



quantumdata

VIDEO TEST INSTRUMENTS

The Quantum Data 882C is programmable test instrument packed with features for video and audio testing of HDMI[®] sources, sinks and repeaters. The 882C is equipped with an HDMI 1.1 transmitter, component analog output up to 250MHz and a composite analog output for testing NTSC and PAL TVs. (NEW!) The HDMI output also supports 3D testing in accordance with HDMI 1.4a standard. The 882C can optionally be equipped with a single link SDI output.

The 882C also supports an HDMI analyzer option for testing timing and video on HDMI source devices. Industry approved compliance test tools for CEC and EDID are available along with an HDCP compliance test application.

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

KEY FEATURES + BENEFITS

HDMI + DVI output

Single link (up to 165 MHz) HDMI and DVI in same instrument.

HDMI + DVI Analyzer (882 only)

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

HDCP including Compliance Test

Production keys included with HDMI and DVI signals. Runs HDCP Compliance test.

CEC including Compliance Test

Utilities for development and compliance.

EDID compliance test

Run basic EDID testing on sink devices. Supports HDMI-approved EDID compliance test for CTS 1.4

Auxiliary Channel Analyzer (ACA)

Monitor DDC, HDCP, CEC and EDID transactions

Component Analog

Up to 250 MHz.

Composite Analog

NTSC and PAL.

SDI / HD-SDI (Optional)

Single link.

comprehensive timing + patterns

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

easy to use

Access powerful features easily using intuitive user interface.

central administration

Update and configure all networked instruments from a single computer.

network control

Fully control instrument from any network location with web browser or Telnet client.

graphics SDK

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

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.

local pattern storage

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



881 / 882C

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

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 &	Pink noise
Main Speaker	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 1.1 Transmitter (Tx)**

Pixel rate	165MHz
Deep color	8 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
Compressed audio	Dolby & DTS compressed formats
Programmability	timing, patterns, automation
EDID 1.4 Compliance	for HDMI sinks approved test tool for HDMI ATCs
Test	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 HDMI 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	Test Management Environment (TME)
Compliance Test	(includes ITE) approved test tool for HDMI ATCs

HDMI

Connector	Two (2) HDMI Type A
Links	Single (165 MHz)
Video	
TMDS protocols	DM 1.0 and HDMI 1.2
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)
Bits/component	8, 10 or 12 (only 8 in DVI mode)
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, Over-scan, 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-C formats All E-EDID sink-requested < 81 MHz

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

Audio	
Streams	4
Channels	8
Bits per sample	16
Sampling rates	32.0, 44.1, 48, 88.2, 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	4
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	VGA w/special SPDIF I/O
Cable	75 ohm special VGA-to-RCA

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

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 with internal reference

SDI / HD-SDI (Optional)

Connector	BNC 75 ohm
Links	Single
Bit stream	1.485 Gb/s and 1.485/1.001 Gb/s
Sampling mode	4:2:2
Bits/component	10-bits/component
Encoding	YCbCr
Signal swing	800mV
Standards	SDI - SMPTE 259M-C; HD-SDI - SMPTE 292M

Analog Component

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	3.9975–250 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 component	8–1000
Analog composite	15.734 or 15.625
HDMI	8–1000
DVI	8–1000
Total pixels (max)	65,535
Active pixels (max)	4096
Blank pixels (min)	
Analog component	0
HDMI	138 (worst case)
DVI	128

Step pixels	
Analog component	1 (2 above 165 MHz)
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	8,192,000 pixels at 32-bits/pixel 32,768,000 pixels at 8-bits/pixel
Maximum width	4096 pixels at 32 bits/pixel 16,384 pixels at 8 bits/pixel
Color depth	32 (24-bit TrueColor) up to 200 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 (882 only)
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 (882 ONLY)

Overview

Use the DVI and HDMI analyzer option to test source products, such as set-top boxes, 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 converts the incoming digital signal to an analog signal, which can be connected to an analog display for monitoring incoming content. 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 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 tests 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.
- > 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
 - Calibration: Pattern with known number of errors (PRN_5 or PRN_9)
- > AV Port for monitoring incoming HDMI signal, which is output as YPbPr component analog video and SPDIF digital audio.
- > HDCP for functionally testing content protection protocol (production key is provided). Also supports HDCP Compliance Testing in accordance with HDCP Compliance Test Specification.
- > CEC Testing. Integrated Troubleshooting Environment (ITE) supports debug testing during development and the Test management Environment (TME) supports CEC Compliance Testing.

Signal Generator Feature Extensions

The analyzer option enables these transmitter-related features:

- > E-EDID Compliance Tester checks E-EDID of an HDMI sink device for compliance with VESA, CEA, and HDMI standards.
- > 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, PRN_5, PRN_9

HDMI Hardware

- > Transmitter: SiI9030
 - 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: SiI9031
 - Links: Single
- > AV Port
 - Analog video output
 - SPDIF digital audio input and output

Specifications are based on hardware and firmware revisions available as of March 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.

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