KRAMER ELECTRONICS LTD.

USER MANUAL

MODEL:

850
Pattern Generator

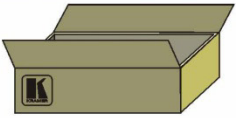
P/N: 2900-300033 Rev 1

850 Quick Start Guide

This page guides you through a basic installation and first-time use of your **850**.
For more detailed information, see the **850** user manual. You can download the latest manual at http://www.kramerelectronics.com.

Step 1: Check what's in the box

- **850** Pattern Generator
- 1 power adapter (5V DC input)
- 4 rubber feet
- 1 Quick start guide
- 1 User Manual



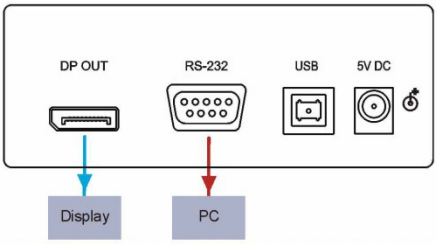
Save the original box and packaging materials in case your Kramer product needs to be returned to the factory for service.

Step 2: Install the 850

Stick the rubber feet to the bottom of the device and place on stable surface.

Step 3: Connect the inputs and outputs

Always switch off the power to the display before connecting it to your **850**.



For best results, we recommend that you always use Kramer high-performance cables to connect AV equipment to the **850**.

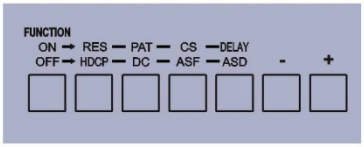
Step 4: Connect the power

Connect the 5V DC power adapter to the **850** and plug the adapter into the mains electricity.
Switch on the power to the display.

Step 5: Operate the 850

Set the parameters using the front panel buttons and/or the Controller Software.

RESOLUTION
PATTERN
COLOR SPACE
DELAY
AUDIO SAMPLING FREQUENCY



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1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better!

Our 1,000-plus different models now appear in 11 groups that are clearly defined by function: GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Matrix Switchers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters and GROUP 11: Sierra Products.

Congratulations on purchasing your Kramer MultiTOOLS® **850** DisplayPort *Pattern Generator*, which is ideal for the following typical applications:

- As a diagnostic tool in AV setups
- Testing and adjusting flat panel LCD displays, projectors, plasmas and DisplayPort cables
- Testing the refresh rates of LCD displays by using the motion patterns

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
  Use Kramer high performance, high resolution cables

Go to http://www.kramerelectronics.com to check for up-to-date user manuals, application programs, and to check if firmware upgrades are available (where appropriate).

2.1 Achieving the Best Performance

To achieve the best performance:

- Use only good quality connection cables to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality
- Position your Kramer **850** DisplayPort *Pattern Generator* away from moisture, excessive sunlight and dust

Go to http://www.kramerelectronics.com to check for up-to-date user manuals, application programs, and to check if firmware upgrades are available (where appropriate).

Caution: No operator serviceable parts inside the unit

Warning: Use only the Kramer Electronics input power wall adapter that is provided with the unit

3 Overview

The **850** is a high performance, DisplayPort video test pattern generator. It can generate 32 preset patterns at 16 popular, predefined, computer and HD video resolutions and seven user-defined resolutions, including several unique patterns incorporating motion.

In particular, the MultiTOOLS® **850** features:

- A DisplayPort output
- Five dual-function and two single-function control buttons
- A two-digit 7 segment display
- An onboard EPROM that saves the last setting

3.1 Defining the 850 DisplayPort Pattern Generator

Figure 1 defines the front panel of the **850**.

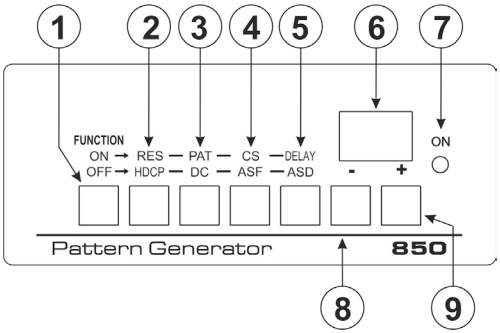

Figure 1: 850 Pattern Generator Front Panel

850 Front Panel Features			
#	Feature		Function
1	*FUNCTION* Buttons	*ON/OFF*	Press to toggle between the top row and bottom row functions. Button LED lights when on. When on, the top row of functions are enabled (RES, PAT, CS and Delay). When off, the bottom row of functions (HDCP, DC, ASF and ASD) are enabled (see Section 5.1)
2		*RES/HDCP*	Press to select either the Resolution (when the ON/OFF button is on) or HDCP functions (when the ON/OFF button is off)
3		*PAT/DC*	Press to select either the Pattern (when the ON/OFF button is on) or Color Depth functions (when the ON/OFF button is off)

850 Front Panel Features			
#	Feature		Function
4		*CS/ASF*	Press to select either the Color Space (when the ON/OFF button is on) or Audio Sample Frequency functions (when the ON/OFF button is off)
5		*DELAY/ASD*	Press to select either the Delay (when the ON/OFF button is on) or Audio Sample Data functions (when the ON/OFF button is off)
6	2-digit 7-segment Display		Indicates the current setting. The display flashes if there is a problem communicating with the display, for example, if the display does not support HDCP or does not support the selected resolution
7	*ON* LED		Lights red when the device receives power
8	– Button		Press to step down through the list of available values
9	+ Button		Press to step up through the list of available values

Figure 2 defines the rear panel of the **850**.

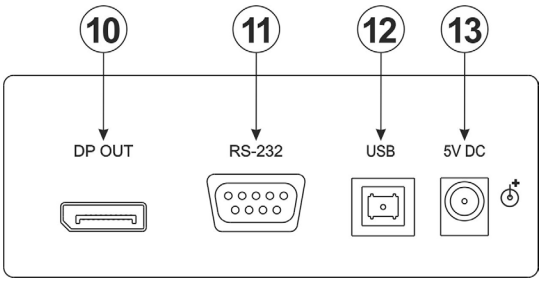

Figure 2: 850 Pattern Generator Rear Panel

850 Rear Panel Features		
#	Feature	Function
10	*DP OUT* Connector	Connect to the DisplayPort acceptor (see Section 4)
11	*RS-232* 9-pin D-sub Connector	Connect to the serial port on a PC for remote control (see Section 4.1.1)
12	*USB* Connector	Connect to a USB port on a PC for remote control
13	*5V DC* Connector	Connect to the power adapter

4 Connecting the 850

Always switch off the power to any device before connecting it to your **850**. After connecting your **850**, connect its power and then switch on the power to the device.

To connect the 850 as illustrated in the example in Figure 3:

1. Connect the DP OUT connector to a DisplayPort acceptor (for example, a flat panel LCD display).
2. Optional—connect a PC to control the **850** via the RS-232 or USB port.
3. Connect the power adapter to the 5V DC socket and to the mains electricity.

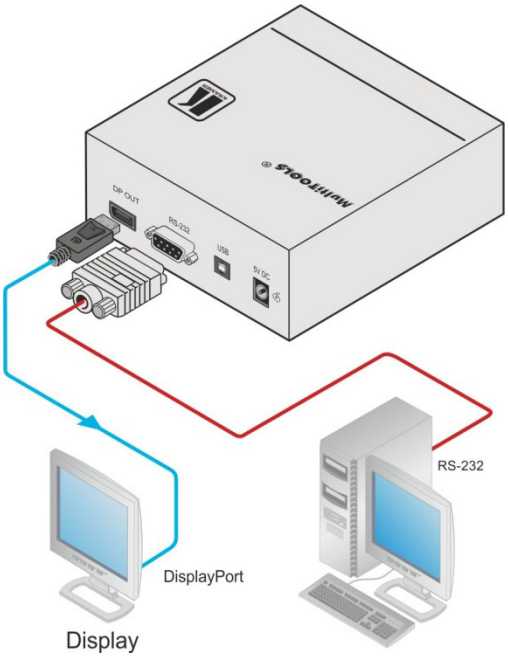

Figure 3: Connecting the 850 Pattern Generator

4.1 Connecting a PC

You can connect to the **850** via the RS-232 serial and via the USB port.

4.1.1 Connecting a PC via the RS-232 Serial Port

You can connect to the **850** via an RS-232 connection using, for example, a PC. Note that a null-modem adapter/connection is not required.

To connect to the product via RS-232:

- Connect the RS-232 9-pin D-sub rear panel port on the product unit via a 9-wire straight cable (only pin 2 to pin 2, pin 3 to pin 3, and pin 5 to pin 5 need to be connected) to the RS-232 9-pin D-sub port on your PC

4.1.2 Connecting a PC via the USB Port

To connect the **850** via a USB port you must download and install the USB driver and **850** Control application.

Note: The driver only works on 32-bit systems.

To install the USB driver and Control Application:

1. Navigate to the Kramer Electronics Web site (http://www.kramerelectronics.com) and search for the product **850**.
2. Click on the **Downloads** tab.
3. Download the **850** Windows USB Driver.
4. Download the **850** *Control Application* to a designated folder on your computer.
5. Extract the compressed USB driver file to your designated folder. Two files are extracted, a **.inf** and a **.sys** file.
6. Connect the USB cable between your computer and the **850**.
7. Connect the power supply to the **850**.

8. After a few seconds the **Found New Hardware** message appears as shown in Figure 4.

Figure 4: Found New Hardware Wizard Window

9. Click on the **No, not this time** radio button.

10. Click **Next**.

11. Select **Install from a list or specific location (Advanced)** as shown in Figure 5.

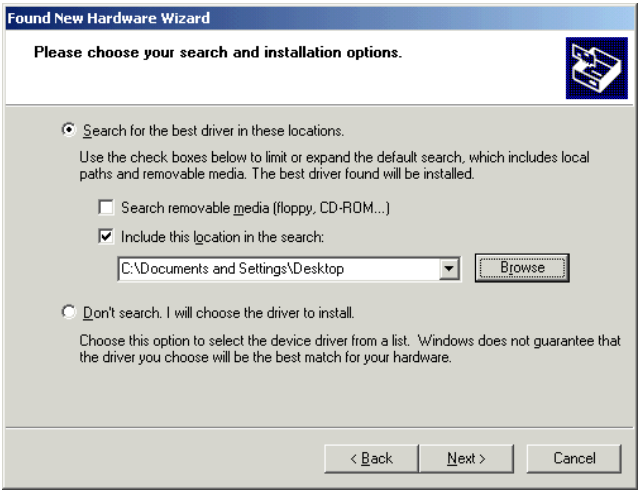

Figure 5: File Location Selection Window

12. Click **Next**.
13. Select **Search for the best driver in these locations**.
14. Check **Include this location in the search**. Browse to your previously designated folder.
15. Click **Next**.
16. Select the file *atm6124.inf*
17. The warning **This driver is not digitally signed!** appears.
18. Click **Next**.
19. Ignore the warning. Click **Continue Anyway**.
20. In the **Insert disk** window, click **OK** as shown in Figure 6.

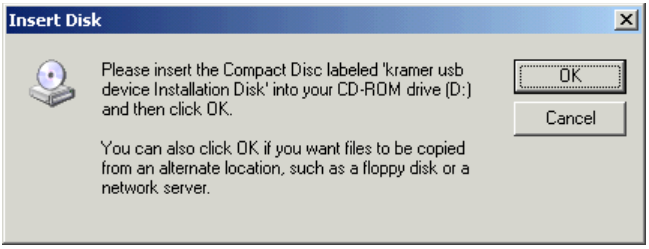

Figure 6: Insert Disk Window

21. Select the file *atm6124.sys* and click **Open**.
    The driver installs and a success message is displayed. The USB driver has been successfully installed and you can install the **850** *Control Application*.

22. Navigate to the designated folder to which you downloaded the *Control Application*.

23. Double-click the file *setup.exe* from this folder or from the distribution media included with the **850**.
    The *Control Application* has been successfully installed.

5 Operating the 850 Pattern Generator

The **850** can be operated using the front panel buttons (see Section 5.1) and the **850** *Control Application* (see Section 5.2).

The **850** *Control Application* is available as a free download from http://www.kramerelectronics.com).

The following output video resolutions are supported.

Resolution Values			
#	Resolution	#	Resolution
1	VGA 640 x 480 @60Hz	13	2048 x 1536 @60
2	SVGA 800 x 600 @60Hz	14	1856 x 1392 @60
3	XGA 1024 x 768 @60Hz	15	2560 x 1440 @60
4	1280 x 720 @60Hz	16	2560 x 1600 @60
5	1280 x 1024 @60	17	User defined
6	WSXGA+ 1680 x 1050 @60Hz	18	
7	SXGA 1280 x 1024 @75Hz	19	
8	HD 1920 x 1080 @60Hz	20	
9	WUXGA 1920 x 1200 @60Hz	21	
10	UXGA 1600 x 1200 @60Hz	22	
11	2048 x 1280 @60	23	
12	2048 x 1152 @60	24	Output native resolution

The following video patterns are supported.

Pattern Values			
#	Pattern	#	Pattern
1	100% Color bar	17	Square
2	75% Color bar	18	White dot
3	Gray bar	19	Alternate pixels
4	Red screen	20	White HScroll
5	Green screen	21	White VScroll
6	Blue screen	22	Multiburst
7	Yellow screen	23	Vertical split
8	Cyan screen	24	Horizontal split
9	Magenta screen	25	Red ramp
10	Gray screen	26	Green ramp
11	White screen	27	Blue ramp
12	RGB ramp	28	Bounce
13	Black screen	29	Window
14	Crosshatch black	30	White border
15	Crosshatch green	31	Target circle
16	Crosshatch blue	32	Moving ball

The following video and audio output options are supported.

Output Settings		
Parameter	**Front Panel**	**Values**
Delay	Delay	Sets the delay before changes are implemented
HDCP	HDCP	On, Off
Color Space	CS	RGB, YUV 444, YUV 422, Auto
Color Depth	DC	24 bit, 30 bit, 36 bit, Auto
Audio Sample	ASF	44kHz, 48kHz, 88kHz, 96kHz, 176kHz, 192kHz, Auto
Audio Bit	ASD	16 bit, 20 bit, 24 bit, Auto

5.1 Operating the 850 Using the Front Panel Buttons

To activate the top row of functions (RES, PAT, CS and DELAY):

- Press the Function ON/OFF button (the button LED lights)

To activate the bottom row of functions (HDCP, DC, ASF and ASD):

- Press the Function ON/OFF button again (the button LED no longer lights)

To select a function and modify the value, for example, to select a specific pattern:

1. Press the **Function** button.
   The button lights to indicate the top row of functions (ON) is active.

2. Press the **PAT/DC** button.
   The button lights to indicate that the Pattern function is active.

3. Press the **+** or **–** button to cycle through the list of available patterns until the required pattern is displayed on the 7-segment display.

Note: The display flashes if there is a problem communicating with the display, for example, the display does not support HDCP or does not support the selected resolution.

5.2 Operating the 850 Using the Control Application

The **850** *Control Application* is a PC-based program which lets you program and control the device.

To use the **850** *Control Application* you must download and install the USB driver and the **850** *Control Application*.

5.2.1 Connecting to the Device

To connect to the device:

1. Run the *Control Application* by clicking **Start** > **Programs** > **Kramer Electronics** > **850**.

2. Click the **Connect** button.
   The **Connection Method** window is displayed as shown in Figure 7.

Figure 7: Connection Method Window

3. Select the required connection method (via a serial or USB connection) by clicking the relevant radio button.

4. For a serial connection, select the required Com port from the drop-down list.

5. For a USB connection, select the required USB device from the drop-down list.
   To view an up-to-date list of available USB ports, press the **Refresh Ports** button.

Note: If the drop-down list shows **No USB Devices**, then either you have not installed the USB driver (see Section 4.1.2) or the installation was not successful.

6. Click **Connect**.
   If the connection is not successful, a Timeout error message appears as shown in Figure 8. If the connection is successful, the main window shown in Figure 9 appears.

Figure 8: Connection Error Message

5.2.2 Controller Software Main Window

The Controller Software Main Window is shown in Figure 9.

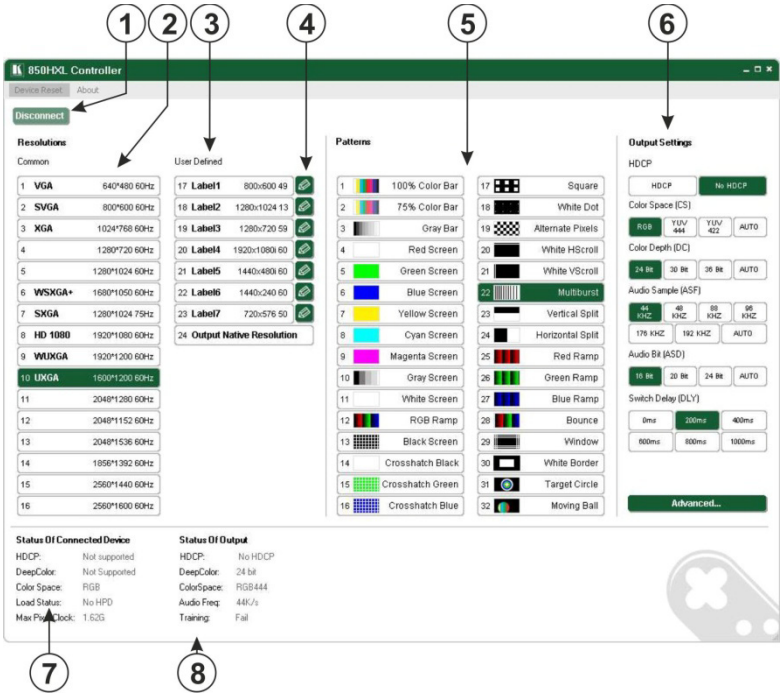

Figure 9: Controller Software Main Window

850 Controller Software Main Window			
#	Feature		Function
1	*CONNECT* Button		Press to connect to a device (see Section 5.2.1)
2	*Resolutions*	*COMMON* Buttons	Press to select a pre-configured output resolution
3		*USER DEFINED* Buttons	Press to select a pre-configured output resolution
4	User Defined Resolution Edit Buttons		Press to edit the relevant user defined output resolution
5	*Patterns* Buttons		Press to select an output pattern
6	*Output Settings* Buttons		Press to modify the output settings: Delay—Sets the delay before changes are implemented HDCP—HDCP, No HDCP Color Space—RGB, YUV 444, YUV 422, Auto Color Depth—24 bit, 30 bit, 36 bit, Auto Audio Sample—44kHz, 48kHz, 88kHz, 96kHz, 176kHz, 192kHz, Auto Audio Bit—16 bit, 20 bit, 24 bit, Auto
7	*Status of Connected Display*		Information on the currently connected display
8	*Status of Output*		Information on the currently selected output settings

5.2.3 Editing User Defined Resolutions

To edit a user defined resolution:

1. Click the required user defined resolution edit button  .
   The **User Defined** Window appears with the **CEA 861 Standard** Tab selected as shown in Figure 10.

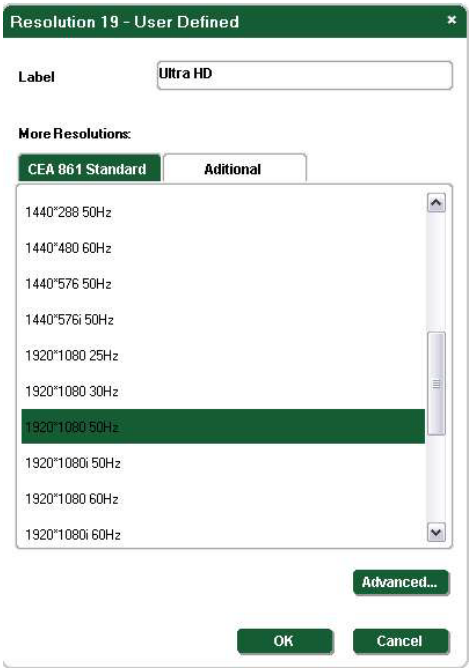

Figure 10: User Defined Resolution Window–Standard Tab

2. In the **Label** field, enter the required label for the button.

3. Click one of the resolutions to select the required resolution.

4. Click **OK** to save the resolution settings or click the **Additional** button to edit the aspect ratio and specific resolution.
   The **Additional** Tab is displayed as shown in Figure 11.

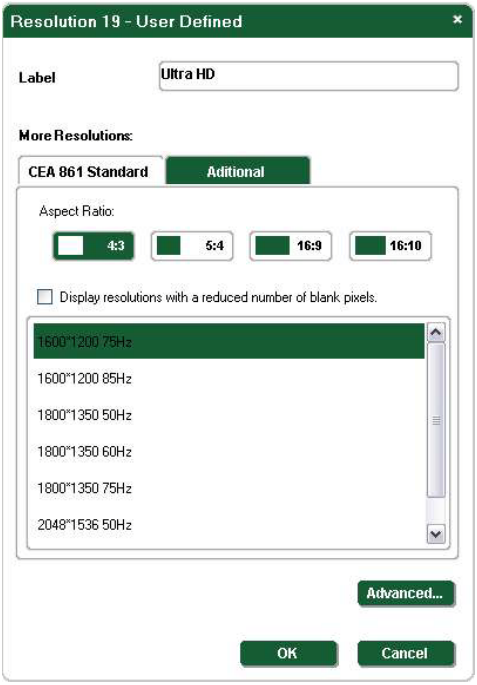

Figure 11: User Defined Resolution Advanced Window–Additional Tab

5. Select the required aspect ratio and resolution.

6. Click **OK** to save the additional parameters or click the **Advanced** button to edit the timing parameters and EDID values.
   The **Advanced** Window appears with the **Timing Parameters** tab selected as shown in Figure 12.

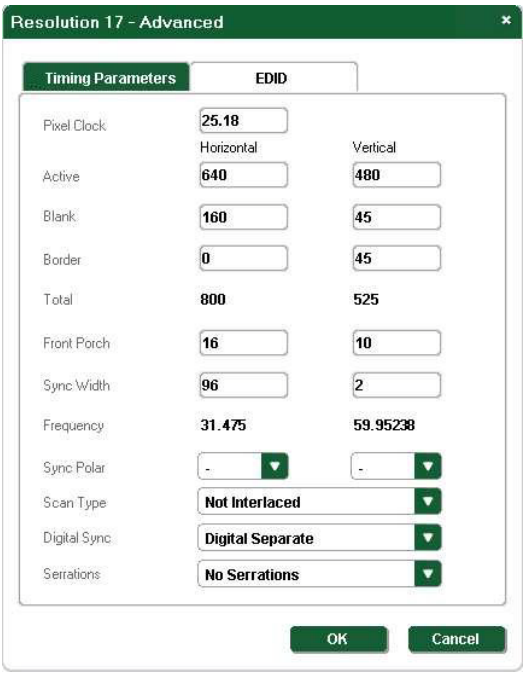

Figure 12: User Defined Resolution Advanced Window–Timing Parameters Tab

7. Edit or select the required resolution timing values, such as, Pixel Clock and Digital Sync.

8. Click **OK** to accept the changes or click on the **EDID** tab to edit the EDID values.
   The **EDID** tab is displayed as shown in Figure 13.

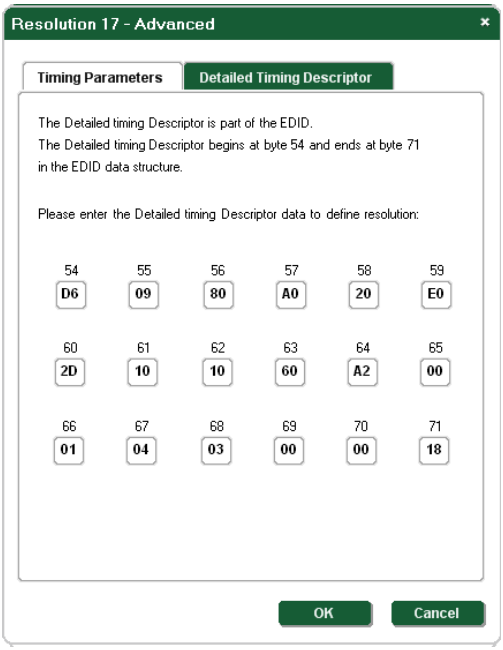

Figure 13: User Defined Resolution Advanced Window–EDID Tab

9. Edit the EDID values as required.

10. Click **OK** to save the values.

6 Technical Specifications

OUTPUT:	1 DisplayPort connector
CONTROL:	Five dual-function and two single function front panel buttons, Remote control via USB on a USB connector and RS-232 on a 9-pin D-sub connector
POWER SOURCE:	5V DC, 670mA
OPERATING TEMPERATURE:	0° to +55°C (32° to 131°F)
STORAGE TEMPERATURE:	-45° to +72°C (-49° to 162°F)
HUMIDITY:	10% to 90%, RHL non-condensing
DIMENSIONS:	10.7cm x 10.0cm x 4.4cm (4.2" x 3.9" x 1.7") W, D, H
WEIGHT:	0.4kg (0.88lbs) approx.
ACCESSORIES:	Power supply
OPTIONS:	RK-1 Universal rack adapter
Specifications are subject to change without notice at http://www.kramerelectronics.com	

7 Communication Parameters

RS-232	
Baud Rate:	9600
Data Bits:	8
Stop Bits:	1
Parity:	None

8 Serial Protocol

The **850** can be controlled via the serial port using the commands described in this section.

8.1 Command Format

Commands must be in the following format:

0xEB, address, command, length of data, data 1,…, data n, checksum

where the following table describes the command components.

Command Component	Description
0xEB	Fixed command start byte
address	Device address. This is always 0x90 for the 850
command	Command to be sent (see Section 8.3)
length of data	How many bytes sent/received (from data 1 to data n)
data 1, data n	One or more command variables within the range 0x01 to 0xFA and excluding 0xEB
checksum	Optional—Checks whether the sending/receiving frame is valid. Check sum = Address + Command + Data length + Data 1+…+Data n For example, EBH, 90H, 01H, 01H, F3H, 85H Check sum = 90H + 01H + 01H + F3H = 185H **Note**: The checksum gets the low 8 bits, for example, if the check sum = EBH, then check sum = 14H

8.2 Device Response

The device responds as follows:

0xEB, 0x90, command, 0x01, answer, check sum

where *answer* is one of the values described in the following table.

Command Component	Description
0xF1	Either: –the device received the wrong address and returns no response –the device gets information about Errors and Alarms
0xF2	The data is out of range. The command is not executed
0xF3	The device is currently controlled by the buttons. The command is not executed
0xF7	The data length is incorrect. The command is not executed
0xFC	The data is out of range. The command is not executed

8.3 Commands

The commands listed below are supported by the **850**.

Note: The checksum is required at the end of the send/receive command as shown in Section 8.1. If a checksum is not included in a sent command, the device will not respond.

8.3.1 Get Device Address and Software Version

Command	Send/Receive	Data
0x00	0xEB, 0x00, 0x00, 0x01, 0xXX, checksum 0xEB, [address], 0x00, 0x02, [version], 0x00, checksum	0xXX can be any data except 0xEB

8.3.2 Set Output Encryption or Decryption

Command	Send/Receive	Data
0xE3	0xEB, 0x00, 0xE3, 0x01, data1, checksum 0xEB, address, 0xE3, 0x01, 0xFA, checksum	data1: • 0 = encryption • 1 = decryption

8.3.3 Get Device Status

Command	Send/Receive	Data
0xE4	0xEB, address, 0xE4, 0x01, 0x00, checksum 0xEB, address, 0xE4, 0x08, data1, ..., data8, checksum	data1: reserved data2: reserved data3: output encryption status: • 0 = encryption • 1 = decryption data4: reserved data5: reserved data6: reserved data7: reserved data8: reserved

8.3.4 Set Output Status

Command	Send/Receive	Data
0xE6	0xEB, address, 0xE6, 0x02, data1, data2, checksum 0xEB, address, 0xE6, 0x01, 0xFA, checksum	data 1: • 0x00: reserved • 0x01: RESOULTION_INDEX • 0x02: PATTERN_INDEX • 0x03: DEEPCOLOR_MODE • 0x04: COLORSPACE_MODE • 0x05: reserved • 0x06: AUDSAMPLE_INDEX • 0x07: AUDBIT_INDEX • 0x08: AUDCHANNEL_INDEX • 0x09: BITRATE_INDEX • 0x0A: OUT_LANE_INDEX • 0x0B: OUT_ENHFRAMING_INDEX • 0x0C: OUT_DELAY • 0x0D: training data 2: • reserved • from 0x00 to 0x17. (24 Resolutions) • from 0x00 to 0x1f. (32 Patterns) • 0 = auto, 0x18 = 24bit, 0x1e = 30bit, 0x24 = 36bit • 0 = auto, 1 = RGB444, 2 = YUV444, 3 = YUV422 • reserved • 0 = auto, 1 = 44k, 2 = 48k, 3 = 88k, 4 = 96k, 5 = 176k, 6 = 192k • 0 = auto, 0x10 = 16bit, 0x14 = 20bit, 0x18 = 24bit • 0 = auto, 1 = turn off, 2 = 2 channels, ……, 8 = 8 channels • 0 = auto, 1 = 1.62G, 2 = 2.7G • 0 = auto, 1 = 1 channel, 2 = 2 channels, 4 = 4 channels • 0 = auto, 1 = not supported, 2 = supported • 0 = 0ms, 1 = 200ms, 2 = 400ms, 3 = 600ms, 4 = 800ms, 5 = 1000ms • 0 = training again

8.3.5 Get Output Status

Command	Send/Receive	Data
0xE7	0xEB, address, 0xE7, 0x01, 0x00, checksum 0xEB, address, 0xE7, 0x0E, data1,… data14, checksum	Data1: FOLLOWENCRY_MONITOR; • 0 = decryption, 1 = encryption Data2: RESOULTION_INDEX; • from 0x00 to 0x17 (24 resolutions) Data3: PATTERN_INDEX; • from 0x00 to 0x1f (32 patterns) Data4: DEEPCOLOR_MODE; • 0 = auto, 0x18 = 24bit, 0x1e = 30bit, 0x24 = 36bit Data5: COLORSPACE_MODE; • 0 = auto, 1 = RGB444, 2 = YUV444, 3 = YUV422 Data6: reserved Data7: AUDSAMPLE_INDEX; • 0 = auto, 1 = 44k, 2 = 48k, 3 = 88k, 4 = 96k, 5 = 176k, 6 = 192k Data8: AUDBIT_INDEX; • 0 = auto, 0x10 = 16bit, 0x14 = 20bit, 0x18 = 24bit Data9: AUDCHANNEL_INDEX; • 0 = auto, 1 = turn off, 2 = 2channels …..,8 = 8channels Data10: BITRATE_INDEX; • 0 = auto, 1 = 1.62G, 2 = 2.7G Data11: OUT_LANE_INDEX; • 0 = auto, 1 = 1, 2 = 2, 4 = 4 (channels) Data12: OUT_ENHFRAMING_INDEX • 0 = auto, 1 = not supported, 2 = supported. Data13: OUT_DELAY; • 0 = 0ms, 1 = 200ms, 2 = 400ms, 3 = 600ms, 4 = 800ms, 5 = 1000 (ms) Data14: training result; • 0 = fail, 1 = succeed

8.3.6 Get Output Status when the Device is in Auto Mode

Command	Send/Receive	Data (Auto Setup)	Data (Not Auto Setup)
0xE7	0xEB, address, 0xE7, 0x01, 0x01, checksum 0xEB, address, 0xE7, 0x08, data1, ……, data8, checksum	data1: Deep Color: 0x18 (24bit), 0x1E (30bit), 0x24 (36bit)	Setup value
		data2: Color Space: 1 = RGB444, 2 = YUV444, 3 = YUV422	Setup value
		data3: Audio sample: 1 = 44k, 2 = 48k, 3 = 88k, 4 = 96k, 5 = 176k, 6 = 192k	Setup value
		data4: Audio bit: 0x10 (16), 0x14 (20), 0x18 (24)	Setup value
		data5: Audio channel number	If setup is auto: 2-8 channels If setup is not auto: setup value
		data6: Bit Rate	If setup is auto: 1=1.62G, 2=2.7G If setup is not auto: setup value
		data7: Lane Number	If setup is auto: 1, 2, 4 If setup is not auto: setup value
		data8: Enhanced Framing	If setup is auto: 1=Not support, 2=Support If setup is not auto: setup value

8.3.7 Get Monitor Status

Command	Send/Receive	Data
0xE8	0xEB, address, 0xE8, 0x01, 0x00, checksum 0xEB, address, 0xE8, 0x08, data1, ……, data8, checksum	data1: reserved data2: reserved data3: reserved data4: monitor type (0 = DVI, 1 = HDMI) data5: monitor HDCP status. (0 = no HDCP support, 1 = HDCP supported) data6: monitor Deep Color status (24/30/36) data7: Load status. (0 = no HPD, 1=HPD) data8: reserved

8.3.8 Set Monitor Status

Command	Send/Receive	Data
0xE9	0xEB, address, 0xE9, 0x01, 0x00, checksum 0xEB, address, 0xE9, 0x08, data1, ……, data8, checksum	data1: monitor Color Space status: 0 = RGB, 1 = YUV422, 2 = YUV444, 3 = YUV444+422 data2: reserved data3: reserved data4: monitor Bit Rate status: 1 = 1.62G, 2 = 2.7G data5: monitor Lane status: 1, 2, 4 data6: monitor Enhanced framing status: 1 = Not support, 2 = Support data7: reserved data8: reserved

8.3.9 Set Detailed Timing for User-defined Resolution

Command	Send/Receive	Data
0xEA	0xEB, address, 0xEA, 0x26, [block index], [perform immediately], data1H_4bits, data1L_4bits, data2H_4bits, data2L_4bits, ……, data17H_4bits, data17L_4bits, data18H_4bits, data18L_4bits, checksum 0xEB, address, 0xEA, 0x01, 0xFA, checksum	1. [block index]: From 0 to 7 **Note**: 7 is the preferred timing of the monitor, so it is preferable to use 0 to 6 2. [perform immediately]: 1 = switch to the user-defined resolution immediately, 0 = save the user-defined resolution but do not switch 3. "H_": high bits 4. "L_": low bits 5. "data nH_4bits" and "data nL_4bits": As, 0xfa apart to 0x0f and 0x0a 6. The 18 data are the detailed timing of the EDID. Example 1: 1600*1200*60 VESA DMT-10 Frame of Command as: EB 90 EA 26 00 00 04 08 03 0F 04 00 03 00 06 02 0B 00 03 02 04 00 04 00 0C 00 01 03 00 00 06 0F 01 03 01 01 00 00 00 00 01 0E (00) Example 2: 720p Frame of Command as: EB 90 EA 26 00 00 00 01 01 0D 00 00 07 02 05 01 0D 00 01 0A 02 00 06 0E 02 08 05 05 00 00 07 0E 08 08 04 02 00 00 00 00 01 0A (00)

8.3.10 Get Detailed Timing for the User-defined Resolution

Command	Send/Receive	Data
0xEA	0xEB, address, 0xEA, 0x01, data1, checksum 0xEB, address, 0xEA, 0x26, block index, 00, data1H_4bits, data1L_4bits, data2H_4bits, data2L_4bits, ……, data17H_4bits, data17L_4bits, data18H_4bits, data18L_4bits, checksum	data1: From 0 to 7

8.3.11 Setting a Predefined Resolution as a User-defined Resolution

Command	Send/Receive	Data
0xEA	0xEB, address, 0xEA, 0x03, data1, data2, data3, checksum 0xEB, address, 0xEA, 0x01, 0xFA, checksum	data1: block index: from 0 to 7 data2: perform immediately: 0 = save the user-defined resolution but do not switch, 1 = switch to the user-defined resolution immediately data3: predefined resolution number, from 0 to 35

8.3.12 Get the Monitor EDID

Command	Send/Receive	Data
0xFD	0xEB, address, 0xFD, 0x02, 0x03, 0x00, checksum 0xEB, address, 0xFD, 0x12, 0x03, [group num], data1H_4bits, data1L_4bits, data2H_4bits, data2L_4bits, ……, data7H_4bits, data7L_4bits, data8H_4bits, data8L_4bits, checksum	[group num]: from 0 to 0x3f. Each group has 8 bytes of EDID data When sending the command, there are 64 groups for 512 bytes of EDID data

8.3.1 Get the Monitor DPCD

Command	Send/Receive	Data
0xFD	0xEB, address, 0xFD, 0x02, 0x05, data1, (check sum) 0xEB, address, 0xFD, 0x12, 0x05, [data num], data1H_4bits, data1L_4bits, data2H_4bits, data2L_4bits, ……, data7H_4bits, data7L_4bits, data8H_4bits, data8L_4bits, (check sum)	data1: 0: Receiver Capability Field 1: Link Configuration Field 2: Link / Sink Status Field 3: Source Device Specific Field 4: Sink Device Specific Field 5: Branch Device Specific Field 6: Sink Control Field [data num]: from 0 to 0x1f. Every group has 8 bytes DPCD data When sending the command, there are 32 groups for 256 bytes of DPCD data

8.3.2 Reset Device

Command	Send/Receive
0xED	0xEB, address, 0xED, 0x04, 0x03, 0x01, 0x02, 0x07, checksum 0xEB, address, 0xED, 0x01, 0xFA, checksum

LIMITED WARRANTY

We warrant this product free from defects in material and workmanship under the following terms.

HOW LONG IS THE WARRANTY

Labor and parts are warranted for seven years from the date of the first customer purchase.

WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

WHAT IS COVERED AND WHAT IS NOT COVERED

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by us or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.
2. Any product, on which the serial number has been defaced, modified or removed, or on which the WARRANTY VOID IF TAMPERED sticker has been torn, reattached, removed or otherwise interfered with.
3. Damage, deterioration or malfunction resulting from:
   i) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
   ii) Product modification, or failure to follow instructions supplied with the product
   iii) Repair or attempted repair by anyone not authorized by Kramer
   iv) Any shipment of the product (claims must be presented to the carrier)
   v) Removal or installation of the product
   vi) Any other cause, which does not relate to a product defect
   vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.
2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.
3. Shipping charges.

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).
3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

LIMITATION OF IMPLIED WARRANTIES

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

EXCLUSION OF DAMAGES

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:
2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

NOTE: All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

EN-50081: "Electromagnetic compatibility (EMC); generic emission standard. Part 1: Residential, commercial and light industry"
EN-50082: "Electromagnetic compatibility (EMC) generic immunity standard. Part 1: Residential, commercial and light industry environment".
CFR-47: FCC* Rules and Regulations: Part 15: "Radio frequency devices Subpart B Unintentional radiators"

CAUTION!

- Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.
- Use the supplied DC power supply to feed power to the machine.
- Please use recommended interconnection cables to connect the machine to other components.

  * FCC and CE approved using STP cable (for twisted pair products)

For the latest information on our products and a list of Kramer distributors, visit our Web site where updates to this user manual may be found.

We welcome your questions, comments, and feedback.
Web site: www.kramerelectronics.com
E-mail: info@kramerel.com

SAFETY WARNING
Disconnect the unit from the power supply before opening and servicing