Letter Size, Analog Output 260 MHz, Digital Output 200 MHz

- High-Speed Pattern Switching
- Built-in Color Still Picture (16-color, 256-color, Full color Scroll/ Rewrite function)

LT 1615

PROGRAMMABLE VIDEO GENERATOR

●GENERAL

This group of three RGB generators offers dedicated analog, digital or combined analog/digital outputs to best suit application needs. High dot-clock capabilities are featured, up to 260 MHz in analog, which allows operation in UXGA (1600 x 1200) systems. All in the group operate from user-replaceable ROMs making them ideal for production operations wherein parameters are not to be altered by operators. Remote control units (LT 1610-01B) extend program selection to remote control points and widen operator control to signal-output conditions including sync format and polarities. Full PC control gives the operator complete control over raster architecture, signal-output conditions and selection from stock and custom patterns. Control extends to the graphic design of custom patterns and the downloading of images from digital still cameras or scanners. X-Y cursors permit the coordinates of defective pixels in the display to be accurately established and provision is made to test monitor power saving actions spelled out in VESA standards. Fast image switching speeds production work by reducing the wait for new images to appear. Image sequencing may be programmed and scrolling window or character actions aid in gauging image-decay characteristics. A factory option adds 4 MB of RAM to extend image memory to accommodate up to 12 VGA format images.

■ LT 1615 Rear Panel

●FEATURES

- **Image Downloading from Scanners and Digital Cameras**
- **Accessories Provide LVDS Drive to LCD Panels**
- **Auto Pattern Switching and Scroll Image Gauge Decay Characteristics**
- **External Clock Input**
- **PC Programming and Control Operates in Windows Environment**
- **ROM Setup and Control for Stand-Alone Operations**
- **Both Analog and Digital RGB, Clock to 260 MHz/ 200 MHz**
- **Digital Outputs 8-Bit Parallel, Handles Most Flat-Panel Displays**
- **High Speed Switching Speeds Pattern Selection**
- **Power Saving Display Function as Specified in VESA Standards**
- **Graphic Design of Custom Test Patterns**
- **Stock Test Patterns Include SMPTE 133 & Flower Image**
- **Image Downloading**
- **X-Y Display Function Locates Pixel Coordinates (to Locate Display Faults)**
- **Auto Display Functions (Pattern Switching & Scroll)**
- **X-Y Coordinates Locates Pixel Faults**

*Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries.

●SPECIFICATIONS LT 1613/ LT 1614/ LT 1615

Model	LT 1613	LT 1614	LT 1615
Dot Clock Frequency			
Analog	1.024 - 260.000 MHz (10 ppm)	————	1.024 - 260.000 MHz (10 ppm)
Digital 1/1 Clock Mode	————	1.024 - 100.000 MHz (10 ppm)	
Digital 1/2 Clock Mode	————	2.048 - 200.000 MHz (10 ppm)	
Horizontal Frequency	3.077 - 250 kHz, 8192 dots maximum (in 1 dot steps *1)		
Number of Vertical Scanning Lines	8179 maximum (interlace) (2048 dots × 2048 dots) × 8		
Video Memory	(2048 dots × 2048 dots) × 8		
Patterns	Fixed Patterns: 33(Color still picture, SMPTE RP-133, crosshatch, dots, color bars, gray scale, circle, window, character list, all character, character, pattern, etc.) Programmable Patterns [Parameter-Controlled Patterns: 15, Special Pattern: 1]		
Signal Output Level			
Analog	Video R, G, B: 0.300 - 1.200 V (5 mV step) Sync: 0.000 - 0.600 V (5 mV step) Setup 0.000 - 0.250 V (1 mV step) HS, VS, CS (BNC): CMOS/TTL level (5 V) DISP(SMA): CMOS/TTL level (5 V)	————	Video R, G, B: 0.300 - 1.200 V (5 mVstep) Sync: 0.000 - 0.600 V (5 mV step) Setup 0.000 - 0.250 V (1 mV step) HS, VS, CS (BNC): CMOS/TTL leve (5 V/3.3 V), selectable DISP(SMA): CMOS/TTL level (5 V/3.3 V), selectable.
	CLK OUT (SMA): ECL amplitude, AC coupled output		
TTL	CMOS/TTL Level (5 V)		
Digital	————	CMOS/TTL level (5 V) and low voltage CMO/TTL level (3.3 V) *2 , selectable.	
Equalizing Pulse	OFF/0.5 H/1 H, selectable		
Serration Pulse	OFF/0.5 H/1 H/XOR, selectable		
Composite Video Sync Signal	ON/OFF, selectable adjustable R, G, B	————	ON/OFF, selectable adjustable R, G, B
Scanning	Non-interlace, interlace, interlace shrink		
Dot Clock Input(SMA)	EXT CLK IN: 116 dBμ (50 Ω) Input range: 1.024 - 260.000 MHz	EXT CLK IN: 116 dBμ (50 Ω) Input range: 1.024 - 200.000 MHz	EXT CLK IN: 116 dBμ (50 Ω) Input range: 1.024 - 260.000 MHz
Analog Output (BNC)	R, G, B, HS, VS, CS		R, G, HS, VS, CS
(SMA)	DISP		DISP
(SMA)	CLK OUT: Output range 1.024 - 260.000 MHz	CLK OUT: Output range 1.024 - 200.000 MHz	CLK OUT: Output range 1.024 - 260.000 MHz
Analog Output Fine Adjustment	Offset level (adjustable R, G, B individualy.) Video level (adjustable R, G, B interlocked.) RGB balance (adjustable R, B only)	————	Offset level (adjustable R, G, B individualy) Video level (adjustable R, G, B interlocked) RGB balance (adjustable R,B only)
TTL Output (Amphenol 57 Series, 24-pin connector)	HS, VS, CS, (HD), (VD), (I), (I'),CLK, (HD), (VD) can be selected by setting of DIP SW 1. Option 71 : R, G, B, R', G', B', (I), (I') can be selected. *3		
Digital Output (Amphenol 57 series, 50-pin connector)			
Digital Output 1	————	R7-R0, G7-G0, B7-B0, HS, VS, CS, HD, VD, DISP, CLK, CTRL0, CTRL1, Vcc (5 V/3.3 V)	R7-R0, G7-G0, B7-B0, HS, VS, CS, HD, VD, DISP, CLK, CTRL0, CTRL1, Vcc (5 V/3.3 V)
Digital Output 2	————	R7-R0, G7-G0, B7-B0, FIELD (1/2 CLOCK RATE) *4 CTRL2, Vcc (5 V/3.3 V)	R7-R0, G7-G0, B7-B0, FIELD (1/2 CLOCK RATE) *4 CTRL2, Vcc (5 V/3.3 V)
Output Control	ON/OFF and inversion for R, G, B ON/OFF and negative/positive for HS, VS, CS, HD, VD, DISP, CLK		
External Interface	RS-232C (D-sub 9-pin connector) REMOTE (Amphenol 57 series, 36-pin connector)		
Environmental Conditions	Operating temperature: 0 to 40°C Spec-Guaranteed temperature: 5 to 35 °C		
Power Requirements	90 to 132 VAC, 180 to 250 VAC, universal (50/60 Hz)		
Dimensions & Weight	295 (W) × 116 (H) × 210 (D) mm, 3.9 kg	295 (W) × 139 (H) × 210 (D) mm, 4.4 kg	295 (W) × 139 (H) × 210 (D) mm, 4.8 kg
Accessories	User ROM…1. Windows application software …1. Power cord…1. Instruction manual…1.		

*1 Timing for H-PERIOD, H-SYNC, H-BP, HD-START, and HD WIDTH can be set in 1 dot steps.
When setting the H-WIDTH in 1 dot steps, the dot clock frequency should be 75 MHz or lower.
When setting the H-WIDTH in 2 dot steps, the dot clock frequency should be 150 MHz or lower.
When setting the H-WIDTH in 3 dot steps, the dot clock frequency can be used.
*2 CMOS/TTL level must be only 3.3 V for frequency range of 135 MHz (67.5 MHz + 67.5 MHz) to 200 MHz (100 MHz + 100 MHz)
*3 TTL video signal output is factory option. (R, G, B, I, R', G', B', I')
*4 In 1/1 clock mode, signals (i.e., R7-R0, G7-G0, B7-B0) are not output. The output impedance is set to 330 Ω through a pull-down resistor connected to ground since output pin of the IC.

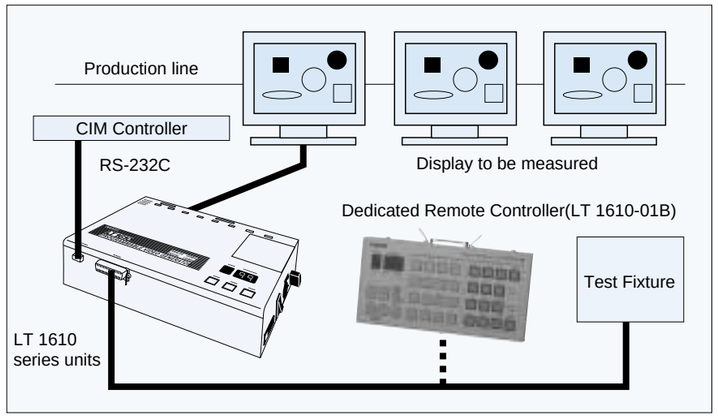
• "Windows" is a trademark of Microsoft Corporation, registered in the USA and other countries.

Evolution of LCD, CRT, Plasma display test

■ Powerful features for production line, high-speedfrequency switching capability, and much more.

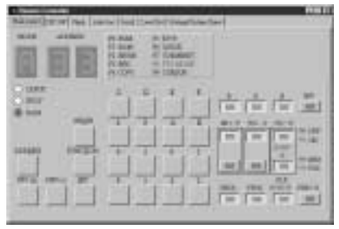
Large-capacity internal memory and uniquely designed data transfer circuit for high-speed pattern switching capability satisfy the production line.

★Complicated operation can be easily done by personal computer or dedicated remote controller.
★Control mode used via the RS-232C interface is ideal for Computer-Integrated Manufacturing(CIM).



● Remote control program screen

（LT 1610A/1611）



（LT 1613/1614/1615）

● Three functions satisfy production line requirements.

Coordinate display capability — Locates defective display areas.

Residual image evaluation capability — Scrolling capability for character and window patterns are provided to evaluate the residual image of displays.

Power saving test capability — The power saving function of computer display in compliance with VESA standards can be tested.

■ Easy editing of program data

Programming(e.g., horizontal/vertical timings, test pattern) to data ROM can be easily executed in the Windows* screen. To write data into the user ROM, picture and data can be transferred from the personal computer to the LT 1610 series units via the RS-232C interface in the Windows* environment.

● LT 1610A/1611
Windows 3.1, Windows 95*
3.5 inch FD software

● LT 1613/1614/1615
Windows 95/98/NT* CD-ROM software

Program can be easily edited on the Excel* or Lotus 1-2-3* since this instrument can fetch external data.

*Mark is a registered trademark of each company.

● Example for program of horizontal and vertical timings

LT 1610A/1611

LT 1613/1614/1615

■ Built-in color still picture

When select display mode to upper-left corner

LT 1610A/1611	•One VGA size 640(H) x 480 (V) 256-color built-in
LT 1613/1614/1615	•One XGA size 1024 (H) x 768 (V) 256-color built-in(rewritable) •There are three modes: 16-color, 256-color, or full color. Up to 1024(H) x 1024(V) size full color pictures can be output. The dot clock frequency is up to 65 MHz for analog output. The 1/1 clock mode is only provided for digital output,and dot clock frequency is up to 50 MHz.

■ Color still Picture by Model

Color still Picture mode	LT1610A/1611	LT1613/1614/1615
Built-in color still picture (internal ROM area)	・One Leader original VGA size 640(H) x 480(V) 256-color still picture built-in (not rewritable)	・One XGA size 1024(H)×768(V)256-color built-in. ・Rewritable up to SXGA size 1280(H)×1024(V)256-color. Up to four 640(H)×480(V)256-color pictures can be rewritten.
Display color and maximum displayable number of dots	・256-color: 2048(H)×1024(V)	・16-color : 4096(H)×2048(V) ・256-color : 2048(H)×2048(V) ・Full color : 1024(H)×1024(V) See "Limit of color still picture"
Display mode	・Upper left corner	・Selectable mode : Upper-left corner, center, tiled
Scroll	・Impossible	・Color still pictures can be scrolled up, down, left, or right in 1 to 25 steps in each vertical sync period.
Color still picture display in direct mode	・Direct pattern display by sending data in bit map format from a personal computer. (Optional RAM not required. Display only ; not stored)	・Color still picture can be directly displayed by sending data in bit map format from a personal computer.(Optional RAM not required. Display only ; not stored)
Optional color still picture, RAM rewrite function (factory option)	・When color still picture backup RAM (2 MB) is built-in, color still picture can be displayed and stored by sending data in bit map format from a personal computer.	・When color still picture backup RAM(4 MB) is built-in, color still picture can be displayed and stored by sending data in bit map format from a personal computer.
Optional color still picture, number of pictures storable to RAM	・Up to six VGA size 640(H)×480(V)256 color still picture can be stored. ・Up to two XGA size 1024(H)×768(V)256 color still picture can be stored.	・Up to 13 VGA size 640(H)×480(V)256 color still picture can be stored. ・Up to five XGA size 1024(H)×768(V)256 color still picture can be stored.
Others		・Sample data of color still picture with major number of dots is stored in the accessory CD-ROM.
Limit of color still picture	・For only 256-color, the dot clock frequency is up to 150 MHz for analog output ; up to 150 MHz for digital output.	・For 16-color and 256-color, the dot clock frequency is up to 260 MHz for analog output ; up to 200 ・For full color, the dot clock frequency is up to 65 MHz for analog output ; up to 50 MHz for digital output.

■ Introducing Optional Equipments for LT 1610 series

Remote Controller LT 1610-01B

[Function]
1.Program memory selection
2.Usable range setting for Program address
3.Program address selection
4.Output pattern selection
5.Directly controlling the output signal
6.Program data copy
7.High-speed pattern switching mode selection

Still picture Backup RAM (Factory option)

[Function]
With the multiple still picture suitable for the display characteric evaluation allows quick pattern evaluation.

[For LT 1610A,1611]
- Still picture backup RAM(2 MB)
- Up to six VGA size patterns can be registered.
- Up to two XGA size patterns can be registered.

[For LT 1613,1614,1615]
- Still picture backup RAM(4 MB)
- Up to 13 VGA size patterns can be registered.
- Up to five XGA size patterns can be registered.

LT 1610 Series • Programmable Video Generators

	LT 1610A	LT 1611	LT 1613	LT 1614	LT 1615
Software	Application Software Windows 3.1/95 FD		Application Software Windows 95/98/NT CD-ROM		
Outputs	Analog	Analog	Analog		Analog
	Digital			Digital	Digital
Systems	VGA 640(H) 480(V)	VGA 640(H) 480(V)	VGA 640(H) 480(V)	VGA 640(H) 480(V)	VGA 640(H) 480(V)
	SVGA 800(H) 600(V)	SVGA 800(H) 600(V)	SVGA 800(H) 600(V)	SVGA 800(H) 600(V)	SVGA 800(H) 600(V)
	XGA 1024(H) 768(V)	XGA 1024(H) 768(V)	XGA 1024(H) 768(V)	XGA 1024(H) 768(V)	XGA 1024(H) 768(V)
	SXGA 1280(H) 1024(V)	SXGA 1280(H) 1024(V)	SXGA 1280(H) 1024(V)	SXGA 1280(H) 1024(V)	SXGA 1280(H) 1024(V)
			UXGA 1600(H) 1200(V)	UXGA 1600(H) 1200(V)	UXGA 1600(H) 1200(V)
Dot clock	Dot Clock (Analog) 150 MHz	Dot Clock (Analog) 150 MHz	Dot Clock (Analog) 260 MHz		Dot Clock (Analog) 260 MHz
	Dot Clock (Digital) 150 MHz			Dot Clock (Digital) 200 MHz	Dot Clock (Digital) 200 MHz
			Dot Clock Extemal input	Dot Clock Extemal input	Dot Clock Extemal input
Color still pictures			Still picture of 16-color	Still picture of 16-color	Still picture of 16-color
	Still picture of 256-color	Still picture of 256-color	Still picture of 256-color	Still picture of 256-color	Still picture of 256-color
			Still picture of full color	Still picture of full color	Still picture of full color
			Internal Still picture for XGA Re-writing function	Internal Still picture for XGA Re-writing function	Internal Still picture for XGA Re-writing function
Optional memory	Option Memory Extention 2MB	Option Memory Extention 2MB	Option 70 Memory Extention 4MB	Option 70 Memory Extention 4MB	Option 70 Memory Extention 4MB
			Option 71 TTL video output	Option 71 TTL video output	Option 71 TTL video output
Optional equipments	Video Encoder ＊1	Video Encoder ＊1	Video Encoder ＊1		Video Encoder ＊1

＊1：The LT1606 Video Encoder can be connected.

Optional Equipments

Video encoder LT1606 ＊2

- Composite output NTSC/PAL
- Composite output Y/C
- Compornent 480I,480P 720P,1080I 1080P

Note：The LT 1606 should be used with the video generator LT 1610A,1611,1613,or 1615.
Note：The LT1606 is not a scan converter.
＊2 ：The plural number format cannot be output simultaneously.