TE460-137 2K/4K HDMI SIGNAL GENERATOR & ANALYZER User's Guide

Welcome!

Everyone at Altinex greatly appreciates your purchase of the TE460-137. We are confident that you will find it to be reliable and easy to use. If you need support, please do not hesitate to call us at 714-990-2300.

At Altinex, we are committed to developing unique and state of the art Signal Management Solutions® for demanding audiovisual installations. Welcome to the Altinex family of satisfied customers around the world!

1. Precautions and Safety Warnings

- These instructions are to ensure the reliable operation of your TE460-137 and to prevent fire and shock hazards. Please read them carefully and heed all warnings.

1.1 General

- Qualified Altinex service personnel or their authorized representatives must perform all service.

1.2 Installation Precautions

- To prevent fire or shock, do not expose this unit to water or moisture. Do not place in direct sunlight, near heaters or heat-radiating appliances, or near liquid. Exposure to direct sunlight, smoke, or steam can harm internal components.
- Handle carefully; dropping or jarring can cause damage.

1.3 Cleaning

- Clean with a dry cloth only. Never use strong detergents or solvents such as alcohol or thinner.

1.4 FCC Notice

- This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
- This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 2 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions found herein, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.
- Any changes or modifications to the unit not expressly approved by Altinex, Inc. could void the user's authority to operate the equipment.

2. Installation Procedures

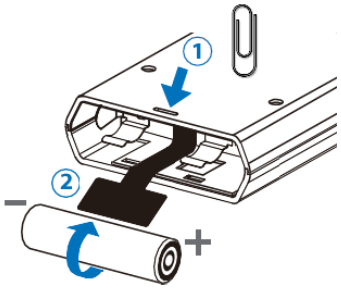
Note: Download and read the entire online manual to become familiar with the TE460-137 and for detailed information. See the top label of the TE460-137 for control details or refer to the complete online manual.

Note 2: Go to www.youtube.com and search TE460-137 for how to videos. Start with EASY MODE.

Step 1: Insert a small paperclip into the battery compartment slot and press firmly.

Step 2: Install the battery provided with the tester. Make sure the mylar tab is underneath the battery as shown in the image to the right.

Caution: Make sure the polarity of the battery matches the tester.



Step 3. The tester is now ready; turn on power. The TE460-137 powers up in EASY MODE. EASY MODE provides the basic functionality required by most users.

If more detailed information or features are required, select ADVANCED MODE as follows. Press and hold the TASK button for about 2 seconds and wait for the TE460-137 to reinitialize.

Step 4. Select the desired mode of operation using the TASK button on the front of the tester. Do NOT press ENTER to confirm the selection. Once the correct task is displayed at the top, just wait for the task to start automatically.

Step 5. Use the MENU and UP/DN arrows to navigate the menus.

ENTER button selects a menu. UP/DN buttons cycle through options. ENTER button confirms the selection.

3. Warranty and Return Policies

Please visit the Altinex website at www.altinex.com for details on warranty and return policies. In the case of a unit needing repair, please complete an RMA (return material authorization) form located in the warranty section or call Altinex Customer Service at 800-ALTINEX. Once completed, please email the form to support@altinex.com.

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4. Technical Specifications

Specifications are subject to change due to design improvements. Please see www.altinex.com for up to date information.

Features/Description	TE460-137
Input Connectors*	
Digital Video + Audio	HDMI F, Type A
Power	Micro USB F (1)
Output Connectors	
Digital Video + Audio	HDMI F, Type A
Compatibility	
Digital Signal types	HDMI 1.4,3D
Signal resolution	Up to 4k x 2k
Accessories Included	
Power supply	2.4A USB Wall charger (1)
2.0 USB cable	6ft, A- M /B- M cable (1)
HDMI Cable	1 ft, HDMI M/M cable (1)
Lithium battery	3.6V 3350MAB (1)
Optional Accessories	

Table 1. TE460-137 General

Mechanical	TE460-137
Material	Steel
Color	Silver
Height	1.06 in. (27 mm)
Width	3.15 in. (80 mm)
Length	5.5 in. (140 mm)
Weight	0.6 lb. (0.26 kg)
T° Operating	10°C-40°C
Humidity	60% RH non-condensing
MTBF (calc.)	38,000 hrs.

Table 2. TE460-137 Mechanical

Electrical	TE460-137
Video Input Signals	
Digital Video + Audio	HDMI Standard
Output Signals	
Digital Video + Audio	HDMI Standard
Power	
5V	5W

Table 3. TE460-137 Electrical

* Warning: The 5V from the source on the HDMI input must NOT exceed +5.3 VDC.

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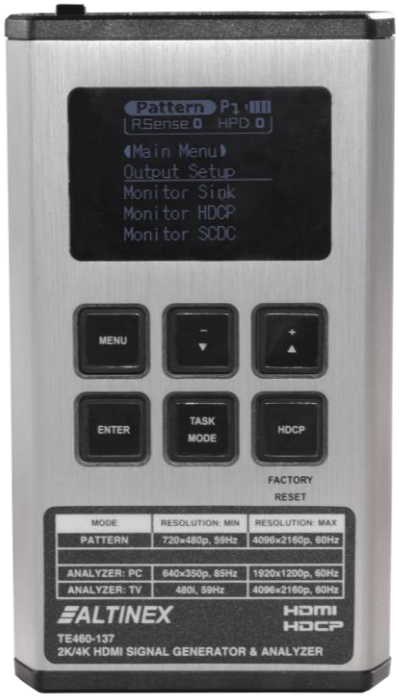
5. About Your TE460-137



- EASY and ADVANCED mode options
- HDMI input and output with 18Gbps (600MHz) 4K UHD support
- DVI 1.0 compliant with the use of an HDMI-DVI adaptor
- HDCP 1.4 and 2.2 compliant
- Supports HD resolutions up to 4096×2160@60Hz (4:4:4, 8-bit)
- Source bypass support in Analyzer mode

  4K sources can be scaled down to 1080p in Analyzer mode to support a wider range of displays when analyzing a high-bandwidth source
- HDR bypass and analysis support
- Source video, audio and timing analysis
- Analysis and emulation of EDID data
- HDCP and SCDC monitoring functions
- HDMI packet analysis
- Analyzer mode complies with the CEA standard HDR static metadata extensions CEA-861-F and CEA-861.3
- 23 selectable output resolutions available in Test Pattern mode
- 17 selectable static test patterns in Test Pattern mode
- HDMI 2.0 cable test function including tests for 5V, CEC continuity, and hot- plug detection support
  - Cables tested at 4k 60Hz (ADVANCED MODE)
  - Cable test starts at 1080p60 (EASY MODE) adjustable over full resolution range
- Supports LPCM 2.0, 5.1, and 7.1 audio output with adjustable sinewave frequencies for each channel
- Comprehensive EDID management support with 10 built-in default EDIDs and 10 user EDIDs copied from sink devices
- Powered by a single Lithium-ion battery (included). Use of an external USB power bank can provide extended operation time
- OLED display with rapid updates of current status information
- Supports optional Windows control software in EASY or ADVANCED modes

The latest firmware supports an EASY MODE option for the TE460-137. In EASY MODE, users have quick access to the most commonly used features. All information is available on a single screen with no need to navigate submenus for information.

The TE460-137 HDMI Signal Generation and Analysis tool provides a convenient way to test and verify all aspects of an HDMI signal path, including source and sink. TE460-137 complies with the HDMI 2.0a and HDCP 1.4/2.2 standards. The TE460-137 Analyzer mode complies with the CEA standard HDR static metadata extensions CEA-861-F and CEA-861.3 for EDID analysis.

TE460-137 is powered by a single rechargeable Lithium-ion battery. Beyond the Lithium-ion battery, the unit may also be powered (and the battery recharged) via the micro USB port using included with unit USB wall charger and USB cable. An external power bank can also be used to extend the portable service time. 4K sources can be scaled down to 1080p output in Analyzer mode to support a wider range of displays when analyzing high- bandwidth sources.

TE460-137 has an integrated OLED display which provides a way to quickly and clearly view the current signal state or the results of signal analysis. This portable handheld design is ideal for both the professional end user and installation engineer alike. TE460-137 unit can be used in following applications Installer/Integrator multi-function test tool, HDMI source and sink testing, HDCP compliance verification, production testing, etc.

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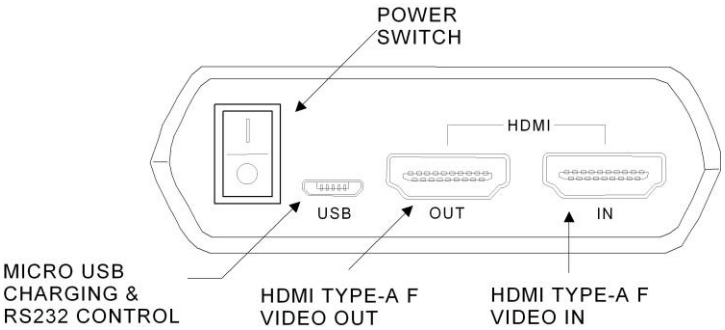
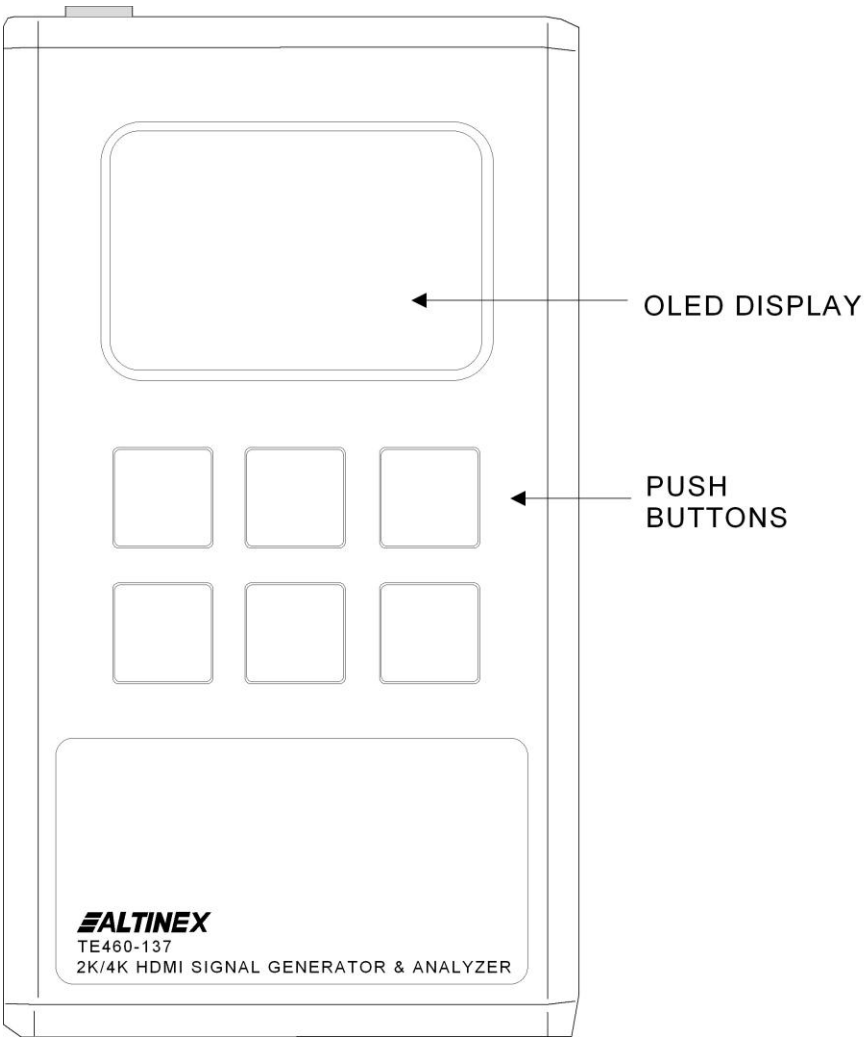
Description





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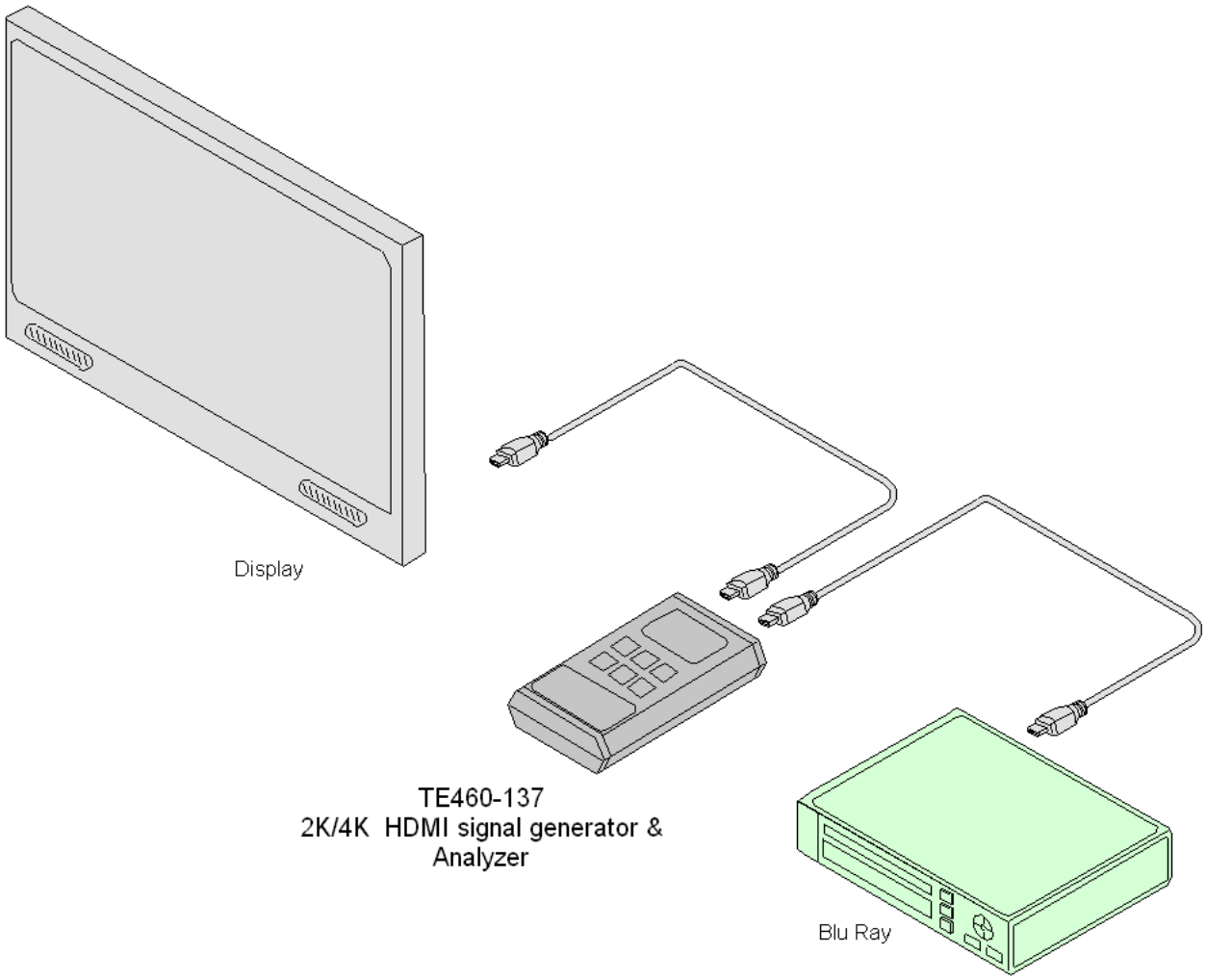
6. Application Diagrams



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7. Operation

The OLED display provides the user with quick access to details about the TE460-137 and the status of the generator/analyzer.

The display automatically switches off after the set number of minutes. All other functions of the unit continue normally while the display is turned off. The HDCP button slowly flashes red indicating it is in power saver mode. Press any button to restore the display.

7.1 Modes of Operation

The TE460-137 powers up in EASY MODE as this is best for most users. However, there are many more advanced features and information available using the ADVANCED MODE.

In order to access ADVANCED MODE, press and hold the TASK MODE button for about 2 seconds and the TE460-137 automatically initializes ADVANCED MODE.

EASY MODE

7.1.1 EASY Analyzer Mode

The status line displays the 5v, TMDS clock, and sync detection state of the connected source. (I = detected, 0 = not detected.) The remaining lines display the signal timing, HDCP version, the format, and audio information.

The information is updated when changes occur, or another source is connected.

7.1.2 EASY Pattern Mode

The status line displays the Rx Sense and Hot-plug detection state of the connected display. (I = detected, 0 = not detected.)

The remaining lines on the display allow navigation to and setting of the output resolution, test pattern, audio volume, and the audio format.

7.1.3 EASY Cable Test Mode

The status line displays a cable connection graphic. If a cable is detected, the test starts automatically. After 10 seconds, the test results are displayed as PASS or FAIL. Failed properties are displayed to indicate the problem. See section 8.1 Cable Test Failure at the end of this manual for details.

Use the UP and DOWN arrows to change the resolution. This resolution is recalled on each startup. Do not over test your cable. If the installation is 1080p, the cable does not need to pass the highest 4096x2160@60 resolution.

At the end of the test, you can press ENTER to re-run the test.

After removing the cable, when a new cable is connected, the test starts again to test the new cable.

ADVANCED MODE

A full listing of menus and submenus may be found later in this section. Each mode has its own table of menu items.

7.1.4 Analyzer Mode

The status line displays the 5v, TMDS clock, and sync detection state of the connected source. (I = detected, 0 = not detected.)

Video, audio, and EDID information is available using the various submenus. See section OSD Menu – Analyzer for menu items.

7.1.5 Pattern Mode

The status line displays the Rx Sense and Hot-plug detection state of the connected display. (I = detected, 0 = not detected.)

Video, audio, and EDID information is available using the various submenus. See section OSD Menu – Pattern Generator for detailed menus.

7.1.6 Cable Test Mode

The status line displays cable connection graphic. In ADVANCED MODE, all cables are tested at 4k60Hz and the minimum test time is 2 minutes.

Do not over test your cable. If the installation is 1080p, the cable does not need to pass the 4096x2160@60 resolution used in ADVANCED MODE. Restart the TE460-137 and use the cable test in EASY MODE. Use the DOWN arrow to set a lower resolution.

There are 2 screens in ADVANCED MODE. The second screen is accessed by pressing the down arrow. This screen shows the graphic progress of the bandwidth test.

7.1.6 Cable Test Description

The ADVANCED MODE cable test resolution is fixed at 3840x2160p60.

During the 2 minutes, the tester makes many signal measurements and compares them against an internal database. If anything is off, the test fails.

This is not a signal voltage level test, it is a data transfer test. The cable quality affects the ability to transfer data. Signal loss results in data loss causing test failures.

As an oversimplification, if some data is lost here and there, the cable test can fail even though it is unlikely any issues will be noticed when watching video. It takes a significant interruption to be noticed visually.

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Basically, there are 3 levels of cable test results.

1) A perfect cable will pass the cable bandwidth test every time.

2) A very good cable can fail the cable test even 50% of the time. However, if it does pass the cable test, it is highly unlikely that a user or customer will ever notice any issues in the video.

3) A cable that never passes the test would be prone to a field failure eventually. It might pass video very well until the right combination of resolution and/or video content is applied resulting in visible errors.

As a note, do not over test your cable. If the installation is 1080p, the cable does not need to pass the resolution used in ADVANCED MODE. Restart the TE460-137 and use the cable test in EASY MODE. Use the DOWN arrow to set a lower resolution.

See section OSD Menu - Cable Test for menu items.

7.1.7 Menu Listings

Use the shortcuts below to view individual sections.

OSD Menu – Analyzer

OSD Menu – Pattern Generator

OSD Menu - Cable Test

Test Timings

PC Resolutions

Test Patterns

RS232 Command Listing

7.2 Notes and Limitations

7.2.1 Analyzer

The CEC line is not affected by the generator. CEC signals pass through the unit, but there is no analysis of the data.

7.2.2 Pattern Generator

The Pattern Generator does not block or prevent CEC signals from passing among devices when connected to a display or switcher.

7.2.3 Cable Test

If BW is displayed after the fail message, the problem is the shielded, twisted-pair lines resulting in insufficient bandwidth.

Note: Do not over test your cable. If the installation is 1080p, the cable does not need to pass a 4k resolution. In EASY MODE, use the DOWN arrow to set a lower resolution. ADVANCED MODE uses only 4096x2160@60. Switch to EASY MODE to test at a lower resolution.

If 5V is displayed after the fail message, the 5V line (pin 18) conductor is either damaged or missing.

If CEC is displayed after the fail message, the CEC line (pin 13) is either damaged or missing.

If DDC is displayed after the fail message, either the SCL or SDA conductor is damaged or missing.

If HDP is displayed after the fail message, either the hot plug detect conductor is damaged or missing. This line also represents the audio return channel (ARC).

7.3 Controls and Indicators

7.3.1 Battery Charging LED

The battery charging LED will illuminate red when a USB power source is connected and actively charging the battery.

7.3.2 Menu Button

Press to back out from menu items and return to the main menu screen.

7.3.3 Plus, Minus, Up, Down Buttons

Press to move up and down or adjust selections within menus.

7.3.4 Enter Button

Press to confirm a selection or to go deeper into a menu.

In Analyzer and Pattern modes, press and hold this button for 2 seconds to toggle audio on and off.

7.3.5 Task Mode Button

Press to switch the unit between Analyzer Mode, Pattern Mode, and Cable Test Mode.

Advanced Mode

- In Analyzer mode, press and hold this button for 2 seconds to toggle the input's hot plug trigger.
- In Pattern mode, press and hold this button for 2 seconds to enable or disable the output's AV Mute function.

7.3.6 HDCP Button

Press to switch between supported HDCP versions (1.4, 2.2) or to disable HDCP. The HDCP features uses the DDC lines in the cable. An HDCP failure can be caused by a damaged cable. In the event of a failure, run the cable test or try another cable.

- In Analyzer mode, this changes the HDCP versions supported by the input port.
- In Pattern mode, this changes the HDCP required by the output port.
- The HDCP mode is used for testing source and display features. It cannot be used to strip HDCP from protected content.

Note: The button's outline illuminates based on the HDCP state and current version.

Red = HDCP 1.4

Blue = HDCP 2.2

Off = HDCP disabled.

A flashing LED indicates HDCP authentication failure.

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7.3.7 Factory Reset (HDCP) Button

Pressing and holding the HDCP button during power on will reset the unit to its factory default settings.

7.4 Inputs/outputs

7.4.1 Power

Flip this switch to turn the unit ON or OFF.

7.4.2 USB

The micro USB port is used for power, battery charging, firmware updates, and/or RS-232 command control.

Note: The different USB modes are accessed using the Setup option in the Main Menu.

7.4.3 HDMI OUT

Connect to an HDMI TV, monitor or amplifier for digital video and audio output.

7.4.4 HDMI IN

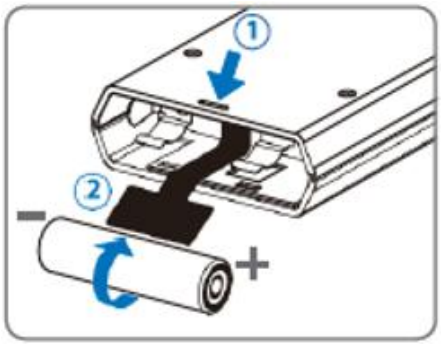
Connect to HDMI source equipment such as a media player, game console or set-top box.

7.4.5 HDMIT OUT to HDMI IN

Cable tests are run by connecting the cable under test between the input and output ports.

7.5 Battery Compartment

The TE460-137 may be powered directly via the USB port or by a rechargeable Lithium-ion battery (included but packaged separately) which is concealed within the bottom of the unit.



7.5.1 Opening the Compartment

Use a paperclip to gently, but firmly press down into the slot behind the base panel and the bottom cover will pop out.

7.5.2 Removing the Battery

If a battery is installed, a Mylar tab is visible beneath the battery. Pull the tab to pop the battery out of its brackets.

7.5.3 Inserting the Battery

Turn the unit so that it is face down and align the battery so that the positive terminal of the battery (marked with a +) is aligned with the positive (+) marking on the right-hand side on the back of the battery compartment. Extend the Mylar tab out of the battery compartment, then place the battery on top of the extended tab and slide the battery into the unit until it snaps into the holding brackets as shown in the illustration.

7.5.4 Closing the Compartment

After the battery has been properly inserted, place the battery compartment cover back into the bottom of the unit by first Ming the 2 small tabs on the cover into the 2 slots in the case and then gently snapping the cover into place.

7.5.5 Charging the Battery

Connect a USB charger (5V/2.1 A minimum) to the USB port to charge the unit's battery until it is full. The typical charging time, from empty to full, is approximately 3 hours while the unit's power is off. Average operation time from a fully charged battery is roughly 4 hours but may be less depending on specific usage and battery quality.

Note: The battery is included; Panasonic NCR 18650B (3.6v/3350mAh) Lithium-ion rechargeable.

7.6 Display Indicators

7.6.1 USB Port

	USB port is power mode
	USB port is RS232 mode
	USB port is in firmware update mode

7.6.2 Battery

	External power only; no battery.
	External power, battery is at max.
	External power, battery is charging.
	Battery percentage 100%
	Battery percentage 75%
	Battery percentage 50%
	Battery percentage 25%
E	Battery critically low

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7.7 OSD Menus

7.7.1 OSD Menu – Analyzer (Menu Listings)

Input Setup		
	Hotplug Time	50ms ~ 500ms (150ms)
	Hotplug Toggle	
	RxSense*	On
		Off
	DDC Bus*	On
		Off
	HDCP Port*	v1.4
		v1.4+v2.2
		Off
	HDCP REAUTH-REQ	
	4K to 1080p	On YCbCr Out
		On RGB Out
		Off (POR)
	SCDC Port*	On (POR)
		Off
	PC Tolerance	1 ~ 10 (6)

Monitor Source		
	Timing	[Measured]
	HDCP	[Measured]
	Format	[Measured]
	Colorspace	[Measured]
	Audio	[Measured]
	Deep Color	[Measured]
	AVI, AIF, HDR, VSI, AVMute,	[Measured]
	SPD, 3D	[Measured]

Monitor HDCP (v1.4)		
	Source HDCP	[Measured]
	Rx HDCP Port	[Measured]
	Aksv	[Measured]
	Bksv	[Measured]
	Ri Source	[Measured]
	Ri' Rx	[Measured]
	Count	[Measured]
	Day 0 00 : 00 : 00	[Measured]

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Monitor HDCP (v2.2)		
	Source HDCP	[Measured]
	Rx HDCP Port	[Measured]
	TxCaps	[Measured]
	RxCaps	[Measured]
	Receiver ID	[Measured]
	rn	[Measured]
	riv	[Measured]

Monitor SCDC		
	Rx SCDC Port	[Measured]
	Sink Version	[Measured]
	Source Version	[Measured]
	Scramble Enabled	[Measured]
	Scramble Status	[Measured]
	Clock Detect	[Measured]
	Ch2/1/0 Locked	[Measured]
	CED Ch0	[Measured]
	CED Ch1	[Measured]
	CED Ch2	[Measured]
	ENTER Reset/Start	[Measured]
	HF VSDB	[Measured]
	SCDC Exist	[Measured]

Video Timing		
	Timing	[Measured]
	TMDS Clock	[Measured]
	Pixel Clock	[Measured]
	Data Rate	[Measured]
	Bit Depth, 3D, Y4:2:0, scramble	[Measured]
	Total (H/V Total Pixel/Line)	[Measured]
	Act (H/V Active Pixel/Line)	[Measured]
	Polarity (H/V Sync. Polarity)	[Measured]
	Scan	[Measured]
	Hfreq (H Sync. Frequency)	[Measured]
	Vfreq (V Sync. Frequency)	[Measured]
	Offset1 (H/V Sync. Offset1)	[Measured]
	Offset2 (H/V Sync. Offset2)	[Measured]

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Audio Timing		
	ACR, AIF, ASP, HBR	[Measured]
	N	[Measured]
	CTS	[Measured]
	ASP PLL Lock	[Measured]
	ASP audio FIFO	[Measured]
	ASP Layout	[Measured]
	ASP Ch No.	[Measured]
	CHS App. Type	[Measured]
	CHS Audio Coding	[Measured]
	CHS Ch No.	[Measured]
	CHS Source No.	[Measured]
	CHS Sampling Rate	[Measured]
	CHS Sampling Size	[Measured]

Packet		
	GCP 0x03	[Measured]
	AVI 0x82	[Measured]
	AIF 0x84	[Measured]
	SPD 0x83	[Measured]
	VSIF H14b 0x81	[Measured]
	DRMI (HDR) 0x87	[Measured]

EDID Analyzer		
	Sink	[Measured]
	Rx EDID	[Measured]
	[D1] DVI	[Default EDID Details]
	[D2] VGA	[Default EDID Details]
	[D3] 8B LPCM PC	[Default EDID Details]
	[D4] 8B LPCM HD	[Default EDID Details]
	[D5] 12 BS 720p	[Default EDID Details]
	[D6] 12 BS HD 3D	[Default EDID Details]
	[D7] 12 BS 4K6G	[Default EDID Details]
	[D8] 12 HBR 4K3G	[Default EDID Details]
	[D9] 12 HBR 4K420	[Default EDID Details]
	[D10] 12 HBR 4K6G	[Default EDID Details]
	[C1 ~ 10] Copy 01 ~ 10	[Copied EDID Details]

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EDID Emulator		
	Copy Sink	
	[D1] DVI	[Default EDID Details]
	[D2] VGA	[Default EDID Details]
	[D3] 8B LPCM PC	[Default EDID Details]
	[D4] 8B LPCM HD	[Default EDID Details]
	[D5] 12 BS 720p	[Default EDID Details]
	[D6] 12 BS HD 3D	[Default EDID Details]
	[D7] 12 BS 4K6G	[Default EDID Details]
	[D8] 12 HBR 4K3G	[Default EDID Details]
	[D9] 12 HBR 4K420	[Default EDID Details]
	[D10] 12 HBR 4K6G	[Default EDID Details]
	[C1 ~ 10] Copy 01 ~ 10	[Default EDID Details]

EDID Copy Sink		
	[C1 ~ 10] Copy 01 ~ 10	

EDID Burn Sink		
	[D1] DVI	[Default EDID Details]
	[D2] VGA	[Default EDID Details]
	[D3] 8B LPCM PC	[Default EDID Details]
	[D4] 8B LPCM HD	[Default EDID Details]
	[D5] 12 BS 720p	[Default EDID Details]
	[D6] 12 BS HD 3D	[Default EDID Details]
	[D7] 12 BS 4K6G	[Default EDID Details]
	[D8] 12 HBR 4K3G	[Default EDID Details]
	[D9] 12 HBR 4K420	[Default EDID Details]
	[D10] 12 HBR 4K6G	[Default EDID Details]
	[C1 ~ 10] Copy 01 ~ 10	[Copied EDID Details]

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Setup		
	USB Port	Power
		RS-232
	OLED Contrast	0 ~ 8 (6)
	Firmware Update	Yes
		No
	Power Saving	2min ~ 10min
		Off
	EDID Reset	Yes
		No
	Factory Restore	Yes
		No

Information		
	[Unit Version Details]	

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7.7.2 OSD Menu – Pattern Generator (Menu Listings)

Output Setup		
	Timing	
		[T1] 720×480p59
		[T2] 720×576p50
		[T3] 1280×720p25
		[T4] 1280×720p30
		[T5] 1280×720p50
		[T6] 1280×720p60
		[T7] 1920×1080i50
		[T8] 1920×1080i60
		[T9] 1920×1080p24
		[T10] 1920×1080p25
		[T11] 1920×1080p30
		[T12] 1920×1080p50
		[T13] 1920×1080p60
		[T14] 3840×2160p24
		[T15] 3840×2160p25
		[T16] 3840×2160p30
		[T17] 3840×2160p50
		[T18] 3840×2160p60
		[T19] 4096×2160p24
		[T20] 4096×2160p25
		[T21] 4096×2160p30
		[T22] 4096×2160p50
		[T23] 4096×2160p60
	Pattern	
		[P1] Black
		[P2] Blue
		[P3] Cyan
		[P4] Green
		[P5] Magenta
		[P6] Red
		[P7] White
		[P8] Yellow
		[P9] Color Bar
		[P10] Grayscale 256
		[P11] V Line OnOff

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Output Setup (cont.)		
	Format	**HDMI**
		DVI
	Colorspace	**RGB**
		YUV444
	ColorRange	**Full**
		Limited
	Audio LPCM*	2CH
		5.1CH
		7.1CH
	HDCP Out	v1.4
		v2.2
		Off
	HDCP V2.2 AKE_Stored_km()	On
		Off
	AVMute*	On
		Off
	Output*	**On**
		Off
	+5V Out	**Follow**
		On

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Monitor Sink		
	HDCP Port/Auth	[Measured]
	EDID	[Measured]
	SCDC Port	[Measured]
Monitor HDCP (Output HDCP 1.4)		
	Tx HDCP	[Measured]
	Sink HDCP Port	[Measured]
	Aksv	[Measured]
	Bksv	[Measured]
	Ri Tx	[Measured]
	Ri' Sink	[Measured]
	Count	[Measured]
	Day 0 00:00:00	[Measured]
Monitor HDCP (Output HDCP 2.2)		
	Tx HDCP	[Measured]
	Sink HDCP Port	[Measured]
	TxCaps	[Measured]
	RxCaps	[Measured]
	Receiver ID	[Measured]
	rn	[Measured]
	riv	[Measured]
	Stored km	[Measured]
	Sink REAUTH	[Measured]
	Count	[Measured]
	Day 0 00:00:00	[Measured]
Monitor SCDC		
	Sink SCDC Port	[Measured]
	Sink Version	[Measured]
	Source Version	[Measured]
	Scramble Enable	[Measured]
	Scramble Status	[Measured]
	Clock Detect	[Measured]
	Ch2/1/0 Locked	[Measured]
	CED Ch0	[Measured]
	CED Ch1	[Measured]
	CED Ch2	[Measured]
	ENTER Reset/Start	[Measured]
	HF VSDB	[Measured]
	SCDC Exist	[Measured]

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Audio Output		
	Volume	
		0 ~ 80 (70)
	Sample Rate	
		48 kHz
		96 kHz
		192 kHz
	Word Length	
		16 Bits
		20 Bits
		24 Bits
	Channels*	
		2
		5.1
		7.1
	SD0-L ~ SD03-L Freq.	
		Mute
		200Hz ~ 1600Hz (**1000Hz**)
	SD0-R ~ SD3-R Freq.	
		Mute
		200Hz ~ 1600Hz (**1000Hz**)

EDID Analyzer	Same as Analyzer Mode	[Measured]
EDID Emulator	Same as Analyzer Mode	[Measured]
EDID Copy Sink	Same as Analyzer Mode	[Measured]
EDID Burn Sink	Same as Analyzer Mode	[Measured]

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HDR Emulator		
	HDR Out	
		On **Off**
	AVI Colorimetry	
		BT.2020 (1) **BT.2020 (2)** No Data ITU601 ITU709 xvYCC601
	AVI Colorimetry	
		xvYCC709 sYCC601 Adobe Y601 Adobe RGB
	EOTF	
		[0] SDR Lumi Range [1] HDR Lumi Range **[2] SMPTE ST2084.2** [3] Future EOTF
	Metadata Descr.	
		S. Metadata Type 1 Reserved
	Max. Content L-L	0 ~ 65500 **(0)**
	Max. FrameAve L-L	0 ~ 65500 **(0)**
	AVI Color Space	*[Measured]*
	Sink EDID HDR	*[Measured]*

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Setup		
	USB Port	
		Power
		RS-232
	OLED Contrast	
		0 ~ 8 **(6)**
	Firmware Update	
		Yes
		No
	Power Saving	
		2min ~ 10min
		Off
	EDID Reset	
		Yes
		No
	Factory Restore	
		Yes
		No

Information	[Unit Version Details]	

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7.7.3 OSD Menu - Cable Test (Menu Listings)

Run Test (Enter- Start/Stop)	Normal/Strict Elapsed Time (Min:Sec) +5V Hotplug DOC Bus CEC 4K6G AN	[Measured] (PASS or FAIL result)
Cable Setup	Level	**Normal** Strict
	Time	**2 minutes** 5 minutes 10 minutes 15 minutes 30 minutes 1 hour Infinite
	Calibration Value	**Default** Loose Strict
Setup	USB Port	**Power**
		RS-232
	OLEO Contrast	0~8 (**6**)
	Firmware Update	YES/**NO**
	Power Saving	2 min ~ 10 min
		Off
	EDID Reset	Yes/**No**
	Factory Restore	Yes/**No**
Information	[Unit Version Details]	

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7.7.4 Test Timings (Menu Listings)

Timing	Hz	ID#
720×480p	59	T01
720×576p	50	T02
1280×720p	25	T03
	30	T04
	50	T05
	60	T06
1920×1080i	50	T07
	60	T08
1920×1080p	24	T09
	25	T10
	30	T11
	50	T12
	60	T13
3840×2160p	24	T14
	25	T15
	30	T16
	50	T17
	60	T18
4096×2160p	24	T19
	25	T20
	30	T21
	50	T22
	60	T23

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7.7.5 PC Resolutions (Menu Listings)

PC Resolution	Vertical Frequency (Hz)	HDMI Input	HDMI Output
640×350p	85	Yes	n/a
640×480p	59, 72, 75, 85	Yes	n/a
720×400p	70, 85	Yes	n/a
800×600p	56, 60, 72, 75, 85	Yes	n/a
848×480p	60	Yes	n/a
1024×768p	60, 70, 75, 85	Yes	n/a
1152×864p	70, 75, 85	Yes	n/a
1280×768p	60 (RB), 60, 75, 85	Yes	n/a
1280×800p	60 (RB), 60, 75, 85	Yes	n/a
1280×960p	60, 85	Yes	n/a
1280×1024p	60, 75, 85	Yes	n/a
1360×768p	60	Yes	n/a
1366×768p	60 (RB), 60	Yes	n/a
1400×1050p	60 (RB), 60	Yes	n/a
1440×900p	60 (RB), 60	Yes	n/a
1600×900p	60 (RB)	Yes	n/a
1600×1200p	60	Yes	n/a
1680×1050p	60 (RB), 60	Yes	n/a
1920×1200p	60 (RB)	Yes	n/a

RB = Reduced Blanking

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7.7.6 TV Resolutions (Menu Listings)

Resolution	Vert Freq	HDMI Input	HDMI Output
480i	59, 60	Yes	59
480p	59, 60	Yes	n/a
576i	50	Yes	n/a
576p	50	Yes	50
720p	25, 29, 30, 50, 59, 60	Yes	25, 30, 50, 60
1080i	50, 59, 60	Yes	50, 60
1080p	23, 24, 25, 29, 30, 50, 59, 60	Yes	24, 25, 30, 50, 60
2048×1080p	23, 24, 25, 29, 30, 50, 59, 60	Yes	n/a
3840×2160p	23, 24, 25, 29, 30, 50, 59, 60	Yes	24, 25, 30, 50, 60
4096×2160p	23, 24, 25, 29, 30, 50, 59, 60	Yes	24, 25, 30, 50, 60

Notes:

- If a source resolution or timing is not natively supported, the resolution will be displayed on the unit as "Timing?"
- Output Resolutions (Analyzer Mode)
- This unit provides 3 options for how to handle the output of 4k video input sources when in Analyzer mode. These choices are selectable from the "Input Setup" menu using the "4K to 1080p" item.
- To pass the 4K source without modification set "4K to 108Op" to "Off".
- To scale the 4k source down to 1080p and output as YCbCr, set to "On YCbCr Out".
- To scale the 4K source down to 1080p and output as RGB, set to "On RGB Out".
- All other (non-4k) resolutions will be passed without modification regardless of this setting.

Note: When 4K sources are scaled down to 1080p they will maintain the same refresh rate.

For example, if the source is 4K@24Hz the scaled timing win be 1080p@24Hz

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7.7.7 Test Patterns (Menu Listings)

Name	ID	Pattern
Black	P01	
Blue	P02	
Cyan	P03	
Green	P04	
Magenta	P05	
Red	P06	
White	P07	
Yellow	P08	
Color Bar	P09	

Name	ID	Pattern
Grayscale	P10	
Vert Lines	P11	
Circle	P12*	
Crosshatch	P13*	
Crosshatch Inverted	P14*	
Diagonal	P15*	
Motion (grey bar moves)	P16*	
Multi-burst	P17*	

Patterns are full screen purity tests; patterns should display an even distribution of brightness/color tone across the screen.

The white pattern should be even across screen and not cause overall brightness to lower, or for image to be unstable.

The black pattern provides the display's true minimum brightness capability; helpful for setting the room lighting levels.

The Color Bar pattern is a series of repeating vertical colored bars (white, yellow, cyan, green, magenta, red, blue, black).

The Grayscale pattern provides a way to fine tune the contrast, brightness and grayscale tracking of your display with a full 265 step gradient progressing from 0% to 100% brightness. When testing a display, no color should be visible at any point across the gradient, and the transition from black to white should appear even and consistent.

The Vert. Line pattern generates an alternating pattern of single- pixel vertical lines. Use to analyze the horizontal pixel resolution display. If the output appears to have mosaic patterns, or appears to be a solid field (grey, white or black), then it is possible that your display does not fully support the resolution you are currently sending to it.

- Patterns 12 through 17 are available on version 2 hardware and later.

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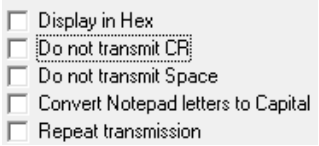
7.8 RS232 Control

RS232 commands are NOT case sensitive.

Baud = 115k Data bits = 8 Stop bits = 1 Parity = None Flow control = none

All commands start with dollar sign ($, 0x24) and end with carriage return (0x0D).



7.8.1 RS232 Examples:

AVSnap Terminal Mode for HELP: `$24help$0D`

AVSnap Object Write for HELP: `Com1.WriteStr('$help' + #13);`

AVSnap Terminal Mode for COLORBARS: `$24pattern 9$0D`

AVSnap Object Write for COLORBARS: `Com1.WriteStr('$pattern 9' + #13);`

7.8.2 RS232 Command Listing (Menu Listings)

Command	Options	AVSnap String Sample for Terminal Mode
?	Show full command list.	$24?$0d
$help	Show full command list.	$24help$0d
$4k_to_1080p	Set the 4K downscaling mode.	
	OFF [No downscaling]	$244k_to_1080p off$0d
	ON_RGB [1080p, RGB color]	$244k_to_1080p on_rgb$0d
	ON_YUV [1080p, YUV color]	$244k_to_1080p on_yuv$0d
$4k_to_1080p?	Display the current 4K downscaling mode.	$244k_to_1080p?$0d
$audio_ch	Set internal source audio channels.	
	2 [2 Channels (2.0)]	$24audio_ch 2$0d
	6 [6 Channels (5.1)]	$24audio_ch 6$0d
	8 [8 Channels (7.1)]	$24audio_ch 8$0d
$audio_ch?	Display the current audio output channels.	$24audio_ch?$0d
$audio_freq	Set audio output frequency (in Hz). Freq MUTE, 200, 400, 600 ...1600 (200 is used in samples)	
	SD0_L [SD0 Left Ch]	$24audio_freq sd0_l,200$0d
	SD0_R [SD0 Right Ch]	$24audio_freq sd0_r,200$0d
	SD1_L [SD1 Left Ch]	$24audio_freq sd1_l,200$0d
	SD1_R [SD1 Right Ch]	$24audio_freq sd1_r,200$0d
	SD2_L [SD2 Left Ch]	$24audio_freq sd2_l,200$0d
	SD2_R [SD2 Right Ch]	$24audio_freq sd2_r,200$0d
	SD3_L [SD3 Left Ch]	$24audio_freq sd3_l,200$0d
	SD3_R [SD3 Right Ch]	$24audio_freq sd3_r,200$0d

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$audio_freq?	Display audio frequency of channel.	
	SD0_L [SD0 Left Ch]	$24audio_freq? SD0_L$0d
	SD0_R [SD0 Right Ch]	$24audio_freq? SD0_R$0d
	SD1_L [SD1 Left Ch]	$24audio_freq? SD1_L$0d
	SD1_R [SD1 Right Ch]	$24audio_freq? SD1_R$0d
	SD2_L [SD2 Left Ch]	$24audio_freq? SD2_L$0d
	SD2_R [SD2 Right Ch]	$24audio_freq? SD2_R$0d
	SD3_L [SD3 Left Ch]	$24audio_freq? SD3_L$0d
	SD3_R [SD3 Right Ch]	$24audio_freq? SD3_R$0d
$audio_mute	Mute/un-mute audio out.	
	ON	$24audio_mute ON $0d
	OFF	$24audio_mute OFF $0d
$audio_mute?	Display the audio output mute state.	$24audio_mute?$0d
$audio_sr	Set the internal audio sampling rate (kHz).	
	48	$24audio_sr 48$0d
	96	$24audio_sr 96$0d
	192	$24audio_sr 192$0d
$audio_sr?	Display internal audio sampling rate.	$24audio_sr?$0d
$audio_vol	Set the audio output volume. 0~80	
	0	$24audio_vol 0$0d
	10	$24audio_vol 10$0d
	20	$24audio_vol 20$0d
	30	$24audio_vol 30$0d
	40	$24audio_vol 40$0d
	50	$24audio_vol 50$0d
	60	$24audio_vol 60$0d
	70	$24audio_vol 70$0d
	80	$24audio_vol 80$0d
$audio_vol?	Display current audio output volume.	$24audio_vol?$0d
$boot go	Reboot unit; no response during boot.	$24BOOT GO$0d
$boot?	Display the current boot state.	$24BOOT?$0d

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$cable_level	Set the cable test level.	
	NORMAL	$24**cable_level normal**$0d
	STRICT	$24**cable_level strict**$0d
$cable_level?	Display the cable test level.	$24**cable_level?**$0d
$cable_result?	Display the cable test result.	$24**cable_result?**$0d
$cable_run	Start/stop cable test.	
	START	$24**cable_run start**$0d
	STOP	$24**cable_run stop**$0d
$cable_run?	Display cable test status.	$24**cable_run?**$0d
$cable_time	Set cable test time.	
	1 [2 Minutes]	$24**cable_time 1**$0d
	2 [5 Minutes]	$24**cable_time 2**$0d
	3 [10 Minutes]	$24**cable_time 3**$0d
	4 [15 Minutes]	$24**cable_time 4**$0d
	5 [30 Minutes]	$24**cable_time 5**$0d
	6 [1 Hour]	$24**cable_time 6**$0d
	7 [Infinite]	$24**cable_time 7**$0d
$cable_time?	Display set testing time.	$24**cable_time?**$0d
$color_space	Set the output color space.	
	RGB [RGB 4:4:4]	$24**color_space rgb**$0d
	Y444 [YCbCr 4:4:4]	$24**color_space y444**$0d
$color_space?	Display the current output color space.	$24**color_space?**$0d
$edid_copy_sink	Copy current sink EDID to a copy slot. If the copy fails "$err" will be displayed. 10 slots available C1~C10	
	1	$24**edid_copy_sink c1**$0d
	2	$24**edid_copy_sink c2**$0d
	10	$24**edid_copy_sink c10**$0d
$edid_manuf?	Display the mfr. name stored in EDID. > Read fail displays "$err_ddc" > Invalid EDID displays "$err_bad"	
	RX [HDMI Input (Rx) Port]	$24**edid_manuf? rx**$0d
	SINK_H [HDMI Sink]	$24**edid_manuf? sink_h**$0d

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$edid_model?	Display EDID model/monitor name. > Read fail displays "$err_ddc" > Invalid EDID displays "$err_bad"	
	RX [HDMI Input (Rx) Port]	$24**edid_model? rx**$0d
	SINK_H [HDMI Sink]	$24**edid_model? sink_h**$0d
$edid_name	Set EDID name of the selected slot.	
	Slot C1 ~ C10, Name [20 characters max]	$24**edid_name c1,testname**$0d
$edid_name?	Display the name of the selected EDID slot.	
	D1 ~ D10, C1 ~ C10	$24**edid_name? c1**$0d
$edid_native?	Display native res. stored in EDID location. > Read fail displays "$err_ddc" > Invalid EDID displays "$err_bad" First detailed timing from Block 0.	
	RX [HDMI Input (Rx) Port]	$24**edid_native? rx**$0d
	SINK_H [HDMI Sink]	$24**edid_native? sink_h**$0d
$edid_read	Displays data block stored in EDID.	
location,block	D1~D10 [Default EDID 1~10]	$24**edid_read d1,block0**$0d
	C1~C10 [Copy EDID 1~10]	$24**edid_read c1,block0**$0d
	SINK_H [HDMI Sink]	$24**edid_read sink_h,block0**$0d
	Block number.	
	BLOCK0 [EDID Block 0]	$24**edid_read sink_h,block0**$0d
	BLOCK1 [EDID Block 1]	$24**edid_read sink_h,block1**$0d
	BLOCK2 [EDID Block 2]	$24**edid_read sink_h,block2**$0d
	BLOCK3 [EDID Block 3]	$24**edid_read sink_h,block3**$0d
	Note: Data is 128 bytes after ACK. Hex data=2 digits hex plus space. Blocks 2 & 3 only supported by sink. Read failure displays "$err_ddc" If block 2 or 3 missing, "$err_block"	
$edid_rx	Select EDID to use with the unit's HDMI input (Rx).	
	D1~D10 [Default EDID 1~10]	$24**edid_rx d1**$0d
	C1~C10 [Copy EDID 1~10]	$24**edid_rx c1**$0d
	SINK [Current HDMI sink]	$24**edid_rx sink**$0d
$edid_rx?	Display the current EDID selection for the unit's HDMI input (Rx).	$24**edid_rx?**$0d

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$edid_type?	Display EDID type of location. > Read fail displays "$err_ddc" > Invalid EDID displays "$err_bad" RX [HDMI Input(Rx) Port] SINK_H [HDMI Sink]	 $24**edid_type? rx**$0d $24**edid_type? sink_h**$0d
$edid_write	Directly write an EDID block. Data is 128 bytes hex data, following CRLF in N3 of command. Data is 3 digits; 2 hex value, one space. If the sum of 128 bytes isn't 0, "$err_ checksum" is displayed. **N1=** RX [HDMI Input(Rx) Port] SINK_H [HDMI Sink] **N2=** BLOCK0 [EDID Block 0] BLOCK1 [EDID Block 1] **N3 =** <CR><LF>{128 byte hex data} **$edid_write N1,N2 N3**	
$factory	Execute a factory reset and reboot unit. Stored Copy EDIDs and Ethernet settings are not reset.	$24**factory**$0d
$fwver?	Display the current firmware version.	$24**fwver?**$0d
$hdcp_in_sw	Enable/disable HDCP support for HDMI input. Note: Affects Analyzer mode only. ON OFF	 $24**hdcp_in_sw on**$0d $24**hdcp_in_sw off**$0d
$hdcp_in_sw?	Display current HDCP setting for input. Note: Affects Analyzer mode only.	$24**hdcp_in_sw?**$0d

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$hdcp_in_ver	Set HDCP version for HDMI input. V1.4 [HDCP v1.4 only] V1.4+V2.2 [HDCP v1.4 & v2.2]	 $24**hdcp_in_ver v1.4**$0d $24**hdcp_in_ver v1.4+v2.2**$0d
$hdcp_in_ver?	Display the current HDCP version used on the HDMI input.	$24**hdcp_in_ver?**$0d
$hdcp_out_sw	Enable/disable HDCP support on the HDMI output. N1 = ON, OFF *Note: Affects Pattern mode only.*	 $24**hdcp_out_sw on**$0d $24**hdcp_out_sw off**$0d
$hdcp_out_sw?	Display the HDMI output's HDCP status. *Note: A status of "Talk" means HDCP is currently handshaking.*	$24**hdcp_out_sw?**$0d
$hdcp_out_ver	Set the HDCP version for HDMI output. V1.4 [HDCP v1.4] V2.2 [HDCP v2.2] *Note: Affects Pattern mode only.*	 $24**hdcp_out_ver v1.4**$0d $24**hdcp_out_ver v2.2**$0d
$hdcp_out_ver?	Display the current HDCP version for the output port.	$24**hdcp_out_ver?**$0d
$hdr_eotf	Set the HDR EOTF mode. (Electro-Optical Transfer Function) SDR [Traditional Gamma, SDR Lum Rng] HDR [Traditional Gamma, HDR Lum Rng] 2084 [SMPTE ST 2084] RSVD [Reserved for future use]	 $24**hdr_eotf sdr**$0d $24**hdr_eotf hdr**$0d $24**hdr_eotf 2084**$0d $24**hdr_eotf rsvd**$0d
$hdr_eotf?	Display the current HDR EOTF mode.	$24**hdr_eotf?**$0d
$hdr_mcll	Set the maximum HDR content light level. N1 = 0 ~ 65500 [100 unit increments] 0 100 65500	 $24**hdr_mcll 0**$0d $24**hdr_mcll 100**$0d $24**hdr_mcll 65500**$0d
$hdr_mcll?	Display current max HDR content light level	$24**hdr_mcll?**$0d

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$hdr_mfall	Set the max HDR frame-avg light level. 0 ~ 65500 [100 unit increments]	
	0	$24hdr_mfall 0$0d
	100	$24hdr_mfall 100$0d
	65500	$24hdr_mfall 65500$0d
$hdr_mfall?	Display the current max HDR frame-average light level.	$24hdr_mfall?$0d
$hdr_sw	Enable/disable HDR support on the unit's HDMI output.	
	ON	$24HDR_SW ON$0d
	OFF	$24HDR_SW OFF$0d
$hdr_sw?	Display the current HDR support status for the unit's HDMI output.	$24HDR_SW?$0d
$hdr_tx_col n1	Set the HDMI output (Tx) AVI Colorimetry mode.	
	1 [No Data]	$24hdr_tx_col 1$0d
	2 [ITU 601]	$24hdr_tx_col 2$0d
	3 [ITU 709]	$24hdr_tx_col 3$0d
	4 [xvYCC 601]	$24hdr_tx_col 4$0d
	5 [xvYCC 709]	$24hdr_tx_col 5$0d
	6 [sYCC 601]	$24hdr_tx_col 6$0d
	7 [Adobe Y601]	$24hdr_tx_col 7$0d
	8 [Adobe RGB]	$24hdr_tx_col 8$0d
	9 [BT.2020 (1) Y'CC'BCC'RC]	$24hdr_tx_col 9$0d
	10 [BT.2020 (2) R'G'B'/Y'C'BC'R]	$24hdr_tx_col 10$0d
$hdr_tx_col?	Display the current HDMI output (Tx) AVI Colorimetry mode.	$24hdr_tx_col?$0d
$model?	Display the unit's model number.	$24model?$0d

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$pattern	Select the test pattern to output.	
	1 [Black]	$24**pattern 1**$0d
	2 [Blue]	$24**pattern 2**$0d
	3 [Cyan]	$24**pattern 3**$0d
	4 [Green]	$24**pattern 4**$0d
	5 [Magenta]	$24**pattern 5**$0d
	6 [Red]	$24**pattern 6**$0d
	7 [White]	$24**pattern 7**$0d
	8 [Yellow]	$24**pattern 8**$0d
	9 [Color Bar]	$24**pattern 9**$0d
	10 [Grayscale 256]	$24**pattern 10**$0d
	11 [V Line On/Off]	$24**pattern 11**$0d
	12 Circle*	$24**pattern 12**$0d
	13 Crosshatch*	$24**pattern 13**$0d
	14 Crosshatch Inv *	$24**pattern 14**$0d
	15 Diagonal*	$24**pattern 15**$0d
	16 Motion*	$24**pattern 16**$0d
	17 MultiBurst*	$24**pattern 17**$0d
$pattern?	Display current test pattern.	$24**pattern?**$0d
$rx_ddc	Enable/disable the DDC bus for the HDMI input (Rx).	
	ON	$24**rx_ddc on**$0d
	OFF	$24**rx_ddc off**$0d
$rx_ddc?	Display the DDC bus state for the HDMI input (Rx).	$24**rx_ddc?**$0d
$rx_hotplug	Set hot plug value for the HDMI in (Rx).	
	OFF [Set hot plug low]	$24**rx_hotplug off**$0d
	ON [Set hot plug high]	$24**rx_hotplug on**$0d
	TOGGLE [Toggle low→high]	$24**rx_hotplug toggle**$0d

* Available on version 2 hardware only.

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$rx_hotplug?	Display current hot plug state for the HDMI input (Rx).	$24rx_hotplug?$0d
$rx_hotplug_t	Set the hot plug time (in ms) for HDMI in (Rx). 50 ~ 500 [50ms steps]	$24rx_hotplug_t 50$0d $24rx_hotplug_t 250$0d $24rx_hotplug_t 500$0d
$rx_hotplug_t?	Display the current hot plug time (in ms) for the HDMI input (Rx).	$24rx_hotplug_t?$0d
$rx_pc_tol	Set PC source clock detection tolerance for the HDMI input (Rx). 1 ~ 10 [1/1000 ~ 10/1000]	
	1	$24rx_pc_tol 1$0d
	5	$24rx_pc_tol 5$0d
	10	$24rx_pc_tol 10$0d
$rx_pc_tol?	Display the PC source clock detection tolerance for the HDMI input (Rx).	$24rx_pc_tol?$0d
$rx_scdc	Enable/disable SCDC port function on HDMI input (Rx).	
	ON	$24rx_scdc on$0d
	OFF	$24rx_scdc off$0d
$rx_scdc?	Display the current SCDC port state for the HDMI input (Rx).	$24rx_scdc?$0d
$rx_sense	Enable/disable RxSense function for the HDMI input (Rx).	
	ON	$24rx_sense on$0d
	OFF	$24rx_sense off$0d
$rx_sense?	Display current RxSense state for the HDMI in (Rx).	$24rx_sense?$0d

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$sink_detect?	Display sink detect and information.	
	HOTPLUG [Sink's hot plug status]	$24**sink_detect? hotplug**$0d
	RSENSE [Sink's RxSense status]	$24**sink_detect? rsense**$0d
	HDCP [Sink HDCP status detection]	$24**sink_detect? hdcp**$0d
	HDCP_AKSV [Sink AKSV, hex (HDCP v1.4)]	$24**sink_detect? hdcp_aksv**$0d
	HDCP_BKSV [Rx BKSV, hex (HDCP v1.4)]	$24**sink_detect? hdcp_bksv**$0d
	HDCP_RXID [HDCP Rx ID, hex (HDCP v2.2)]	$24**sink_detect? hdcp_rxid**$0d
	SCDC_SCR_ENABLE [Rx SCDC source scrambling]	$24**sink_detect? scdc_scr_enable**$0d
	SCDC_SCR_STATUS [SCDC sink scrambling status]	$24**sink_detect? scdc_scr_status**$0d
	SCDC_SINK_VER [SCDC sink ver]	$24**sink_detect? scdc_sink_ver**$0d
	SCDC_SOURCE_VER [SCDC source ver]	$24**sink_detect? scdc_source_ver**$0d

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$source_detect?	Displays source detection and information.	
(analyzer mode)	5V [5V detection state]	$24**source_detect? 5v**$0d
	HDCP [Source HDCP status detection]	$24**source_detect? hdcp**$0d
	HDCP_AKSV [Source AKSV, hex (HDCP v1.4)]	$24**source_detect? hdcp_aksv**$0d
	HDCP_BKSV [Rx BKSV, hex (HDCP v1.4)]	$24**source_detect? hdcp_bksv**$0d
	HDCP_RXID [HDCP Rcvr ID, hex (HDCP v2.2)]	$24**source_detect? hdcp_rxid**$0d
	SCDC_SCR_ENABLE [Rx scrambling]	$24**source_detect? scdc_scr_enable**$0d
	SCDC_SCR_STATUS [sink scrambling]	$24**source_detect? scdc_scr_status**$0d
	SCDC_SINK_VER [SCDC sink ver]	$24**source_detect? scdc_sink_ver**$0d
	SCDC_SOURCE_VER [SCDC source ver]	$24**source_detect? scdc_source_ver**$0d
	CKDT [TMDS clock detection]	$24**source_detect? ckdt**$0d
	DATA_RATE [Video data rate in Mbps]	$24**source_detect? data_rate**$0d
	TMDS_FORMAT (DVI or HDMI)	$24**source_detect? tmds_format**$0d
	SCDT [TMDS sync detection]	$24**source_detect? scdt**$0d
	HA [Horizontal active pixels]	$24**source_detect? ha**$0d
	HBP [Horizontal back porch pixels]	$24**source_detect? hbp**$0d
	HFP [Horizontal front porch pixels]	$24**source_detect? hfp**$0d
	HSW [Horizontal sync width pixels]	$24**source_detect? hsw**$0d
	HT [Total horizontal pixels]	$24**source_detect? ht**$0d
	HSP [Horizontal sync polarity]	$24**source_detect? hsp**$0d
	HVS_OFFSET1 [Horiz/vert sync offset1 in dot]	$24**source_detect? hvs_offset1**$0d
	HVS_OFFSET2 [Horiz/vert sync offset2 in dot]	$24**source_detect? hvs_offset2**$0d
	PIXEL_CLOCK [Pixel clock in kHz]	$24**source_detect? pixel_clock**$0d
	SCAN [Video scan mode (P = Prog, I = Intr)]	$24**source_detect? scan**$0d
	TIMING [Video timing (Ref. "Src Vid Tim List")]	$24**source_detect? timing**$0d
	TMDS_CLOCK [TMDS clock in kHz]	$24**source_detect? tmds_clock**$0d
	VA [Vertical active lines]	$24**source_detect? va**$0d
	VBP [Vertical back porch lines]	$24**source_detect? vbp**$0d
	VFP [Vertical front porch lines]	$24**source_detect? vfp**$0d
	VSW [Vertical sync width lines]	$24**source_detect? vsw**$0d
	VT [Total vertical lines]	$24**source_detect? vt**$0d
	VSP [Vertical sync polarity]	$24**source_detect? vsp**$0d

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	ACR [Audio-Clock-Recovery packet status]	$24**source_detect? acr**$0d
	ACR_CTS [Audio-Clk-Recovery CTS value]	$24**source_detect? acr_cts**$0d
	ACR_N [Audio-Clk-Recovery N value]	$24**source_detect? acr_n**$0d
asp	ASP [status]	$24**source_detect? asp**$0d
audio sample	ASP_CH [channel number]	$24**source_detect? asp_ch**$0d
packet	ASP_FIFO [audio FIFO (error or normal)]	$24**source_detect? asp_fifo**$0d
	ASP_LAYOUT [layout]	$24**source_detect? asp_layout**$0d
	ASP_PLL [PLL (locked/unlocked)]	$24**source_detect? asp_pll**$0d
	CHS_CODE [Chan-status audio coding]	$24**source_detect? chs_code**$0d
	CHS_SR [Chan-status sampling rate in kHz]	$24**source_detect? chs_sr**$0d
	CHS_SS [Chan-status sampling size]	$24**source_detect? chs_ss**$0d
	CHS_TYPE [app type consumer/pro]	$24**source_detect? chs_type**$0d
	HBR [High-Bit-Rate packet status]	$24**source_detect? hbr**$0d
	AIF [Display packet-AIF data in 2-digit hex]	$24**source_detect? aif**$0d
	AVI [Display packet-AVI data]	$24**source_detect? avi**$0d
	DRMI [Display packet-DMI data]	$24**source_detect? drmi**$0d
	GCP [Display packet-GCP data]	$24**source_detect? gcp**$0d
	SPD [Display packet-SPD data]	$24**source_detect? spd**$0d
	VSI [Display packet-VSI data]	$24**source_detect? vsi**$0d
	SCDC_SCR_ENABLE [Rx scramble]	$24**source_detect? scdc_scr_enable**$0d
	SCDC_SCR_STATUS [sink scramble]	$24**source_detect? scdc_scr_status**$0d
	SCDC_SINK_VER [SCDC sink version]	$24**source_detect? scdc_sink_ver**$0d
	SCDC_SOURCE_VER [SCDC source ver]	$24**source_detect? scdc_source_ver**$0d

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$task_mode	Set mode to Analyzer, Pattern, or Cable.	
	CABLE [Cable Test Mode]	$24**task_mode cable**$0d
	ANALYSER [Analyzer Mode]	$24**task_mode analyser**$0d
	PATTERN [Pattern Mode]	$24**task_mode pattern**$0d
$task_mode?	Display the unit's current operation mode.	$24**task_mode?**$0d
$timer_day?	Display the unit's test timer day value.	$24**timer_day?**$0d
$timer_hour?	Display the unit's test timer hour value.	$24**timer_hour?**$0d
$timer_minute?	Display the unit's test timer minute value.	$24**timer_minute?**$0d
$timer_second?	Display the unit's test timer second value.	$24**timer_second?**$0d
$timing	Select the output resolution to use.	
	1 [720×480p@59]	$24**timing 1**$0d
	2 [720×576p@50]	$24**timing 2**$0d
	3 [1280×720p@25]	$24**timing 3**$0d
	4 [1280×720p@30]	$24**timing 4**$0d
	5 [1280×720p@50]	$24**timing 5**$0d
	6 [1280×720p@60]	$24**timing 6**$0d
	7 [1920×1080i@50]	$24**timing 7**$0d
	8 [1920×1080i@60]	$24**timing 8**$0d
	9 [1920×1080p@24]	$24**timing 9**$0d
	10 [1920×1080p@25]	$24**timing 10**$0d
	11 [1920×1080p@30]	$24**timing 11**$0d
	12 [1920×1080p@50]	$24**timing 12**$0d
	13 [1920×1080p@60]	$24**timing 13**$0d
	14 [3840×2160p@24]	$24**timing 14**$0d
	15 [3840×2160p@25]	$24**timing 15**$0d
	16 [3840×2160p@30]	$24**timing 16**$0d
	17 [3840×2160p@50]	$24**timing 17**$0d
	18 [3840×2160p@60]	$24**timing 18**$0d
	19 [4096×2160p@24]	$24**timing 19**$0d
	20 [4096×2160p@25]	$24**timing 20**$0d
	21 [4096×2160p@30]	$24**timing 21**$0d
	22 [4096×2160p@50]	$24**timing 22**$0d
	23 [4096×2160p@60]	$24**timing 23**$0d

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$timing?	Display current output res. timing number.	$24**timing?**$0d
$timingx?	Display current output resolution.	$24**timingx?**$0d
$tmds_format	Set the video output format.	
	HDMI	$24**tmds_format hdmi**$0d
	DVI	$24**tmds_format dvi**$0d
$tmds_format?	Display the current video output format.	$24**tmds_format?**$0d
$tmds_sw	Enable or disable video output.	
	ON	$24**tmds_sw on**$0d
	OFF [Off disables video output]	$24**tmds_sw off**$0d
$tmds_sw?	Display the current video output status.	$24**tmds_sw?**$0d
$tx_5v	Set +5V pin state to follow the TMDS output state or always on.	
	FOLLOW [Only out 5V if there is a live signal]	$24**tx_5v follow**$0d
	ON [Always out 5V]	$24**tx_5v on**$0d
$tx_5v?	Display current output +5V pin setting.	$24**tx_5v?**$0d
$update_fw	Update firmware from USB & reboot.	$24**update_fw**$0d

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7.9 Analyzer Information Examples

7.9.1 Deepcolor

In Analyzer mode, you can find the deepcolor settings of the source signals by navigating the menus as follows:

Analyzer Mode

Main Menu

Monitor Source	Example Values
Timing	3840x2160p24
HDCP Format	v1.4
Format	HDMI
Colorspace	RGB
Audio	LPCM
Deepcolor	8 bits

7.9.2 General Control Packet

In Analyzer mode, you can find the settings in some of the basic HDMI of the source signals by navigating the menus as follows:

Analyzer Mode

Main Menu

Packet	Example Values
GCP	On (*or Off*)
AVMUTE	Clear (*or Set*)
Color Depth	Not Indicated

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8. Troubleshooting Guide

We have carefully tested and have found no problems in the supplied TE460-137. However, we would like to offer suggestions for the following:

TE460-137	
Symptom	Resolution
Poor Output Image	1. Verify the cable between the transmitter input and the source is a genuine HDMI cable. 2. Troubleshoot with a lower gauge, shorter distance HDMI cable.
Output Image Flashes above 1080p	1. Make sure the battery is installed and charged. 2. Connect USB power. 3. Troubleshoot with a lower gauge, shorter distance HDMI cable. 4. Lower the resolution insteps to see if the problem is bandwidth.
Cable Test Fails	1. The cable test requires a battery or USB power of at least 2 A. Most computers and USB power supplies do not supply enough current. 2. Make sure the battery is installed and has a good charge. 3. Make sure the USB power supply is at least 2 A or is defined as a high-power port. See section 8.1 Cable Test Failure at the end of this manual for details.
Cable Test Fails but Video Passes	1. The cable test fails when data is lost from input to output. This may not be noticeable with video if the data lost is minor. However, not all sources provide the same video strength quality and some displays are able to recover a weak signal better than others. It is best to replace a less than optimal cable to prevent unstable issues in the field. The status line displays a cable connection graphic. If a cable is detected, the test starts automatically. After 10 seconds, the test results are displayed as PASS or FAIL. Failed properties are displayed to indicate the problem. See section 8.1 Cable Test Failure at the end of this manual for details.
HDCP is NOT v2.2	1. Analyzer Mode: In order to produce a signal for troubleshooting, the analyzer downgrades the HDCP signal from v2.2 to v1.4 if the display does not support v2.2.
OLED Display Goes Blank	The OLED screen automatically turns off after 10 minutes of inactivity, but the signals are still generated. This is a power saving feature. 1. Press any key to restore the screen; takes about 2 to 3 seconds. 2. In the Setup section of the Main Menu, look for the power saving option. This feature can be turned off or a lower time set.
Color Range Will Not Set to Limit	1. The Color Range limit feature is only available on solid color patterns. It is not available on patterns at or above Color Bars. FULL = 0 to 255 LIMIT = 16 to 235
Can't Find Resolution 3440x1440	1. The TE460-137 hardware does NOT support this ultra-wide resolution.
Can't Find Color Bit Depth	1. The TE460-137 Pattern Generator only support 8-bit color depth. The Analyzer can detect 8, 10, and 12-bit depths.
Color Depth reads "Not Indicated"	1. In Analyzer mode, "8 bits" and "Not Indicated" have the same meaning. Main Menu > Monitor Source : Deepcolor reads 8 bits (actual analyzed data) Main Menu > Packet > GCP 0x03 : Color depth reads "Not Indicated" (in packet general)
RS232 Commands Not Recognized	1. Verify baud rate is 115200, 8 data, 1 stop, no parity, no flow control. 2. Each command starts with a $ (0x24). This may be a special character depending on your software. You may need to send as a hex character. 3. Each command ends with a carriage return(0x0D). Verify your software allows this character.

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8.1 Cable Test Failure

There are basically two parts to the cable test. The first part tests the basic control lines for continuity. The second part is the bandwidth test which measures the ability of the cable to reliably pass video. Following are the cable test error codes you may see:

Fail Code	Description
5V	The 5V line, pin 18, is open or making poor contact.
HPD	The hot plug line, pin 19, is open or making poor contact.
CEC	The CEC line, pin 13, is open or making poor contact.
DDC	The display data lines, pins 15/16, are open or making poor contact.
BW	Bandwidth test failed. See the detailed failure description below.

Example:

```
<Main Menu>
ENTER to Re-test
Result> Fail: DDC
```

The cable bandwidth test is more vigorous than playing video. The tester makes many signal measurements and compares them against an internal database. If the measurements deviate beyond very strict limits, the test fails. However, in most cases this would not be noticed watching video.

Basically, there are 3 levels of cable test results.

1. A perfect cable passes the cable bandwidth test every time. Many cables pass every time. It is really a construction dependent.
2. A very good cable can fail the cable test as much as 50% of the time. If a cable does pass the cable test, it is highly unlikely users notice any issues with the video.
3. A cable that never passes the test is prone to an eventual field failure.

   Video may pass very well at some resolutions and/or video content combinations. However, when the right combination of resolution and content are applied, video may become intermittent or fail completely. Additionally, a weak source may also cause poor operation.

8.2 Firmware Update Failure

The following error message may be displayed when trying to upgrade from very old firmware.

```
!File Error!
Ignore error?
Abort update!
```

If this message is received, restart the TE460-137.

Enter firmware update mode and wait for USB drive window on your computer.

Do NOT copy the BIN file yet. You should see a message like the following.

```
Firmware Update
Plug USB Host...
Paste FW File...
```

Press and hold the ENTER key on the TE460-137.

While holding the ENTER key, copy the new BIN to TE460-137 USB drive.

When the word "Program" appears on the TE460-137 display, you may release the ENTER key.

Wait for the update to finish and the TE460-137 to restart.

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