC

**HDMI (included with HDMI 1.3 option)**

Connector	One HDMI Type A
TMDS (single link)	225MHz clock; 2.25 Gb/s link rate

Video	
TMDS protocols	DVI 1.0 and HDMI 1.3
Encoding	RGB or YCbCr (only RGB in DVI mode)
Sampling modes	4:4:4 or 4:2:2 (only 4:4:4 in DVI mode)
Color depth (HDMI)	24/30/36-bit 4:4:4 RGB / YCbCr 16/20/24-bit 4:2:2 YCbCr
Color depth (DVI)	24-bits per pixel RGB 4:4:4
Clocks per pixel	1 or 2
Pixel repetition	1 to 10 using interactive test image
TMDS differential swing	150-1560 mVp-p (programmable)
Quantization modes	Full with optional gamma correction ITU-R BT.709-5 Part 1, Sec 6.10 SMPTE 296M Sec 7.12 under/overshoot

Colorimetry	Legacy HDTV SMPTE 260M-1999 Table 1, ITU-R BT.601-5 Sec 3.5.1 and ITU-R BT.709-5 Sec 4.2-1125 xvYCC 601 & xvYCC 709 for x.v.Color
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Content fitting methods	All AFD cases (Shoot & Protect, Overscan, Under-scan, Letterbox/Pillarbox, Anamorphic Squeeze)
Aspect ratio	
Content	4:3, 14:9, 16:9
Embedded	4:3, 16:9
Format (coded)	4:3, 16:9
Format timings	All EIA/CEA-861-D formats All E-EDID sink-requested < 165 MHz

Data (island) packet generator types	General control packet, audio samples, ACR data, InfoFrames, null frame
InfoFrame types	AVI, SPD, AUD, MPG, GIF (generic)

Audio	
Streams	4
Channels	8
Bits per sample	16, 20, 24
Sampling rates	32.0, 44.1, 48, 88.2, 96.0, 176.4, 192 kHz
Stream type	IEC 60958-3 Consumer LPCM Dolby Digital, Dolby Digital Plus, Dolby TrueHD Other audio formats with external source

Audio content	FL, FR, LFE, FC, RL, RR, RC, FLC, FRC, RLC and RRC
Mixer mux	Sinewave or external audio

Embedded sonic data generator	
Channels	8
Waveform	Sinewave
Amplitude	-96.3 to 0.0 dBFS
Frequency Change	20 Hz to 20 kHz
Controls	Mute, amplitude, frequency

External audio interface	
Type	SPDIF input (coaxial)
Amplitude	As received
Connector	BNC with special SPDIF I/O
Cable	75 ohm coax cable

**DVI**

Connector	HDMI output with HDMI-to-DVI cable
Encoding	RGB (4:4:4 with 8-bits/component)
TMDS differential swing	150-1560 mVp-p (programmable)

**Analog Composite (included with analog video option; not available with 882E analyzer)**

Connectors	CVBS (BNC) and S-Video
Encoding	NTSC and PAL
Sample rate	24.55-29.50 MHz
Pixel rate	12.27-14.75 MHz
Pixel aspect ratio	Standard or square
Swing	1000 mVp-p fixed with programmable calibration
Calibration	self-calibration with internal reference

**Analog Component (included with analog video option; not available with 882E analyzer)**

Connector	VGA
Color encoding	RGB, YPbPr (unfiltered)
Video levels	
Video swing	0-1000 mV
Sync swing	0-400 mV (bi-level), 0-800 (tri-level)
Video setup	0-100 IRE
Calibration	Self-calibration with internal reference
Protection	Buffered with 75 ohm isolation
Internal data storage	15 MB

**Digital Sync**

Outputs	HS, VS and Special Sync
Swing	> 2V fixed into 75 ohm

**Pixel Clock**

Frequency range	
Analog component	5.16-250 MHz
HDMI	25-165 MHz (single-link)
DVI	25-165 MHz (single-link)
Step	Less than 0.1 Hz
Accuracy	50 ppm (electronically adjustable to <5 ppm with external frequency counter)

**Horizontal Timing**

Frequency range (kHz)	
Analog composite	15.734 or 15.625
HDMI / DVI	8-1000
Total pixels (max)	65,535
Active pixels (max)	4096
Active pixels 882EA (max)	2048
Blank pixels (min)	
HDMI	14 (minimum)
DVI	12 (minimum)
Step pixels	
HDMI	1
DVI	1

**Vertical Timing**

Frequency range	1-650 Hz
Total lines (max)	4095 progressive, 8193 interlaced and segmented
Active lines (max)	4096
Blank lines (min)	1 to Total-1
Step lines	1
Scan types	Progressive, interlaced, segmented
Composite sync types	ORed, Serrated, Serrated and Equalized, Tri-level

**Video Memory**

Size	16,384,000 pixels at 32-bits/pixel 32,768,000 pixels at 8-bits/pixel
Maximum width	16,384 pixels at 32 bits/pixel 16,384 pixels at 8 bits/pixel
Color depth	36 bit up to 165 MHz 32 (24-bit TrueColor) up to 250 MHz 8 bits up to 250 MHz

**Administration**

Physical user interface (selection keys and display)	
Control interfaces	RS-232 serial AT 10/100 BaseT Ethernet (TCP/IP, FTP, Telnet) GPIB
Browser-based virtual control panel to manage from any network location	
Create custom Microsoft Windows-based applications using Quantum Data SDK (includes API documentation, sample application & source)	
PCMCIA slot	Compact Flash card to boot generator, backup generator configuration, copy generator configuration to other generators, and store patterns



## ANALYZER OPTION

**Overview**

Use the DVI and HDMI analyzer option to test HDMI 1.3 deep color source products, such as set-top boxes, DVDs as well as repeaters and cables. Source product manufacturers will find this option invaluable for verifying signal quality, timing, color encoding, and E-EDID/E-DDC/HPD-related behavior.

The analyzer option adds a digital video receiver to the base instrument. This receiver emulates a sink device (display), while the generator output emulates a source (host) device. The receiver presents an on-the-fly reprogrammable E-EDID to the source, and analyzes incoming video for data errors and timing anomalies. The receiver can analyze video from the instrument itself or from an external source. Results can be displayed on the instrument's front panel or issued as formatted reports.

The HDMI and DVI analyzer option passes through the incoming digital signal to the HDMI Tx interfaces, which can be connected to a HDMI display for monitoring incoming content. The displayed image rendered identically as the source on a pixel per pixel basis. The analyzer also routes incoming audio to a SPDIF output, which can be connected to an external digital speaker or audio analyzer.

Signal quality can be measured without meticulous inspection of a display screen. The analyzer accepts standard QDI-BCM pseudo-random noise test patterns, which allow overall signal quality to be measured and expressed in simple objective terms. In cases where the analyzer is connected to a video source that does not support the rendering of pseudo-random noise data, a pixel error measurement technique can be alternately used, which counts flickering pixels in still-frame test images. Detailed pixel-by-pixel analysis is also supported for checking color encoding, scaling, and masking in test images.

Timing can be measured, independent of video content. The signal analyzer manager can be used to check several timings and obtain HTML report.

The analyzer option is also excellent for finding problems with repeaters, cables, cable extenders, and distribution systems. Everything needed to test transmission systems from end-to-end, using pseudo-random noise or test images, is now available in a single instrument.

The analyzer optionally supports CEC compliance testing with the Test Management Environment (TME). The TME application is used for testing CEC compliance in the HDMI Authorized Test Centers.

The analyzer optionally supports HDCP compliance testing enabling developers of HDMI products to perform fast, comprehensive HDCP compliance test. on sources, sinks or repeaters, in accordance with the HDCP compliance test specification. The HDCP compliance test application has been approved by Digital Content Protection (DCP).

**Signal Analyzer Features**

> **EEPROM Emulator** emulates an EEPROM (up to 8 blocks) with rapid on-the-fly re-programmable E-EDID for testing how source devices respond to different sink devices.

> **EDID Editor.** Supports acquisition, editing and emulation of EDIDs including CEA extension block.

> **Hot-Plug Generator** generates hot-plug events in concert with E-EDID changes.

> **Timing Analyzer** measures timing of external video signal.

Measurements: pixel rate, fields-per-frame, H and V rate/total/active, sync delay/width/polarity/ H-to-V alignment

Machine Unit Accuracy: zero tolerance

Frequency Accuracy: < 0.3%

> **Pixel Data Analyzer** measures pixel values and detects flickering pixels in user-defined region of 1024 square pixels.

Error Tallies: pixel errors (in static images)

Tally Range: 0 to 4095

> **Packet Analyzer** displays InfoFrame, general control, audio sample, ACR, and generic data along with audio channel status and errors.

> **Pseudo-Noise Analyzer:**

Noise type accepted: QDI-BCM

Error Tallies: Errors by channel (0, 1, and 2), total

pixel errors, floating-point pixel error rate (in errors per-billion)

Tally Range: 0 to 4095

PN Error Memory: One expected and one measured 24-bit value

> **HDMI TX** ports are used for monitoring incoming HDMI signal.

> **SPDIF** out port is used to extract audio embedded in incoming HDMI stream.

**Signal Generator Feature Extensions**

The analyzer option enables these transmitter related features:

> **HDCP** for functionally testing content protection protocol (production key is provided). Also supports HDCP Compliance Testing (option) in accordance with HDCP Compliance Test Specification.

> **CEC Testing (optional).** Integrated Troubleshooting Environment (ITE) supports debug testing during development and the Test management Environment (TME) supports CEC Compliance Testing.

> **Pseudo-Noise Generator:**

Noise Type Generated: QDI-BCM (source code provided)

Sequence Length: manually set from 4 to  $(2^{31}-1)$  pixels or automatically set to hActive\*vActive

Bit-to-Bit Correlation: none

Noise Value Advance: manually choose between every pixel and active pixels only or automatically set to active pixels only

Sequence Repeat: continuous or stop after n=1 to 4,294,967,295 sequences

Seed Value: manually set form 0x00000001 to 0x7FFFFFFF or automatically set to 0x08000001

Re-seed Logic: via "magic" pixel value

Re-seed Period: manually set from 3 to 2,147,483,647 pixels or automatically set to hActive\*vActive

> **Analyzer-related Images:** FormatRx, PacketRx, ErrorRx HDMI Hardware

> **Transmitter:** Sil9134

**Links:** Single

**CEC:** Consumer Electronics Control

**Audio:** 8-Ch L-PCM programmable sinewave (frequency and amplitude) at 32, 44.1, 48 88.2, 96, 176.4 and 192 kHz

> **Receiver:** Sil9135

**Links:** Single

Specifications are based on hardware and firmware revisions available as of March 2010, and are subject to change without notice. HDMI, the HDMI logo and High-Definition Multimedia interface are trademarks or registered trademarks of HDMI Licensing LLC.

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