HD-STAR

HD Personal Test and Measurement Monitor

Installation and Operation Handbook

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Harris Corporation
243 Shoemaker Road
Pottstown, PA 19464-6433

OPERATOR'S SAFETY SUMMARY

CAUTION — these instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform this installation or any servicing unless you are qualified to do so. Refer all servicing to qualified service personnel.

To ensure safety:

- The unit should not be exposed to dripping or splashing, and no objects filled with liquids, such as vases, shall be placed on the unit.
- When the unit is to be permanently cabled, connect the protective ground conductor *before* making any other connections.
- Operate built-in units only when they are properly fitted into the system.
- For permanently cabled units without built-in fuses, automatic switches, or similar protective facilities, the AC supply line must be fitted with fuses rated to the units.
- Before switching on the unit, ensure that the operating voltage set at the unit matches the line voltage, if appropriate. If a different operating voltage is to be set, use a fuse with the appropriate rating. Refer to the Installation Instructions.
- Units of Protection Class I with an AC supply cable and plug that can be disconnected must be operated only from a power socket with protective ground contact:
  - Do not use an extension cable—it can render the protective ground connection ineffective.
  - Do not intentionally interrupt the protective ground conductor.
  - Do not break the protective ground conductor inside or outside the unit or loosen the protective ground connection; such actions can cause the unit to become electrically hazardous.
- Before opening the unit, isolate it from the AC supply. Then ensure that:
  - Adjustments, part replacements, maintenance, and repairs are carried out by qualified personnel only.
  - Safety regulations and rules are observed to prevent accidents.
  - Only original parts are used to replace parts relevant to safety (for example, the power on/off switches, power transformers, and fuses).
- Replaceable fuses can be hazardous when live. Before replacing a fuse, disconnect the AC power source.
- Use caution when cleaning the equipment; isopropyl alcohol or similar solvents can damage or remove the labels.
- Observe any additional safety instructions specified in this manual.

These symbols may appear on Videotek equipment:

Explanation of Symbols


Read the *Operator's Handbook* or the *Service and Instruction Manual* and observe the safety symbols used.


Unit ground


Caution: shock hazard


Equipotentiality


Protective ground connection


Ground

European Restriction on Hazardous Substance (RoHS), and Waste from Electrical and Electronic Equipment (WEEE) Compliance

About This Document

This document provides information concerning Harris Corporation's compliance with EU Directive 2002/95/EC and EU Directive 2002/96/EC.

Restriction on Hazardous Substances (RoHS) Directive

Directive 2002/95/EC—commonly known as the European Union (EU) Restriction on Hazardous Substances (RoHS)—sets limits on the use of certain substances found in electrical and electronic equipment. The intent of this legislation is to reduce the amount of hazardous chemicals that may leach out of landfill sites or otherwise contaminate the environment during end-of-life recycling. The Directive takes effect on July 1, 2006, and it refers to the following hazardous substances:

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent Chromium (Cr-V1)
- Polybrominated Biphenyls (PBB)
- Polybrominated Diphenyl Ethers (PBDE)

In accordance with this EU Directive, all Harris Technology products sold in the European Union will be fully RoHS-compliant and "lead-free." (See the Harris web site, www.harris.com, for more information on dates and deadlines for compliance.) Spare parts supplied for the repair and upgrade of equipment sold before July 1, 2006 are exempt from the legislation. Harris equipment that complies with the EU directive will be marked with a RoHS-compliant symbol, as shown in Figure 1.

Figure 1. RoHS Compliance Symbol

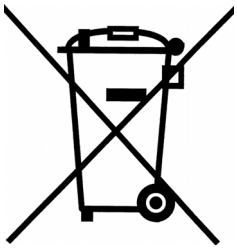
WASTE FROM ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) DIRECTIVE

The European Union (EU) Directive 2002/96/EC on Waste from Electrical and Electronic Equipment (WEEE) deals with the collection, treatment, recovery, and recycling of electrical and electronic waste products. The objective of the WEEE Directive is to assign the responsibility for the disposal of associated hazardous waste to either the producers or users of these products. Effective August 13, 2005, producers or users will be required to recycle electrical and electronic equipment at end of its useful life, and must not dispose of the equipment in landfills or by using other unapproved methods. (Some EU member states may have different deadlines.)

In accordance with this EU Directive, Harris Corporation and other companies selling electric or electronic devices in the EU will affix labels indicating that such products must properly recycled.

(See the Harris web site, www.harris.com, for more information on dates and deadlines for compliance.) Contact your local Harris sales representative for information on returning these products for recycling. Harris equipment that complies with the EU directive will be marked with a WEEE-compliant symbol, as shown in Figure 2.

Figure 2. WEEE Compliance Symbol



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Section 1 ♦ Introduction

The Videotek HD-STAR HD Personal Test and Measurement Monitor is a multi-purpose digital device with Test Signal Generator, Waveform, Vector Scope, Color Monitor, and Audio Analyzer/Monitor functionality. It is ideal for monitoring field production camera setup, equipment installation, or troubleshooting signal path issues related to high definition and standard definition digital formats.

The hand-held test and measurement instrument offers the convenience of portability without sacrificing function and performance. The HD-STAR features an integrated 320 x 240 color LCD display, utilizing touch-screen technology and the provided stylus to control and configure each operation. Maintaining power in the field is supported by a lithium ion battery. An optional battery holder (STAR-PWR AA) that uses six "AA" batteries to power the device can be purchased (AA batteries not included).

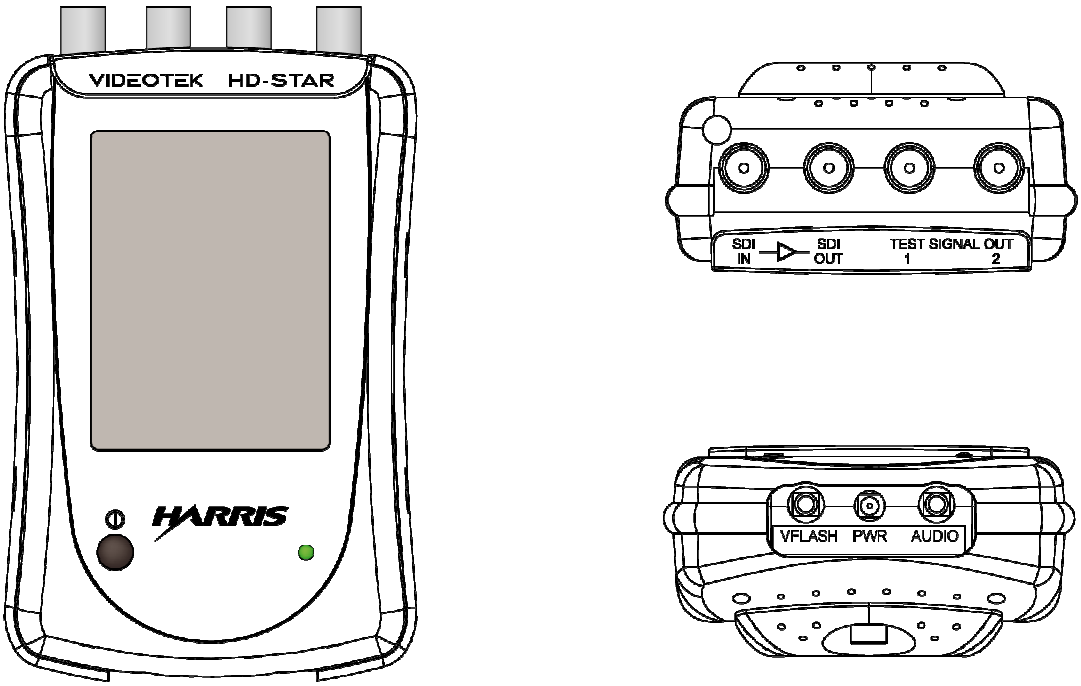
The HD-STAR includes one video input with an active looping connector for monitoring HD-SDI and SD-SDI signals formatted as SMPTE 259M or SMPTE 292M with embedded AES audio. It also has two video test signal outputs from the test signal generator formatted as SMPTE 259M or SMPTE 292M with embedded AES audio. The HD-STAR has a stereo analog audio output of the input embedded source. It also contains a Serial Data Analyzer.

Features include:

- Multiple functionality
  - Color Monitor
  - Vectorscope
  - Waveform Monitor
  - Test Signal Generator
  - Embedded Audio Monitor
  - Serial Data Analyzer (Serial Monitor)
- Multi-formats
  - SD-SDI
  - HD-SDI
- Portable, handheld
  - Weighs under one pound
- Integrated 320 x 240 color LCD display
- Touch Screen Operation

The HD-STAR views are illustrated in **Figure 1-1**.

Figure 1-1. HD-STAR Views



This product contains no hazardous substances or elements above the specified limits stated in the Standard of the Electronics Industry of the People's Republic of China, SJ/T11363-2006. This product meets the criteria to be labeled with "Logo 1" (shown in **Figure 1-2**) as specified in the People's Republic of China Electronic Industry Standard SJ/T11364-2006. This product can be recycled at the end of its useful life and should not be casually discarded.

Figure 1-2. RoHS Logo

Service and Support

For service support, telephone the Customer Service Department at **888-534-8246**. If the problem cannot be resolved over the telephone and the instrument must be shipped to Videotek for service or repair:

- Obtain a Return Authorization (RA) number from the Videotek Customer Service Department.
- Attach a tag to the unit with:
  - Your company name, address, and telephone number
  - The name of the contact person at your company
  - The RA number
  - The unit serial number
  - An explanation of the problem
- To prevent shipping damage, pack the unit the same way Videotek had packed it. If possible, use the original packing materials in the original shipping container.
- Ship the unit to:

  Harris Corporation

  Videotek Test and Measurement
  243 Shoemaker Road
  Pottstown, PA 19464-6433
  Attn: RA *xxx* (where *x* is the RA number)

  Email: BCDService@harris.com

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Section 2 ♦ Installation

This section provides information about inspecting, installing, and configuring the HD-STAR.

Inspecting the Shipment

Before using the HD-STAR, inspect the box and the contents. Report any damage to the shipper and telephone the Videotek Customer Service Department for service and support (see Section 1, "Service Support").

NOTE: Refer to the enclosed packing sheet for the latest list of items that are supplied with the unit.

The box contains the following:

- One HD-STAR
- One *HD-STAR Installation and Operation Handbook*
- One power adapter and cord
- One stylus
- One sunshield
- One belt-style pouch
- One 6' long 9-pin D-sub to 3.5 mm connector cable
- One lithium ion battery pack installed

Save the box and packing material for any future shipping requirements.

Connecting the HD-STAR

The HD-STAR connectors and features are illustrated in **Figure 2-1**, and the function of each is described in **Table 2-1**.

Figure 2-1. HD-STAR Panel

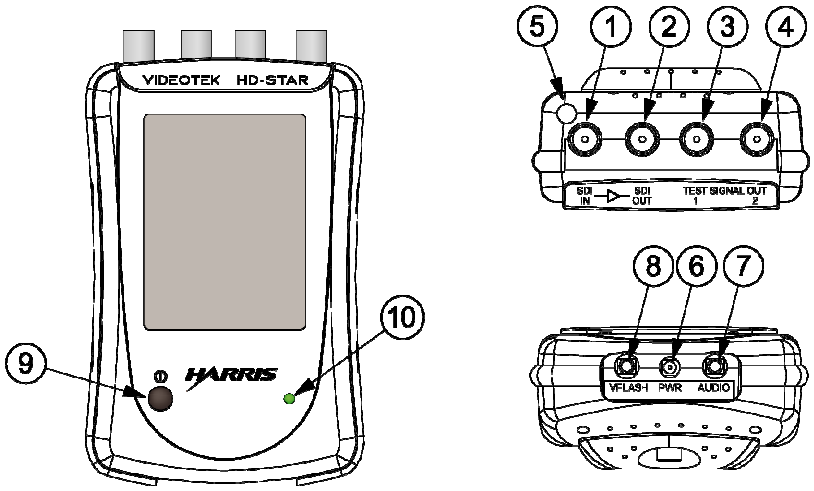


Table 2-1. Description of HD-STAR

Key	Label	Description
1	SDI IN	Female BNC HD-SDI and SD-SDI input connector. The connector is internally terminated at 75Ω.
2	SDI OUT	Female BNC active loop thru HD-SDI and SD-SDI output connector.
3	TEST SIGNAL OUT 1	Female BNC connector for HD-SDI or SD-SDI test signals output.
4	TEST SIGNAL OUT 2	Female BNC connector for HD-SDI or SD-SDI test signals output.
5	(Stylus Container)	Stylus storage for when the stylus is not in use.
6	PWR	Micro-miniature, female, Power connector to receive the 5.0V DC to charge the lithium battery and/or power the HD Star.
7	AUDIO	3.5 mm phone jack, female, connector with a stereo output to monitor input embedded audio.
8	VFLASH	3.5 mm phone jack, female, connector for updating the HD Star using the supplied cable.
9	⏻ (Power Button)	▪ Press and hold until the backlight illuminates to turn the HD-STAR ON. ▪ Press to turn the HD-STAR OFF.
10	LED	Multi-colored LED to indicate battery charge status: ▪ Yellow – low battery charge. When the Lithium Battery is installed, the LED will only turn yellow when the battery is extremely low. ▪ Red – battery is charging ▪ Green – battery is fully charged

Battery Pack and Powering Up the HD-STAR

The HD-STAR is powered by a lithium ion battery pack that is charged with a power adapter. The device can still be in use without affecting charge time. The front panel LED will turn green when the battery is fully charged. The lithium battery should be charged for 8-hours before using the unit for the first time without the power adapter.

If the **Lithium ion battery pack** needs to be replaced, perform the following:

1. Unscrew the thumbscrew on the battery compartment lid on the back of the HD-STAR.
2. Remove the lithium ion battery pack from the J5 connection inside the battery compartment.
3. Plug the new lithium ion battery pack into the J5 connection inside the battery compartment.
4. Insert lithium ion battery pack into the battery compartment.
5. Place the battery compartment lid back onto the HD-STAR and secure the lid using the thumb screw.
6. Connect the power adapter to the AC outlet and the PWR connector of the HD-STAR.
7. Press and hold the power button until the LCD backlight illuminates to activate the unit. Allow a few seconds for the unit to initialize.

An optional AA battery holder (STAR-PWR AA) can be purchased to replace the lithium ion battery pack. To install the STAR-PWR AA:

1. Unscrew the thumbscrew on the battery compartment lid on the back of the HD-STAR and remove.
2. Remove the lithium ion battery pack and plug from the J5 connection inside the battery compartment.
3. Insert the six AA batteries into the battery holder. The battery holder indicates which direction each battery should be placed. Ensure the proper polarity when installing the batteries.
4. Plug the AA battery holder plug in to the J5 connector.
5. Insert the AA battery holder into the battery compartment.
6. Place the battery AA holder lid onto the HD-STAR and secure the lid using the thumbscrew.

When the batteries reach a low level, WARNING BATTERY LOW flashes in the middle of the display. It is recommended at that time to plug the power adapter into the HD-STAR or replace the batteries.

A short time after viewing WARNING BATTERY LOW, the batteries reach a critical level, and the unit briefly displays BATTERY EXHAUSTED prior to deactivation.

Battery Saver mode in the System Setup menu is used to darken the display in order to save battery power. The LCD screen will flash at regular intervals when Battery Saver

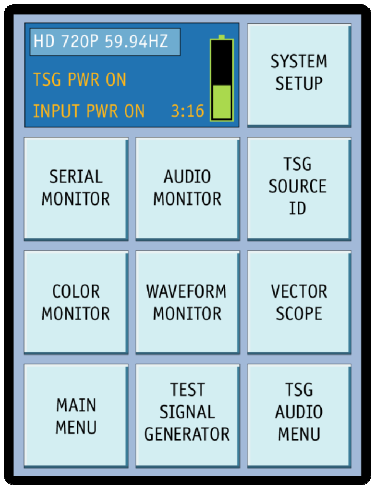
mode is activated. This greatly extends the battery life. The Battery Saver mode selections are Off, 1 minute, 5 minutes (default), or 10 minutes. The test signal outputs continue to function when in Battery Saver mode. To exit Battery Saver mode touch anywhere on the screen with the stylus.

Section 3 ♦ General Operation

Main Menu

The Main Menu is shown in **Figure 3-1**.

Figure 3-1. Main Menu



The HD-STAR main menu is the first screen to appear after the unit is powered on. The **MAIN MENU** button is always active in the lower-left corner of the screen, even though it is not seen on some screens. To return to the main menu just tap the stylus on the lower left of any screen.

The **STATUS INDICATION** on the upper left of the main menu screen is used to indicate if the device is in HD or SD, the frame rate and standard selected, and if the Test Signal Generator and Input power selections (found in the System Setup menu) are ON or OFF. Also, the battery power volume is shown in this area. The remaining charge time is displayed to the bottom left of the battery charge indication. The time remaining will adjust based upon the TSG Power, Input Power, and Screen Saver selections.

The **SYSTEM SETUP** button is used to access the System Setup display. The System Setup display is used to change the configurations in the HD-STAR. For more information on the System Setup display, see page 3-2.

The **TEST SIGNAL GENERATOR** button is used to access the HD or SD test signal generator menu. The Test Signal Generator (TSG) screen is used to set up the SD and HD test signals. For more information on the Test Signal Generator, see page 3-4.

The **TSG AUDIO MENU** button is used to access the test signal generator embedded audio menu. The Test Signal Generator Audio screen is used to set the test signal generator audio functions. For more information on the Audio Test Signal Generator, see page 3-5. There is an Embedded ON or OFF selection in the SYSTEM SETUP menu that enables and disables the embedded audio in the test signal generator.

The **COLOR MONITOR** button is used to access the Color Monitor display. The Color Monitor display shows the picture of the input signal. For more information on the Color Monitor display, see page 3-7.

The **WAVEFORM MONITOR** button is used to access the Waveform Monitor display. For more information on the Waveform Monitor, see page 3-9.

The **VECTOR SCOPE** button is used to access the Vector Display. For more information on the Vector Display screen, see page 3-10.

The **SERIAL MONITOR** button is used to access the Serial Monitor display. The Serial Monitor screen is used to measure the number and type of errors that occur on the serial input. For more information on the Serial Monitor Screen (HD), see page 3-12. For more information on Serial Monitor (SD), see page 3-13.

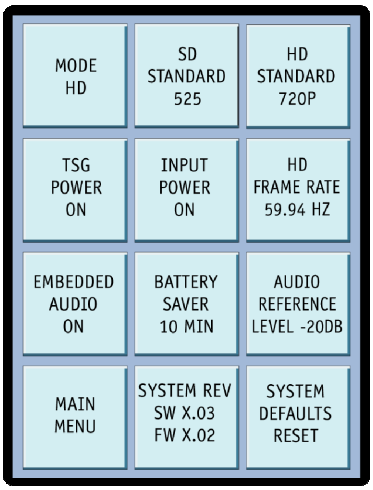
The **AUDIO MONITOR** button is used to access the Audio Monitor display. This screen is used to control the STEREO output that uses the audio output connector. For more information on the Audio Monitor display, see page 3-14.

The **TSG SOURCE ID** button is used to access the Test Signal Generator Identification display. The TSG Source ID display is used to customize the identification of the test signal. For more information on the TSG Source ID display, see page 3-16.

System Setup

The System Setup is shown in **Figure 3-2**.

Figure 3-2. System Setup



The System Setup screen consists of the settings to utilize various functions of the HD-STAR. Only one format/frame rate can be used at a time. The input format/frame rate and test signal generator must be manually selected in this menu. The buttons include:

- MAIN MENU: the MAIN MENU button is used to return to the Main Menu.
- SYSTEM REV: indicates the current HD-STAR Software (SW) and Firmware (FW) revision level.

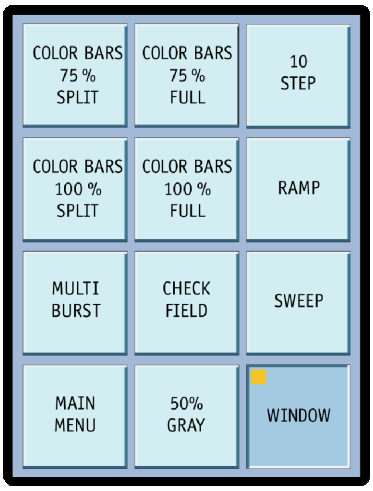
- SYSTEM DEFAULTS RESET: Resets the HD-STAR to the factory default settings.
- EMBEDDED AUDIO: Enables and disables the Embedded audio in the test signal generator.
- BATTERY SAVER: used to darken the display in order to save battery power. The settings are OFF, 1 minute, 5 minutes (default), or 10 minutes. The test signal outputs continue to function when in Battery Saver mode. The LCD screen will flash at regular intervals when Battery Saver mode is activated. Touch anywhere on the screen with the stylus to exit Battery Saver mode.
- AUDIO REFERENCE LEVEL: Within the Audio Monitor screen bar graph is a set of reference tick marks that can be set in this menu selection. The reference selections are –18 dB and –20 dB. Once the audio bar goes above the reference marks, the color of the bar changes from green to yellow. When the bar passes the -12 dB mark, then the bar changes from yellow to red. This selection affects one other button:

  The AMPLITUDE FULL SCALE -20(-18) button in the TSG AUDIO menu changes to either -18 or -20 dB with this selection.
- TSG POWER: Enables and disables the test signal generator output.
- INPUT POWER: Enables and disables the input monitoring functions.
- HD FRAME RATE: Used to select the HD Frame rate for the test signal generator and input. The selections are 60 Hz, 59.94 Hz, 50 Hz, 30 Hz, 29.97 Hz, 25 Hz (1080p only), 24 Hz, and 23.98 Hz.
- MODE: Used to set the device input and output to Standard Definition (SD) or High Definition (HD). Selecting this button causes a brief pause in utilization due to a firmware change.
- SD STANDARD: Select the 525 or 625 SD standard.
- HD STANDARD: Select the 720p, 1080i, or 1080p HD standard.

Test Signal Generator

The Test Signal Generator is shown in **Figure 3-3**.

Figure 3-3. Test Signal Generator



The HD-STAR outputs an HD signal when HD mode is selected in the SYSTEM SETUP menu. The Test Signal Generator screen is used to set up the HD test signal for the output. The selections are:

- Color Bars 75% Split
- Color Bars 75% Full
- 10 Step
- Color Bars 100% Split
- Color Bars 100% Full
- Ramp
- Multi Burst
- Check Field
- Sweep
- 50% Gray
- Window
- Main Menu – pressing Main Menu returns to the Main Menu

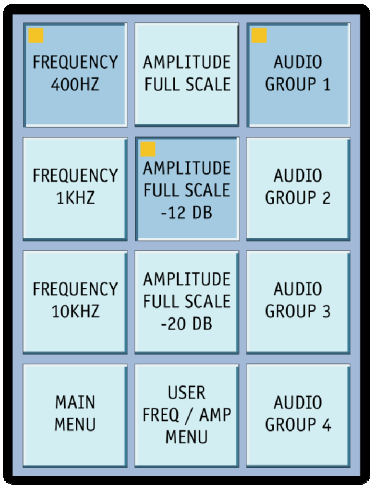
Where appropriate, the HD output will have both luminance and color components. An example of this is multiburst. Multiburst in SDI has Y, C_B, and C_R components. The same is true for multipulse, sweep, and ramp.

The Window selection is a pulse and bar signal that has two luminance pixels at the beginning of the line and two luminance pixels at the end of the line. These signals are used for checking video alignment.

TSG Audio Menu

The TSG Audio Menu is shown in **Figure 3-4**.

Figure 3-4. TSG Audio Menu



The TSG (Test Signal Generator) AUDIO MENU is used to select the embedded audio for the SDI test signal generator output.

The FREQUENCY buttons are used to set the frequency for the embedded audio signal. The frequency selections are 400 Hz, 1 KHz, or 10 KHz. The AMPLITUDE buttons are used to select the amplitude for the embedded audio signal. The Amplitude selections are FULL SCALE, -12 dB, and –18/–20 dB (-18 and –20 are dependent upon the selection made in the SYSTEM SETUP menu's AUDIO REFERENCE LEVEL button).

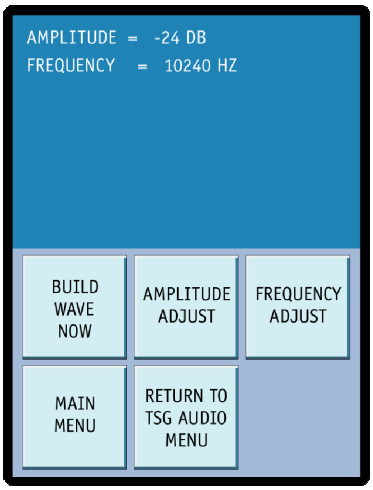
Embedded audio is standardized into sixteen channels (four groups of four channels). This SDI embedded audio supports one group at a time. Selecting an AUDIO GROUP button selects the four channels in an audio group. Group 1 is channels 1, 2, 3, and 4. Group 2 is channels 5, 6, 7, and 8. Group 3 is channels 9, 10, 11, and 12. Group 4 is channels 13, 14, 15, and 16.

The User FREQ/AMP menu button is used to access the USER FREQ/AMP menu.

User FREQ/AMP Menu

The User Freq/Amp menu is shown in **Figure 3-5**.

Figure 3-5. User Freq/Amp Menu



The USER FREQ/AMP MENU button in the TSG Audio Menu screen is used to access the User Freq/Amp Menu screen. Once the screen is accessed, press the AMPLITUDE ADJUST or FREQUENCY ADJUST button. Move the stylus up and down in the blue area of the screen to adjust the Amplitude or Frequency values. The changes occur when the BUILD WAVE NOW button is selected. The RETURN TO TSG AUDIO MENU button is used to return the display to the TSG AUDIO MENU screen.

The USER FREQ/AMP MENU button remains highlighted for as long as a custom setting is selected. Pressing another FREQUENCY or AMPLITUDE button on the TSG AUDIO menu changes the customized settings.

Color Monitor

The COLOR MONITOR button is used to display a picture on the display. When first displaying the color monitor, the picture display is a vertical display with three buttons at the bottom: Main Menu, Color Monitor 90º, and Pulse Cross, as shown in **Figure 3-6**. The active picture is the currently selected input video format from the SYSTEM SETUP\MODE menu. If the input source is the internal generator and if TSG Source ID is enabled, an identification indicator will appear through the center of the picture.

Press Color Monitor 90º to display the picture horizontally. When viewing the picture horizontally, no buttons are displayed. However, there are 3 invisible buttons on the right side of the picture, as shown in **Figure 3-7**.

Pulse Cross is used to offset the picture to view the vertical and horizontal blanking area of the picture. Data can be embedded in the blanking areas and viewed using this mode. Sample pulse cross screen is shown in **Figure 3-8** (a Pulse Cross Horizontal View is also available).

Figure 3-6. Color Monitor Button Locations (Vertically)

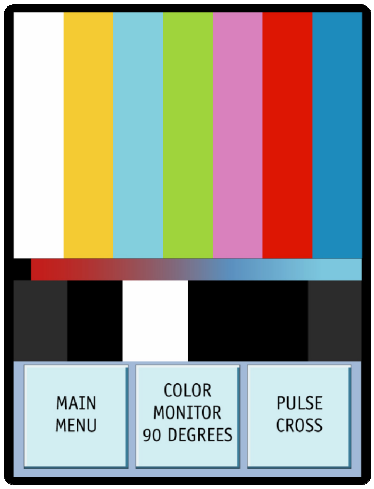


Figure 3-7. Color Monitor Button Locations (Horizontally)

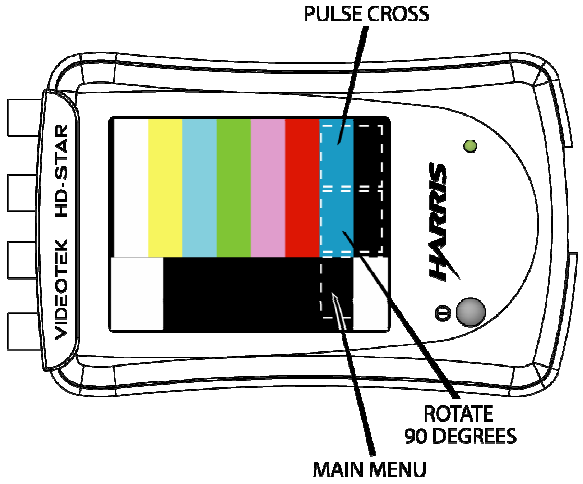
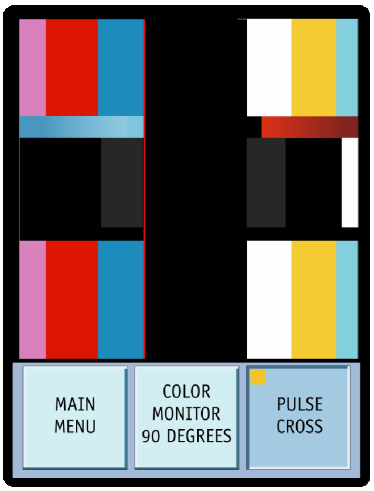


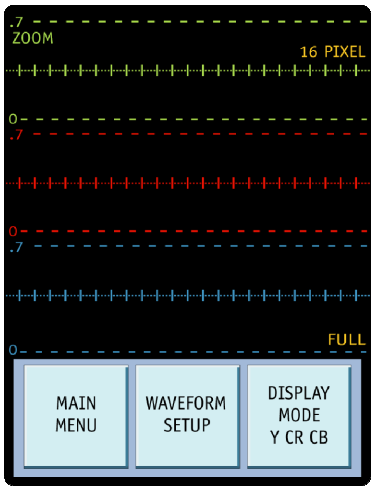
Figure 3-8. Sample Pulse Cross Screen



Waveform Monitor

The WAVEFORM MONITOR menu is shown in **Figure 3-9**.

Figure 3-9. Waveform Monitor Menu



The Waveform Monitor screen shows the 1H waveform of the input video. Two display modes are available with the DISPLAY MODE button in the waveform display: YC_RC_B and GRB. YC_RC_B mode displays the waveform in a luma, component blue, and component red representation. GRB displays the waveform into a green/red/blue component representation.

At the upper right of the display is the pixel number. Dragging the stylus horizontally across the display changes the active starting pixel number and moves the waveform. The pixel number represents the position of the waveform starting at the left side of the display. To change the waveform position, drag the stylus across the screen to change the starting position of the waveform. For example, if the pixel indication says 0, then the active starting pixel is 0.

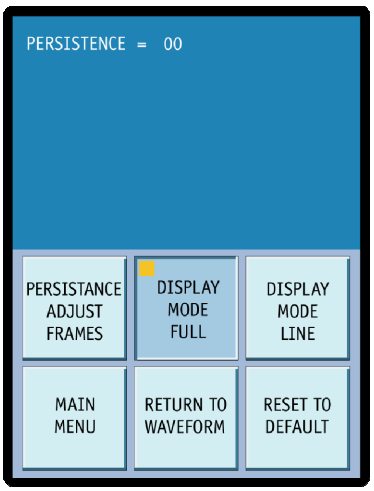
The upper-left side of the display shows the ZOOM function. Pressing ZOOM expands the display so that every pixel in the waveform will be shown. When in ZOOM mode, the entire waveform cannot fit on the screen. Drag the stylus across the screen to move the waveform. Press ZOOM again to return to 1H mode.

At the lower right of the screen is the FULL or LINE indication. The DISPLAY MODE selection is made in the WAVEFORM SETUP menu. When FULL is selected, Full will be displayed to indicate the waveform being displayed is the full field. If LINE is selected, the Line number will be displayed to indicate the waveform is displaying one line only. Vertically dragging the stylus on the Waveform display changes the selected line.

In the WAVEFORM SETUP menu, as shown in **Figure 3-10**, press the PERSISTENCE ADJUST FRAMES button to adjust the persistence of the Waveform. Once it is selected, drag the stylus up/down in the blue area to make the appropriate adjustments.

Pressing the RESET TO DEFAULT buttons sets the Persistence to 80, and the Display Mode to FULL.

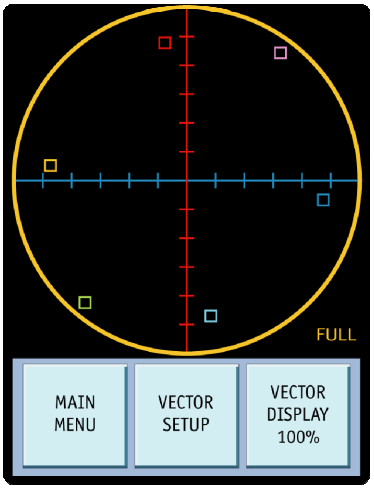
Figure 3-10. Waveform Setup Menu



Vector Scope

The Vector Scope is shown in **Figure 3-11**.

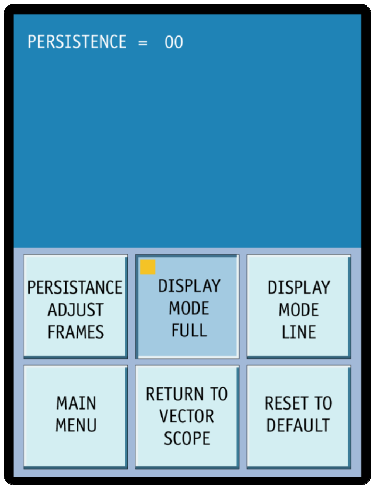
Figure 3-11. Vector Scope



The Vector Scope screen is used to measure the vector of the SD or HD input. The vector display itself is a yellow circle with a blue horizontal graticule and red vertical graticule. The color boxes in the vector display represent the actual colors being measured: Green, Yellow, Red, Magenta, Blue, and Cyan.

At the bottom-right of the display is the FULL or LINE number indication, which is selectable using the DISPLAY MODE button in the VECTOR SETUP MENU. The Vector Setup Menu display is shown in **Figure 3-12**. When LINE is selected, it indicates the line number being monitored. Drag the stylus up/down on the screen in the Vector Scope display to change the line.

Figure 3-12. Vector Setup Menu



The VECTOR SETUP menu contains the RESET TO DEFAULT selection. Pressing the RESET TO DEFAULT buttons sets the Persistence to 80, and the Display Mode to FULL.

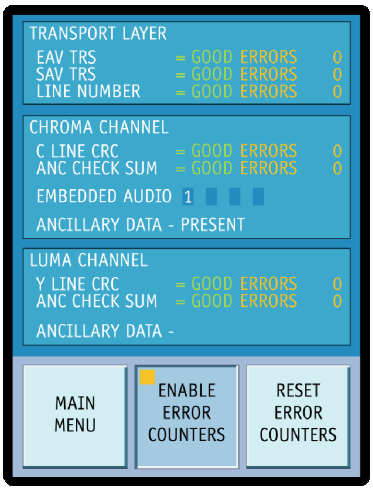
Press the PERSISTENCE ADJUST FRAMES button to adjust the persistence of the Vector Scope. Once it is selected, move the stylus up/down to make the appropriate adjustments.

Select the RETURN TO VECTOR SCOPE to return to the Vector display.

Serial Monitor (HD)

The Serial Monitor is shown in **Figure 3-13**.

Figure 3-13. Serial Monitor (HD)



The Serial Monitor screen is used to measure the number and type of errors that occur on the serial input. If everything is acceptable for a particular measurement, GOOD is displayed on the line. During an error, the GOOD indication changes to BAD and the number of times the error occurs is counted. The errors are measured on the following parameters:

Transport Layer:

- **EAV TRS**: EAV (End of Active Video) looks at the position of that preamble word and verifies that the EAV hamming code is correct.
- **SAV TRS**: SAV (Start of Active Video) looks for the position of the preamble word, and verifies that the SAV hamming code is correct.
- **LINE NUMBER**: The Line Number indicates when there are an incorrect number of words between EAV and SAV

Chroma Channel:

- **C LINE CRC**: Verifies that no CRC errors is detected for chroma.
- **ANC CHECK SUM**: Verifies that the internal calculated CRC value is the same as the received CRC value. The error occurs when the internal calculated CRC value is different from the received CRC value.
- **EMBEDDED AUDIO**: Detects how many groups of audio are available.
- **ANCILLARY DATA**: Detects other ancillary Chroma information.

Luma Channel:

- **Y LINE CRC**: Verifies that no CRC errors are detected for luma.

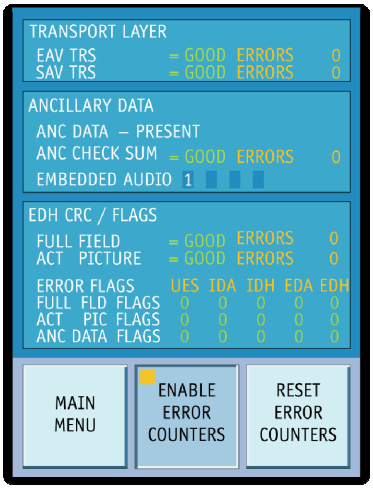
- **ANC CHECK SUM**: Verifies that the internal calculated CRC value is the same as the received CRC value. The error occurs when the internal calculated CRC value is different from the received CRC value.
- **ANCILLARY DATA**: Detects ancillary Luma information.

At the bottom of the screen are three buttons. The ENABLE ERROR COUNTERS button activates the counters. If the counters are not enabled, the counters will not increase each time an error occurs. The RESET ERROR COUNTERS button resets all the counters back to zero and turns off the counters.

Serial Monitor (SD)

The Serial Monitor (SD version) is shown in **Figure 3-14**.

Figure 3-14. Serial Monitor (SD)



The Serial Monitor screen is used to measure the number and type of errors that occur on the serial input. If everything is acceptable for a particular measurement, GOOD is displayed on the line. During an error, the GOOD indication changes to BAD and the number of times the error occurs is counted. The errors are measured on the following parameters:

Transport Layer:

- **EAV TRS**: EAV (End of Active Video) looks at the position of that preamble word and verifies that the EAV hamming code is correct.
- **SAV TRS**: SAV (Start of Active Video) looks for the position of the preamble word, and verifies that the SAV hamming code is correct.

Ancillary Data:

- **ANC DATA PRESENT** – Verifies that ANC data is detected
- **ANC CHECK SUM**: Verifies that the internal calculated ANC CRC value is the same as the received CRC value. The error occurs when the internal calculated CRC value is different from the received CRC value.
- **EMBEDDED AUDIO**: Detects how many groups of audio are available.

EDH CRC/Flags:

- **FULL FIELD**: Verifies that no EDH or CRC errors occur within the full field.
- **ACT PICTURE**: Verifies that no EDH or CRC errors occur within the active picture.

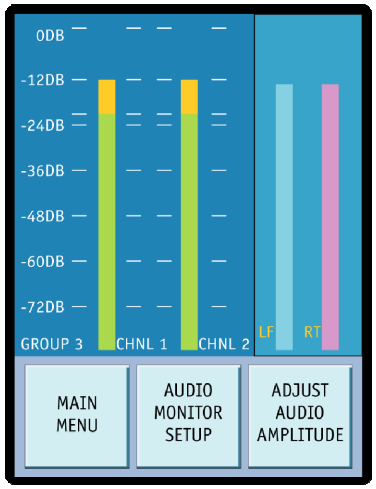
Beneath the parameters are error flags that represent problems that can happen in Full Field, Active Picture, and Ancillary Data. The flags are Unknown Error Status (UES), Internal Error Detected Already (IDA), Internal Error Detected Here (IDH), Error Detected Already (EDA), and Error Detected Here (EDH). When an error occurs in one of these fields, the flag changes from "0" to "1."

At the bottom of the screen are three buttons. The ENABLE ERROR COUNTERS button activates the counters. If the counters are not enabled, the counters will not increase each time an error occurs. The RESET ERROR COUNTERS button resets all the counters back to zero and turns off the counters.

Audio Monitor

The Audio Monitor is shown in **Figure 3-15**.

Figure 3-15. Audio Monitor



The audio monitor screen displays two channels of audio. The channels that appear on the display are determined by the selection made in the AUDIO MONTOR SETUP menu.

At the top of the vertical graph is the upper most value 0 dB. From 0 dB the indicators are -12 dB, -24 dB, -36 dB, -48 dB, -60 dB, and -72 dB. Each one of the bar graphs is Peak and Average response. Within the graph is an extra set of reference tick marks that can be set in the SYSTEM SETUP\AUDIO REFERENCE menu. The reference selections are -18 dB and -20 dB. Once the audio bar goes above the reference marks, the color of the bar changes from green to yellow. When the signal level exceeds the -12 dB mark, then the bar changes from yellow to red.

The ADJUST AUDIO button is used to select between adjusting the BALANCE AND AMPLITUDE of the Left and Right (LF/RT) audio. Once AMPLITUDE is selected,

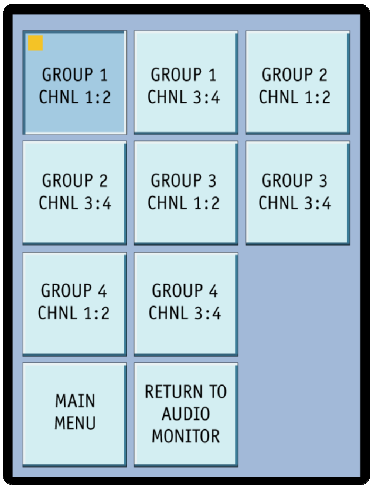
move the stylus up/down to increase and decrease the left and right amplitude for the audio output. If BALANCE is selected, move the stylus up/down to change the balance between the left and right channels for the audio output.

The AUDIO MONITOR SETUP menu, as shown in **Figure 3-16** is used to select which two channels from a particular group are displayed. Embedded audio is standardized into sixteen channels (four groups of four channels). The currently selected group and channels are indicated at the bottom of the Audio Monitor screen. The selections are:

- AUDIO GROUP 1 CHNL 1:2
- AUDIO GROUP 1 CHNL 3:4
- AUDIO GROUP 2 CHNL 1:2
- AUDIO GROUP 2 CHNL 3:4
- AUDIO GROUP 3 CHNL 1:2
- AUDIO GROUP 3 CHNL 3:4
- AUDIO GROUP 4 CHNL 1:2
- AUDIO GROUP 4 CHNL 3:4

Once configured, press the AUDIO MONITOR MENU to return to the Audio Monitor screen.

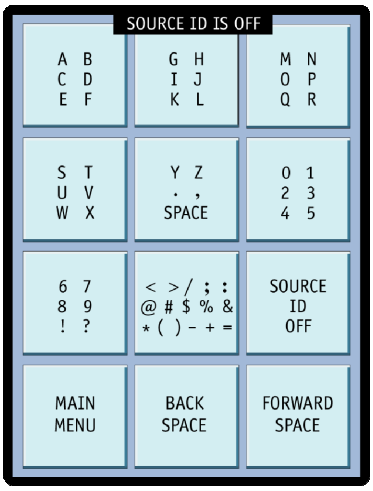
Figure 3-16. Audio Monitor Setup



Test Signal Generator Source ID

The TSG (Test Signal Generator) Source ID screen is shown in **Figure 3-17**.

Figure 3-17. Test Signal Generator Source ID



The TSG SOURCE ID menu is used to control the internal character generator. The character generator can insert text into the output of the test signal generator. There are five 18-character identifier outputs through both outputs.

The SOURCE ID button steps through the Source ID selections OFF, 1, 2, 3, 4, 5, and CYCLE. The user can actually have stored in the unit up to five different source IDs. When enabled, the Source ID selection will be inserted in the center of the TSG signal. When CYCLE is selected, the source IDs appear on the TSG Output one ID at a time in sequential order.

The character buttons step through the group of characters indicated on the button face. For example, the first button steps between A, B, C, D, E, and F. With each tap of the stylus, the character in the naming field will change letters. Once the desired character is selected, press the FORWARD SPACE button to move the character cursor one space to the right. Press the BACKWARD SPACE button to move the character cursor to the left one space. The cursor can move anywhere in the line.

Press the MAIN MENU button in the lower left corner to return to the Main Menu.

Section 4 ♦ Troubleshooting

CAUTION — these instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform this installation or any servicing unless you are qualified to do so. Refer all servicing to qualified service personnel.

If the HD-STAR is not functioning properly, first verify that:

- The HD-STAR is connected to a power source (batteries functioning, power plugged into the unit).
- All cables are correctly connected (see Section 2, "Installation").

Initial difficulties with operation or display can be due to improper setup. Review the Section 3, "Operation" to ensure that the proper adjustments have been made for the signal requirements.

Problems, Causes, and Solutions

Table 4-1. HD-STAR: Problems, Causes, and Solutions

Problem/Symptom	Possible Cause	Solution or Explanation
Will not display SD waveform.	Wrong input mode selected.	Go to SYSTEM SETUP and select MODE SD.
WARNING BATTERY LOW appears on the display.	Batteries are low.	▪ Connect the power adapter. If lithium ion battery pack is attached, the battery will recharge. If the AA batteries are attached, the batteries will not recharge. ▪ Change the batteries (STAR-PWR AA option only)
No audio output indication in the audio monitor screen	Audio signal generator set to OFF.	Check the Audio Signal Generator\Test Signal is OFF or that the System Setup Menu\Audio Output is OFF.
Display goes dark or flashes between light and dark.	Battery Saver Mode is turned on.	Change BATTERY SAVER to OFF in the SYSTEM SETUP menu.
Black line in is in the middle of the color monitor screen.	TSG SOURCE ID is set to ON with no text.	Go to the SOURCE ID and select SOURCE OFF or enter the text for the ID source.
Blank Color Monitor screen with input connected.	Incorrect format selected.	Select the MODE SD or HD in the SYSTEM SETUP menu to match the source.
Audio not at correct level or frequency.	Parameters not set correctly in the USER FREQ/AMP menu.	After selecting the AMPLITUDE and Frequency, select BUILD WAVE NOW for changes to occur.

If the problem still exists after troubleshooting the HD-STAR, see Section 1, "Service Support," for further instructions.

Care and Maintenance

- Do not scratch the screen. Use only the stylus to operate the HD-STAR. Avoid using sharp objects to operate the HD-STAR like pens and pencils.
- Do not use your fingers to operate the HD-STAR. The oils from the fingers will soil the screen.
- Use a soft and damp cloth to clean the HD-STAR. If the screen needs to be cleaned, use a soft lint-free cloth moistened with a diluted window-cleaning solution. If the HD-STAR is utilizing the power adapter, unplug the adapter before cleaning. Do not use alcohol, aerosol sprays, or abrasives.
- Do not use in rain or areas with heavy moisture.
- Do not charge batteries that are rusty, leaking, or corroded.
- Do not drop the handheld. A strong impact or crushing it in any way may damage it.
- Store the unit in a cool, dry area. Avoid dirty, dusty, damp, or wet areas for storage. Also, avoid areas of extreme hot or cold temperature.

Impairment Clause

Do not use the product in any way beyond its intended use. Using the product beyond the scope of its design may impair the safety of the device and the user.

Battery Warning

Do not puncture, damage, or discard batteries in fire. The batteries can explode, releasing hazardous chemicals. Dispose of the batteries according to the instructions of the battery manufacturer and in accordance with local laws.

Star VFlash Installation and Update

Star VFlash is the application software used to update the firmware in the HD Star. The latest version of the Star VFlash and the latest firmware file for the Star can be found on the Harris website at http://www.broadcast.harris.com/television/tmc/software.asp. Once the Star VFlash software and firmware file is downloaded, access the Star VFlash folder at the downloaded location and select Setup.exe. Once Setup.exe is accessed, install the Star VFlash software into the PC by following the on-screen instructions. The firmware file will be used after the Star VFlash program is running, so remember where the firmware file was saved (if the file was downloaded).

To perform a Star VFlash update:

NOTE: Ensure the PC COM port is enabled and set to 38400 Bits Per Second, 8 Data Bits, NONE for Parity, 1 Stop Bits, and NONE for Flow Control. These settings can be established in HyperTerminal.

1. Power off the HD-STAR.
2. Plug the RS-232 cable into the HD-STAR. Plug the other end of the RS-232 cable into the serial port on the PC.

3. Plug the power supply into the HD-STAR.
4. Power on the HD-STAR. The backlight will flash for about one second. The device will appear inactive for the remainder of the update.
5. Run Star VFlash.
6. On the Star VFlash screen, click the BROWSE button. The Open dialog box appears.
7. Select the CD firmware flash update file or downloaded firmware flash update file (referred to as a ".flu" file) that is compatible with the HD-STAR. Once the .flu file is selected, click the OPEN button.
8. On the Star VFlash screen, the "Current Version" field displays the firmware revision of the currently connected hardware. The "Updated Version" field displays the firmware revision of the currently loaded .flu file. If the "Updated Version" field version number is later than the "Current Version" field version number, click the UPDATE button.
9. A Progress bar indicates VFlash is in the process of updating the firmware. The progress bar will cycle from 0 to 100% six times (going through the Programming Flash, Verifying Flash, Programming HD, Verifying HD, Programming SD, and Verifying SD cycles). This will take several minutes.
10. When the Flash update is complete, the blue progress bar changes green when the flash process is successful. A dialog box appears to indicate that the firmware has been updated. The HD-STAR will boot. Remove the RS-232 cable.
11. Once the software is updated, perform an HD-STAR E^2 memory reload:
    a) Enter SYSTEM SETUP and activate the SYSTEM DEFAULTS RESET button. Wait for the device to reboot.
    b) Once the device has rebooted, enter the SYSTEM setup menu and toggle MODE to the video format not currently selected (HD to SD or SD to HD). Wait for the device to reboot.
    c) Once the device has rebooted, enter the SYSTEM SETUP menu and activate the SYSTEM DEFAULTS RESET BUTTON. Wait for the device to reboot.
    d) Once the device is rebooted, cycle the power button.

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Appendix A ♦ Specifications

Video/Audio Input

Connector	1 active looping 75Ω BNC.
Multi-formats	HD and SD-SDI (only 1 is operable at a time).
Return Loss	>12 dB 5 MHz to 1.5 GHz
Waveform	Selectable as Y, CR, CB, or GRB with Line select, full select persistence, zoom and horizontal position selections.
Vector	75% and 100% display mode, line select, full select, and persistence selections.
Picture	Color monitor with horizontal and vertical offset. Picture can be set to display upright while holding unit in either portrait or landscape orientation.
Data	▪ Display Chroma and Luma, CRC, Embedded Audio, and Ancillary Data information for HD and SD. ▪ EDH and CRC error flags (SD only).
Audio	▪ Displayed as 2 bar graphs for selected channels of embedded audio with meter response as VU + Peak with reference selection of -20 and -18 dB. ▪ De-embed 2 channels of AES/EBU 48 KHz audio from any 1 group for display and output analog audio via a headphone jack (16-bit stereo DAC). ▪ Bar graph type indicators show output level and balance settings for analog audio output. Control done by stylus.

Generator Outputs

Connector

2 75Ω BNC connectors with same output.

Multi-formats

HD and SD-SDI (only 1 is operable at a time).

Return Loss

>12 dB 5 MHz to 1.5 GHz

Source ID

5 memory locations for store/recall of source ID (up to 18 characters)

HD-SDI Output

- Test signal HD-SDI output with CRC insertion. Generator to have less than 1 CRC error per hour.
- Format selectable for HD as SMPTE 292 at 1.485 Gb/s in SMPTE 274 or SMPTE 296 formats: 1808i at 60 Hz, 59.94 Hz, and 50 Hz, 1080p at 30 Hz, 29.97 Hz, 25 Hz, 24 Hz, and 23.98 Hz, 720p at 60 Hz, 59.94 Hz, 50 Hz, 30 Hz, 29.97 Hz, 24 Hz, and 23.98 Hz

Level

800 mV p-p ± 10%

Rise and Fall Times

< 270 pS (20 to 80%)

Test Signals

- Color Bars split and Full Field at 75% & 100%.
- Multi Burst
- 10-step
- Ramp
- Sweep
- 50% Gray
- Checkfield
- Window Test Signal

SD-SDI Output

- Test Signal SD-SDI output with EDH insertion. Generator to have less than 1 EDH error per hour.
- Format selectable for SD as SMPTE 259M-C at 270 Mb/s in formats: 525 at 59.94 Hz, and 625 at 50 Hz

Level

800 mV p-p ± 10%

Rise and Fall Times

< 1.5 ns (20 to 80%)

GENERATOR OUTPUTS (CONT)

Test Signals

- Color Bars split and Full Field at 75% & 100%.
- Multi Burst
- 10-step
- Ramp
- Sweep
- 50% Gray
- Checkfield
- Window Test Signal

Audio Tone

4 channels of audio tone generated in any selectable group.

Tone frequencies: set at 400 Hz, 1000 HZ, and 10 kHz. Adjust from 20 Hz to 20000 Hz in 10 Hz steps.

Tone level settings for Full scale: -12, -18, or -20 dBFS Adjust the audio level from -60 dBFS to 0 dBFS in 1 dB steps

General

Functionality

Color Monitor, Vectorscope, Waveform Monitor, Video/Audio Test Signal Generator, Embedded Audio Monitor, Serial Data Analyzer

Color TFT touch screen LCD

- 320 x 240 pixels
- 54 x 72 mm display

Color Picture Monitor

- Horizontal and vertical offset
- Horizontal and vertical displays

Waveform Monitor

- Serial digital video input
- GRB or Y, C_R, C_B levels
- Color display
- Digital line select
- Persistence adjustable
- Zoom and pan mode

Vectorscope

- 75% and 100% display mode
- Digital line select
- Persistence adjustable

Serial Digital Data Analyzer (SD)

- EAV TRS
- SAV TRS
- ANC data present
- ANC Check Sum
- Embedded Audio
- Full Field CRC and EDH
- Active Picture CRC and EDH
- EDH and CRC Error flags
- Ancillary Data: Active picture and Full field

General (continued)

Serial Digital Data Analyzer (HD)

- EAV TRS
- SAV TRS
- Transport Layer Line Number
- Chroma (C) Line CRC
- ANC Check Sum
- Embedded Audio
- Ancillary Data
- Luma Channel (Y) Line CRC
- ANC Check Sum
- Ancillary Data

Embedded Serial Audio Monitor

- AES/EBU 48KHz audio data supported
- Analyze one pair from any one of four groups
- Stereo bar graph peak audio meters
- Stereo bar graph average audio meters
- 16-bit stereo DAC
- Variable stereo headphone output (from embedded audio sources)

Power Requirements

Power Adapter

- Input: 100 – 240 VAC, 50/60 Hz, 0.7A Max
- Output: 5.0V VDC at 3A max

Battery

1 lithium battery pack or optional one 6 “AA” battery pack

Power Management

Auto shutdown of unused functions, dim display

Installation Category

Category I

Installation Category Descriptions

The Installation Categories are:

- Category I is for measurements that occur on circuits not attached to a live electrical supply outlet (115/230 VAC). The voltages come from secondary power sources. The secondary power source includes circuits energized by low-voltage sources and electronics such as batteries.
- Category II is for measurements that occur on circuits attached to a live electrical supply outlet (115/230 VAC).
- Category III is for measurements that occur on equipment permanently connected to the building. The distribution level equipment are usually fixed installations and circuit breakers.
- Category IV is for measurements that occur at the main electrical power supply.

Mechanical

Dimensions

- Height: 5.8" (15 cm)
- Width: 3.6" (9.0 cm)
- Depth: 1.8" (4.7 cm)

Weight 411 grams (12.6 oz)

Environmental

Operating temperature 0° to +40°C

Non Operating Temperature -30 to +85°C

Transportation 24" (60.96 cm) impact-drop survivable in original factory packaging

Pollution Degree Pollution Degree 2

Pollution Degree Descriptions Pollution degrees measure the foreign materials such as conductive dust, gas, and moisture between the internal areas of the product and the outside environment. The Pollution Degrees are:

- Pollution Degree 1 describes that no pollution occurs or only dry, nonconductive pollution occurs. This is normal for equipment located in clean rooms. The pollution classified under Pollution Degree 1 has no environmental influence.
- Pollution Degree 2 describes that dry, nonconductive pollution occurs. This is normal in an office environment. Temporary conductivity caused by condensation may occur when the unit is not in service.
- Pollution Degree 3 describes that conductive pollution occurs, or dry, nonconductive pollution occurs due to condensation. Rooms that cannot maintain the moisture or temperature fall into this category. The location can only protect from outside weather conditions such as direct sunlight, rain, snow, and wind. Industrial areas can fall under Pollution Degree 3.
- Pollution Degree 4 describes pollution that generates persistent conductivity through conductive dust, rain, or snow. Pollution Degree 4 is for outdoor locations.

Specifications are subject to change without notice.

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Appendix B ♦ Pinouts

Figure B-1. Power Connector

Table B-1. Phone Jack connector Audio Pinouts

Pinout	Audio
SLEEVE	GND
TIP	Left
RING	Right

Table B-2. Phone Jack Connector VFlash Pinouts

Pinout	VFLASH
SLEEVE	GND
TIP	Receive
RING	Transmit

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Appendix C ♦ Glossary

601 An international standard (ITU-R BT.601) for component digital television. It defines the sampling systems, matrix values, and filter characteristics for digital television.

8 VSB Vestigial sideband modulation with 8 discrete amplitude levels.

16 VSB Vestigial sideband modulation with 16 discrete amplitude levels.

Advanced Television Systems Committee (ATSC) The parent organization that developed, tested and described the form and function of the US digital television formats.

AES/EBU A digital audio standard established jointly by the Audio Engineering Society (AES) and the European Broadcasting Union (EBU).

Artifacts Unwanted visible effects in the picture created by disturbances in the transmission or image processing, such as edge crawl or 'hanging dots' in analog pictures or 'pixelation' in digital pictures.

Aspect Ratio The ratio of horizontal to vertical dimensions. A square has an aspect of 1:1 since the horizontal and vertical measurements are always equal. Current television screen aspect ratios are 4:3 and 16:9.

Asynchronous Serial Interface (ASI) A transmission method adopted by the DVB, and called DVB-ASI. The transmission method allows for the transport of varying data payloads in a constant data stream. The DVB-ASI transport stream rate is 270 Mb/s.

Audio Breakaway Routing video and accompanying audio in separate signal paths.

Audio-Follow Routing video and accompanying audio together in the same signal path.

Auto Trans Automatic transition. The execution of a single wipe or fade from current picture to another picture by way of an automatic device.

Bandwidth The range of frequencies used to transmit information such as picture and sound.

Baseband Video An unmodulated video signal.

Black Also color black, blackburst. A composite color video signal that has the composite sync, reference burst, and a black video signal.

Blanking Processor A circuit which removes sync, burst and blanking from the program video and then replaces it with sync, burst and blanking from the reference input. The process ensures constant sync and burst levels on program video.

Border An electronically-generated picture member which is used in wipes to separate the two video sources used in the wipe. It is of even thickness and has color produced by the matte generator.

Broadcast Legal Encoding video signal parameters to conform to prescribed limits for broadcast. Encoding rules vary by NTSC, PAL, country and broadcast facility.

BTSC Broadcast Television Standards Committee. A US standard for stereo audio encoding in NTSC broadcast television.

CAV Component Analog Video

CES Consecutive Errored Samples

Composite Video A single video signal that includes all color video and timing information. A composite signal includes luminance, chrominance, blanking pulses, sync pulses and color burst information.

Chrominance The color portion of a video signal that represents the saturation and hue. Black, gray and white have no chrominance; color signals have both chrominance and luminance.

CH Chroma

Chrominance/Luminance Delay (C/L Delay) A measurement that indicates the amount to which chrominance and luminance are aligned with respect to each other. A low C/L delay figure can minimize the effects of ghosts or color offset on the received picture.

Clipping The electronic process of shearing off the peaks of either the white or black excursions of a video signal for limiting purposes. Clipping is often performed prior to modulation to limit the signal.

CMRR Common Mode Rejection Ratio

Color Burst The portion of a color video signal which contains a short sample of the color subcarrier. It is used as a color synchronization signal to establish a reference for the color information following it and is used by a color monitor to decode the color portion of a video signal. The color burst acts as both amplitude and phase reference for color hue and intensity. The color oscillator of a color television receiver is phase locked to the color burst.

Composite Sync A signal consisting of horizontal sync pulses, vertical sync pulses and equalizing pulses only.

CRC Cyclical Redundancy Check

Crosspoint An electronic switch, usually controlled by a button on the panel. Control logic will allow for only one crosspoint, for each bus, to be switched "ON" on at a time.

D/A Conversion of digital to analog signals.

DA Distribution Amplifier

Data Element An item of data as represented before encoding and after decoding.

Decoded Stream The decoded reconstruction of a compressed bit stream.

Decibel (dB) A logarithmic measure of the ratio between two powers, voltages, currents, sound intensities, etc. Signal-to-noise ratios are expressed in decibels.

Default A factory preset value or condition.

Demodulator A receiver, such as for television broadcast, cable, and closed circuit applications. A TV demodulator receives and processes off-air or cable RF signals and provides baseband video and audio outputs.

DHCP Dynamic Host Configuration Protocol

Differential Gain A measurement that specifies how much the chrominance gain is affected by the luminance level. Expressed as a percentage showing the largest amplitude change between any two levels, it indicates how much color saturation variance occurs when the luminance level changes.

Differential Phase A peak-to-peak measurement that specifies the extent to which the chrominance phase is affected by the luminance level. Expressed in degrees of subcarrier phase, it indicates how much hue shift occurs with luminance level changes.

Digital Video Broadcasting (DVB) A specific project office of the European Broadcast Union. This group has produced a set of digital broadcasting standards.

DSK Down Stream Key, a keyer which is electronically located after (or down stream from) all other functions of a switcher. The key resulting will appear to be on top of all other pictures from the switcher.

D-VITC Digital Vertical Interval Time Code. Timecode information stored on specific lines in the vertical blanking interval of a television signal.

EAV End of Active Video in component digital systems.

EBU European Broadcasting Union

Editor A device or system which controls video tape recorders, video switchers, and other related devices in order to electronically splice segments of recorded video into a finished production.

EDH Error Detection and Handling. A recommended practice defined in SMPTE RP 165. A system to generate and then detect video data errors in serial digital video systems.

Effects Keyer A keyer which is electronically located in the mix/wipe generator portion of a switcher. The resulting key would appear under the down stream key.

EIA Rack Space or Unit A specific size as designated by the Electronics Industry Association. The rack unit is 19 inches wide, and is 1.75 inches tall. A device which requires 3 EIA rack units is 19 inches wide and 5.25 inches (3x1.75 = 5.25) tall.

Elementary Stream (ES) A generic term for one of the coded video, audio or other variable length bit streams which are packetized to form MPEG-2 transport streams. Consists of compressed data from a single source (audio, video, data, etc.). One elementary stream is carried in a sequence of PES packets with one and only one stream ID.

Embedded Audio Digital audio information multiplexed onto a serial digital data stream. Up to sixteen channels can be multiplexed on a single stream of 601 video, minimizing cabling and routing requirement.

ENG Electronic News Gathering

Encoded Clip Softness In the encoded legalization process, "softness," as applied to encoded clips, refers to the processing of the video at the point of the clip. The clips are applied in YC_BC_R color space. The clip point is either an immediate limit (no softness) or will have a range of values leading to the clip point, all reduced to smooth the clip point to a less immediate limit (softness).

Encoded Legalization Limiting of the luminance and color difference signals such that, once encoded into a composite video signal, the resultant encoded video does not violate the maximum or minimum signal levels as defined by the specific encoding rules. NTSC and PAL video plus various users of these types of video have many varied rules for maximum and minimum encoding limits. Encoded legalization usually calculates first the encoded luminance value and then the corresponding chroma value to make legalization judgements.

Encoded Video A combined single video signal that is constructed from either separate GRB or luminance and two color difference video signals. NTSC, PAL, and SECAM are all examples of encoded video.

Envelope Detection An RF signal detection technique that does not respond to phase variations in the carrier signal, enabling measurement of a transmitter's incidental phase. When used together with synchronous detection, envelope detection helps isolate either video and/or RF as the causes of phase distortion.

External Key Input This is an alternate source for key cut. This is usually a separate external input to a switcher

Fade-thru-Black A production technique which is a two step process. The first step will fade the program video to black. The second step will fade from black to the video selected on the preview bus. This is usually used in major scene transitions.

Fade-to-Black A production technique which simply fades the program video to black and program audio to silent. This is used to end programs and to escape from embarrassing pictures or sounds.

Field A picture or picture portion which is produced within one cycle of vertical synchronization. In interlaced systems, a full picture or frame requires two consecutive fields.

FM Trap A circuit designed to minimize potential interference from strong FM signals in receiving equipment, such as a TV demodulator. For example, an FM trap can attenuate signals between 88-108 MHz to reduce interference on NTSC television channel 6.

Frame A single full resolution picture as viewed in either a video or film system. In the case of interlaced video, two consecutive fields provide all of the information of one frame. In non-interlaced systems, one cycle of vertical synchronization produces a frame. A 60 Hz interlaced system, produces 30 frames of video in one second. A 60 Hz progressive (or non-interlaced) system, produces 60 frames of video in one second. Common frame rates are 24 (film) 25, 29.97, 30, 50, 59.94 and 60.

Frame Synchronizer An electronic device that synchronizes two or more video signals. Using one input as a reference, it locks a second signal to the reference.

Frame Store An electronic method of capturing and storing a single frame of video.

Gamma This term applies to the linearity of the change from black to white. Gamma controls adjust the gray or 50% point of the video either up or down, with the effect of changing the gray level of the video.

Gamut The whole or total of whatever is being addressed. In color space, gamut refers to all colors which are included in a particularly defined color group, such as 601 gamut.

Genlock (Generator Lock) A method of synchronization involving the generation of a video signal that is time and phase locked with another signal.

GPI General Purpose Interface

Headend In a cable TV system, the facilities where program sources (satellite, terrestrial, VTR, local) are received and remodulated for distribution through a cable plant.

High Definition Television (HDTV) High definition television has a resolution of approximately twice that of conventional television in both the horizontal (H) and vertical (V) dimensions and a picture aspect ratio (H to V) of 16:9.

High Level A range of allowed picture parameters defined by the MPEG-2 video coding specification which corresponds to high definition television.

HRC Harmonically-Related Carrier

Hue Color tint

ICPM Incidental Carrier Phase Modulation. A measurement of picture carrier phase distortion (affected by the video signal level) that occurs in the transmitter.

IP Internet Protocol

IRC Incrementally-Related Carrier

I.R.E. Refers to the Institute of Radio Engineers, and is used as a unit of measurement. In NTSC television, 1 volt of signal equals 140 IRE units.

ISP Internet Service Provider

Jitter A deformation of a signal affected by poor synchronization.

Key An effect in television where a selected portion of background video is removed and replaced with another video.

Key Cut In a key effect, this is the video which designates the portion of background video which is removed.

Key Fill In a key effect, this is the video which is used to replace the portion of background video which was removed. This may be the same video as the Key Cut video.

Key Invert In a key effect, this is an electronic action which reverses the polarity of the key cut signal. It makes black appear as white, and white appear as black.

Key Mask In a key effect, it uses a wipe pattern from the wipe pattern generator to restrict the key cut from removing video in a portion of the screen. This requires the use of the wipe pattern generator and the Mask/Preset Size controls.

Key Source Another term which is the same as key cut.

Legalization The modification of serial digital video to conform to analog color space rules, as required by users.

LCD Liquid Crystal Display

LED Light-Emitting Diode

LFE Low Frequency Effects

Lissajous A display of the amplitude and phase relationships between two input signals.

LS Left Surround

LTC Longitudinal Time Code, A SMPTE timecode standard usually recorded onto the linear audio track of a VTR.

Luminance The degree of brightness (black and white portion of the video signal) at any given point in the video image. A video signal is comprised of luminance, chrominance and sync. If luminance is high, the picture is bright and if low the picture is dark. Changing the chrominance does not affect the brightness of the picture.

Main Level A range of allowed picture parameters defined by the MPEG-2 video coding specification with maximum resolution equivalent to standard definition television.

Main Profile A subset of the syntax of the MPEG-2 video coding specification that is supported over a large range of applications. Applications include, MP@HL (Main profile at high level) and MP@ML (Main profile at main level).

Mask/Preset Size Uses the wipe pattern generator in the keyer portion of the effects generator. This is used to adjust the size of a preset pattern or for adjusting the size of a mask to block a portion of the key cut (source) from use in the keyer.

Matte Generator An internal generator which can make any color, is used for border color and may be used for key fill. It is identical to the Color Background Generator, but simply used in other areas of the switcher.

Mbps Megabits Per Second

mV Millivolts

M/E Mix/Effects System

MP@HL Main profile at high level

MP@ML Main profile at main level

MPEG Refers to standards developed by the ISO/IEC JTC1/SC29 WG11, Moving Picture Experts Group.

MPEG-2 Refers to ISO/IEC standards 13818-1 (Systems), 13818-2 (Video), 13818-3 (Audio), and 13818-4 (Compliance).

Multi-Level Effects Applies to any effects generator which can do more than one effect at a time. Typically, a multi level switcher can produce a Key and a Background transition in the same effects generator at one time.

NTSC National Television Systems Committee, the color television system used in the United States, Canada, Mexico and Japan.

NVRAM Nonvolatile RAM

Packet Identifier (PID) A unique integer value used to associate elementary streams of a program in a single or multi-program transport stream.

Packet A packet consists of a header followed by a number of contiguous bytes from an elementary data stream. It is a layer in the system coding syntax.

Packetized Elementary Stream (PES) The data structure used to carry elementary stream data. The packets consist of a header followed by payload data, and a stream is a series of packets which form an elementary stream and have a single stream identification.

PAL Phase Alternation Line; the standard color television system in many European and other countries.

Passive Looping Video and audio signals routed through components, even if power is removed. Signals are not amplified or processed, maintaining transparency.

Pedestal Level An offset used in a video system to separate the active video from the blanking level by maintaining the black level above the blanking level by a small amount.

Pixel A Picture cell or Picture element representing one sample of picture information, such as an individual sample of R, G, B, luminance or chrominance.

Preset Refers to establishing any condition prior to use on the Program output. This term is used in reference to wipe patterns and is often interchanged with Preview.

Preview The video output channel used to view the intended Program results prior to the execution of the next transition.

PRO Audio A transmitted audio channel for talent cueing via Interrupt Foldback (IFB) to ENG vans and remote applications. Some demodulators support PRO audio monitoring.

Program A transport stream combination of a video stream and one or more audio and data streams associated with that video stream. In analog terms, “Program” refers to the Base Band video and audio produced by the final output of a switcher.

Program Association Table (PAT) A list of all programs that are in the ATSC data stream.

Program Map Table (PMT) A listing of all elementary streams that comprise a complete (television) program.

Program Clock Reference (PCR) This is a time reference signal that is placed in MPEG streams for the purpose of time coordinating various data streams.

Program and System Information Protocol (PSIP) Information sent out as part of an ATSC transport stream which lists all of the video, audio, data and program information contained in the stream. This is the "TV guide" for a given stream.

Progressive Scanning Also non-interlaced. A system of video scanning where lines of a picture are transmitted consecutively, such as with VGA monitor displays.

Push-push Toggle Switch An electro-mechanical device which, when pushed, alternates the condition of the switch. Push once, it's off, push again, it's on.

Quadrature Output An output in a television demodulator used for measuring Incidental Carrier Phase Modulation (ICPM) in a transmitter.

QPSK Quadrature Phase Shift Keying, typically used by satellite downlinks.

QAM Quadrature Amplitude Modulation, the technique used by cable TV systems (64-QAM and 256-QAM) to remodulate signals for distribution in a cable plant.

GRB Legalization Limiting of luminance and color difference video signals such that, once transcoded into GRB component video signals, the resultant video does not violate the maximum or minimum signal levels as defined by component video level rules. Typically, the maximum value for R, G, or B is 700 mV, and the absolute minimum value for any of these signals is 0 mV.

Reclocking The process of regenerating digital data with a clock recovered from the input data.

Resolution A measure of the finest detail that can be seen, or resolved, in a reproduced image.

RS Right Surround

RS-422 Recommended Standard number 422, an E.I.A. standard which describes a type of data interchange. Television products use this standard as its communication format between the electronics frame and editors, control panel and computers. An RS-422 line may be extended up to 1,000 feet (304m).

Sampling Process by which an analog signal is sampled to convert the analog signal to digital.

SAP Secondary Audio Program, used in television broadcast for second language broadcasting, simulcasting, and separate audio programming.

Saturation Color intensity

SAW Filter Surface Acoustic Wave filter

Segment Error Rate (SER) A calculated average of uncorrected transport stream packets vs. total packets as accumulated over a designated period of time.

Signal to Noise Ratio -Analog (SNR) A measurement of the noise level in a signal expressed in dB (decibels) as a ratio of between the audio or video signal’s maximum peak-to-peak signal voltage and the measured voltage of noise present when the signal is removed. Higher SNR figures indicate that any noise introduced by system components will not be perceived in the picture and sound output signals.

Signal to Noise Ratio-8VSB (SNR) As applies to 8VSB transmissions, this is a calculated average power of the ideal signal divided by the actual demodulated signal power.

SMPTE Society of Motion Picture and Television Engineers

Standard Definition Television (SDTV) This term is used to signify a digital television system in which the quality is approximately equivalent to that of NTSC. This equivalent quality may be achieved from pictures originated at the 4:2:2 level of ITU-R BT.601 and subjected to processing as part of the bit rate compression. The results should be such that when judged across a representative sample of program material, subjective equivalence with NTSC is achieved. The displayed picture may be either the traditional 4:3 or the wide-screen 16:9 aspect ratio.

STL Studio Transmitter Link

Synchronous Detection A common detection technique used in television demodulators that removes quadrature distortion, enabling comparison of transmitter output with video input signal.

S-Video Also Y/C. Transmits luminance and color portions separately via multiple wires, thus avoiding the color encoding process and resulting loss of picture quality.

Tally A system used to light lamps and indicate usage. Most production switchers have an internal tally system to indicate selected functions, and which selected functions are currently involved with Program.

TCP Transmission Control Protocol

Telecine A device used to convert film to video; movie film is digitally sampled and converted to video frame by frame in real-time.

TCXO Temperature Compensated Crystal Oscillator

THD Total Harmonic Distortion

Transport Stream-ATSC (TS) Consists of the following: (1) Packets: 188 bytes - fixed length with descriptive data, (2) Carries several programs, (3) has a PID which identifies the type of TS packet (video, audio, other), and (4) carries descriptive information about the program.

UHF Ultra High Frequency

Unity Gain An electronic term indicating that a signal will be neither amplified or attenuated. One volt of signal level in results in one volt of signal level out.

Vector A measure that has two individual properties: magnitude and direction.

Vector Clip A special encoded clip version that limits only the C_B and C_R input video signals and does not affect (nor is it affected by) the luminance component. This color-only clip limits the maximum vector excursions as viewed in an encoded state and is intended for users who wish to prevent encoded vectors from ever exceeding the perimeter circle of an encoded vector display.

VHF Very High Frequency

VITC Vertical Interval Time Code, a method for recording on to video tape the timecode address for each video frame inserted in the vertical interval.

Waveform A visual representation of a signal in the shape of a wave that plots amplitude versus time.

White Level The brightest part of a video signal, corresponding to approximately 1.0 Volt.

White Balance An electronic process used to calibrate the picture for accurate color display in different lighting conditions.

Wipe A special effect in which two pictures from different video sources are displayed on one screen. Production switchers and special effects generators provide numerous wipe patterns varying from simple horizontal and vertical wipes to multi-shaped, multi-colored arrangements.

XGA High resolution 1024x768 non-interlaced (progressive) display monitor

XVGA Extended Video Graphics Adapter

YP_BP_R: CAV format composed of luminance (Y) and two color difference signals (P_B and P_R)

Y/C Also S-video. Describes the separation of video signal luminance and chrominance components.

Zero Carrier Pulse (chopper) In a TV demodulator, removes the carrier in the vertical interval for a short period, enabling depth of field measurement.

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