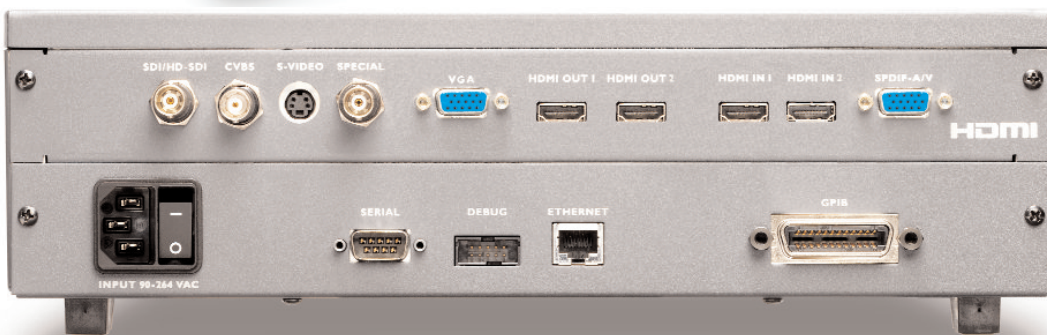




## VIDEO TEST INSTRUMENTS

Introducing the latest video test instruments from Quantum Data for testing analog and digital video display devices. The 881 provides features for testing video displays in production environments. The 882 is its complement. It provides extended features to test video displays for development environments and quality assurance applications. Now with CEC support.



## KEY FEATURES + BENEFITS

### 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.

### HDMI + DVI

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 and pixel errors. Include formatted reports.

### CEC

Utilities for development and compliance.

### HDCP

Production keys included with HDMI and DVI signals.

### 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.

### 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.

# 881 / 882C

<b>HDCP</b>	
HDMI and DVI	Authentication and encryption of uncompressed HDMI and DVI signals

<b>HDMI InfoFrames (882 only)</b>	
HDMI	Verify InfoFrames sent to display

<b>HDMI Pixel Repetition (882 only)</b>	
HDMI	Test gaming formats with variable horizontal resolution

<b>HDMI Active Format Descriptor (AFD) (882 only)</b>	
HDMI	Verify HDMI content mapping

<b>HDMI Audio Tests</b>	
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

<b>EDID Read</b>	
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)

<b>EDID Testing</b>	
HDMI, DVI, VGA	Reads EDID from display and presents as displayed image

<b>EDID Compliance Testing (882 only)</b>	
HDMI, DVI, VGA	HDMI EDID processing

<b>DV Swing Test</b>	
HDMI, DVI	Vary TMDS digital video signal swing in 4mV increments from 150 to 1560 mVp-p (programmable)

<b>Scrolling Image Test</b>	
All interfaces	Scroll any static image

<b>Special Sync Tool</b>	
Analog video	Trigger scope or inspection camera anywhere in video

<b>Formats</b>	
Format file types	XML
Standard formats	Over 200 formats for testing IT, CE, military and other display test applications
Custom formats	Graphical format editor

<b>Patterns</b>	
Pattern file types	Custom object (.o) files, BMP, JPEG, PNG
Standard patterns	Over 200 standard static and dynamic images included for testing CRTs and FPDs
Custom patterns	Graphics SDK to create complex patterns
Internal data storage	15 MB

<b>Test Sequences</b>	
	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)

<b>General Specifications</b>	
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

Specifications and features are subject to change without notice.

<b>HDMI</b>	
Connector	Two (2) HDMI Type A
Links	Single (165 MHz)

Video	
TMDS protocols	DM 1.0 and HDMI 1.1
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 ration	
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

<b>DVI</b>	
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)

<b>Analog Composite</b>	
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

<b>Analog Component</b>	
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

<b>Digital Sync</b>	
Outputs	HS, VS and Special Sync
Swing	> 2V fixed into 75 ohm

<b>Pixel Clock</b>	
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)

<b>Horizontal Timing</b>	
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

<b>Vertical Timing</b>	
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

<b>Video Memory</b>	
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

<b>Administration</b>	
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 re-programmable 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.

**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).

**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 from 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