

# Video Test Equipment

All monitors serve as a video and audio signal processor. A high resolution, high performance monitor must process the input and output signals correctly and the Video Pattern Generator is the tool to test the video signals. It provides test screens of international standard signals to input to the monitor for performance check and for calibrating the focus, resolution, contrast and geometric distortion. Accuracy is essential since the signals sent by Video Pattern Generators are conceived as the standard.

Color Analyzer tests the color presentation of a monitor using the advanced microprocessor and technology of photoelectric conversion. With accurate optical element and circuit design, it is able to measure the photo energy ejected from the panel and calibrate chromaticity, luminance, brightness and white balance via graphical control software to adhere to international standard.

For large displays, the Front Projector Auto Test System is capable of testing the optical properties of LCD, DLP and LCOS projectors. This system uses advanced microprocessor and accurate photo element with integrated video pattern generator. All users need is to press the Measure button once; it will measure all ANSI items simultaneously via multiple dots for acceptance judgment and then save it into file within seconds.

## Selection Guides

Analog Video Pattern Generator (VPG)

HDTV Video Pattern Generator (VPG)

RF Video Pattern Generator (VPG)

True Color Video Pattern Generator (VPG)

TV/HDTV Video Pattern Generator (VPG)

Video Signal Box

Digital Video Distributor

Color Analyzer

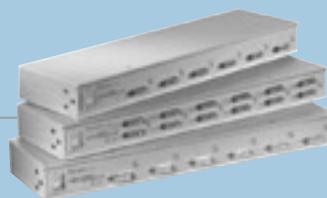
Front Projector ATS

Display Multi probe ATS

## VIDEO PATTERN GENERATOR



Video Signal Box



Digital Video Distributor



Video Pattern Generator

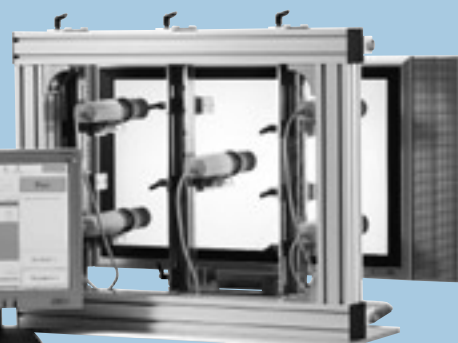
## COLOR ANALYZER



Display Color Analyzer



Front Projector ATS



Display Multi-probe ATS

Video Pattern Generator Selection Guide

TYPE	Model	Analog	Digital				DTV		TV							PAGE
			DVI (TMDS)	HDMI	LVDS	TTL	SDTV	HDTV	NTSC	PAL	SECAM	RF	HDCP	AUDIO	I/O	
Programmable	2226	250MHz	165MHz				V	V							RS-232	<a href="#">7-3</a>
	2227	250MHz	165MHz				V	V	V	V	V		V	V	RS-232	<a href="#">7-5</a>
	2237	360MHz	330MHz				V	V	V	V	V		V	V	RS-232	<a href="#">7-4</a>
	2228	250MHz	165MHz		224MHz	200MHz	V	V	V	V	V		V	V	RS-232	<a href="#">7-7</a>
	2230	250MHz	165MHz	150MHz			V	V	V	V	V	V	V	V	RS-232	<a href="#">7-13</a>
	2231	250MHz	165MHz	150MHz			V	V	V	V	V		V	V	USB, RS-232	<a href="#">7-15</a>
	22291	250MHz	165MHz	150MHz			V	V	V	V	V		V	V	RS-232	<a href="#">7-9</a>
	22293	250MHz	330MHz	* 165MHz			V	V	V	V	V		V	V	USB	<a href="#">7-11</a>
Non-Programmable	2326	250MHz	165MHz				V	V							RS-232	<a href="#">7-3</a>
	2327	250MHz	165MHz				V	V	V	V	V		V	V	RS-232	<a href="#">7-5</a>
	2337	360MHz	330MHz				V	V	V	V	V		V	V	RS-232	<a href="#">7-4</a>
	2328	250MHz	165MHz		224MHz	200MHz	V	V	V	V	V		V	V	RS-232	<a href="#">7-7</a>
	2330	250MHz	165MHz	150MHz			V	V	V	V	V	V	V	V	RS-232	<a href="#">7-13</a>
	2331	250MHz	165MHz	150MHz			V	V	V	V	V		V	V	USB, RS-232	<a href="#">7-15</a>
	23291	250MHz	165MHz	150MHz			V	V	V	V	V		V	V	RS-232	<a href="#">7-9</a>
Economy	2401	165MHz					V	V	V	V	V			V	USB	<a href="#">7-17</a>
	2402	165MHz	165MHz	165MHz			V	V					V	V	USB	<a href="#">7-17</a>

\* TMDS Rate 225MHz

# Selection Guides

Distributor Selection Guide					
Distributor	Model	Signal Interface			PAGE
		DVI (TMDS)	HDMI	LVDS	
	28101			V	7-21
	28102			V	7-21
	28111	V			7-21

Audio/Video Signal Box Selection Guide									
Audio/Video Signal Box	Model	Output Signal							PAGE
		D-SUB	YPbPr	D-Terminal	SCART	CVBS	S-Video	Audio	
	A222701							V	7-19
	A222702	V	V	V	V				7-19
	A222704	V	V	V	V	V	V	V	7-20

# Programmable Video Pattern Generator

Model No.

## 2226/2326



ANALOG



- Optional memory card expansion for unlimited data storage
- Standard RS-232 interface
- ESD protection circuit
- CE marking

## Programmable Video Pattern Generator

Model 2226/ 2326

Analog 250 MHz

DVI (TMDS) 165 MHz

### KEY FEATURES

- Analog video pixel rate up to 250 MHz
- Support DFP interface standards up to 165 MHz
- Large graphic display size up to 2408x2048 (4096x2048 optional)
- All timing parameters are fully programmable in one-pixel resolution
- Satisfactory color display performance up to 256 colors
- Natural picture for total color balance check
- Factory-installed standard pattern and timing library
- Screen drawing includes blinking and motion picture function
- DDC2B communication pin embedded in DVI connector
- Power saving mode test capability

Chroma 2226 & 2326 Video Pattern Generators combine the Analog and DVI (TMDS) as their output with the frequency (Analog 250MHz and DVI 165MHz) meets the multimedia and video requirements. They follow the VESA standard of United States and support the digital output resolution up to UXGA (1600 X 1200). The built-in software 2226 allows users to recall and edit test application of different video frequencies, video levels, timing parameter, pattern and color. Moreover, the included timing parameters and graphics make the monitor inspection more convenient. The complete functions of one pixel resolution, 256 colors support, dynamic display, and DDC2B read/write are most applicable to the video related products like Analog CRT, Digital CRT, LCD Monitor, and Projector in development, manufacturing and quality assurance.

The Chroma Model 2226 / 2326 series are programmable, microprocessor-based instrument for testing high resolution CRT or monitor, display monitor, projectors, and video printers. The instrument is capable of generating sophisticated video graphic display with 256 colors selection on every pixel. All horizontal and vertical timing parameters are fully programmable

in one-pixel resolution. It supports the Analog RGB and DVI SIGNAL outputs for the testing need of both LCD and CRT monitor. Manufacturers of monitors, projectors, and video printers can use the video pattern generators for design characterization, engineering, incoming inspection, production testing, and product demonstration.

The instrument provides a high integration digital CRT or LCD monitor testing. With a full DVI single link bandwidth of 25-165 MHz, the instrument supports resolutions up to SXGA (1280 x 1024) at 85Hz refresh, or UXGA (1600 x 1200) at 60Hz refresh.

In test application, the user can program and display various timing/pattern combinations on the monitor in an automatic sequencing mode or in a manual control mode. The screen drawing, including blinking function and motion picture, makes you operate more easily and friendly. The instrument can be operated using the front panel keypad or from the remote controller via RS232.

The Chroma Model 2326 is designed to generate video graphic patterns and timing formats which has been programmed into a memory card from PC or any Chroma 2226 series video pattern generators. Also, the operation can be programmed and controlled from PC through RS-232 interface.

### SPECIFICATIONS

#### MODEL

2226/2326

#### GRAPHIC DISPLAY

2048 x 2048

4096 x 2048 (optional)

#### SCAN MODE

Non-interlace / Interlace & Video Sync

#### HORIZONTAL TIMING

**Total Pixels:** 128 - 8192 pixels

**Resolution:** 1 pixel

**Sync Width:** 16-8191 pixels

**Resolution:** 1 pixel

**Sync Position:** Leading edge in blanking period

#### VERTICAL TIMING

**Total Pixels:** 6-4096 lines (non-interlace)

6-2047 lines (interlace)

**Resolution:** 1 line

**Sync Width:** 1 - 4095 lines (non-interlace)

1 - 2046 lines (interlace)

**Resolution:** 1 line

**Sync Position:** Leading edge in blanking period

#### ANALOG OUTPUT

**Color:** 256 colors (1-pixel resolution)

**Video:** R.G.B (75 ohms loading)

Level : 0 - 1.0V programmable

**Sync on Green:** On/Off programmable

Level: 0 - 0.5V programmable

#### White Level:

Level: 0-1.2V programmable

Black Level: 7.5/0 IRE programmable

**Video & Sync Phase Shift:** 0 ns - 8nS

**Separate sync:** Hs,Vs,Xs(Xs can be Hs,Vs,Composite Sync) (TTL level)

#### DVI Output

**Pixel Rate Range :** 25 - 165 MHz (TMDS)  
3.126 - 250 MHz (Analog)

**DDC2B:** Read and Write to smart monitor

#### COMPOSITE SYNC

**Programmable Mode:** H+V,H Exclusive OR V,RS343A

Waveform with Equalization & Serration Pulse

#### DATA STORAGE DEVICE

**Flash Memory (Read only):** 100 timing + 100 patterns

**NVRAM (R/W):** 300 timing + 100 patterns+ 100 programs

**Memory Card(R/W):** Unlimited data storage

**Disk on PC(R/W):** Unlimited data storage

#### USER INTERFACE

LCD, Keypad, Remote (optional), special I/O, RS232

#### AC INPUT

**Auto Range:** 90-132V / 180 - 250V,47-63Hz, auto range

#### TEMPERATURE

**Operation:** +5 - +40 deg.C

**Storage:** -20 - +60 deg.C

#### HUMIDITY

20- 90%

#### DIMENSION(W x H x D)

**2226:** 430 x 133 x 380mm / 16.9 x 5.2 x 15 inch

**2326:** 318 x 100 x 320mm / 12.5 x 3.9 x 12.6 inch

#### WEIGHT

**2226:** 8.3kg / 18.27 lbs

**2326:** 4.5kg / 9.91 lbs

### ORDERING INFORMATION

**2226 :** Programmable Video Pattern Generator

Analog 250MHz/DVI 165MHz

**2326 :** Video Pattern Generator

Analog 250MHz/DVI 165MHz

**A225003 :** Remote Keypad

**A225010 :** Memoer Card (4MB in JEIDA Standard)



Model 2326

# Programmable Video Pattern Generator 2237/2337

Model No.



## Programmable Video Pattern Generator Model 2237/ 2337 Analog 360 MHz DVI (TMDS) 330 MHz

### KEY FEATURES

- Analog pixel rate up to 360 MHz and DVI (TMDS) up to 330 MHz
- Ultra fast slew rate less than 1.1ns (typical)
- One pixel resolution
- Graphic display size up to 2048x2048 (4096x2048 Optional)
- Superior frequency setting to 25ppm (typical) and 1ppm after calibration
- Natural picture with BMP format for checking total balance of color
- Factory-installed standard 100 timing and 100 patterns library
- Customer install 300 timing and 100 patterns
- Screen drawing includes blinking function and motion picture
- provide memory card for unlimited data storage (option)
- Unique analog protection circuit to prevent the damage of surge, energy and ESD.
- None-trimmer design for fully automatic calibration and keep long-term of system performance.
- DVI-I / DVI-D connect and One link / Two link support
- DDC2B: communication pin embedded in DVI connector
- Standard RS-232 interface



Chroma 2237 / 2337 Video Pattern Generator that follow the VESA and DFP Standards. They meet the high frequency digital and analog signal requirements of today and the near future to provide Video Display Device for display characteristics test. Besides the complete factory built-in test functions, 2237 allows users to edit various timing parameters and patterns from the panel or through the windows based software VPG PLUS on PC. The patterns are easier to edit when they are showed on the monitor automatically or manually via the software. This series of products provide both analog and digital signals to support the resolution above QXGA (2048 X 1536), and the DVI signal (TMDS) is able to switch automatically between 25~330MHz in 1 Link or 2 Link transmission. The transmission interface uses the DVI-I or DVI-D standard for future display and supports DDC2B standard. The features of high frequency and complete signals with test functions are the best solution for high resolution CRT and LCD monitor test in development, manufacturing and quality assurance.

Chroma 2237 is designed with precision phase lock loop (PLL) frequency synthesizer circuit (25PPM accuracy), it is capable of generating sophisticated video graphic display with 256 colors selection on every pixel. All horizontal and vertical timing parameters are fully programmable in one-pixel resolution.

The instrument has built-in software to let the user recall and edit test application of different video frequencies, video levels, timing parameters, patterns, and colors. It offers factory-installed selections of universal timing, pattern, and icon formats. Monitor testing, such as display size, pincushion, linearity, focus,

geometry, resolution, contrast, color, convergence, high voltage regulation, etc. can be performed with minimum setup.

Additionally, the instrument has built-in user programmable NVRAM device and optional memory card to let the user store his customized timing, patterns and icons for instant recall.

In test applications, the user can program and display various timing/pattern combinations on the monitor in an automatic sequencing mode or in a manual control mode. The screen drawing, including blinking function and motion picture, makes you operate more easily and friendly. It also has the power-saving mode test capability for testing your monitor's compliance with the standard of display power management. The instrument can be operated using the front panel keypad or from the remote controller via RS232.

All the features and benefits applied to the Chroma 2237 allow you to fully characterize the monitor's high-frequency performance and high-quality image. In view of the modern extremely demanding LCD and CRT monitor industry where every pixel of monitor is critical, the Chroma 2237 must be your key to success.

The chroma Model 2337 is designed to generate video graphic patterns and timing formats which has been programmed into a memory card from PC or any Chroma 2337 video pattern generators. Also, the operation can be programmed and controlled from PC through RS-232 interface.

### SPECIFICATIONS

#### MODEL

2237/2337

#### PIXEL RATE

Analog:15-360 MHz

DVI (TMDS):25-330 MHz

#### GRAPHIC DISPLAY

2048 X 2048, 4096 X 2048 ( optional )

SCAN MODE: Non-interlace / Interlace Video & Sync

#### HORIZONTAL TIMING

Horizontal Range: 1K ~ 400K Hz

#### Total Pixels:

- Width: 128 - 8192 pixels
- Resolution: 1 pixel

#### Sync:

- Width: 16 - 8191 pixels
- Resolution: 1 pixel
- Position: Leading edge in blanking period

#### VERTICAL TIMING

Vertical Range: 1Hz~10K Hz

#### Total Pixels:

- Width: 6-4096 lines(non-interlace)  
6-2047 lines(interlace)
- Resolution: 1 line

#### Sync:

- Width: 1-4095 lines(non-interlace)  
1-2046 lines(interlace)
- Resolution: 1 line
- Position: Leading edge in blanking period

#### ANALOG OUTPUT

##### Video Output

Color: 256 colors ( 1- pixel resolution )

##### Video:

- R 、 G 、 B ( 75 ohms loading )
- Level: 0 ~ 1.0 V programmable

- Resolution: 1 mV
- Accuracy:  $\pm 2mV$

#### Sync on Green:

- On / Off programmable
- Level: 0 ~ 0.5 V programmable
- Resolution: 1 mV
- Accuracy:  $\pm 5mV$

#### White:

- Level: 0 ~ 1.2 V programmable
- Resolution: 1 mV
- Accuracy:  $\pm 2mV$

#### Black Level: 7.5/ 0 IRE

Video & Sync Phase Shift: 1pixel+8nS

#### Separate Sync

Hs , Vs , Xs ( Xs can be Hs , Vs , composite Sync )

#### DVI Output

Pixel Rate Range: 25 ~ 330 MHz (TMDS)  
3.126 ~ 360 MHz (Analog)

DDC2B: Read and Write to smart monitor

#### COMPOSITE SYNC

H+V, H Exclusive OR V, RS-343A

Waveform with Equalization & Serration

#### DATA STORAGE DEVICE

Flash Memory (Read only): 100 timing + 100 patterns

NVRAM (R/W): 300 timing + 100 patterns+ 100 programs

Memory Card(R/W): Unlimited data storage

Disk on PC(R/W): Unlimited data storage

#### USER INTERFACE

LCD, Keypad, Remote (optional), special I/O, RS232

#### AC INPUT

90-132V/180-250V, 47-63 Hz auto range

#### TEMPERATURE

Operation: +5 ~ +40 deg .C

Storage: -20 ~ +60 deg .C

#### DIMENSION (W x H x D)

2237: 430 x 133X 380mm/ 16.9 X 5.2 x 15 inches

2337: 318 x 100X 320mm/ 12.5 X 3.9 x 12.6 inches

#### WEIGHT

2237: 8.7 Kgs /19.6 lbs

2337: 4.8 Kgs /10.6 lbs

### ORDERING INFORMATION

2237 : Programmable Video Pattern Generator

Analog 360 MHz/DVI 330 MHz

2337 : Video Pattern Generator

Analog 360 MHz/DVI 330 MHz

A225003 : Remote Keypad

A225010 : Memoer Card (4MB in JEIDA Standard)



Model 2337

# Programmable Video Pattern Generator 2227/2327

Model No.



## Programmable Video Pattern Generator

**Model 2227/ 2327**

**Analog 250 MHz**

**DVI (TMDS) 165 MHz**

**TV/ HDTV**

### KEY FEATURES

- Analog pixel rate 250MHz
- DVI pixel rate 165MHz
- TV(NTSC/PAL/SECAM)signal support
- S-Video output
- VBS composite output
- Bi-level SDTV format support
- Tri-level HDTV format support
- HDCP support
- Closed caption function support
- V-chip function support
- Y, Pb, Pr/Y, Cb, Cr/Y, R-Y, B-Y output
- One-pixel resolution
- Display size up to 4096x2048 max
- Picture for BMP format support
- DDC2B Read / Write
- PC remote control
- Storing data with memory cards
- Supporting Gamma calibration
- ESD protection circuit built-in



**ANALOG**

**DVI**

**TV NTSC/PAL SECAM**

**TV Close Caption**

**V-Chip**

**4:3 SDTV**

**16:9 HDTV**

Chroma 2227/2327 Video Pattern Generators not only combine the signals of analog (250MHz) and DVI (165MHz) to provide the VESA standard video signal source for LCD Monitor/CRT Monitor, it also integrates the TV (NTSC/PAL/SEAM) signal to fit in the multi-media display applications for the newly risen LCD TV, PDP TV, LCOS TV and DLP RPTV industries. Users can utilize the software application, VPG PLUS, either on PC or on the Video Pattern Generator itself to edit various timing parameters, patterns and test procedures. Its complete test functions can fully meet the requirements for R&D, production test and quality assurance in all video related industries.

### Analog/TMDS/SDTV/HDTV Signals Support

The 2227/2327 Video Pattern Generators equipped with microprocessor and precision Phase Locked Loop (PLL) circuit have accuracy up to 25PPM/1PPM after calibration are featured in high accuracy, high stability and high speed. Moreover, all of its horizontal timing parameters are in one-pixel resolution, which can provide the video signal with 256-color per pixel. For analog signal output, its pixel frequency can up to 250MHz and the RGB signals meet the RS-343A standard. It also supports Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y and sync signals for tri-level output to fulfill the test requirements for HDTV.

The digital signal is in TMDS output with pixel frequency from 25~165MHz and test screen resolution up to UXGA. Its DVI-I Connector containing digital, analog and DDC2B signals meet the DDWG DVI standard. In addition Electrostatic Discharge (ESD) and Surge are designed for protection.

As to the TV output spec, the image and chromaticity of 2227/2327 meet the regulations of NTSC/PAL/SEAM, which the output signals include VBS composite signal with BNC and Y/C (Luminance/Chrominance) image/chromaticity separation signal with S-Video output connector.

Chroma 2227/2327 Video Pattern Generators have built in rich timing files and various patterns selections to increase the product usage as well as to decrease the engineer workload for setting operation. The embedded NVRAM memory device and optional memory card allow users to save the data files of accomplished settings for recall. The parameters for output patterns and timings can be programmed by PC via RS232 and loaded to memory card via the 22xx Series VPGs, meanwhile the operation sequences can be programmed and controlled by VPGplus on PC via RS232 interface. VPGplus provides a convenient operating environment for VPG users. Users can set the VPG parameters for the data of timing, pattern, program and icon, etc.



Model 2327

### ORDERING INFORMATION

**2227** : Programmable Video Pattern Generator

Analog 250 MHz/DVI 165 MHz/TV/HDTV

**2327** : Video Pattern Generator

Analog 250 MHz/DVI 165 MHz/TV/HDTV

**A225003** : Remote Keypad

**A225010** : Memoer Card (4MB in JEIDA Standard)

**A222701** : Audio Signal Generator

**A222702** : Video Signal Box

**A222704** : Video Signal Box



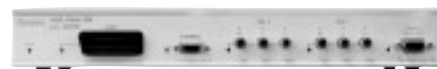
A225003



A225010



A222701



A222702



A222704



# Programmable Video Pattern Generator 2227/2327

Model No.

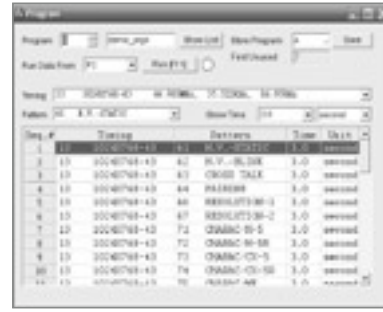
## VPG Plus Software



Timing Editor



Pattern Editor



Program Editor

## SPECIFICATIONS

### ANALOG OUTPUT

Display Size	2048 x 2048 / 4096 x 2048 (Option)
Pixel Rate Range	3.126~250MHz
Video Level	R,G,B (75 ohms) 0~1.0V programmable
Sync on Green / Level	0~0.5V On/Off programmable
White Level	0~1.2V programmable
Blank Level	7.5 IRE / 0 IRE selectable

### HORIZONTAL TIMING

Total Pixels	128~8192 pixels / 1 pixels resolution
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### VERTICAL TIMING

Total Pixels	6~4096 lines (non-interlace) 6~2047 lines (interlace) / 1 line resolution
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### COMPOSITE SYNC

H OR V, H X OR V, with RS-343A Equalization & Serration Pulse

### SEPARATE SYNC

Hs, Vs, Xs

### DVI (TMDS) OUTPUT

Pixel Rate Range	25MHz~165MHz
EDID	Read / Write / Compare / Edit
HDCP	Support HDCP V.1.0 Production-Key
Compliant	DVI 1.0 specification
Video Signal Type	RGB or YCbCr
Sampling Mode	4:4:4

### TV OUTPUT

Output Mode	NTSC	PAL						SECAM	
Subcarrier Frequency	443 4.43	M,J 3.58	BDGHI 4.43	M 3.57	60 4.43	N 4.43	Nc 3.58	4.41/ 4.25	MHz
Subcarrier Stability					±50				Hz
Video Output	Composite (BNC, RCA), S-Video Burst On/Off (NTSC, PAL) Contrast programmable Brightness programmable Saturation programmable Hue programmable								
Closed Caption Support (NTSC)	C1 ~ C4, T1 ~T4								
V-CHIP (NTSC)	MPAA Rating : G, PG, PG-13, R, NC-17, X FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA Canada English Rating : C, C8+, G, PG, 14+, 18+ Canada French Rating : G, 8 ans+, 13 ans+, 16 ans+, 18 ans+								

### SDTV FORMAT : All SDTV Timing can be programmable

Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
720 x 483	59.94P	60/1.001			SMPTE 293
			59.94I	59.94/2	ITU 601 SMPTE 170M
720 x 576	50P	50			ITU 1358
			50I	25	ITU 601

### HDTV FORMAT

Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
1920 x 1080	60P	60	60I	30	SMPTE 274
	59.94P	60/1.001	59.94I	30/1.001	SMPTE 274
	50P	50	50I	25	SMPTE 274
	30P	30			SMPTE 274
	29.97P	30/1.001			SMPTE 274
	25P	25			SMPTE 274
	24P	24			SMPTE 274
	23.98P	24/1.001			SMPTE 274
1920 x 1035			60I	30	SMPTE 240
			59.94I	30/1.001	SMPTE 240
1280 x 720	60P	60			SMPTE 296
	59.94P	60/1.001			SMPTE 296
	50P	50			SMPTE 296

### DATA STORAGE DEVICE

Flash Memory (read only)	100 timings + 100 patterns
NVRAM (R/W)	300 timings + 100 patterns + 100 programs
Memory Card (R/W)	Unlimited data storage

### OTHERS

AC Input	90~132 V / 180~250 V, 47~63 Hz auto range
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %

### DIMENSION / WEIGHT

2227	430 x 133 x 380 mm / 9.0 kg	16.9 x 5.2 x 15 inch / 19.82 lb
2327	318 x 100 x 320 mm / 5.0 kg	12.5 x 3.9 x 12.6 inch / 11.01 lb



# Programmable Video Pattern Generator

Model No.

## 2228/2328



### Programmable Video Pattern Generator

#### Model 2228/ 2328

Analog	250 MHz
DVI (TMDS)	165 MHz
LVDS	224 MHz
TTL	200 MHz
TV/ HDTV	

#### KEY FEATURES

- Analog pixel rate 250MHz
- DVI pixel rate 165MHz
- LVDS pixel rate 224MHz
- TTL pixel rate 200MHz
- TV NTSC/PAL/SECAM signal support
- S-Video / CVBS composite output
- Bi-level SDTV format support
- Tri-level HDTV format support
- HDCP support
- Closed Caption function (NTSC)
- V-Chip function (NTSC)
- Teletext function (PAL)
- Y,Pb,Pr/Y,Cb,Cr/Y,R-Y,B-Y output
- One-pixel resolution
- Display size up to 4096x2048 max
- Picture for BMP format support
- DDC2B Read / Write/Compare
- PC remote control
- Storing data with memory cards
- Supporting Gamma calibration
- ESD circuit protection built-in
- DI-D5-terminal for SDTV to HDTV



ANALOG

DVI

LVDS

HDCP

TV NTSC/PAL  
SECAM

TV Close  
Caption



Chroma 2228 / 2328 Video Pattern Generators combine the signals of analog (250MHz) and DVI (165MHz) / LVDS (224MHz) / TTL (200MHz) to provide the VESA standard video signal source for LCM / LCD Monitor / multimedia Monitor, it also integrates the TV (NTSC/ PAL / SECAM) / SDTV / HDTV signal to fit in the multi-media display applications for the newly risen LCD TV, PDP TV, LCOS TV and DLP RPTV industries.

Users can utilize the software application, VPG PLUS, either on PC or on the Video Pattern Generator itself to edit various timing parameters, patterns and test procedures. Its complete test functions can fully meet the requirements for R&D, production test and quality assurance in all video related industries.

ANALOG / DVI / LVDS / TTL / TV / SDTV / HDTV seven in one 2228 / 2328 Video Pattern Generators equipped with microprocessor and precision Phase Locked Loop (PLL) circuit have accuracy up to 25PPM/1PPM after calibration are featured in high accuracy, high stability and high speed. Moreover, all of its horizontal timing parameters are in one-pixel resolution, which can provide the video signal with 256-color per pixel.

For analog signal output, its pixel frequency can up to 250MHz and the RGB signals meet the RS-343A standard. It also supports Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y and sync signals for tri-level output to fulfill the test requirements for HDTV.

The digital signal is in DVI/LVDS/TTL output, the pixel frequency from DVI is 25~165MHz/LVDS is 20~224MHz/TTL is 5~200MHz and test screen resolution over UXGA.

As to the TV output spec, the image and chromaticity of 2228 / 2328 meet the regulations of NTSC443, NTSC M/J, PAL BDGHI, SECAM standard, which the output signals include VBS composite signal with BNC and Y/C (Luminance / Chrominance) image / chromaticity separation signal with S-Video output connector.

Chroma 2228 / 2328 output patterns and timings can be programmed by PC via RS232C and loaded to memory card via the 22xx Series VPGs, meanwhile the operation sequences can be programmed and controlled by VPGplus on PC via RS232C interface. VPGplus provides a convenient operating environment for VPG users. Users can set the VPG parameters for the data of timing, pattern, program and icon, etc.

Chroma 2228 / 2328 seven in one Video Pattern Generators with high resolution test quality and multi-output can meet the multimedia display applications at present, and the features described above make the Video Pattern Generator a indispensable testing tool for the RD engineers and production manufacturers.



Model 2328

#### ORDERING INFORMATION

**2228** : Programmable Video Pattern Generator

Analog 250 MHz/DVI 165 MHz/LVDS 224MHz/TTL/TV/HDTV

**2328** : Video Pattern Generator

Analog 250 MHz/DVI 165 MHz/LVDS 224MHz/TTL/TV/HDTV

**A225003** : Remote Keypad

**A225010** : Memoer Card (4MB in JEIDA Standard)

**A222701** : Audio Signal Generator

**A222702** : Video Signal Box



A225003



A225010



A222701



A222702

# Programmable Video Pattern Generator Model No. 2228/2328

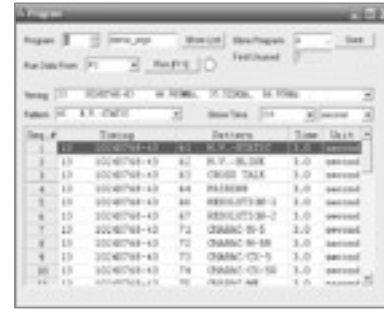
## VPG Plus Software



Timing Editor



Pattern Editor



Program Editor

## SPECIFICATIONS

### ANALOG OUTPUT

Display Size	2048 x 2048 / 4096 x 2048 (Option)
Pixel Rate Range	3.126–250MHz
Video Level	R,G,B (75 ohms) 0–1.0V programmable
Sync on Green / Level	0–0.5V On/Off programmable
White Level	0–1.2V programmable
Blank Level	7.5 IRE / 0 IRE selectable

### HORIZONTAL TIMING

Total Pixels	128–8192 pixels / 1 pixels resolution
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### VERTICAL TIMING

Total Pixels	6–4096 lines (non-interface) 6–2047 lines (interlace) / 1 line resolution
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### COMPOSITE SYNC

H OR V, H X OR V, with RS-343A Equalization & Serration Pulse

### SEPARATE SYNC

Hs, Vs, Xs

### DVI (TMDS) OUTPUT

Pixel Rate Range	25MHz–165MHz
EDID	Read / Write / Compare / Edit
HDCP	Support HDCP V1.0 Production-Key
Compliant	DVI 1.0 specification
Video Signal Type	RGB or YCbCr
Sampling Mode	4:4:4

### LVDS OUTPUT

Pixel Rate Range	20–112MHz / 1 link, 40–224MHz / 2 link
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### TTL OUTPUT

Pixel Rate Range	5–100MHz / 1 link, 10–200MHz / 2 link
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### DATA STORAGE DEVICE

Flash Memory (read only)	100 timings + 100 patterns
NVRAM (R/W)	300 timings + 100 patterns + 100 programs
Memory Card (R/W)	Unlimited data storage

### OTHERS

AC Input	90–132 V / 180–250 V 47–63 Hz auto range
Operation/Storage Temp.	+5–+40 deg.C / –20–+60 deg.C
Humidity	20–90 %

### DIMENSION / WEIGHT

2228	430 x 133 x 380 mm / 9.0 kg	16.9 x 5.2 x 15 inch / 19.82 lb
2328	318 x 100 x 320 mm / 5.0 kg	12.5 x 3.9 x 12.6 inch / 11.01 lb

### TV OUTPUT

Output Mode	NTSC						PAL			SECAM	
Subcarrier Frequency	443	M,J	BDGHI	M	60	N	Nc	4.41/4.25	MHz		
Subcarrier Stability	4.43	3.58	4.43	3.57	4.43	4.43	3.58				
Video Output	Composite (BNC, RCA), S-Video Burst On/Off (NTSC, PAL) Contrast programmable Brightness programmable Saturation programmable Hue programmable										
Closed Caption Support (NTSC)	C1, C2, C3, C4/ T1, T2, T3, T4										
V-CHIP (NTSC)	MPAA Rating : G, PG, PG-13, R, NC-17, X FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA Canada English Rating : C, C8+, G, PG, 14+, 18+ Canada French Rating : G, 8 ans+, 13 ans+, 16 ans+, 18 ans+										
Teletext (PAL)	Teletext System B Level 1, 1.5										

### SDTV FORMAT : All SDTV Timing can be programmable

Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
720 x 483	59.94P	60/1.001			SMPTE 293
			59.94I	59.94/2	ITU 601 SMPTE 170M
720 x 576	50P	50			
			50I	25	ITU 601

### HDTV FORMAT

Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
1920 x 1080	60P	60	60I	30	SMPTE 274
	59.94P	60/1.001	59.94I	30/1.001	SMPTE 274
	50P	50	50I	25	SMPTE 274
	30P	30			SMPTE 274
	29.97P	30/1.001			SMPTE 274
	25P	25			SMPTE 274
	24P	24			SMPTE 274
	23.98P	24/1.001			SMPTE 274
1920 x 1035			60I	30	SMPTE 240
			59.94I	30/1.001	SMPTE 240
1280 x 720	60P	60			SMPTE 296
	59.94P	60/1.001			SMPTE 296
	50P	50			SMPTE 296

# Programmable Video Pattern Generator

Model No.

22291/23291



## Programmable Video Pattern Generator

### Model 22291/ 23291

Analog 250 MHz

DVI (TMDS) 165 MHz

HDMI V1.2a 150 MHz

TV/ HDTV

#### KEY FEATURES

- Analog pixel rate 250MHz
- DVI pixel rate 165MHz
- HDMI V1.2a pixel rate 150 MHz
- DVI-I & HDMI with HDCP output
- TV NTSC/PAL/SECAM signal support
- Bi-level SDTV format support
- Tri-level HDTV format support
- Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y output
- S-Video Y/C separation output
- CVBS composite signal
- Closed Caption function (NTSC)
- V-Chip function (NTSC)
- Teletext function (PAL)
- Optical/Coaxial audio input (SPDIF)
- Low distortion analog audio wave output
- One-pixel resolution
- E-EDID Read / Write / Compare
- HDMI / DVI Plug & Play function
- Gamma correction
- Supporting Dynamic Pattern
- ESD circuit protection built-in
- PC Programming & Control
- Storing data with memory cards



Chroma 22291/23291 Video Pattern Generators combine the signals of analog (250MHz) and DVI (165MHz) / HDMI V1.2a (150MHz) to provide the VESA standard video signal source for LCD Monitor/ multi-media Monitor, it also integrates the TV (NTSC / PAL / SECAM) / SDTV / HDTV signal to fit in the multi-media display applications for the newly risen LCD TV, PDP TV, projector industries.

HDMI (High Definition Multimedia Interface) is the first industry-supported, uncompressed, all-digital audio / video interface. HDMI provides an interface between any audio/video source, such as a set-top box, DVD player, A/V receiver, amplifier and an audio and/or video monitor, such as a digital television (DTV). Chroma 22291/23291 supports standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable. It transmits HDTV standards and supports digital audio, with bandwidth to spare to accommodate future enhancements and requirements.

The video signal type of HDMI output is RGB/YCbCr and the sampling modes are 4:4:4 / 4:2:2. The audio output of HDMI V1.2a has 8 channels with built-in low distortion sine wave that can be input by Optical and Coaxial cable. The audio sample rate is 32.0 / 44.1 / 48 / 88.2 / 96 / 176.4 / 192KHz.

The function of HDCP provided with Chroma 22291/23291 is a specification to protect digital entertainment content across the DVI & HDMI interface. The HDCP specification provides a robust, cost-effective and transparent method for transmitting and receiving digital entertainment content to DVI & HDMI compliant digital displays.

For analog signal RGB output, its pixel frequency can up to 250MHz and meet the RS-343A standard. It also supports Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y and sync signals for tri-level output to fulfill the test requirements for HDTV. The digital signal is in TMDS output, the pixel frequency of TMDS is 25~165MHz and test screen resolution supports over UXGA.

As to the TV output spec, the image and chromaticity of 22291/23291 meet the regulations of NTSC and PAL that contain CVBS composite signal with BNC and Y/C (Luminance/Chrominance) image/chromaticity separation signal as well as S-Video output connector.

Chroma 22291/23291 have the functions of Closed Caption and V-chip for TV (NTSC). The ratings of MPAA for movie, USA TV, Canada English, and Canada French are available for selection. Closed Captions are captions that are hidden in the video signal. The V-chip is a standard for placing program rating information on a television program, so that parents can choose to filter what program their children can watch.

Teletext is the generic name for a system of information broadcast as pages of test alongside the television signal for PAL system, 22291/23291 has 5 sets of default teletext code TEST 1 to TEST 5, and 640 packets available for users to download. Following the rising market of multi-media display the competition and demand for product quality are getting more and more severe as consumers often request and search for higher pixels with less bad dots as well as low cost video display products before purchasing. Under this circumstance, the Chroma 22291/23291 Video Pattern Generators with high resolution test quality and multi-output can meet the multimedia display applications at present, and the features described above make the Video Pattern Generator a indispensable testing tool for the RD engineers and production manufacturers.



Model 23291

#### ORDERING INFORMATION

**22291** : Programmable Video Pattern Generator

Analog 250 MHz/DVI 165 MHz/HDMI 150MHz/TV/HDTV

**23291** : Video Pattern Generator

Analog 250 MHz/DVI 165 MHz/HDMI 150MHz/TV/HDTV

**A225003** : Remote Keypad

**A225010** : Memoer Card (4MB in JEIDA Standard)

**A222702** : Video Signal Box

**A222704** : Video Signal Box



A225003



A225010



A222701



A222702

# Programmable Video Pattern Generator 22291/23291

Model No.

## SPECIFICATIONS

### ANALOG OUTPUT

Display Size	2048 x 2048 / 4096 x 2048 (Option)
Pixel Rate Range	3.126~250MHz
Video Level	R,G,B (75 ohms) 0~1.0V programmable
Sync on Green / Level	0~0.5V On/Off programmable
White Level	0~1.2V programmable
Blank Level	7.5 IRE / 0 IRE selectable

### HORIZONTAL TIMING

Total Pixels	128~8192 pixels / 1 pixels resolution
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### VERTICAL TIMING

Total Pixels	6~4096 lines (non-interlace) 6~2047 lines (interlace) / 1 line resolution
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### COMPOSITE SYNC

	H OR V, H X OR V, with RS-343A Equalization & Serration Pulse
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### SEPARATE SYNC

	Hs, Vs, Xs
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### DVI (TMDS) OUTPUT

Pixel Rate Range	25MHz~165MHz
E-EDID	Read / Write / Compare / Edit
HDCP	Support HDCP V.1.0 Production-Key
Compliant	DVI 1.0 specification
Video Signal Type	RGB or YCbCr
Sampling Mode	4:4:4

### HDMI VIDEO OUTPUT

Version	HDMI V1.2a
Pixel Rate Range	25MHz~150MHz (1080p)
Support HDMI Timing	59 Timing (CEA-861C)
Pixel Repetition	4
Video Signal Type	RGB or YCbCr
Sampling Mode	4:4:4 / 4:2:2
Bits per Component	8 / 10 / 12
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709
HDCP Support	HDCP V.1.1
EDID	Read / Write / Compare / Edit

### HDMI AUDIO OUTPUT

Sample Rate	32,44.1,48,88.2, 96,176.4, 192KHz
Number of Channel	8 Channel (FL/FR/LR/RR/FC/LFE/RLC/RRC)
Bits per Sample	16
Waveform	Sine wave
Amplitude	-90.3 to 0.0 dBFS
Frequency Range	10Hz to 20KHz
Frequency Resolution	10Hz / Step
External Audio Input	Optical and Coaxial ( S/PDIF )
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

### AUDIO (ANALOG) OUTPUT

Frequency Range	10Hz to 20KHz / 10Hz step
Waveform	Sine wave
Number of Channel	2 Channel (R / L)
Level Range	0V to 2V (at 600 Ohms Load)
Level Resolution	0.05V / Step
T.H.D	0.2%
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

### TV OUTPUT

Output Mode	NTSC			PAL				SECAM	
Subcarrier Frequency	443 4.43	M,J 3.58	BDGHI 4.43	M 3.57	60 4.43	N 4.43	Nc 3.58	4.41/4.25	MHz
Subcarrier Stability	±50								Hz
Video Output	Composite (BNC, RCA), S-Video								
	Burst On/Off (NTSC, PAL)								
	Contrast programmable								
	Brightness programmable								
	Saturation programmable								
	Hue programmable								
Closed Caption Support (NTSC)	C1, C2, C3, C4/ T1, T2, T3, T4								
V-CHIP (NTSC)	MPAA Rating : G, PG, PG-13, R, NC-17, X								
	FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA								
	Canada English Rating : C, C8+, G, PG, 14+, 18+								
	Canada French Rating : G, 8 ans+, 13 ans+, 16 ans+, 18 ans+								
Teletext (PAL)	Teletext System B Level 1 : 1.5								

### SDTV FORMAT : All SDTV Timing can be programmable

Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
720 x 483	59.94P	60/1.001			SMPTE 293
			59.94I	59.94/2	ITU 601 SMPTE 170M
720 x 576	50P	50			ITU 1382
			50I	25	ITU 601

### HDTV FORMAT

Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
1920 x 1080	60P	60	60I	30	SMPTE 274
	59.94P	60/1.001	59.94I	30/1.001	SMPTE 274
	50P	50	50I	25	SMPTE 274
	30P	30			SMPTE 274
	29.97P	30/1.001			SMPTE 274
	25P	25			SMPTE 274
	24P	24			SMPTE 274
	23.98P	24/1.001			SMPTE 274
1920 x 1035			60I	30	SMPTE 240
			59.94I	30/1.001	SMPTE 240
1280 x 720	60P	60			SMPTE 296
	59.94P	60/1.001			SMPTE 296
	50P	50			SMPTE 296

### DATA STORAGE DEVICE

Flash Memory (read only)	500 timings + 200 patterns
NVRAM (R/W)	300 timings + 100 patterns + 100 programs
Memory Card (R/W)	Unlimited data storage

### OTHERS

AC Input	100/115/230V AC, 47~63Hz auto range
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %

### DIMENSION / WEIGHT

22291	430 x 133 x 380 mm / 9.0 kg	16.9 x 5.2 x 15 inch / 19.82 lb
23291	318 x 100 x 320 mm / 5.0 kg	12.5 x 3.9 x 12.6 inch / 11.01 lb



## Video Pattern Generator Model 22293

**Analog** 250 MHz  
**DVI (TMDS)** 330 MHz  
**HDMI V1.3** 165 MHz  
(TMDS Rate 225 MHz)

### KEY FEATURES

- 4K x 2K Graphic size
- 36 bit True color
- Analog pixel rate 250MHz
- DVI pixel rate 330MHz
- HDMI V1.3a (with 36 bit deep color / xvYCC )
- CEC Control
- DVI & HDMI with HDCP output
- Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y output
- S-Video/CVBS/SCART/RGB/Color Component/D-terminal
- NTSC / PAL / SECAM signal
- Closed Caption function ( NTSC )
- V-Chip function ( NTSC )
- Teletext function ( PAL )
- E-EDID Read / Write / Compare
- Easy and variable pattern edit
- HDMI/DVI Plug & Play function
- Gamma correction
- ESD protection circuit
- USB interface
- 3.5" LCD panel display performance



Chroma 22293 Programmable Video Pattern Generator provides a total solution for multi-media tests that are applied in the industries of high frequency digital and analog displays such as LCM Monitor / LCD TV / PDP / Projector of today and in the future.

Large scale and high definition have become the trend as the development of video industry goes. Chroma 22293 has high speed signal transmission features that presented in a user friendly interface not only provide complete and standard digital and analog signals but also support the up-to-date interface, HDMI V1.3, for video image transmission with higher speed bandwidth and deep color.

HDMI (High Definition Multimedia Interface) is the digital signal standard interface of the latest generation. A single cable can synchronize the video image signals without any interrupts during transmission. The advantage of simple layout and high speed transmission capability has become the interface that can provide various audio and video sources in-between for the equipment like Set Top Box, DVD Player, A/V Receiver, Amplifier and all kinds of video monitors.

Chroma 22293 is able to provide analog/digital/TV signals concurrently: For the analog signal RGB output, the pixel frequency is up to 250MHz that meets the RS-343A standard, and it supports Y, Pb, Pr/Y, Cb, Cr/Y, R-Y, B-Y. Meanwhile it can select the sync signal of tri-level output to fit in the HDTV test application. For the digital signal TMDS output, the pixel frequency is 25~330MHz and the resolution of test screen supports UXGA and higher.

As to the specification of TV output, the image and chrominance signals of Chroma 22293 meet the NTSC, PAL and SECAM standards. The output signals include CVBS compound signals, BNC and Y/C (Luminance/ Chrominance) separated signals as well as S-Video/SCART output connectors. Tests for special TV functions such as Closed Caption, V-chip and Teletext are also supported.

Chroma 22293 is designed with embedded architecture that uses Power PC to carry the high speed/high density FPGA as Graphics Rendering Engine to provide highly efficient system control and save the test time.

Chroma 22293 equipped with 3.5 inches super large screen and graphic operation interface is convenient for users to edit various timing parameters and patterns directly via the panel icon. The comprehensive, rapid and easy to understand user interface can improve the test efficiency effectively. The USB interface using VPG MASTER control software on PC can also be applied to show the patterns on display for test by running automatically or manually.

Following the rising market of new generation display the competition and demand for product quality are getting more and more sever. Under the consideration of quality and cost, Chroma 22293 Video Pattern Generator has built in the most complete multi-media test interfaces covering all standard signals output that can meet the requirements for various video tests in the industry. It is the best solution for the users in the field of RD, production and inspection.

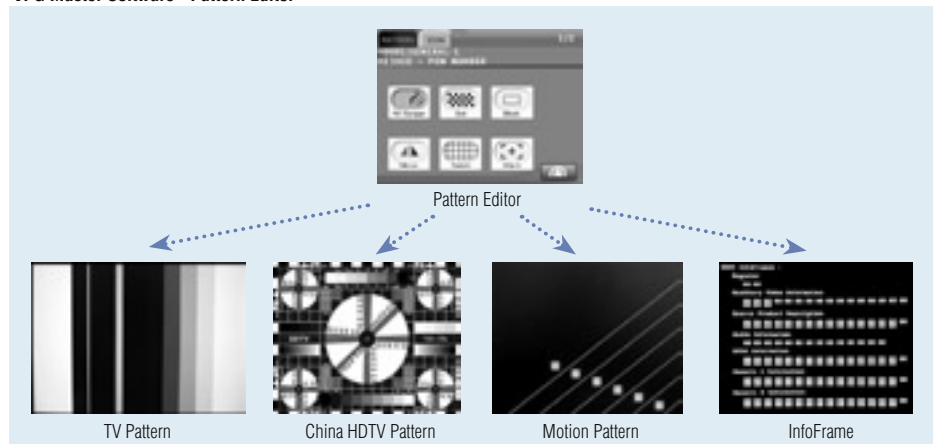


Model 22293 Rear View

### ORDERING INFORMATION

**22293** : Video Pattern Generator  
Analog 250MHz/DVI 330MHz/HDMI 165MHz (TMDS Rate 225MHz)/  
TV/HDTV  
**A240001**: Remote Keypad

### VPG Master Software - Pattern Editor





### SPECIFICATIONS

ANALOG OUTPUT	
Display Size	4096 x 2048
Pixel Rate Range	0.5~250MHz
Video Level	R,G,B (75 ohms) 0~1.0V programmable
Sync on Green / Level	0~0.5V On/Off programmable
White Level	0~1.2V programmable
Blank Level	7.5 IRE / 0 IRE selectable
HORIZONTAL TIMING	
Total Pixels	32~8192 pixels / 1 pixels resolution
VERTICAL TIMING	
Total Pixels	4~4096 lines (non-interlace) / 1 line programmable 4~2048 lines (interlace) / 1 line programmable
COMPOSITE SYNC	
	H+V, H EXOR V, Equalization & Serration Pulse
SEPARATE SYNC	
	BNC: Hs, Vs, Xs D-SUB: Hs (Xs), Vs
VIDEO FORMAT	
Video Output	R,G,B / RS-343A
	Y, R-Y, B-Y
	Y, Cb, Cr / ITU 601
	Y, Pb, Pr / ITU 709, RP 177, SMPTE 240M DDC II B (D-SUB)
MULTI OUTPUT	
	Y, Cb, Cr & R,G,B independence output

DVI (TMDS) OUTPUT	
Pixel Rate Range	25< 1 link< 165MHz / 165< 2 link< 330MHz
E-EDID	Read / Write / Compare / Edit
HDCP	Support HDCP V.1.0 Production-Key
Compliant	DVI 1.0 specification
Video Signal Type	RGB
Sampling Mode	4:4:4

HDMI VIDEO OUTPUT	
Version	HDMI V1.3a
Pixel Rate Range	25 ~ 165 MHz ( TMDS rate 225MHz)
Support HDMI Timing	77 Timing(CEA-861D)
Pixel Repetition	4
Video Signal Type	RGB or YCbCr
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2
Bits per Component	24 / 30 / 36 @RGB & YCbCr
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709 / xvYCC
HDCP Support	HDCP V.1.2
EDID	Read / Write / Compare / Edit

HDMI AUDIO OUTPUT	
Sample Rate	32,44.1,48,88.2, 96,176.4, 192KHz
Number of Channel	8 Channel (FL/FR/LR/RR/FC/LFE/RLC/RRC)
Bits per Sample	16 / 24 bit
Waveform	Sine wave
Amplitude	-90.3 to 0.0 dBFS
Frequency Range	10Hz to 20KHz
Frequency Resolution	10Hz / Step
External Audio Input	Optical and Coaxial ( S/PDIF )
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time



Audio Screen



EDID Screen

TV OUTPUT									
Output Mode	NTSC			PAL				SECAM	
Subcarrier Frequency	443 4.43	M,J 3.58	BDGHI 4.43	M 3.57	60 4.43	N 4.43	Nc 3.58	4,41/4,25	MHz
Subcarrier Stability	±50								Hz
Video Output	Composite (BNC, RCA), S-Video								
	Burst On/Off (NTSC, PAL)								
	Contrast programmable								
	Brightness programmable								
	Saturation programmable								
	Hue programmable								
Closed Caption Support (NTSC)	C1, C2, C3, C4/ T1, T2, T3, T4								
V-CHIP (NTSC)	MPAA Rating : G, PG, PG-13, R, NC-17, X								
	FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA								
	Canada English Rating : C, C8+, G, PG, 14+, 18+								
	Canada French Rating : G, 8 ans+, 13 ans+, 16 ans+, 18 ans+								
Teletext (PAL)	Teletext System B Level 1, 1.5								

SDTV FORMAT				
Timing	Progressive Mode Frame Rate (Hz)	Interlace Mode Frame Rate (Hz)		Standard
720 x 483	59.94P	60/1.001		SMPTE 293
			59.94I	ITU 601 SMPTE 170M
720 x 576	50P	50		ITU 1382
			50I	ITU 601

HDTV FORMAT					
Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
1920 x 1080	60P	60	60I	30	SMPTE 274
	59.94P	60/1.001	59.94I	30/1.001	SMPTE 274
	50P	50	50I	25	SMPTE 274
	30P	30			SMPTE 274
	29.97P	30/1.001			SMPTE 274
	25P	25			SMPTE 274
	24P	24			SMPTE 274
	23.98P	24/1.001			SMPTE 274
1920 x 1035			60I	30	SMPTE 240
			59.94I	30/1.001	SMPTE 240
1280 x 720	60P	60			SMPTE 296
	59.94P	60/1.001			SMPTE 296
	50P	50			SMPTE 296

DATA STORAGE DEVICE	
Default	2000 timings + 2000 patterns
Internal Memory	3000 timings + 3000 patterns + 1000 programs
External Memory	USB Host interface

OTHERS	
AC Input	100-240V , 5A , 50-60Hz
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %

DIMENSION / WEIGHT	
22293	350(W)x88(H)x345(D)mm / 5 kg



## RF Video Pattern Generator Model 2230/ 2330

**TV RF** 855.25 MHz  
**Analog** 250 MHz  
**DVI (TMDS)** 165 MHz  
**HDMI V1.2a** 150 MHz

### KEY FEATURES

- RF output for NTSC / PAL / SECAM
- Easy to use RF function Hot Key
- RF output level 10uV~100mV
- Support NICAM/BTSC sound system
- DVI pixel rate 165MHz
- HDMI V1.2a pixel rate 150 MHz
- DVI-I & HDMI with HDCP output
- TV NTSC/PAL/SECAM signal support
- Bi-level SDTV format support
- Tri-level HDTV format support
- Y, Pb, Pr/ Y, Cb, Cr/ Y, R-Y, B-Y output (Color component signal)
- S-Video Y/C separation output
- CVBS composite signal
- Closed Caption function (NTSC)
- V-Chip function (NTSC)
- Teletext function (PAL)
- Optical/Coaxial audio input (SPDIF)
- Low distortion audio R/L output
- 8 ch audio embedded HDMI output
- One-pixel resolution
- E-EDID Read / Write / Compare
- Gamma correction
- Supporting Dynamic Pattern
- ESD circuit protection built-in
- PC Programming & Remote Control
- Storing data with memory cards



Chroma 2230/2330 RF Video Pattern Generators offer a vast selection of outputs including RF for NTSC / PAL / SECAM / CATV, Analog (250MHz), TMDS (165MHz) and HDMI (150MHz). They also have EDID Read, Write and Compare capabilities and internal ESD protection. In addition, it also provides a VESA standard video signal source for LCD and multi-media monitors, and TV outputs for (NTSC /PAL/SECAM)/SDTV/HDTV signal standards to fit into the multimedia display applications for LCD TV, PDP TV, LCOS TV and DLP RPTV industries.

The RF output support Video NTSC 55.25 ~ 801.25 (MHz) VHF: H2 ~ CH13 & UHF:CH14 ~ CH69 , PAL/SECAM 48.25 ~ 855.25 (MHz) VHF:CH\_E2 ~ CH\_S41 & UHF:CH21 ~ CH69 , and CATV 55.25~799.25 (MHz) : CH1~CH125, than Audio Carrier Frequency selectable with 4.5(MHz), 5.5(MHz), 6(MHz), 6.5(MHz)

HDMI (High Definition Multimedia Interface) is the first industry-supported, uncompressed, all-digital, audio/video interface standard. The Chroma 2230/2330 function supports standard, enhanced, or high- definition video, plus multi-channel digital audio on a single cable.

The HDMI Video output of the 2230/2330 supports RGB/YCbCr with sampling modes of 4:4:4 or 4:2:2. The Digital Audio outputs have 2 channels (L/R) and can be input either by external source via Optical and Coaxial SPDIF cable or generated via programmable embedded Sine Wave with sample rates at 32.0, 44.1, 48, 88.2, 96, 176.4, 192 KHz. Special Control Mode allows for Tone, Sweep, Mute, Repeat and Play time programmability.

HDCP (High-bandwidth Digital Content Protection) is a specification developed by Intel(R) Corporation to protect digital entertainment content across the HDMI and DVI interfaces. The Chroma 2230/2330 HDCP function supports Production Key encryption and is included on both HDMI and DVI outputs.

The Analog signal output on the Chroma 2230/2330 supports pixel frequencies of (3.126- 250MHz). It also allows for Y, Pb, Pr/Y, Cb, Cr/Y, R-Y, B-Y with tri-level sync signal output to fulfill the test requirements for HDTV.

The Television output specifications for image and chromaticity of 2230/2330 meet the NTSC 443, NTSC M/J, PAL BDGHI and SECAM standards. Output connectors include VBS composite signal via the provided BNC connector and Y/C (Luminance/ Chrominance) via the provided S-Video output connector. Contrast, Brightness, Saturation and Hue are also programmable on the 2230/2330 models.

Closed Caption and V-chip testing for Television (NTSC) is included with the Chroma 2230/2330. Closed Captions are text signals that are embedded in the video. The V-chip is a standard for placing program rating information on a program/movie broadcast so parents can choose to filter what their children see. Teletext is the generic name for a system of information broadcast as pages of text alongside the television signal for PAL systems. The Chroma 2230/2330 has 5 sets of default teletext code TEST1 thru TEST 5 with 640 packets available for user downloads.

Additionally, Chroma 2230/2330 supports Analog and Digital audio (NICAM / BTSC) for Stereo, Dual and Mono sound mode to meet the TV systems of different countries.

The market for multi-media display test devices demands product quality and relentless reliability for their operating environments. The Chroma 2230/2330 RF Video Pattern Generators with all the standard outputs provided and with its designed-in quality and reliability can meet all multi-media display applications now and in the future.



RF Test Screen



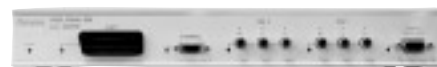
Model 2330

### ORDERING INFORMATION

- 2230** : RF Video Pattern Generator  
Analog 250 MHz/DVI 165 MHz/HDMI 150 MHz  
**2330** : RF Video Pattern Generator  
Analog 250 MHz/DVI 165 MHz/HDMI 150 MHz  
**A225003** : Remote Keypad  
**A222702** : Video Signal Box  
**A222704** : Video Signal Box



A225003



A222702



A222704



## SPECIFICATIONS

ANALOG OUTPUT	
Display Size	2048 x 2048 / 4096 x 2048 (Option)
Pixel Rate Range	3.126~250MHz
Video Level	R,G,B (75 ohms) 0~1.0V programmable
Sync on Green / Level	0~0.5V On/Off programmable
White Level	0~1.2V programmable
Blank Level	7.5 IRE / 0 IRE selectable
HORIZONTAL TIMING	
Total Pixels	128~8192 pixels / 1 pixels resolution
VERTICAL TIMING	
Total Pixels	6~4096 lines (non-interlace) 6~2047 lines (interlace) / 1 line resolution
COMPOSITE SYNC	
H OR V, H X OR V, with RS-343A Equalization & Serration Pulse	
SEPARATE SYNC	
Hs, Vs, Xs	

DVI (TMDS) OUTPUT	
Pixel Rate Range	25MHz~165MHz
E-EDID	Read / Write / Compare / Edit
HDCP	Support HDCP V1.0 Production-Key
Compliant	DVI 1.0 specification
Video Signal Type	RGB or YCbCr
Sampling Mode	4:4:4

HDMI VIDEO OUTPUT	
Version	HDMI V1.2a
Pixel Rate Range	25MHz~150MHz (1080p)
Support HDMI Timing	59 Timing (CEA-861C)
Pixel Repetition	4
Video Signal Type	RGB or YCbCr
Sampling Mode	4:4:4 / 4:2:2
Bits per Component	8 / 10 / 12
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709
HDCP Support	HDCP V1.1
EDID	Read / Write / Compare / Edit

HDMI AUDIO OUTPUT	
Sample Rate	32,44.1,48,88.2, 96,176.4, 192KHz
Number of Channel	8 Channel (FL/FR/LR/RR/FC/LFE/RLC/RRC)
Bits per Sample	16
Waveform	Sine wave
Amplitude	-90.3 to 0.0 dBFS
Frequency Range	10Hz to 20KHz
Frequency Resolution	10Hz / Step
External Audio Input	Optical and Coaxial ( S/PDIF )
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

AUDIO (ANALOG) OUTPUT	
Frequency Range	10Hz to 20KHz / 10Hz step
Waveform	Sine wave
Number of Channel	2 Channel ( R / L )
Level Range	100mV to 2000mV (at 600 Ohms Load)
Level Resolution	0.05V / Step
T.H.D	0.2%
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

RF FORMAT	
Frequency Range	48.25 ~ 855.25 MHz
Output Level (Vrms)	10uV~100mV/10uV Step
Impedance	75 Ohm
NTSC	Frequency Range
	55.25 ~ 801.25 (MHz) / 250 (KHz) step VHF : CH2 ~ CH13 (55.25 ~ 211.25MHz) UHF : CH14 ~ CH69 (471.25 ~ 801.25MHz)
PAL / SECAM	Frequency Range
	48.25 ~ 855.25 (MHz) / 250 (KHz) step VHF : CH_E2 ~ CH_S41 (48.25 ~ 463.25MHz) UHF : CH21 ~ CH69 (471.25 ~ 855.25MHz)
CATV	Frequency Range
	55.25~799.25 (MHz) / 250 (KHz) step CH1~CH125 (55.25 ~ 799.25MHz)
Video Modulation	AM modulation
Polarity	Negative (for NTSC / PAL ); Positive for SECAM
Audio Carrier Frequency	4.5(MHz), 5.5(MHz), 6(MHz), 6.5(MHz) Selectable
Sound System	2 carrier / NICAM / BTSC

TV OUTPUT									
Output Mode	NTSC			PAL				SECAM	
Subcarrier Frequency	443 4.43	M,J 3.58	BDGHI 4.43	M 3.57	60 4.43	N 4.43	Nc 3.58	4.41/4.25	MHz
Subcarrier Stability	±50								Hz
Video Output	Composite (BNC, RCA), S-Video								
	Burst On/Off (NTSC, PAL)								
	Contrast programmable								
	Brightness programmable								
	Saturation programmable								
	Hue programmable								
Closed Caption Support (NTSC)	C1, C2, C3, C4/ T1, T2, T3, T4								
V-CHIP (NTSC)	MPAA Rating : G, PG, PG-13, R, NC-17, X								
	FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA								
	Canada English Rating : C, C8+, G, PG, 14+, 18+								
	Canada French Rating : G, 8 ans+, 13 ans+, 16 ans+, 18 ans+								
Teletext (PAL)	Teletext System B Level 1 . 1.5								

HDTV FORMAT					
Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
1920 x 1080	60P	60	60I	30	SMPTE 274
	59.94P	60/1.001	59.94I	30/1.001	SMPTE 274
	50P	50	50I	25	SMPTE 274
	30P	30			SMPTE 274
	29.97P	30/1.001			SMPTE 274
	25P	25			SMPTE 274
	24P	24			SMPTE 274
	23.98P	24/1.001			SMPTE 274
	1920 x 1035			60I	30
59.94I				30/1.001	SMPTE 240
1280 x 720	60P	60			SMPTE 296
	59.94P	60/1.001			SMPTE 296
	50P	50			SMPTE 296

DATA STORAGE DEVICE	
Flash Memory (read only)	500 timings + 200 patterns
NVRAM (R/W)	300 timings + 100 patterns + 100 programs
Memory Card (R/W)	Unlimited data storage

## OTHERS

AC Input	100/115/230V AC, 47~63 Hz auto range
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %

## DIMENSION / WEIGHT

2230	430 x 133 x 380 mm / 9.0 kg	16.9 x 5.2 x 15 inch / 19.82 lb
2330	318 x 100 x 320 mm / 5.0 kg	12.5 x 3.9 x 12.6 inch / 11.01 lb

# True Color Video Pattern Generator 2231/2331

Model No.



## True Color Video Pattern Generator Model 2231/ 2331

**True Color** 200 MHz  
**Analog** 250 MHz  
**DVI (TMDS)** 165 MHz  
**HDMI V1.2a** 150 MHz

### KEY FEATURES

- True Color pixel rate 200MHz
- DVI pixel rate 165MHz
- HDMI V1.2a pixel rate 150 MHz
- DVI-I & HDMI with HDCP output
- TV NTSC/PAL/SECAM signal support
- Bi-level SDTV format support
- Tri-level HDTV format support
- Y,Pb,Pr/ Y,Cb,Cr/ Y,R-Y,B-Y output
- S-Video Y/C separation output
- CVBS composite signal
- Closed Caption function (NTSC)
- V-Chip function (NTSC)
- Teletext function (PAL)
- Optical/Coaxial audio input (SPDIF)
- Low distortion analog audio wave output
- One-pixel resolution
- E-EDID Read / Write / Compare
- Gamma correction
- Supporting Dynamic Image
- ESD circuit protection built-in
- PC Programmable & Control
- Storing data with CF card
- Supporting USB 1.1/2.0



Chroma 2231/2331 True Color Video Pattern Generators combine the signals of analog (256 Color 250MHz / True Color 200MHz) and DVI (165MHz) / HDMI V1.2a(150MHz) to provide the VESA standard video signal source for LCD Monitor/multi-media Monitor, it also integrates the TV (NTSC / PAL /SECAM) / SDTV / HDTV signal to fit in the multi-media display applications for the newly risen LCD TV, PDP TV, LCOS TV and DLP RPTV industries.

Chroma 2231/2331 supports Analog / DVI / HDMI true color image tests via the saved BMP image files or the external CF storage interface for reading and outputting high resolution images. The presentation of 167,700 colors fully satisfies the requirements for HDTV and multimedia video tests.

HDMI (High Definition Multimedia Interface) is the first industry-supported, uncompressed, all-digital audio / video interface. HDMI provides an interface between any audio/video source, such as a set-top box, DVD player, A/V receiver, amplifier and an audio and/or video monitor, such as a digital television (DTV). Chroma 2231/2331 supports standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable. It transmits HDTV standards and supports digital audio.

The video signal type of HDMI output is RGB/YCbCr and the sampling modes are 4:4:4 / 4:2:2. The audio output of HDMI V1.2a has 8 channels with built-in low distortion sine wave that can be input by Optical and Coaxial cable. The audio sample rate is 32.0 / 44.1 / 48 / 88.2 / 96 / 176.4 / 192KHz.

The function of HDCP provided with Chroma 2231/2331 is a specification to protect digital entertainment content across the DVI & HDMI interface. The HDCP specification provides a robust, cost effective and transparent method for transmitting and receiving digital entertainment content to DVI & HDMI-compliant digital displays.

For analog signal RGB output, its pixel frequency can up to 250MHz and meet the RS-343A standard. It also supports Y, Pb, Pr/ Y, Cb, Cr/ Y, R-Y, B-Y and sync signals for tri-level output to fulfill the test requirements for HDTV. The digital signal is in DVI output, the pixel frequency is 25~165MHz and test screen resolution supports over UXGA.

As to the TV output spec, the image and chromaticity of 2231/2331 meet the regulations of NTSC and PAL that contain CVBS composite signal with BNC and Y/C (Luminance/ Chrominance) image/chromaticity separation signal as well as S-Video output connector.

Chroma 2231/2331 have the functions of Closed Caption and V-chip for TV (NTSC). The ratings of MPAA for movie, USA TV, Canada English, and Canada French are available for selection. Closed Captions are captions that are hidden in the video signal. The V-chip is a standard for placing program rating information on a television program, so that parents can choose to filter what program their children can watch.

Teletext is the generic name for a system of information broadcast as pages of text alongside the television signal for PAL system, 2231 / 2331 has 5 sets of default teletext code TEST 1 to TEST 5, and 640 packets available for users to download.

Following the rising market of multimedia display the competition and demand for product quality are getting more and more severe as consumers often request and search for higher pixels with less bad dots as well as low cost video display products before purchasing. Under this circumstance, the Chroma 2231/2331 True Color Video Pattern Generator with high resolution test quality and multi-output can meet the multi-media display applications at present, and the features described above make the Video Pattern Generator a indispensable testing tool for the RD engineers and production manufacturers.



Model 2331

### ORDERING INFORMATION

- 2231** : True Color Video Pattern Generator  
Analog 250 MHz/DVI 165 MHz/HDMI 150 MHz
- 2331** : True Color Video Pattern Generator  
Analog 250 MHz/DVI 165 MHz/HDMI 150 MHz
- A225003** : Remote Keypad
- A223101** : Memory Card 256MB (CF Card)
- A223102** : CF to PCMCIA Adapter Transcend
- A222702** : Video Signal Box
- A222704** : Video Signal Box



A225003



A223101



A223102



A222702



A222704

# True Color Video Pattern Generator 2231/2331

Model No.

## SPECIFICATIONS

### ANALOG OUTPUT

Display Size	2048 x 2048 / 4096 x 2048
Pixel Rate Range	3.126~250MHz (256 Color)
	3.126~200MHz (True Color)
Video Level	R,G,B (75 ohms) 0~1.0V programmable
Sync on Green / Level	0~0.5V On/Off programmable
White Level	0~1.2V programmable
Blank Level	7.5 IRE / 0 IRE selectable

### HORIZONTAL TIMING

Total Pixels	128~8192 pixels / 1 pixels resolution
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### VERTICAL TIMING

Total Pixels	6~4096 lines (non-interlace)
	6~2047 lines (interlace) / 1 line resolution

### COMPOSITE SYNC

	H OR V, H X OR V, with RS-343A Equalization & Serration Pulse
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### SEPARATE SYNC

	Hs, Vs, Xs
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### DVI (TMDS) OUTPUT

Video Memory	2048 x 2048 x 24 bit
Pixel Rate Range	25MHz~165MHz
E-EDID	Read / Write / Compare / Edit
HDCP	Support HDCP V.1.0 Production-Key
Compliant	DVI 1.0 specification
Video Signal Type	RGB or YCbCr
Sampling Mode	4:4:4

### HDMI VIDEO OUTPUT

Version	HDMI V1.2a
Pixel Rate Range	25MHz~150MHz (1080p)
Support HDMI Timing	59 Timing (CEA-861C)
Pixel Repetition	4
Video Signal Type	RGB or YCbCr
Sampling Mode	4:4:4 / 4:2:2
Bits per Component	8 / 10 / 12
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709
HDCP Support	HDCP V.1.1
EDID	Read / Write / Compare / Edit

### HDMI AUDIO OUTPUT

Sample Rate	32,44.1,48,88.2, 96,176.4, 192KHz
Number of Channel	8 Channel (FL/FR/LR/RR/FC/LFE/RLC/RRC)
Bits per Sample	16
Waveform	Sine wave
Amplitude	-90.3 to 0.0 dBFS
Frequency Range	10Hz to 20KHz
Frequency Resolution	10Hz / Step
External Audio Input	Optical and Coaxial ( S/PDIF )
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

### AUDIO (ANALOG) OUTPUT

Frequency Range	10Hz to 20KHz / 10Hz step
Waveform	Sine wave
Number of Channel	2 Channel (R / L)
Level Range	0V to 2V (at 600 Ohms Load)
Level Resolution	0.05V / Step
T.H.D	0.2%
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

### TV OUTPUT

Output Mode	NTSC			PAL				SECAM	
	443	M,J	BDGHI	M	60	N	Nc	4.41/4.25	
Subcarrier Frequency	4.43	3.58	4.43	3.57	4.43	4.43	3.58		MHz
Subcarrier Stability	±50								Hz
Video Output	Composite (BNC, RCA), S-Video								
	Burst On/Off (NTSC, PAL)								
	Contrast programmable								
	Brightness programmable								
	Saturation programmable								
Closed Caption Support (NTSC)	C1, C2, C3, C4/ T1, T2, T3, T4								
	MPAA Rating : G, PG, PG-13, R, NC-17, X								
	FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA								
	Canada English Rating : C, C8+, G, PG, 14+, 18+								
	Canada French Rating : G, 8 ans+, 13 ans+, 16 ans+, 18 ans+								
V-CHIP (NTSC)									
Teletext (PAL)	Teletext System B Level 1, 1.5								

### SDTV FORMAT : All SDTV Timing can be programmable

Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
720 x 483	59.94P	60/1.001			SMPTE 293
			59.94I	59.94/2	ITU 601 SMPTE 170M
720 x 576	50P	50			ITU 1382
			50I	25	ITU 601

### HDTV FORMAT

Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
1920 x 1080	60P	60	60I	30	SMPTE 274
	59.94P	60/1.001	59.94I	30/1.001	SMPTE 274
	50P	50	50I	25	SMPTE 274
	30P	30			SMPTE 274
	29.97P	30/1.001			SMPTE 274
	25P	25			SMPTE 274
	24P	24			SMPTE 274
	23.98P	24/1.001			SMPTE 274
1920 x 1035			60I	30	SMPTE 240
			59.94I	30/1.001	SMPTE 240
1280 x 720	60P	60			SMPTE 296
	59.94P	60/1.001			SMPTE 296
	50P	50			SMPTE 296

### DATA STORAGE DEVICE

Flash Memory (read only)	500 timings + 200 patterns
NVRAM (R/W)	300 timings + 100 patterns + 100 programs
Memory Card (R/W)	Unlimited data storage with CF card
Memory Bank	64 MB

### OTHERS

AC Input	100/115/230V AC, 47~63 Hz auto range
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %

### DIMENSION / WEIGHT

2231	430 x 133 x 380 mm / 9.7 kg	16.9 x 5.2 x 15 inch / 21.37 lb
2331	318 x 100 x 320 mm / 5.8 kg	12.5 x 3.9 x 12.6 inch / 12.77 lb



## Video Pattern Generator Model 2401/2402

**Analog** 165MHz  
**DVI(TMDs)** 165MHz (2402)  
**HDMI V1.3** 165MHz (2402)  
(TMDs Rate 225MHz)

### KEY FEATURES

- Analog pixel rate 165MHz
- Analog output with DDC
- 2K x 2K Graphic size
- NTSC / PAL / SECAM signal (Model 2401)
- Closed Caption function ( NTSC ) (Model 2401)
- V-Chip function ( NTSC ) (Model 2401)
- Teletext function ( PAL ) (Model 2401)
- S-Video / CVBS / SCART / RGB Color Component / D-Terminal (Model 2401)
- Bi-level SDTV format (Model 2401)
- Tri-level HDTV Format (Model 2401)
- DVI pixel rate 165MHz (Model 2402)
- HDMI V1.3 (with xvYCC) (Model 2402)
- DVI & HDMI with HDCP output (Model 2402)
- Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y output (Model 2401)
- PC remote control
- User Define Key
- Built-in variety of video timings & patterns
- Scrolling Pattern
- USB interface
- High Capacity Memory
- ESD protection circuit
- Economy



Along with the rapid development of LCD TV industry, all manufacturers are facing the competition of producing high value added and low cost products; and seeking for a total test solution to meet their needs has become the first priority.

Chroma 2401/2402 Video Pattern Generator with the features described below is specially designed to fit in the requirements and application of production line for LCD-TV manufacturers.

**(1). Lightweight Design** : The size of Chroma 2401/2402 VPG is close to A4 that is portable and handy for various kinds of spaces or locations.

**(2). Exclusive Signals** : The mapped international standard signal sources are provided for diverse Video signals requirements such as the requisite TV and monitor that are applied in the configuration of production line planning and test workstation.

**(3). Convenient & Rapid Function** : The test programs created in advance increase the production efficiency; in addition for the frequently used function keys, users can edit the USER KEY to work with compound functions in specific test to save the test time.

**(4). USB Interface** : The convenient USB interface can use USB Disk on PC to edit test programs, patterns and even to upload or download the upgrade programs to 2401/2402 to reduce engineer's workload in setup and management.

**(5). Large Capacity** : It has built in large capacity of storage memory that allows users to swap and save for different UUT without backup or download.(1000 TIMINGS and PATTERNS, 500 PROGRAMS)

**(6). Abundant Test Patterns** : It includes standard static, dynamic and pattern screens to check the characteristics response, white balance and residual of UUT. Also it can use PC to create the test patterns required.

**(7). Extended Control** : The default extended function on the front/rear panel is able to add remote control device or output control device for on-line link automatically.



Model 2401 Rear View



Model 2402 Rear View

### ORDERING INFORMATION

**2401:** Video Pattern Generator

Analog 165MHz/TV/HDTV

**2402:** Video Pattern Generator

Analog 165MHz/DVI 250MHz/HDMI 165MHz (TMDs Rate 225MHz)

**A240001:** Remote Keypad

### Softpanel - Model 2401



Closed Caption Screen



Teletext Screen

### Softpanel - Model 2402



InfoFrame Screen



EDID Screen

## SPECIFICATIONS

ANALOG OUTPUT	
Display Size	2048 x 2048
Pixel Rate Range	0.5~165MHz
Video Level	R,G,B (75 ohms) 0~1.0V programmable
Sync on Green / Level	0~0.5V On/Off programmable
White Level	0~1.2V programmable
Blank Level	7.5 IRE / 0 IRE selectable
HORIZONTAL TIMING	
Total Pixels	64~8192 pixels / 2 pixels resolution
VERTICAL TIMING	
Total Pixels	4~4096 lines (non-interlace) / 1 line programmable 4~2048 lines (interlace) / 1 line programmable
<b>COMPOSITE SYNC</b>	H+V, H EXOR V, Equalization & Serration Pulse
<b>SEPARATE SYNC</b>	Hs(Xs), Vs
VIDEO FORMAT	
Video Output (D-SUB)	R, G, B / RS-343A
	Y, R-Y, B-Y
	Y, Cb, Cr / ITU 601
	Y, Pb, Pr / ITU 709, RP177, SMPTE 240M
	DDC II B

HDMI VIDEO OUTPUT (Model 2402 only)	
Version	HDMI V1.3 (with xvYCC)
Pixel Rate Range	25MHz~165MHz
Support HDMI Timing	77 Timing (CEA-861D)
Pixel Repetition	4
Video Signal Type	RGB or YCbCr
Sampling Mode	RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2
Bits per Component	8 bits (1024 color)
Color Space	RGB / ITU-R BT.601 / ITU-R BT.709 / xvYCC
HDCP Support	HDCP V1.2
EDID	Read / Write / Compare / Edit
HDMI AUDIO OUTPUT (Model 2402 only)	
Sample Rate	32, 44.1, 48, 88.2, 96, 176.4, 192KHz
Number of Channel	8 Channel (FL/FR/LR/RR/FC/LFE/RLC/RRC)
Bits per Sample	16
Waveform	Sine wave
Amplitude	-90.3 to 0.0 dBFS
Frequency Range	10Hz to 20KHz
Frequency Resolution	10Hz / Step
External Audio Input	Optical and Coaxial ( S/PDIF )
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

DVI (TMDS) OUTPUT (Model 2402 only)	
Pixel Rate Range	25< 1 link< 165MHz (256 color)
E-EDID	Read / Write / Compare / Edit
HDCP	Support HDCP V1.0 Production-Key
Compliant	DVI 1.0 specification
Video Signal Type	RGB
Sampling Mode	4:4:4

TV OUTPUT (Model 2401 only)									
Output Mode	NTSC			PAL				SECAM	
Subcarrier Frequency	443 4.43	M,J 3.58	BDGHI 4.43	M 3.57	60 4.43	N 4.43	Nc 3.58	4.41/ 4.25	MHz
Subcarrier Stability	±50								Hz
Video Output	Composite (BNC, RCA), S-Video								
	Burst On/Off (NTSC, PAL)								
	Contrast programmable								
	Brightness programmable								
	Saturation programmable								
	Hue programmable								
Closed Caption (NTSC)	C1, C2, C3, C4 / T1, T2, T3, T4								
V-CHIP (NTSC)	MPAA Rating : G, PG, PG-13, R, NC-17, X								
	FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA								
	Canada English Rating : C, C8+, G, PG, 14+, 18+								
	Canada French Rating : G, 8 ans+, 13 ans+, 16 ans+, 18 ans+								
Teletext (PAL)	Teletext System B Level 1, 1.5								

SDTV FORMAT (Model 2401 only)					
Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
720 x 483	59.94P		60/1.001		SMPTE 293
			59.94I		ITU 601 SMPTE 170M
720 x 576	50P		50		ITU 1382
			50I		ITU 601

HDTV FORMAT (Model 2401 only)					
Timing	Progressive Mode Frame Rate (Hz)		Interlace Mode Frame Rate (Hz)		Standard
1920 x 1080	60P		60		SMPTE 274
	59.94P		60/1.001		SMPTE 274
	50P		50		SMPTE 274
	30P		30		SMPTE 274
	29.97P		30/1.001		SMPTE 274
	25P		25		SMPTE 274
	24P		24		SMPTE 274
	23.98P		24/1.001		SMPTE 274
1920 x 1035			60I		SMPTE 240
			59.94I		SMPTE 240
1280 x 720	60P		60		SMPTE 296
	59.94P		60/1.001		SMPTE 296
	50P		50		SMPTE 296

AUDIO (ANALOG) OUTPUT	
Frequency Range	50Hz/100Hz/200Hz/500Hz/1KHz/2KHz/5KHz/10KHz/15KHz/20KHz
Waveform	Sine wave
Number of Channel	2 Channel (R / L)
Level Range	0V to 2V (at 600 Ohms Load)
Special Control Mode	Tone / Sweep / Mute / Repeat / Play Time

DATA STORAGE DEVICE	
Default	1000 timings + 1000 patterns
Internal Memory	1000 timings + 1000 patterns + 500 programs
External Memory	USB Host interface
OTHERS	
AC Input	100/115/220/230V AC, 47~63 Hz auto range
Operation/Storage Temp.	+5~+40 deg.C / -20~+60 deg.C
Humidity	20~90 %
DIMENSION / WEIGHT	
2401/2402	320(W)x88(H)x240(D)mm / 3kg





## Audio Signal Generator Model A222701

### KEY FEATURES

- Sine Wave Output
- 10Hz~20KHz Programmable
- Tone or Sweep Mode
- Tone Freq Setting
- Level Setting
- Sweep Freq Setting
- Sweep Time Setting
- Mute on / off Setting
- PC editing software
- Can be support VPG Model 2227/2327/2228/2328

## Video Signal Box Model A222702

### KEY FEATURES

- Signal Switching
- RGB D-SUB Connector
- Y/Pb/Pr RCA Connector
- SCART Connector
- D-Terminal
- Can be support VPG Model 2227/2327/  
2228/2328/2229/2329/2230/2330/  
2231/2331

Chroma A222701 Audio Signal Box mainly provides audio signals for testing the acoustics of the audio circuit and the loudspeaker. Today's Multi-media instrument video/audio test is combined with the Video Pattern Generator and offers a complete test solution for built-in loudspeaker of LCD Monitor/PDP/Projector/TV/HDTV test applications.

Coordinating with PC software, the A222701's user interface allows programmable editing and single key operations. Moreover, Program and Step mode for testing can be switched fast and easily. The comprehensive and easy-to-use A222701 hardware equipment offers the most convenient test environment for R&D, production automation, quality assurance and service.

In terms of operations, A222701 is able to switch Program mode directly via the panel function key or via the control of the RS-232 interface under the full function mode for instant editing and processing. Also, users can download and save the edited test procedures to the A222701. With the combination of simple easy operation and composite keypad functions, the A222701 provides the fastest and the most convenient test and measurement.

In order to meet the standard video interface and multi-media audio display device applications of today's TV/HDTV/SDTV/Monitor/PDP/Projector, Chroma's A222702 Video Signal Box and Chroma 2227/2327/2228/2328/2229/2329/2230/2330/2331/2331 Video Pattern Generator are customized to expanded interfaces, such as RGB/D-Sub, YPrPb/RCA, D-terminal/D1-D5 and SCART Connector. This feature fulfills any video test interface requirements and makes Video Pattern Generator more flexible and comprehensive. In addition, the A222702 can control and process output signal formats and output interface via the VPG's various video output signals and special I/O control signals.

The output terminal of A222702 includes the following four signals: (1) SCART: Supporting Euro- type TV connector - signals include TV Composite and RGB output and control voltage. (2) D-Terminal: a HDTV signal D-Terminal connector that supports D1-D5; its signals include color difference signal YPrPb and control voltage. (3) RCA1 & RCA2: Two groups that can support HDTV/SDTV color difference signal or RCA connector of RGB. (4) D-Sub15 ANALOG RGB: supports a 15-Pin D-type Connector that has an Analog RGB.

### SPECIFICATIONS

Model	A222701 (Audio Signal Generator)
<b>OUTPUT FREQUENCY</b>	
Range	10Hz ~ 20KHz
Resolution	10Hz / step
<b>OUTPUT LEVEL</b>	
Channel	2 Channel (L / R)
Range	100 ~ 2000mV (at load 600 Ohms)
Resolution	100mV / step
Output Impedance	600 Ohms
<b>OUTPUT WAVE FORM</b>	
Signal	Sine Wave
THD	0.1%
<b>SWEEP/SEQUENCE TIME</b>	
Range	0 ~ 5sec
Resolution	0.1sec / step
<b>SPECIAL FUNCTION</b>	
Signal	Mute / Repeat
<b>AC INPUT</b>	
Voltage	110V or 220V $\pm 10\%$
Frequency	54Hz~66Hz
<b>DIMENSION</b>	
W x H x D	210 x 88 x 113 (mm)
Weight	1.1 (kg)

Model	A222702 (Video Signal Box)		
INPUT SIGNAL FROM 2X27			
Special I/O	Control Signal Input / +5Vcc		
D-SUB	Analog RGB Signal Input		
BNC	Composite TV Signal Input		
OUTPUT SIGNAL			
D-SUB	Analog RGB Signal Output		
Dual RCA	Analog RGB or YPbPr		
D Terminal			
Type	Control Pin 1	Control Pin 2	Control Pin 3
D1	480 Line (0V)	i (0V)	4:3 (0V)
D2	480 Line (0V)	i (0V) / p (5V)	4:3 Letter Box (2.2V)
D3	480 Line (0V)	i (0V) / p (5V)	16:9 (5V)
	1080 Line (5V)	i (0V)	
D4	480 Line (0V)	i (0V) / p (5V)	4:3 (0V)
	720 Line (2.2V)	p (5V)	4:3 Letter Box (2.2V)
	1080 Line (5V)	i (0V)	16:9 (5V)
D5	480 Line (0V)	i (0V) / p (5V)	4:3 (0V)
	720 Line (2.2V)	p (5V)	4:3 Letter Box (2.2V)
	1080 Line (5V)	i (0V) / p (5V)	16:9 (5V)
SCART Port	Stereo Audio, Composite and RGB Video (Audio / TV / Analog)		
DIMENSION			
W xH x D	332 x 45 x 106 (mm)		
Weight	1.0 (kg)		

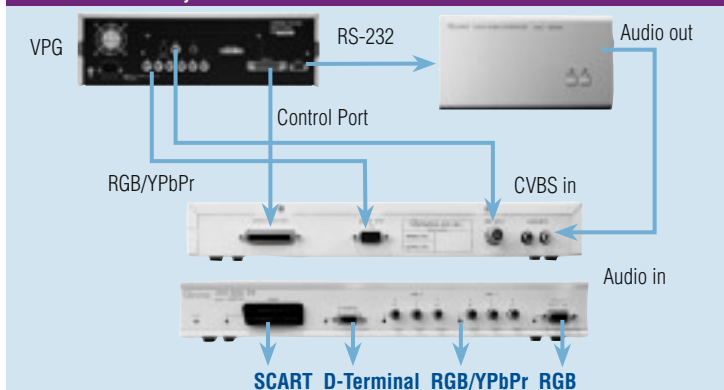


Model A222701



Model A222702

### A222701 & A222702 System Connection





Chroma A222704 Video Signal Box provides the standard video/audio interface of today's TV/HDTV/SDTV/Monitor/PDP/Projector application. In order to meet the standard test signal requirements of various panels, this device combined with the Chroma 2229/2329/22291/23291/2230/2330/2231/2331 Video Pattern Generator to expand interfaces, such as RGB/D-Sub, YPbPr/RCA, S-Video, D-Terminal/D1-D5, SCART and CVBS connector in Multi-media instrument testing.

In addition, the A222704 can control and process output signal formats and output interface via the VPG's various video output signals and special I/O control signals. Users can utilize the software application, VPG PLUS, either on PC or on the Video Pattern Generator itself to edit various timing parameters, patterns and test procedures. Its complete test functions can fully meet the requirements for R&D, production test and quality assurance in all video related industries.

### Video Signal Box Model A222704

#### KEY FEATURES

- Analog RGB D-SUB Connector
- Y/Pb/Pr RCA Connector
- D-Terminal ( SDTV / HDTV )
- SCART Connector
- CVBS Composite
- S-Video Y/C separation
- Analog Audio (R/L)
- Can be control by 22/23 Series
- Output protection

The output terminal of A222704 includes the following signals:

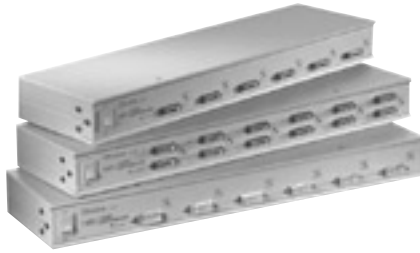
- (1) **SCART** : support Euro- type TV connector - signals include TV Composite and RGB output and control voltage.
- (2) **R1,L1 & R2,L2** : Analog Audio Right / Left output
- (3) **CVBS** : a Composite connector for TV output
- (4) **S-Video** : for Y/C (Luminance/Chrominance) video separate signals
- (5) **RCA1 & RCA2** : Two groups that can support HDTV/SDTV color difference signal or RCA connector of RGB.
- (6) **D-Terminal** : a HDTV signal D-Terminal connector that supports D1-D5; its signals include color difference signal YPbPr and control voltage.
- (7) **D-Sub15 ANALOG RGB** : supports a 15-Pin D-type Connector that has an Analog RGB.



A222704 Rear view

SPECIFICATIONS				
Model		A222704		
INPUT SIGNAL TYPES				
Special I/O Input		Control Signal Input		
D-SUB Input		Analog Video Signal Input		
BNC Input		TV Signal Input		
CVBS Input		TV Signal Input		
Y/C Input		TV Signal Input		
XS Input		Seperate V-Sync Input		
Stereo Audio Input		(R/L) Audio Input		
OUTPUT SIGNAL TYPES				
D-SUB Port		Analog Video Signal Output		
Y1PB1PR1		HDTV / SDTV color difference signal RCA connector		
Y2PB2PR2		HDTV / SDTV color difference signal RCA connector		
D-Terminal (D5)	Type	LINE 1	LINE 2	LINE 3
	D1	480 Line (0V)	i (0V)	4:3 (0V)
	D2	480 Line (0V)	i (0V) / p (5V)	4:3 Letter
	D3	480 Line (0V)	i (0V) / p (5V)	Box (2.2V)
		1080 Line (5V)	i (0V)	16:9 (5V)
	D4	480 Line (0V)	i (0V) / p (5V)	4:3 (0V)
		720 Line (2.2V)	p (5V)	4:3 Letter Box (2.2V)
		1080 Line (5V)	i (0V)	16:9 (5V)
	D5	480 Line (0V)	i (0V) / p (5V)	4:3 (0V)
		720 Line (2.2V)	p (5V)	4:3 Letter Box (2.2V)
		1080 Line (5V)	i (0V) / p (5V)	16:9 (5V)
SCART 1 Port		Stereo Audio, Composite and RGB Video (Audio / TV / Analog)		
SCART 2 Port		Stereo Audio, Composite and RGB Video (Audio / TV / Analog)		
Audio R1 / L1		Analog Audio R/L Output		
Audio R2 / L2		Analog Audio R/L Output		
CVBS1		TV Composite Signal Output		
CVBS2		TV Composite Signal Output		
S Video 1		Y/C (Luminance/Chrominance) Separate Signal		
S Video 2		Y/C (Luminance/Chrominance) Separate Signal		
ACCURACY				
Note 1		± 2% at all of the signal output		
Note 2		± 2V @ D5 control voltage 2.2V / 5V		
Note 3		± 0.2V @ 2.2 / 5V, ± 1V @ 12V for SCART control voltage		
DIMENSION				
W x H x D (mm) / Weight		318 x 44 x 105 / 1.2 kgs		





## Digital Video Distributor Model 28101/ 28102/ 28111

### KEY FEATURES

#### Model 28101/28102

- LVDS signal input / output
- Video pixel rate up to 85 MHz(1 link) / 170 MHz(2 link)
- Graphics display size up to XGA(1 link) / UXGA(2 link)
- Support MDR-26 Connector

#### Model 28111

- TMDS signal input / output
- Video pixel rate up to 165 MHz(1 link)
- Graphics display size up to UXGA(1 link)
- Support DVI-I Connector

Chroma Model 281XX Series Digital Distributors can distribute 1 signal to 5 output signals. Conforming to the digital video standards of today, they are able to work alone or be extended for additional signals for remote or multiple display devices.

The digital video distributor is suitable for applications like long distance transmission, burn-in system, production line, multi-display in exhibition, signal source protection and repair center.

The high-speed differential transmission feature provides the qualities of high volume data without any output distortion, high anti-noise, and long distance transmission that can be broadly used in video and communication industries.

Total four models of Low Voltage Differential Signaling (LVDS), and Transition Minimized Differential Signaling (TMDS), with 1 link / 2 links are provided for various applications without changing the connectors to avoid the distortion caused by signal conversion. Its unique circuit design and internal regulator device enable it to work stably when operating under maximum frequency. The 19" Rack Mount design chassis can fit in the industrial cabinet easily for unification.

Model 28101(1 link) / 28102(2 link) are LVDS signal distributors. The frequency range for 1 link is 20MHz~85MHz that can support up to XGA display, and for 2 link is 40MHz~170MHz that can support up to UXGA display. The MDR-26 connector used has up to 10M transmission length and does not cause any signal distortion.

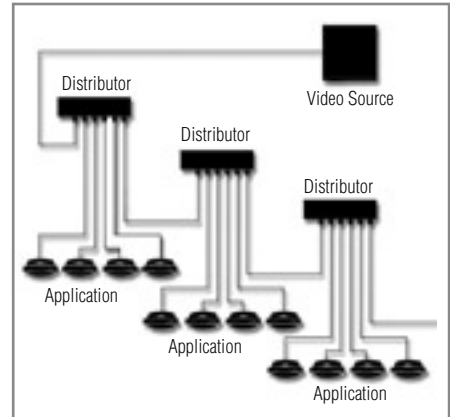
Model 28111(1 link) is TMDS signal distributor. The frequency range for 1 link is 25MHz~165MHz that can support up to UXGA display.

### ORDERING INFORMATION

**28101** : LVDS Digital video distributor 85MHz

**28102** : LVDS Digital video distributor 170MHz

**28111** : TMDS Digital video distributor 165MHz



1 to 5 Video Distributor Block Diagram

SPECIFICATIONS			
Model	28101	28102	28111
In / Out	1 In / 5 Out	1 In / 5 Out	1 In / 5 Out
Pixel Range			
1 Link	20 - 85 MHz	20 - 85 MHz	25 - 165MHz
2 Link	-	40 - 170 MHz	-
Display			
Display Size	Up to XGA	Up to UXGA	Up to UXGA
Signal Interface			
LVDS	Yes	Yes	—
TMDS	—	—	Yes
DDC 2B	—	—	Yes
Connector	MDR-26	MDR-26	DVI-D
Transmission Distance	5m	5m	2m
Input Level			
Differential Input Voltage	200mV (Typ)	200mV (Typ)	250 - 1000mV (Typ)
Output Level			
Differential Output Voltage	250 - 450mV	250 - 450mV	400mV (min)
Terminator Resistance	100Ω Typical	100Ω Typical	50Ω Typical
Power			
Input Power	110V ±10%/ 60Hz 0.3A	110V ±10%/ 60Hz 0.3A	110V ±10% / 60Hz 0.5A
	220V ±10%/ 50Hz 0.1A	220V ±10%/ 50Hz 0.1A	220V ±10% / 50Hz 0.2A
Power Indicator	Yes		
Environment			
Operation Temp.	0 - 40°C		
Storage Temp.	-20 - 60°C		
Humidity	20 - 90		
Dimension (WXHxD)	424x44x112 mm / 16.7x1.73x4.4 inch		424x44x176 mm / 16.7x1.73x6.92 inch
Weight	1.45 kg / 3.2 lbs	1.68 kg / 3.7 lbs	1.73 kg / 3.81 lbs



## Display Color Analyzer Model 7121

### KEY FEATURES

- Non-contact luminance and chromaticity measurement for color displays
- Wide luminance range: 0.1 to 9999 cd/m<sup>2</sup> (0.03 to 2918 fL)
- High accuracy measurement:  
±2% ±1digit for luminance (Y),  
±0.002 for Chromaticity coordinates (xy)
- Selectable display modes: xyY, T $\Delta$ uvY, u'v'Y, RGB, XYZ
- Memory for storing 100 channels of standard color data and calibration data
- Built-in flat display calibration data (LCD-D65, LCD-9300, PDP-D65, PDP-9300) to be applied for chromaticity measurement instantly
- Convenient user interface that switches the luminance unit by a single button
- The measurement position can be easily confirmed by positioned projecting light
- Standard USB & RS-232 data communication interface design to connect with PC
- Received the tenth Outstanding Photonics Product Award in 2007

Chroma 7121 Display Color Analyzer adopts the design of non-contact type measurement to measure the luminance and chromaticity of display panels. Developed with the most advanced digital signal processor and the technology of optoelectronic transfer as well as precision optical parts and circuit design, the 7121 Display Color Analyzer is capable of performing high speed, accurate and stable tests.

The configuration of Chroma 7121 complies with the color matching function sensor of CIE 1931 and CIE1976 UCS that can measure the luminance and chromaticity of display panel accurately. Users can switch to various types of chromaticity coordinates including xyY, T $\Delta$ uvY, u'v'Y, RGB and XYZ modes, etc. freely. The luminance measurement range is up to 0.1 to 9999 cd/m<sup>2</sup> (0.03 to 2918 fL) that can cover the luminance and chromaticity measures for all displays.

The optical measurement software incorporated by Chroma 7121 is able to do chromaticity and Gamma measurements on PC, and then show the measured data on CIE 1931 and CIE1976 UCS chromaticity coordinate directly. Besides the function of drawing Gamma curve, the measured data can also be stored on PC and exported to EXCEL® for process. The example programs enclosed in optical measurement software allow users to develop the test programs that suit their needs.

Chroma 7121 Display Color Analyzer has 100 channels of built-in memory for storing the value of standard colors and calibrated data. In addition, Chroma 7121 also provides many friendly user interfaces for operation such as the way test data shows, the position set for push buttons, the positioning projector, USB and RS-232 interfaces for data transmission, etc. to satisfy the requirements for actual measures.

As the technology and products of flat displays have become the mainstream in the market today, every manufacturer is seeking for high value-added and low cost measurement solutions to raise its competitiveness; Chroma 7121 Display Color Analyzer is the excellent tool to assist in achieving that purpose.

### 7121 OPTICAL MEASUREMENT SOFTWARE / SDK (STANDARD)

Chroma 7121 Display Color Analyzer working with the optical measurement software is able to grab the measured data to PC and store it or export it to EXCEL® for process. The example programs of optical measurement software are also enclosed for users to develop the application that suits their need.

#### Color Measurement

It shows both digital and analog at the same time and there are xyY, T $\Delta$ uvY, u'v'Y, RGB and XYZ five display modes available for setting one time or continuous measurement.

#### Gamma Measurement

Gamma measurement for red, green, blue and white four colors can be done when it is connected to the VPG of Chroma. The measurement can be set for 16, 32, 64, 128 and 256 levels as need.

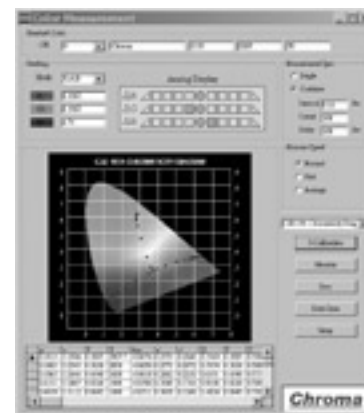
#### Software Development Kit (SDK)

- Example Program:
  - Color Measurement
  - Gamma Measurement
  - Color Calibration
- API Development Library

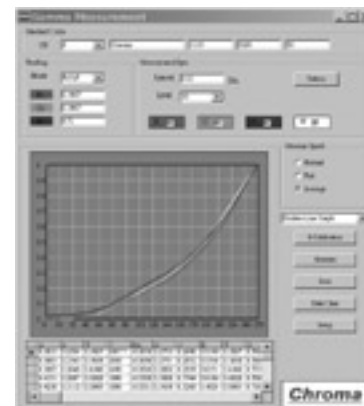
#### System Requirements

Operating System: Windows® 2000/XP

Windows® & EXCEL® are the trademarks of Microsoft in United States and other countries.



Color Measurement



Gamma Measurement

• Continued on next page →

SPECIFICATIONS		
Model		7121
Main unit		
Measurement Area		ø27 mm
Acceptance Angle		± 2.5°
Display Range	Luminance	0.01 to 9999 cd/m <sup>2</sup>
	Chromaticity	Displayed in 4 or 3 digit value
Measuring Range		0.10 to 9999 cd/m <sup>2</sup> (0.03 to 2918 fL)
Luminance Unit		cd/m <sup>2</sup> or fL, selectable via front panel key
Display		Digital : xyY; XYZ; T Δ uvY ; u' v' Y; RGB Analog : Δ x Δ y Δ Y; Δ R Δ G Δ B; Δ R G/R B/R; R/G Δ G B/G
Luminance	Accuracy	± 2% ± 1digit (Calibrated by standard illuminant A under Chroma's testing condition)
	Repeatability	0.10 to 0.99 cd/m <sup>2</sup> : 0.2% + 1digit (2 σ) Above 1.00 cd/m <sup>2</sup> : 0.1% + 1 digit (2 σ)
Chromaticity	Accuracy	0.1 to 2.99 cd/m <sup>2</sup> : ± 0.008 (for standard illuminant A) 3.0 to 4.99 cd/m <sup>2</sup> : ± 0.005 (for standard illuminant A) 5.00 to 9.99 cd/m <sup>2</sup> : ± 0.003 (for standard illuminant A) 10.00 to 9999 cd/m <sup>2</sup> : ± 0.002 (for standard illuminant A)
	Repeatability	0.10 to 0.19 cd/m <sup>2</sup> : 0.015 (2 σ) 0.20 to 0.49 cd/m <sup>2</sup> : 0.008 (2 σ) 0.50 to 1.99 cd/m <sup>2</sup> : 0.003 (2 σ) 2.00 to 9999 cd/m <sup>2</sup> : 0.001 (2 σ)
Measurement Speed		0.1 to 3.99 cd/m <sup>2</sup> : 5 times/second Above 4.00 cd/m <sup>2</sup> : 15 times/second
Memory Channel		100 channels
SYNC Mode		NTSC, PAL, EXT, UNIV, INT
Object Under Measurement		10~100 Hz
Interface		USB(2.0), RS232C (Baud rate max. 115200 )
Input Voltage range		AC 100~240V, 50/60 Hz, 50VA
Temperature Range		Operation : 0°C to 40°C (32°F to 104°F) Storage : -20°C to 55°C (-4°F to 131°F)
Humidity Range		Less than 85% relative humidity (at 35°C/95°F with no condensation)
Dimensions (WxHxD)		320 x 115 x 240mm
Weight		2.5 Kg
Measuring Probe		
Number of measurement		One probe
Dimensions		Ø 46 x 235(D) mm
Weight		500g
Cord Length		2.5m
Optical System		LED pointing function
Other Functions		Calibration of user-selected color reference, storage of channel ID name, variable analog display range, measurement hold, remote control
Certification		CE

\*Reference Standard : IEC 61747-6, EIAJ ED-2522, ASTM E455-03, VESA Standard

\*All specifications are subject to change without notice.

## ORDERING INFORMATION

**7121** : Display Color Analyzer

**A712100** : Probe with a 2.5-Meters Cable

**Optional Accessory :**

**A712101** : Probe with a 5-Meters Cable

**A712102** : Tripod (including a level)



### Small Panel Color Analyzer Model 71701/ 71702

#### KEY FEATURES

- Selectable display modes in xyY, T $\Delta$ uvY and u'v'Y
- Measuring area : 20 mm diameter (Model 71701)  
5 mm diameter (Model 71702)
- Miniature probe end for tight space arrangement
- High accuracy measurement :  
Y :  $\pm 2\% \pm 1$ digit  
x, y :  $\pm 0.002$
- Precise repeatability measurement:  
Y :  $\pm 0.3\% \pm 1$ digit  
x, y :  $\pm 1\% \pm 1$ digit ( $2 \text{ cd/m}^2 \leq Y < 30 \text{ cd/m}^2$ )  
 $\pm 0.3\% \pm 1$ digit ( $30 \text{ cd/m}^2 \leq Y \leq 4000 \text{ cd/m}^2$ )

- Fast measurement rate : 5 times/sec
- Friendly graphic user interface
- NIST traceable calibration
- Data output for statistical analysis
- Memory for storing 12 channels of standard color data and calibration data, expandable to 100 channel with optional card

The Chroma 71701/ 71702 is a versatile instrument for measuring Small Panel Displays. Designed with advanced microprocessor and A/D converter, and using precision optical components and electrical circuit, it is capable of making high speed color measurement accurately to tight specification.

It uses sensors filtered to closely match the CIE 1931 color-matching functions to measure the energy of the light emitted by the Backlight, OLED panel and other Flat Panel Displays. The user can display the measured data in xyY( xy as chromaticity coordinates, Y as luminance), T $\Delta$ uvY (T as correlated color temperature,  $\Delta$ uv as color difference from black body locus, and Y as luminance value), or RGB mode. A wide luminance measurement range from 2.0 to 4000 cd/m<sup>2</sup>, or 0.58 to 1167fL makes the measurement of any Backlight, OLED Panel and other Small Panel Displays possible.

The advanced graphic control software facilitates fast and simple colorimetric measurements. The software is a Windows™-based control program with graphical user interface. The standard graphics screen shows the relative intensity of the RGB, color coordinates, luminance, and pass/fail testing of Backlight, OLED Panel and other Small Panel Display.

As the demand of thin, lightweight and low radiation monitor is increasing quickly, the Backlight, OLED Panel and other Small Panel Displays will play an important role in the near future. Every maker is looking for a high value-added but cost-effective test solution to keep up with the trend. Such a versatile and easy-to-use instrument like Chroma 71701/ 71702 must satisfy your intent to win competitive advantages.

#### ORDERING INFORMATION

- 71701** : Small Panel Color Analyzer (measuring area:  $\phi 20\text{mm}$ )  
**71702** : Small Panel Color Analyzer (measuring area:  $\phi 5\text{mm}$ )

SPECIFICATIONS		
Model	71701	71702
Photo Sensor	Three sensors with tuned color filters (closely approximates CIE 1931 color matching functions).	
Luminance Measuring Range	2~4000 cd/m <sup>2</sup> or 0.584~ 1167fL	1~999 cd/m <sup>2</sup> or 0.292~ 291.7fL
Luminance Unit	cd/m <sup>2</sup> or fL, selectable via front panel key	
Display Modes	xyY; TΔuvY; u' v' Y	
Display Values	Digital : xyY; TΔuvY; u' v' Y Analog : ΔxΔyΔY	
Memory	12 channels(standard); 100 channels with optional PCMCIA type II memory card	
Accuracy	Y : ±2% ± 1digit x, y : ±0.002 (Measurement conditions 20 ± 2°C, Standard light source A, 50 cd/m <sup>2</sup> or above)	
Repeatability	Y : ±0.3% ±1 digit x, y : ±1% ±1 digit (2 cd/m <sup>2</sup> ≤ Y < 30 cd/m <sup>2</sup> ) ± 0.3% ±1 digit (30 cd/m <sup>2</sup> ≤ Y≤ 4000 cd/m <sup>2</sup> )	
Measurement Rate	Approx. 5 times/second (Measurement condition : display mode : xyY)	
Measuring Area	ø20 mm	ø5 mm
Other Functions	Calibration of user-selected color reference, storage of channel ID name, variable analog display range, measurement hold, remote control	
Data Communication	RS-232	
Operating Environment		
Temperature	5°C ~ 40°C	
Humidity	Less than 85% relative humidity (at 35°C/95°F with no condensation)	
Power	115/230 Vac, 50/60 Hz	
Dimension (W x H x D)	424 x 133 x 261 mm	
Measuring Probe	ø43x144mm Cord Length : 2.5m (8.2ft)	
Weight		
Main Unit	6.1Kg (13.5lb.)	
Measuring Probe	250g (8.8oz.)	



- Precise repeatability measurement: Y:  $\pm 1\% \pm 1$  digit  
x, y:  $\pm 0.0005$
- NIST traceable calibration
- User-defined calibration function facilitates the system maintenance
- Programmable Video Pattern Generator whose specifications meet the requirement of ANSI standard
- Testing criteria storage for various models requirements
- "Pre-Test" function for programmable testing items setting
- Friendly graphic user interface
- User authority control
- Data output for statistical analysis
- Heavy-duty fixture

## Front Projector ATS Model 7600

### KEY FEATURES

- Hardware & software compliance with ANSI (ANSI/NAPM IT 7.228-1997) and JBMA standard
- High measuring speed: 15 seconds to complete all ANSI testing items with video pattern generator integration
- Measuring Area: Rectangle in 4 : 3 and 16 : 9 ratio and 2 in 1 (4:3 & 16:9), with diagonal line of 60 inches
- One click to complete all the ANSI and JBMA testing items: ANSI Lumens, Light Uniformity, Color Uniformity, Contrast Ratio, JBMA Light Uniformity, JBMA Contrast Ratio and Correlated Color Temperature
- Accurate chroma meter with tuned color filters (closely approximates CIE 1931 color matching functions), and cosine correctors
- High accuracy measurement: Y:  $\pm 2\% \pm 1$  digit  
x, y:  $\pm 0.002$

The Chroma 7600 is an automatic test system for identifying the performance of front projectors by measuring the optical properties. It is compliance with ANSI (ANSI/NAPM IT 7.228-1997) and JBMA standard and suitable for different types of front projectors, including LCD, DLP and LCOS etc. Designed with advanced microprocessor, A/D converter and precision optical components, it offers accurate, stable and high-speed chromatic measurements performance.

The software of Chroma 7600 is a Windows™-based control program with comprehensive graphic user interface and facilitates fast, simple colorimetric measurements of front projectors. To accommodate the diversified needs users may have, Chroma 7600 provides various test results including ANSI Lumens, Light Uniformity, Color Uniformity, Contrast Ratio, JBMA Light Uniformity, JBMA Contrast Ratio and Correlated Color Temperature for one's choice. With the integration with video

pattern generator, just one click you can complete all the ANSI testing items and it takes only 15 seconds. In addition, you can use the "Pre-Test" function to edit your own testing items for non-ANSI standard tests, like convergence, grayscale tests and VR adjustment etc. And with the user-defined calibration function, it is very convenient for the system maintenance.

As the demand of compact, high brightness and resolution display devices is increasing quickly now, the front projector will play a leading role in the near future. Every front projector maker is looking for the most cost-effective test solution to keep up with this trend. Such a versatile and easy-to-use instrument like Chroma 7600 must satisfy your intent to win competitive advantages.

### 7600 Software Package



### KEY FEATURES

- Open architecture software
  - Friendly graphic user interface
  - User editable test item
  - User editable outputted pattern
  - User editable calculating formula
  - User editable test program
  - User editable report format
  - Testing parameters storage for various models' requirements
  - User authority control
  - Support bar code reader
  - Data output for statistic analysis
- Cost effective
- High test throughput
- User-defined calibration function facilitates system maintenance

### ORDERING INFORMATION

**7600** : Front Projector ATS  
**Probe** : 29 sets (Chroma Meter & Lux Meter); 13 sets (Lux Meter)  
**Boddy Modular**: 4:3 ratio/ 60in; 16:9 ratio/ 60in  
**Project Board** : 4:3 ratio/ 60in/ white or black; 16:9 ratio/ 60in/ white or black  
**Personal Computer**  
**VPG** : Refer to 2326/ 2327/ 2337/ 2328/ 23291/ 2330/ 2331

SPECIFICATIONS	
Model	7600
Photo Sensor	29 points of measurement with tuned color filters (closely approximates CIE 1931 color matching functions), and cosine correctors
Illuminance Range	0.10 to 29,999 Lux
Display Range	0.01 to 29,999 Lux
OS	Windows 2000
Software User Interface	13 points with Yxy; Yu'v'; CCT and 16 points with Lux for Contrast Ratio Analysis Calculation: ANSI Lumens/ Uniformity/Contrast Ratio / Max/Min/Avg / JBMA Light Uniformity / JBMA Contrast Ratio User-defined testing parameters Data storage
Measuring Area	Rectangle in 4 : 3 and 16 : 9 ratio and 2 in 1 (4:3 & 16:9), with diagonal line of 60 inches 20 mm in diameter for each measurement points Allocating meets ANSI/NAPM IT7.228-1997
Repeatability	Y: $\pm 1\% \pm 1$ digit x, y: $\pm 0.0005$
Accuracy	Y: $\pm 2\% \pm 1$ digit x, y: $\pm 0.002$ (Measurement conditions: 300 Lux Illuminant A, at 18-22°C)
Measurement Time	15 seconds for full ANSI test
Power	100-230 VAC, 50-60Hz
Data Communication	USB Interface
Power Consumption	55VA max.
Dimension ( W x H x D )	Approx. 1400 x 1100 x 120 mm (without foot-stand)
Temperature (Measurement Body, without PC)	
Operating	5-40°C (41-104°F)
Storage	0-50°C (32-122°F)
Humidity (Measurement Body, without PC)	
Operating	20%-85% R.H. (at 35°C/95°F with no condensation)
Storage	10%-85% R.H. (at 35°C/95°F with no condensation)



Chroma 7660 Display Multi-Probe ATS adopts the design of non-contact type measurement with the sensor that complied with CIE 1931 and CIE1976 UCS color matching function can measure the luminance and chromaticity uniformity of display panels accurately. Developed with the most advanced digital signal processor and the technology of optoelectronic transfer as well as precision optical parts and circuit design, the probes are able to perform high speed, accurate and stable color tests.

Chroma 7660 Multi-Probe Measurement Software is structured on the OS of Windows XP for graphics operation. The comprehensive and easy to use interface design not only improves the test efficiency effectively but also reduces the human cost for manufacturers. Users can execute all programmed measurement items within a short time by pressing one button when a Video Pattern Generator is integrated. In the mean time, the acceptance and archive are determined automatically as well.

To satisfy different requirements from user, Chroma 7660 provides the user-defined test items that can be edited as need. The "Pre Test" function provided by control software allows users to monitor the readings of each sensor on every pattern in real time for analysis. Chroma 7660 has the function of selfcalibration that makes the system maintenance fairly convenient and reduces the succeeding calibration cost effectively.

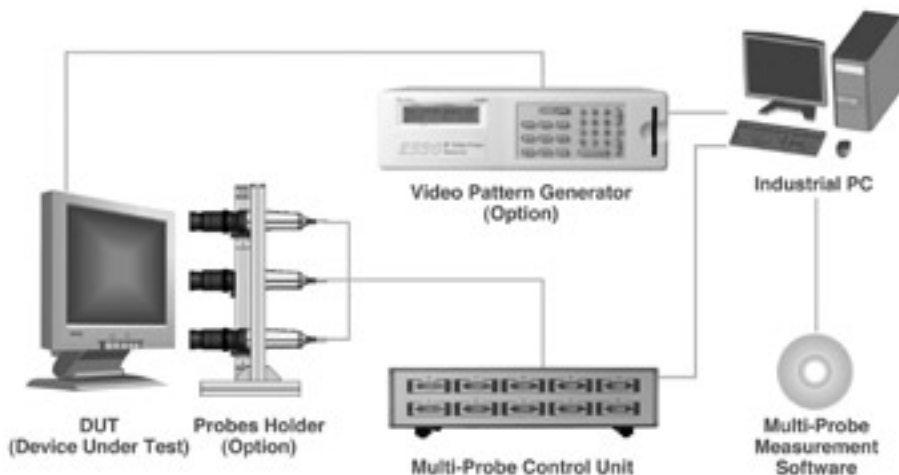
When the presentation of light chromaticity becomes a key factor for display products, the identification of color has to be standardized and more efficient. As the technology and products of flat panel displays have turned into the mainstream in the market today, the consistency of product quality and the improvement of production efficiency as well as the reduction of cost are the competitions of all manufacturers. Chroma 7660 with excellent capability is the device of best choice for gaining and increasing competitiveness.

## Display Multi-probe ATS Model 7660

### KEY FEATURES

- Multiple dots non-contact luminance and chromaticity measurements for color display
- Wide luminance range: 0.1 to 9999 cd/m<sup>2</sup> (0.029 to 2918 fL)
- High accuracy measurement:
  - ±2% ±1digit for luminance (Y)
  - ±0.002 for chromaticity coordinates (xy)
- Support LCD, PDP and various types of flat panels
- Support 2, 5, 9, 16, 25 sensors measurement simultaneously with fast speed
- Able to store 200 channels of calibration data
- Available test items are:
  - Luminance, chromaticity, color temperature, luminance uniformity, chromaticity uniformity and contrast
- Exclusive test software that can be programmed by user with high flexibility and operation efficiency
- User can complete all planned measurements by pressing a single button when integrated with video pattern generator
- Multiple Pre Test modes: Y, xyY, T Δ uvY, u' v' Y, XYZ
- Pre Test function provides user a single step to track the reading of each sensor in real time
- Both English and Chinese operation interfaces are available for switch as need
- Test results can be saved and output automatically for statistics analysis
- Provide access authority control setting for system management
- Support Bar Code Reader input
- Supports remote control function that control commands can be written to integrate with various application systems such as production line automated software, white balance auto adjustment software, Gamma auto adjustment software and etc.

### SYSTEM STRUCTURE





## 7660 MULTI-PROBE MEASUREMENT SOFTWARE

Through the connection of multiple probes on the Multi-Probe Control Unit and the output patterns generated by the integrated Video Pattern Generator, the Multi-Probe Measurement Software worked on Chroma 7660 Display Multi-Probe ATS is able to send the measured readings to PC for calculation. The software will calculate the color and luminance uniformity that should be measured by the probe for assessment. It shows Pass if the uniformity is within the specification and shows NG if otherwise. In the end, the test result can be saved to PC and exported to Excel® for process.

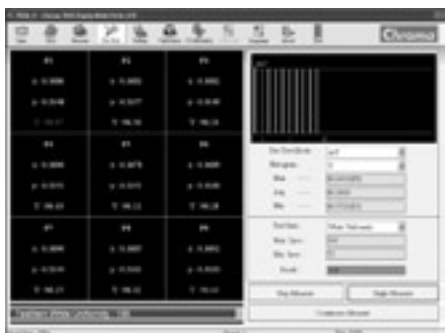
### Main Screen

It is the major screen displayed for test execution. Click the key of "Measure" can perform the measurement of all test items and display the test results. This screen provides the test information including model name, serial number, date, time and etc. It also lists the test items, specifications as well as the outcome of test. The obvious production information in the statistics area helps understanding the quantity tested, the yield rate, the defect rate and etc. of the production line at present. Continuous test function allows users to do long hour test for one single DUT such as product stability test.



### Pre Test

Pre Test function allows users to monitor the readings of each measurement also to analyze the DUT's status effectively in real time by showing the differences of single scale in histogram. The multiple Pre Test modes enable users to select the mode they need. Functions of single step test, single test item and continuous test are provided with the concurrent results display, users are able to do further accurate analysis on DUT.



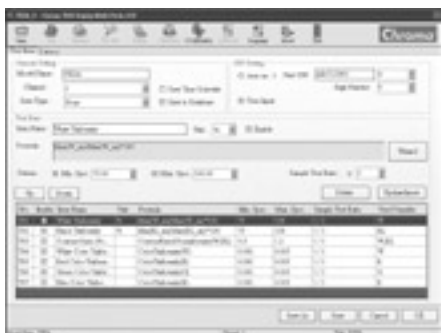
### Pattern Editor

Multi-Probe Measurement Software can be used to set the patterns for test and timings, output patterns in real time and inspect the set patterns and timings are correct when integrated with Chroma Series Video Pattern Generator. Users can download the pattern and timing names on the Video Pattern Generator to program directory for easy editing. Different patterns can set different measurement dots that make the usage even more flexible.



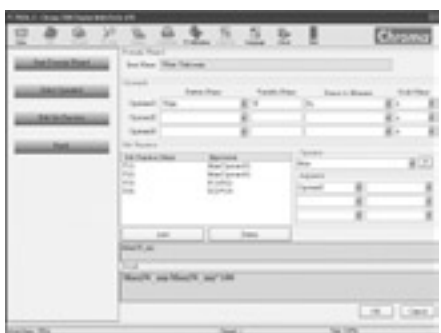
### Test Item Editor

Users can set information for different models and save the mapped test items to various test programs. Switching the model to be tested can be done easily by opening the saved file. The serial number can be entered automatically or by user input; in addition it supports the input from bar code reader. Users can define conditions and specifications for the specified pattern and the program will judge if those criteria are met and save the test results automatically for statistics analysis use later on. For the items that do not require complete execution, the Save Time Schedule function enables users to specify test item for Sampling.



### Formula Wizard

Users are able to define the calculation formula for test item. The Multi-Probe Measurement Software provides a wizard to help users editing the formula. Its easy-to-learn pull-down menus can select the pattern name and scale name directly for calculation. Also, specific probe measurement can be set in the formula for flexible application. The real time on-line function description is provided for help at any time.



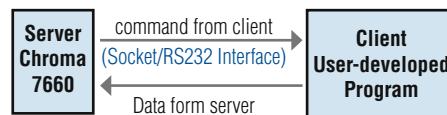
### User Calibration

The function of user calibration allows users to perform calibration directly within the factory without sending the device back to its original producer to save time and cost. There are single probe and multi-probe sync calibrations available for selection. Maximum 200 channels of memory can be used to save different calibration parameters. Calibrations of white, matrix and enhanced matrix are also provided so that the calibration can be closer to the readings of standard unit.



### Remote Control Function

7660 Display Multi-Probe ATS has remote control function that allow users to develop software programs such as production line automated software, white balance auto adjustment software and Gamma auto adjustment software by themselves. As the 7660 Multi-Probe measurement software is controlled by Socket or RS232 interface to read the probe measured value, the 7660 is called Server and the user-developed program is called Client as the diagram shown below.



### System Requirement

Operation System : Windows® XP, Windows® and EXCEL® are the registered trademarks of Microsoft in USA and other countries.



SPECIFICATIONS		
Model		7660
Probe		
Measurement Area		Ø27 mm
Measurement Distance		30 ± 10 mm
Acceptance Angle		± 2.5°
Measurement Range		0.10 to 9999 cd/m <sup>2</sup>
Luminance	Accuracy	± 2% ± 1digit (Calibrated by standard illuminant A under Chroma's test condition.)
	Repeatability	0.10 to 0.99 cd/m <sup>2</sup> : 0.2% + 1digit (2 $\sigma$ ) 1.00 cd/m <sup>2</sup> or above : 0.1% + 1 digit (2 $\sigma$ )
Chromaticity	Accuracy	0.1 to 2.99 cd/m <sup>2</sup> : ± 0.008 (for standard illuminant A) 3.0 to 4.99 cd/m <sup>2</sup> : ± 0.005 (for standard illuminant A) 5.00 to 9.99 cd/m <sup>2</sup> : ± 0.003 (for standard illuminant A) 10.00 to 9999 cd/m <sup>2</sup> : ± 0.002 (for standard illuminant A)
	Repeatability	0.10 to 0.19 cd/m <sup>2</sup> : 0.015 (2 $\sigma$ ) 0.20 to 0.49 cd/m <sup>2</sup> : 0.008 (2 $\sigma$ ) 0.50 to 1.99 cd/m <sup>2</sup> : 0.003 (2 $\sigma$ ) 2.00 to 9999 cd/m <sup>2</sup> : 0.001 (2 $\sigma$ )
Sync Mode		NTSC, PAL, EXT, UNIV, INT
Sync Frequency		10~100 Hz
Dimension		Ø 46 x 235(D) mm
Weight		500g (Per Probe)
Cord Length		2.5m
Multi-Probe Control Unit		
No. of Port		10
Communication Interface		USB
Length of USB Cable		4.5m
Input Voltage Range		AC 100~240V, 50/60 Hz, 50VA
Temperature Range		Operating : 0°C to 40°C (32°F to 104°F) Storage : -20°C to 55°C (-4°F to 131°F)
Humidity Range		Less than 85% relative humidity (at 35°C/95°F non-condensing)
Dimension		303(W)x206(D)x70(H)mm
Weight		2.0 Kg
Industrial PC		
Operating System		Windows® XP
Software Installation		7660 Multi-Probe Measurement Software
Communication Interface		Socket, RS-232
Input Voltage Range		AC 100~240V, 50/60 Hz, 300W (Max.)
Option		LCD Monitor

\*Reference Standard: IEC 61747-6, EIAJ ED-2522, ASTM E455-03, VESA Standard, TCO

## ORDERING INFORMATION

**7660** : Display Multi-Probe ATS (Probe \*2 + Multi-Probe Control Unit \*1 + IPC)  
**7660** : Display Multi-Probe ATS (Probe \*5 + Multi-Probe Control Unit \*1 + IPC)  
**7660** : Display Multi-Probe ATS (Probe \*9 + Multi-Probe Control Unit \*1 + IPC)  
**7660** : Display Multi-Probe ATS (Probe \*16 + Multi-Probe Control Unit \*2 + IPC)  
**7660** : Display Multi-Probe ATS (Probe \*25 + Multi-Probe Control Unit \*3 + IPC)  
**A766000** : Multi-Probe Control Unit (10 ports)  
**A766001** : 7660 Probe (Including a 2.5m cable)  
**A766002** : 7660 Probe (Including a 5m cable)  
**VPG** : Refer to 2326/ 2327/ 2337/ 2328/ 23291/ 2330/ 2331