



quantumdata

VIDEO TEST INSTRUMENTS

Introducing the latest video test instrument from Quantum Data, the 881E/882E/EA. The HDMI interface supports the latest HDMI 1.3 standard, with up to 36-bit/pixel (12-bit/component) Deep Color mode for the entire range of CEA-861-D formats. The 882EA is equipped the analyzer functionality for testing HDMI 1.3 source devices.



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.

Image Control Tool (882E/EA)

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 (882EA only)

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).

graphics SDK

Create complex patterns based on your specifications using C++ software development kit.

analog video

(optional, not available w/ 882EA)
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

Include 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 & restore different instrument configurations for different users or applications.

881E/882E/EA

HDCP	
HDMI and DVI	Authentication and encryption of uncompressed HDMI and DVI signals
HDMI InfoFrames (882 only)	
HDMI	Verify InfoFrames sent to display
HDMI Pixel Repetition (882 only)	
HDMI	Test gaming formats with variable horizontal resolution
HDMI Active Format Descriptor (AFD) (882 only)	
HDMI	Verify HDMI content mapping
HDMI Audio Tests	
Rate	Vary audio sampling rate to test sink handling
Frequency	Vary audio frequency to test sink handling
Amplitude	Vary audio amplitude to test sink handling
EDID Read	
HDMI, DVI, VGA	Auto-configuration of generator format list
Data channels	
Physical	I2C per VESA E-DDC
Protocols	DDC2B, E-DDC & DDC/CI (reads E-EDID Ver 1.3)
EDID Testing	
HDMI, DVI, VGA	Reads EDID from display and presents as displayed image
EDID Compliance Testing (882 only)	
HDMI	HDMI EDID processing
DV Swing Test	
HDMI, DVI	Vary TMDS digital video signal swing in 4mV increments from 150 to 1560 mVp-p (programmable)
Scrolling Image Test	
All interfaces	Scroll any static image
Special Sync Tool	
	Trigger scope or inspection camera anywhere in video
Formats	
Format file types	XML
Standard formats	Over 580 formats for testing IT, CE, military and other display test applications
Custom formats	Graphical format editor
Patterns	
Pattern file types	Custom object (.o) files, BMP, JPEG, PNG
Standard patterns	Over 320 standard static and dynamic images included for testing CRTs and FPDs
Custom patterns	Graphics SDK to create complex patterns
Internal data storage	15 MB
Test Sequences	
	Create test sequences with unlimited number of steps; each step defines a video format, image, sync, gating and duration (0.1 sec to 24 hours, or frames)

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 w/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
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, 92, 176.4, 192 kHz
Stream type	IEC 60958-3 Consumer LPCM (IEC61937 possible with external source)
Audio content	FL and FR
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 w/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 w/ 882EA)	
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 w/programmable calibration
Calibration	self-calibration w/ internal reference

Analog Component (included with analog video option; not available w/ 882EA)	
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
Blank pixels (min)	
HDMI	14 (minimum)
DVI	12 (minimum)
Step pixels	
HDMI	1
DVI	1

Vertical Timing	
Frequency range	
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



quantumdata

ANALYZER OPTION (882EA)

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.

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:** SiI9134

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:** SiI9135

Links: Single

Specifications are based on hardware and firmware revisions available as of May 2007, 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.

Revised 05/24/07