

HDMI 1.3a-Compliant Multiformat Pattern Generator



Shown with Option Units

LT 450 MULTIFORMAT PATTERN GENERATOR

GENERAL

The LT 450 is a DTV-compatible multiformat pattern signal generator equipped with analog component and composite outputs and digital outputs.

It generates monoscope, color bar, ramp, crosshatch, multiburst, character, and other test patterns.

You can add additional digital outputs such as DVI-I and HDMI and analog outputs such as a SCART connector by ordering option units.

FEATURES

■ Multiformat support

With the formats available on the LT 450, you can test most video displays, including television sets, PC monitors, and projectors.

The LT 450 supports 19 component output formats, 8 composite output formats, and 5 PC monitor formats.

■ HDMI output

The LT 450 is equipped with an HDMI connector, which is a digital interface used in household televisions and set-top boxes. It can be used to check HDCP-compliant copyright protection functions and to make simple checks on the CEC and DDC functions (PASS/FAIL results can be displayed on screen). In all systems, simple checks can be made simultaneously on up to seven outputs (when option units are installed).

■ G, B, R and Y, P_B, P_R signal outputs

Analog and digital component outputs can be switched between G, B, R and Y, P_B, P_R signal formats.

■ S connector

Equipped with an S connector for Y/C separation signal output. An ID signal is superimposed on the C signal.

■ D connector

Equipped with a JEITA CP-4120 D5 output. Supports ID signals (lines 1, 2, and 3).

■ RGB connector

Equipped with a mini D-sub 15-pin connector, which is an analog interface for PC monitors.

■ DVI-I output

Equipped with a DVI-I connector, which is a digital interface for PC monitors. It can be used to check HDCP-compliant copyright protection functions and to make simple checks on the DDC function.

■ Sync signal outputs

Equipped with sync signal connectors that transmit CS (tri-level or binary), HD, and VD signals.

■ Analog audio output

The frequency (400 Hz or 1 kHz) can be set and the output can be turned off separately for left and right channels.

■ Simple motion picture

You can make any test pattern into a simple motion picture pattern by scrolling it vertically, horizontally, or diagonally.

■ Variable output level feature

The video signal level and the analog sync signal level can be adjusted separately in the range of 0 to 100 %.

■ Closed caption and teletext

Supports closed captions. Teletext (VBI), CGMS, and WSS will be supported in the future.

■ Remote control via RS232C

The LT 450 can be remotely controlled from a PC

■ Preset/recall features

Up to 100 panel settings can be stored and recalled.

■ Factory Option

LT 45SER04 TIMING/PICTURE TOOL

Allows storage and output of natural picture data. Allows generation of video timing and test patterns that have been created on an external PC.

Output Unit Options

Output units can be added freely according to your objectives.



LT 45SER01 DVI-I Unit
An output unit with a DVI-I connector. Can be used to check HDCP-compliant copyright protection functions and to make simple checks on the DDC function.



LT 45SER02 HDMI Unit
An output unit with two HDMI connectors. Can be used to check HDCP-compliant copyright protection functions and to make simple checks on the CEC and DDC functions.

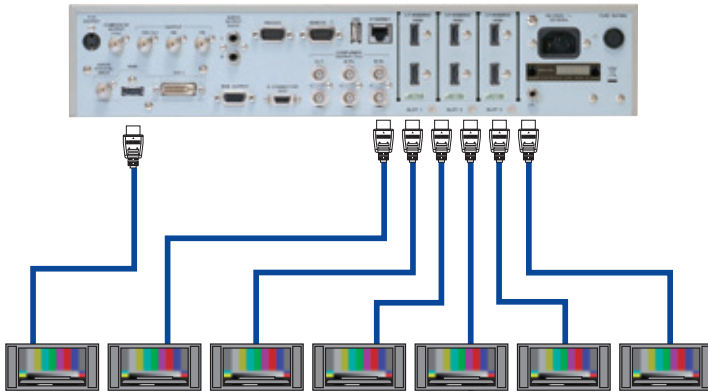


LT 45SER03 SCART Unit
A PAL- and SECAM-compatible SCART connector unit. Can be used to make simple checks on European AV equipment.

Example of Output Unit Combinations (Seven HDMI Outputs)

Example in which three LT 45SER02 HDMI units are installed

You can expand the output to up to seven HDMI outputs and perform simultaneous inspection and verification on all outputs.



Example of a Combination with Another Product (VSB-AM Support)

LG 226 TV Signal Generator and LT 450

An LT 450 NTSC, PAL, or SECAM signal can be modulated into a VSB-AM signal that conforms to the broadcasting formats of various countries.



LG 226

LT 450

The LT 450 preset/recall feature can be remotely controlled from the LG 226.

Main Patterns

16:9



Full field color bar
(100%/75%)



Multiformat color bar



Ramp



Step 10/15/32



Natural picture factory option
(Bitmap data is not included.)



Crosshatch



Multiburst



Character

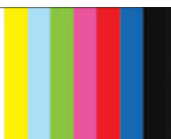


Monoscope



Checker

4:3



Full field color bar
(100%/75%)



SMPTE color bar



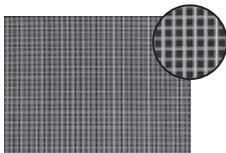
Ramp



Step 10/15/32



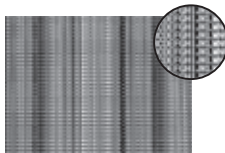
Natural picture factory option
(Bitmap data is not included.)



Crosshatch



Multiburst



Character



Monoscope



Checker

		Format								
NO.	Format	Standard	Number of Samples in an Active Line (S/AL)	Number of Active Lines in a Frame	Frame Rate (Hz)	Scan Mode	Interface Sampling Frequency (MHz)	Number of Samples in All Lines (S/TL)	Number of Lines in a Frame	Aspect Ratio
COMPONENT, HDTV										
01	1080p/59.94	274M,861	1920	1080	60/1.001	Prog	148.5/1.001	2200	1125	16:9
02	1080i/59.94 (29.97sF)	274M,861,RP211	1920	1080	30/1.001	Int, Prog(sF)	74.25/1.001	2200	1125	16:9
03	1080p/29.97	274M,861	1920	1080	30/1.001	Prog	74.25/1.001	2200	1125	16:9
04	1080p/23.98	274M,861	1920	1080	24/1.001	Prog	74.25/1.001	2750	1125	16:9
05	1080PsF/23.98	RP211	1920	1080	24/1.001	Prog(sF)	74.25/1.001	2750	1125	16:9
06	1080p/50	274M,861	1920	1080	50	Prog	148.5	2640	1125	16:9
07	1080p/25	274M,861	1920	1080	25	Prog	74.25	2640	1125	16:9
08	1080i/50 (25sF)	274M,861,RP211	1920	1080	25	Int, Prog(sF)	74.25	2640	1125	16:9
09	1080p/50 (1250T)	295M	1920	1080	50	Prog	148.5	2376	1250	16:9
10	1080i/50 (1250T)	295M	1920	1080	25	Int	74.25	2376	1250	16:9
11	720p/59.94	296M,861	1280	720	60/1.001	Prog	74.25/1.001	1650	750	16:9
12	720p/29.97	296M	1280	720	30/1.001	Prog	74.25/1.001	3300	750	16:9
13	720p/23.98	296M	1280	720	24/1.001	Prog	74.25/1.001	4125	750	16:9
14	720p/50	296M,861	1280	720	50	Prog	74.25	1980	750	16:9
15	720p/25	296M	1280	720	25	Prog	74.25	3960	750	16:9
COMPONENT, SDTV										
16	480p/59.94 *1	861	720	480	60/1.001	Prog	27.0	858	525	16:9(S)
17	480i/59.94 *1 (1440)	601 861	720 1440	480	30/1.001	Int	13.5 27.0	858	525	4:3,16:9(L/S)
18	576p/50	1358, 861	720	576	50	Prog	27.0	864	625	16:9(S)
19	576i/50 (1440)	601 861	720 1440	576	25	Int	13.5 27.0	864	625	4:3,16:9(L/S)
COMPONENT, PC MONITOR										
20	VGA (640x480@60Hz)	MTS,861	640	480	59.940	Prog	25.175	800	525	4:3
21	SVGA (800x600@60Hz)	MTS	800	600	60.317	Prog	40.000	1056	628	4:3
22	XGA (1024x768@60Hz)	MTS	1024	768	60.004	Prog	65.000	1344	806	4:3
23	SXGA (1280x1024@60Hz)	MTS	1280	1024	60.020	Prog	108.000	1688	1066	5:4
24	UXGA (1600x1200@60Hz)	MTS	1600	1200	60.000	Prog	162.000	2160	1250	4:3
COMPOSITE, Y/C SEPARATION										
25	NTSC-M *1	170M	720	480	30/1.001	Int	13.5	858	525	4:3,16:9(L/S)
26	NTSC-J *1	170M	720	480	30/1.001	Int	13.5	858	525	4:3,16:9(L/S)
27	NTSC 4.43 *1	—	720	480	30/1.001	Int	13.5	858	525	4:3,16:9(L/S)
28	PAL	470	720	576	25	Int	13.5	864	625	4:3,16:9(L/S)
29	PAL-M *1	470	720	480	30/1.001	Int	13.5	858	525	4:3,16:9(L/S)
30	PAL-N	470	720	576	25	Int	13.5	864	625	4:3,16:9(L/S)
31	PAL-60 *1	—	720	480	30/1.001	Int	13.5	858	525	4:3,16:9(L/S)
32	SECAM	470	720	576	25	Int	13.5	864	625	4:3,16:9(L/S)

*1: The number of active lines in a frame is 480, matching the digital output.

* Times and frequencies are typical values. * The SECAM field color ID signal is not supported. * 274M:SMPTE 274M, 295M:SMPTE 295M, 296M:SMPTE 296M, 170M:SMPTE 170M, RP211:SMPTE RP 211, 601:ITU-R BT.601, 470:ITU-R BT.470, 1358:ITU-R BT.1358, 861:CEA-861-D, and MTS:VESA Monitor Timing Specifications. * 1250T: Total number of lines 1250. * 16:9 (L/S): 16:9 (letterbox/squeeze).

NO.	Format	Test Pattern														Output Connector															
		Aspect Ratio	Color Bar			Ramp	Deep Color Ramp	10/15/32 Step	Convergence	Crosshatch	Multiburst	Character	1/2, 1/10 Window	Monoscope	Natural Picture (Option)	OTHERS				COMPONENT OUTPUT (BNC)	D Connector	RGB OUTPUT (Mini D-sub 15-pin)	DVI-I		COMPOSITE OUTPUT (BNC)	Y,C OUTPUT (S Connector)	OUTPUT HD, VD, CS(BNC)				
			Full Field *2	Multiformat *3	SMPTE *3											Raster *4, *5	Demodulation	ANSI Grayscale	Checker				Analog	Digital				HDMI			
COMPONENT, HDTV																															
01	1080p/59.94	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
02	1080i/59.94	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
03	1080p/29.97	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
04	1080p/23.98	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
05	1080PsF/23.98	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
06	1080p/50	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
07	1080p/25	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
08	1080i/50	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
09	1080p/50 (1250T)	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
10	1080i/50 (1250T)	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
11	720p/59.94	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
12	720p/29.97	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
13	720p/23.98	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
14	720p/50	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
15	720p/25	16:9	○	○		○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
COMPONENT, SDTV																															
16	480p/59.94	16:9(S)	○			○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
17	480i/59.94 (1440)	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
		16:9(L/S)	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○
18	576p/50	16:9(S)	○			○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
19	576i/50 (1440)	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
		16:9(L/S)	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○
COMPONENT, PC MONITOR																															
20	VGA (640x480@60Hz)	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
21	SVGA (800x600@60Hz)	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
22	XGA (1024x768@60Hz)	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
23	SXGA (1280x1024@60Hz)	5:4	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
24	UXGA (1600x1200@60Hz)	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	
COMPOSITE, Y/C SEPARATION																															
25	NTSC-M	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○						○	○	○	○	
		16:9(L/S)	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	
26	NTSC-J	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○						○	○	○	○	
		16:9(L/S)	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	
27	NTSC 4.43	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○						○	○	○	○	
		16:9(L/S)	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	
28	PAL	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○						○	○	○	○	
		16:9(L/S)	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	
29	PAL-M	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○						○	○	○	○	
		16:9(L/S)	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	
30	PAL-N	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○						○	○	○	○	
		16:9(L/S)	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	
31	PAL-60	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○						○	○	○	○	
		16:9(L/S)	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	
32	SECAM	4:3	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○						○	○	○	○	
		16:9(L/S)	○		○	○	○		○	○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	

*2: Can be switched between Saturation 100 % (100/0/100/0) and 75 % (100/0/75/0).

*3: Set to LT 450 original specifications for RGB output and 16:9 (L/S) output.

*4: SATURATION 100 %/75 % Selectable.

*5: G/Y, B/P_B, and R/P_R can be turned on/off separately.

* Connectors that are marked ◎ and ○ are active. Other output connectors are inactive.

* ◎ indicates that you set the video signal format to RGB or Y, P_B, P_R from the front panel.

SPECIFICATIONS

LT 450

Output Signal

Analog Component Signal

* Unless specified otherwise, the specifications apply to HDTV, SDTV, and PC monitor.

Standards

HDTV:	SMPTE 274M, SMPTE 295M, SMPTE 296M, SMPTE RP 211
SDTV:	ITU-R BT.601, ITU-R BT.1358
PC Monitor:	VESA MTS (Monitor Timing Specifications)

Video Signal Format: Select from two formats: G, B, R or Y, P_B, P_R.
Only RGB output is available for SVGA, XGA, SXGA, and UXGA.

Number of Data Quantization Bits: 10 bits

Output Impedance: 75 Ω

Output Connector: BNC

Number of Outputs: 2

Sync Signal: ON/OFF selectable for G, B, R.

HDTV: Tri-level sync added to G/Y, B/P_B, and R/P_R

SDTV: Binary sync added only to G/Y

PC Monitor: Binary sync added only to G/Y (SYNC ON G)

Invert: Available

Variable Output Levels

Video Signal: The video signal levels for G, B, R and Y, P_B, P_R can be adjusted separately (linked to DVI-I and HDMI)

Sync Signal: The H SYNC and V SYNC levels can be adjusted simultaneously.

Variable range: 0 to 100 % (in units of 1 %). 100 % is the normal level.

Composite Signal and Y/C Separation Signal

* Unless specified otherwise, the specifications apply to NTSC-M (USA) and NTSC-J (Japan).

Standard: SMPTE 170M, ITU-R BT.470

Y/C Separation: JEITA CPR-1201

Color System: NTSC, NTSC 4.43, PAL, PAL-M, PAL-N, PAL-60, SECAM

Number of Data Quantization Bits: 10 bits

Setup Level: Fixed to 0 % for the monoscope pattern

NTSC-M, PAL-M: 7.5 % (with variable setup level feature)

NTSC-J, NTSC 4.43: 0 %

PAL, PAL-N, PAL-60, SECAM: 0 %

Output Impedance: 75 Ω

Output Connector

Composite: BNC

Y/C Separation: S connector

Number of Outputs: 1 each

Variable Output Levels: Can be varied simultaneously with the Y/C separation signal

Video Signal: The video signal level can be varied after encoding.

Sync Signal: The H SYNC and V SYNC levels can be varied simultaneously.

Burst signal: The amplitude can be varied.

Variable range: 0 to 100 % (1 % unit). 100 % is the normal level.

Aspect Ratio ID Signal: Only superimposed on the C signal when NTSC-J of Y/C separation signal is selected

DC Output Impedance: 10 kΩ ± 3 kΩ

Signal Level: Fixed to 0 V for all formats except NTSC-J

S1 (Squeeze): 5 V

S2 (Letterbox): 2.2 V

4:3: 0 V

Inversion: Available

Closed Caption and Teletext: Supports closed caption Teletext (VBI), CGMS, and WSS will be supported in the future.

Sync Signal

CS Output

Output Impedance: 75 Ω

Output Connector: BNC

Number of Outputs: 1

HD/VD Output

Level: TTL level

Output Connector: BNC

Number of Outputs: 1 each

Output Polarity: Negative (positive for SVGA and SXGA)

Can be changed through the user setting feature.

Analog Audio Output

Frequency: Switch between OFF, 400 Hz, and 1 kHz separately for left and right channels.

Output Level: Switch between 0 dBm (600 Ω termination) and 1.2 Vp-p (600 Ω termination)

Output Impedance: 600 Ω

Output Connector: RCA jack

Number of Outputs: 2 (L/R)

D Terminal (D5-Compatible)

Standards: JEITA CP-4120 (D1/D2/D3/D4/D5) and RC-5237

Video Signal: Conforms to component signals

Hot Plug Detection: None (always output)

ID Signals (Lines 1, 2, and 3): Supported (except LT 450 original output for formats not listed in JEITA CP-4120)

DC Output Impedance: 10 kΩ ± 3 kΩ

Auxiliary Lines 1, 2, 3: Not used (not connected)

Connector: D connector (JEITA RC-5237 compliant)

RGB Connector

Video Signal: Conforms to component signals

Connector: Mini D-sub 15-pin

DVI-I

Standards: DVI 1.0, HDCP 1.2

Analog Signal: Conforms to component signals

TMDS

Output Format: G,B,R/Y,P_B,P_R 4:4:4 8 bit and Y,P_B,P_R 4:2:2 8/10/12 bit

Linked with the HDMI output format.

Fixed to G,B,R/Y,P_B,P_R 4:4:4 8 bit when HDMI Deep Color is selected

Only RGB output is available for SVGA, XGA, SXGA, and UXGA.

Link: Single

Variable Output Levels

Video Signal: The video signal levels for G, B, R and Y, P_B, P_R can be adjusted separately. (Linked to analog component and HDMI)

Variable range:	0 to 100 % (1 % unit). 100 % is the normal level.
HDCP:	Includes a production key
DDC:	DDC2B
Hot Plug Detection:	ON/OFF selectable using the menu
Connector:	DVI-I

HDMI

Standards:	HDMI 1.3a, HDCP 1.2
TMDS	
Output Format:	G,B,R/Y,P _B ,P _R 4:4:4 8 bit and Y,P _B ,P _R 4:2:2 8/10/12 bit Only RGB output is available for SVGA, XGA, SXGA, and UXGA.
Deep Color:	G,B,R/Y,P _B ,P _R 4:4:4 10/12 bit Formats VGA (640x480@60 Hz), 720p/59.94, 1080i/59.94, 480p/59.94, 480i/59.94 (1440), 720p/50, 1080i/50, 576p/50, 576i/50 (1440)
xvYCC:	Future support
Link:	Single
Variable Output Levels	
Video Signal:	The video signal levels for G, B, R and Y, P _B , P _R can be adjusted separately. (Linked to analog component and DVI-I)
Variable range:	0 to 100 % (1 % unit). 100 % is the normal level.

Audio

Internal	
Format:	AES/EBU
Channels:	2
Output Level:	0 dB
Frequency:	Switch between OFF, 400 Hz, and 1 kHz
Sampling Frequency:	32, 44.1, 48 kHz
Number of Quantization Bits:	16 bits
External Input:	SPDIF coaxial
InfoFrame:	Supports AVI, SPD, and AUDIO InfoFrames
HDCP:	Includes a production key
DDC:	DDC2B
Hot Plug Detection:	ON/OFF selectable using the menu
CEC:	Checks connection with <Give Physical Address>
LipSync:	Future support
Connector:	HDMI Type A

Simple Motion Pictures

Simple Motion Pictures:	Pattern scroll
Scroll Directions:	Up/down and left/right
Scroll Speed Settings	
Progressive:	Vertical: 0 to 256 lines/frame (1 line steps) Horizontal: 0 to 256 dots/frame (4-dot steps)
Interlace:	Vertical: 0 to 256 lines/field (2 line steps) Horizontal: 0 to 256 dots/field (4-dot steps)

External Interface

RS232C Connector

Function:	Remotely control the LT 450 settings from an external PC via RS232C.
Connector:	D-sub 9-pin (male)

USB Connector (Front Panel)

Function:	Remotely control the LT 450 settings from an external PC via USB (future support).
Connector:	USB (B type)

USB Connector (Rear Panel)

Function:	Save and load preset data from USB memory (future support).
Connector:	USB (A type)

Ethernet

Function:	Remotely control the LT 450 settings through Telnet.
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Remote

Function:	Increment or decrement the recalled address through an external contact input.
Connector:	XM4K-1542-112 (by Omron)

Preset/Recall

	Store and recall up to 100 panel settings (addresses 00 to 99)
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Area Settings

	Set a range of consecutive addresses to be recalled from the 100 addresses.
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BEGIN

	Recall start address
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END

	Recall end address
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Startup Memory

	Stores the panel settings at power-on to the internal memory
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Environmental Conditions

Operating Temperature:	0 to 40 °C
Operating Humidity:	≤ 85 % RH (without condensation)
Spec-Guaranteed Temperature:	10 to 35 °C
Spec-Guaranteed Humidity:	≤ 85 % RH (without condensation)
Operating Environment:	Indoor use
Operating Altitude:	Up to 2,000 m
Overvoltage Category:	II
Pollution Degree:	2

Power Requirements

	90 to 250 VAC, 50/60 Hz
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Power Consumption

	80 W max.
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Dimensions and Weight

	426 (H) x 88 (W) x 400 (D) mm (excluding projections)
	5.8 kg

Accessories

	Power cord 1
	Instruction Manual 1