



quantumdata

VIDEO TEST INSTRUMENTS

Generate and optionally analyze video signals associated with the design, manufacture and service of computer, consumer, medical, military and other video products. Now provides signal link HDMI 1.1 and single link DVI in the same instrument.

Now ATC-Certified for HDMI 1.1



KEY FEATURES + BENEFITS

management

Update and configure all networked instruments through a graphical management program (VGM) from your computer.

HDMI with DVI support

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

HDMI Analyzer with DVI support

Single link HDMI analyzer (up to 150 MHz) with single link DVI analyzer for measuring source timing and pixel errors.

Dual link DVI

Dual link (up to 330 MHz).

Dual link DVI Analyzer

Dual link DVI analyzer for measuring source timing and pixel errors.

LVDS

Open LDI/FPD-link to 224MHz

HDCP

Production test keys included with HDMI and DVI signals. Now supports full Dual link DVI HDCP.

comprehensive timing +

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

802R/802BT

APPLICATION TESTS

HDCP

HDMI and DVI	Authentication and encryption of uncompressed HDMI and DVI signals
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HDMI InfoFrames

HDMI	Verify InfoFrames sent to display
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HDMI Pixel Repetition

HDMI	Test gaming formats with variable horizontal resolution
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HDMI Active Format Descriptor (AFD)

HDMI	Verify HDMI content mapping
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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
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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
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EDID Compliance Testing

HDMI, DVI, VGA	HDMI EDID processing
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DV Swing Test

HDMI, DVI	Vary TMDS digital video signal swing in 4mV increments from 150 to 1560 mVp-p (programmable)
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Scrolling Image Test

All interfaces	Scroll any static image
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Special Sync Tool

Analog video	Trigger scope or inspection camera anywhere in video
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Formats and Images

Standard formats	Over 200 formats for testing IT, CE, military and other display test applications
Custom formats	VGM with graphical format editor

Patterns	
Pattern file types	BMP downloads through USB
Standard patterns	Over 200 standard static and dynamic images included for testing CRTs and FPDs
Custom patterns	VGM with graphical image editor
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)
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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

Specifications and features are subject to change without notice.

SPECIFICATIONS

HDMI

Connector	One (1) 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
	All AFD cases (Shoot & Protect, Over-scan, Under-scan, Letterbox/Pillarbox, Anamorphic Squeeze)

Content fitting methods	
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-B formats
	All E-EDID sink-requested < 81 MHz

Data (island) packet	General control packet, audio samples,
generator types	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	DVI dual link (R only)
Links	Single link or dual link up to 25-330MHz
TMDS protocols	DM 1.0
Encoding	RGB (4:4:4 with 8-bits/component)
TMDS differential swing	150–1560 mVp-p (programmable)

LVDS

Connector	MDR-36
Links	Single link: 32.5 to 112MHz
	Dual link: 112 to 224MHz

Analog Composite

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

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	3.9975–400 MHz (R) - 200MHz(BT)
HDMI	25–165 MHz (single-link)
DVI	25–165 MHz (single-link)
	25-330 MHz (dual-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, interfaced, segmented
Composite sync types	ORed, Serrated, Serrated and Equalized, Tri-level

Video Memory

Configuration	4096 x 4096 x 8-bit indexed color
	2048 x 2048 x 24-bit TrueColor
Color depth	32 (24-bit TrueColor) up to 100 MHz for 802R-400; up to 82.5MHz for 802BT/R-300
	8 bits up to 200, 300 or 400 MHz

Administration

Physical user interface (selection knobs and keys with LCD display)	
Control interfaces	RS-232 serial, USB, GPIB
Create custom Microsoft Windows-based applications using Quantum Data SDK (includes API documentation, sample application & source)	
USB port	Download bitmap image files
PCMCIA slot	Backup settings, transfer settings from one generator to another, and store bitmap images for rapid recall using standard SRMA card.



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ANALYZER OPTION

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 connected monitor or generator LCD.

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 "delta 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: delta 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 $hActive \times vActive$
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 0xFFFFFFFF 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 $hActive \times vActive$
- > **Analyzer-related Images:** FormatRx, PacketRx, ErrorRx, EdidHDMI, PRN_5, PRN_9, DeltaErr

DVI Hardware

- > **Transmitter:** Si168 (single or dual-link)
- > **Receiver:** Si169 (single or dual-link)

HDMI Hardware

- > **Transmitter:** Si9030
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:** Si9031
Links: Single
- > **AV Port**
Analog video output
SPDIF digital audio input and output

Specifications are based on hardware and firmware revisions available as of September 2005, 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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