INSTRUCTION MANUAL

Model HDE-3000

High Definition and Standard Definition Serial Digital Interface Captioning Encoder/Decoder and Graphics Inserter

Revised for firmware version 1.44

LINK ELECTRONICS, INC.

2137 Rust Avenue
Cape Girardeau, Missouri 63703
Phone: 573-334-4433
Fax: 573-334-9255

e-mail: sales @ linkelectronics.com
website: www.linkelectronics.com

Table of Contents

Table of Contents Continued

Important Safeguards and Notices

Information on the following pages provides important safety guidelines for both Operator and Service personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear here. Please read and follow the important safety information, noting especially those instructions related to risk of fire, electric shock or injury to persons.

WARNING

Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

Symbols and Their Meaning in This Manual

READ THIS MANUAL: To gain knowledge of the Link product, user must read and understand the operator's manual before using this product. There are features known to the user, only if the manual is read.

The lightning flash with arrowhead symbol, within an equilateral triangle, alerts the user to the presence of "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle alerts the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

This symbol represents a protective grounding terminal. Such a terminal must be connected to earth ground prior to making any other connections to the equipment.

The fuse symbol indicates that the fuse referenced in text must be replaced with one having the ratings indicated.

Important Warnings and Cautions

Warnings:
Always use good engineering practice. It is highly recommended to mount this equipment in a well ventilated equipment rack. It is also recommended to use a blank one RU spacer between mounting frames.

- Heed all warnings on the unit and in the operating instructions.
- Do not use this product in or near water.
- Disconnect ac power before installing any options.
- This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting the product inputs or outputs.
- Route power cords and other cables so that they are not likely to be damaged.
- Disconnect power before cleaning. Do not use liquid or aerosol cleaners; use only a damp cloth.
- Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.
- Do not wear hand jewelry or watches when troubleshooting high current circuits, such as the power supplies.
- During installation, do not use the door handles or front panels to lift the equipment as they may open abruptly and injure you.
- To avoid fire hazard, use only the specified correct type, voltage and current rating as referenced in the appropriate parts list for this product. Always refer fuse replacements to qualified service personnel.
- To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.
- Have qualified personnel perform safety checks after any completed service.
- If equipped with redundant power, this unit has two power cords. To reduce the risk of electrical shock, disconnect both power supply cords before servicing.
- This equipment may employ laser(s). If it does, they comply with the current construction requirements of the code of Federal regulations, title 21, chapter I, subchapter J, sections 1010.2 and 1010.3 and sections 1040.10 and 1040.11.
- Do not attempt to view light output of the laser transmitter, eye damage may result. Always use an optical power meter to verify laser output.

To prevent injury:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch un-insulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

Cautions:

- When installing this equipment, do not attach power cord to building surfaces.
- To prevent damage to equipment when replacing fuses, locate and correct the trouble that caused the fuse to blow before applying power.
- Verify that all power supply lights are off before removing power supply or servicing equipment.
- Use only specified replacement parts and follow static precautions at all times when handling this equipment.
- Leave the back of the frame clear for air exhaust cooling and to allow room for cabling. Slots and openings in the cabinet are provided for ventilation. Do not block them.
- Front door is part of fire enclosure and should be kept closed during normal operation.
- This product should be powered on as described in the manual. To prevent equipment damage select the proper line voltage at the ac input connector as described in the installation documentation.
- To prevent damage to this equipment read the instructions in this document for proper input voltage range selection.
- To reduce the risk of electric shock, ensure that the two power supply cords are each plugged into a separate branch circuit.
- Circuit boards in this product are densely populated with surface mount and ASIC components. Special tools and techniques are required to safely and effectively troubleshoot and repair modules that use SMT or ASIC components. For this reason, service and repair of Link products incorporating surface mount technology are supported only on a module exchange basis. Customers should not attempt to troubleshoot or repair modules that contain SMT components. Link assumes no liability for damage caused by unauthorized repairs. This applies to both in- and out-of-warranty products.

North American Power Supply Cords

This equipment is supplied with molded grounding plug (NEMA 5-15P) at one end and molded grounding connector (IEC 320-C13) at the other end. Conductors are CEE color coded, light blue (neutral), brown (line) and green/yellow (ground).

Operation of this equipment at voltages exceeding 130 VAC will require power supply cords which comply with NEMA configurations.

International Power Supply Cord

This equipment is supplied with molded grounding connector (IEC 320-C13) at one end and stripped connectors (50/5 mm) at the other end. Connectors are CEE color coded, light blue (neutral), brown (line) and green/yellow (ground).

Other IEC 320-C13 type power supply cords can be used if they comply with the safety regulations of the country in which they are installed.

Notes:

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 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 instruction manual, may cause harmful interference, in which case the user will be required to correct the interference at his own expense.

1. General Information

1.1 Introduction

Thank you for purchasing the HDE-3000, a versatile Windows XP platform for high definition and standard definition SDI captioning encoder/decoder and subtitle/graphics inserter. With HDE-3000 you can insert slates, bugs, TV rating icons and subtitles while encoding closed caption and XDS data. Post production and tape duplication facilities can perform these jobs in a single pass without the need for a PC. Broadcasters can comply with FCC rules by encoding closed captions and V-chip data while simultaneously displaying on-screen TV rating icons.

HDE-3000 is constructed in a modular fashion. All of the components plug into industry standard PCI slots. The modular architecture allows for easy upgrades in the field. There are slots available for functions that may be required in the future.

Easy operation

A common complaint in the caption industry is that post houses must deal with caption files with different formats and encoding requirements. HDE-3000 addresses this by reading most of the popular caption file formats. The encoder automatically determines the proper settings by looking at the data contained in the file, the operator doesn't even have to specify the format.

In a broadcast environment, HDE-3000 can act as a caption server. Caption data does not have to reside in the VANC of programs on videotape; it can be encoded "on-the-fly" as the program airs. Captions may be downloaded to HDE-3000's hard disk via a network connection, floppy drive, or USB drive. A script may be generated that instructs HDE-3000 to encode a sequence of shows based on time code. This technique saves a tape generation, plus it allows easier reformatting of captions if a show is edited.

The HDE-3000 is network ready and will allow you to load closed caption jobs, interactive TV links, subtitles, scripts, or graphics files from your server.

1.2 HDE-3000 core hardware and Operating System

The HDE-3000 utilizes an advanced Intel microprocessor and the Microsoft Windows XP Embedded operating system. The Windows XP Embedded (XPE) operating system is based on Microsoft Windows XP SP2, but it is customized specifically for the HDE-3000 core hardware. XPE provides an established, stable operating system and user interface for the HDE-3000.

When a VGA monitor, keyboard, and mouse (optional) are connected to an HDE-3000, the HDE-3000 appears to the user to be a standard Windows XP workstation. This allows the HDE -3000 network to be easily configured by IT personnel who are familiar with Windows XP.

IMPORTANT! The HDE-3000 is a sophisticated piece of video equipment. Never think of or use an HDE-3000 as if it were a standard desktop PC. Do not install any software, update any operating system components, or apply any service packs intended for "normal" Windows XP. Doing so may cause the HDE-3000 to malfunction, will void the warranty, and will require the operating system to be re-installed at the factory.

IMPORTANT! Always shut down the HDE-3000 using the "shut down" menu and wait for the front panel LED's to go out before turning off the power via the front panel "soft power-off" switch. Never turn off the power without executing the "shut down" menu unless absolutely necessary. Turning off the power to the unit while it is running may cause damage to the file system on the hard disk which can only be repaired by re-installing the operating system at the factory.

1.3 Closed Caption Encoder

HDE-3000's most important feature is its ability to read caption files from the industry's leading agencies and caption software providers. Files from unsupported software venders may be converted to .ULT format and read directly. Of course, HDE-3000 may still encode captions the old fashion way, by sending data to a HDE-3000 serial port or network interface from a PC. HDE-3000 may also encode "live" caption data via an optional internal or external modem. HDE-3000 encodes captions into the VANC portion of the stream using the latest SMPTE standards.

1.4 Graphics Inserter

HDE-3000 comes standard with a full screen, full color graphics inserter (GI). The GI provides two video frame stores of 24 bit RGB plus 8 bits of transparency ("alpha" channel). You can create any image in 16 million colors with 256 levels of transparency over the background video. Your image can occupy the full screen of all HD formats, including wide screen. A global fade function allows you to fade images on and off the screen independently from transparency settings.

How images are displayed with HDE-3000 GI

The HDE-3000 GI displays text and graphics in a special format known as "UYC" format. Link provides file converters to convert from BMP, TIF, and PNG formats to UYC. Sub-pictures are loaded into a non-displayed graphics buffer then displayed at the desired time. Sub-pictures are always rendered off-line, that is, on an external PC or Mac. You can use any graphics drawing program to create sub-pictures including those from Adobe, Macromedia, Jasc and many others. Sub-pictures can be faded on and off the screen.

Link also has an optional drop and drag graphic software that will convert the images for you and write the script file that controls the graphics inserter. The program can also be used to remotely insert graphics.

2. Installing and Operating Instructions

2.1 Installation procedure

The following is the recommended installation and setup procedure when an HDE-3000 is installed at the customer site:

1. Unpack HDE-3000 from its shipping container. Please retain the original shipping container, if it is ever necessary to ship the HDE-3000 to the factory for service, this specially designed double-box container will prevent the unit from being damaged during shipment.

2. Mount the HDE-3000 into a standard 19 inch equipment rack, leaving 6 inches of space behind the unit for ventilation. It is not necessary to mount the HDE-3000 in an equipment rack, but it is recommended.

3. Connect power to the HDE-3000. It is recommended that the HDE-3000 be powered from a clean, uninterruptible power source.

4. To connect the HDE-3000 to your network, connect a category 5 network cable to the NETWORK connector and refer to section 3.1 Network Setup. A VGA monitor and keyboard may be connected to the HDE-3000 at any time (a VGA monitor is required for normal HDE-3000 operation); a mouse may be connected prior to boot-up.

   Power

   Apply AC line power to the unit via the detachable three wire cord.

   Grounding (earth ground)

   The HDE-3000 must be connected to a protective earth conductor via the three wire AC line (mains) cord. The AC power plug shall be inserted only into a receptacle outlet that has a protective earth contact. The ground wire must not be defeated by use of a two wire extension cord.

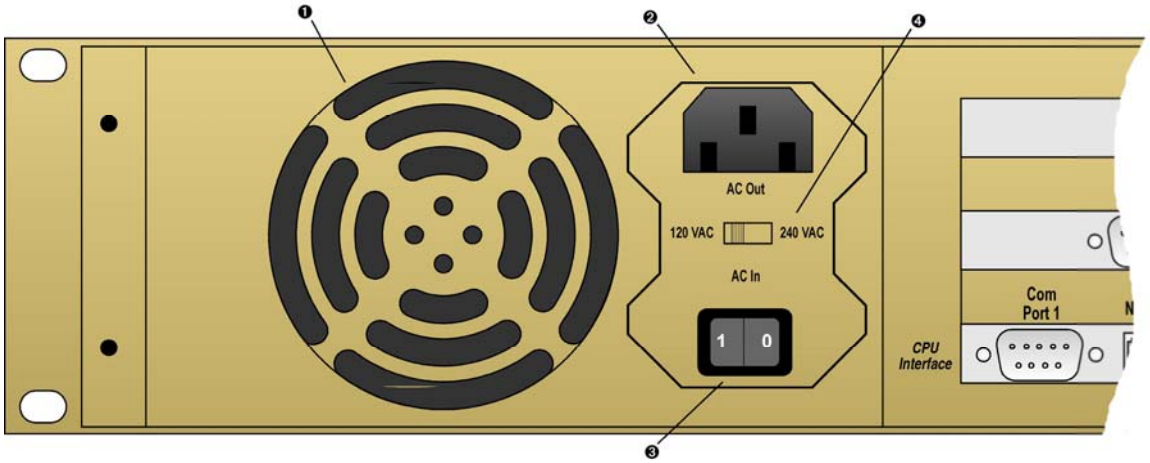
2.2 Rear Panel Connections

1. Fan Grill. You must mount the HDE-3000 in a location that provides at least 6” of clearance behind this grill. Air is supplied through the front panel filter and discharged through the rear panel fan grill.

2. IEC power output connector for detachable three wire AC line cord. Rated 120 VAC at 3A Max, or 240V at 2A Max.

3. Main power switch.

4. 120 VAC / 240 VAC line voltage selection switch.



2.3 CPU / Data Connections

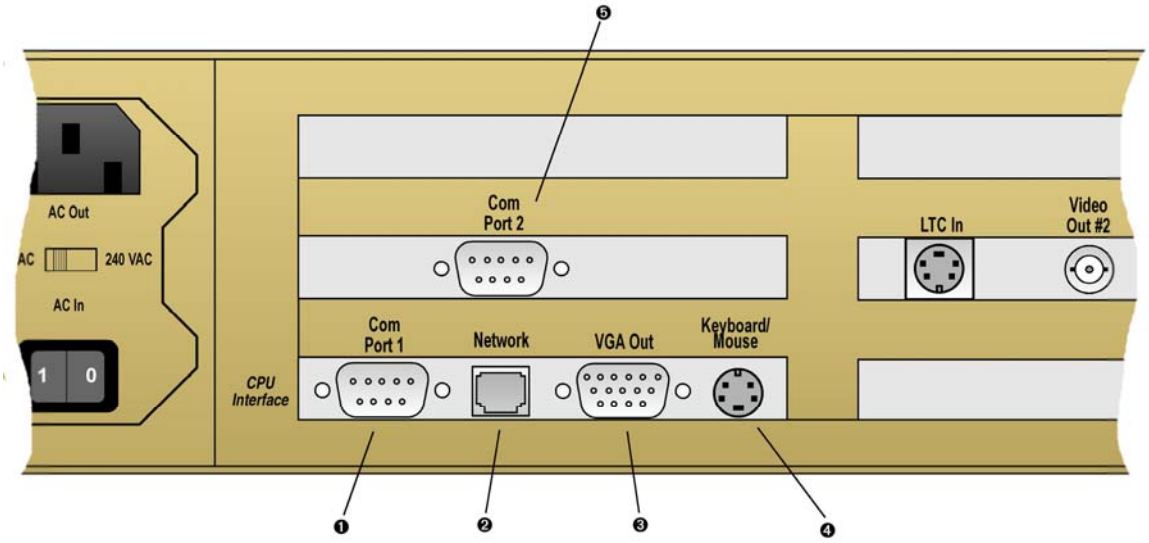
1. Com 1 RS-232 serial interface connector.

2. RJ-45 modular jack for unshielded twisted pair 100 Mbps network cabling.

3. VGA output connector. You do not need a VGA monitor for normal operation. All on-screen menus and status screens appear at the VGA output. You need a VGA monitor when performing upgrades and maintenance.

4. Keyboard/mouse connector. LINK supplies an adapter cable that enables you to plug a PS-2 style keyboard and mouse into HDE-3000. However, you do not need to connect a keyboard/mouse for normal operation. You only need a keyboard for performing system upgrades or maintenance.

5. Com 2 RS-232 serial interface connector. Note Com 2 is not available when optional modem is installed.



2.4 Digital video connections

The following procedure describes the proper sequence of digital video connections required to enable an HDE-3000 to encode data or graphics into digital video.

1. Connect input video (HD serial digital video) to the VIDEO IN connector. Typically this video comes from a digital VTR set up to play a master tape. The HDE-3000 terminates the source video with 75 ohms. Source must be standard SMPTE 292M video.

2. Connect input longitudinal time code (LTC) to the LTC IN connector (next to the VIDEO OUT #2 connector) using the supplied time code adapter cable (XLR to mini-DIN). Typically this time code comes from the digital VTR that the input video is coming from. The LTC input can use either balanced or single-ended time code with a nominal level of +4 dBu.

3. Connect the output serial digital video of the HDE-3000 (the VIDEO OUT #1 connector) to the destination video equipment. Typically the output video is connected to a digital VTR set up to record a dub tape. This output has a power-off bypass relay on HDE-3000s that connects VIDEO OUT #1 to VIDEO IN when power is removed from the unit.

2.5 Serial Digital Interface and LTC Connections

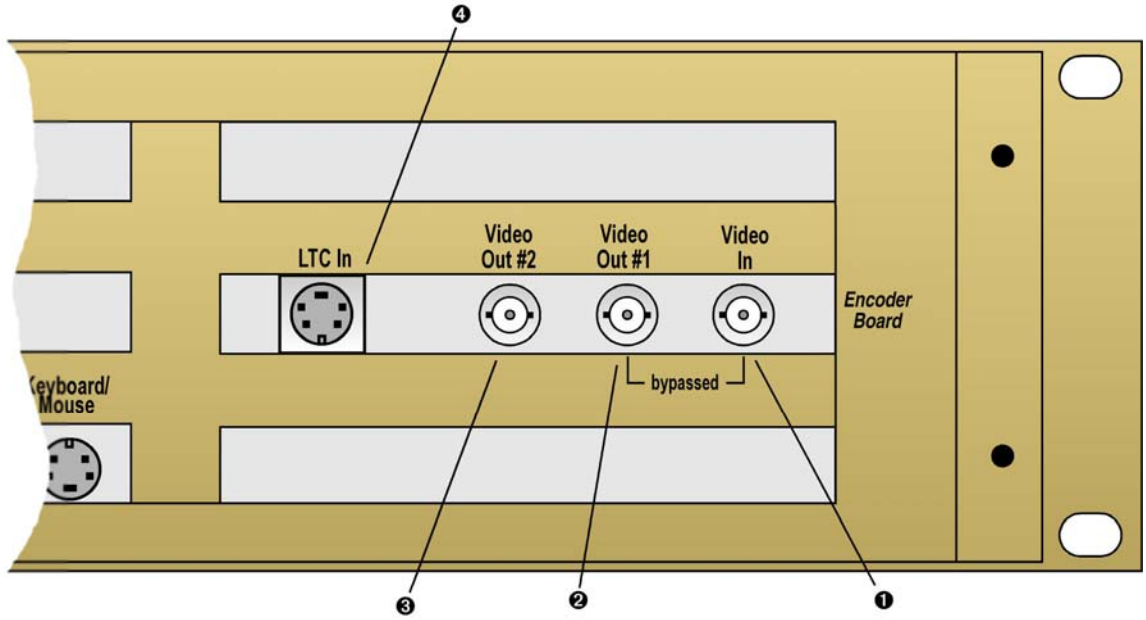
1. HD Serial digital video input. This input expects a standard SMPTE-292M digital signal. The input is internally terminated by 75 ohms.

2. HD serial digital program video output #1. This is a standard SMPTE-292M output with a 75 ohm source impedance. The output employs a controlled rise time cable driver circuit and has a power-off bypass relay to Video In.

3. Serial digital program video output #2. Identical to program video output #1.

4. LTC time code input. This is a balanced longitudinal time code input that expects a nominal +4 dbu analog signal. A mini-DIN connector is used to save panel space.

   Note: If the unit is a dual unit then it will have two encoder cards in it, the connections for both will be the same. ENC 1 will be the encoder card that is in the top slot and ENC 2 will be the encoder card that is in the middle slot.



2.6 Front Panel Controls and Indicators

1. Power on/off switch. **IMPORTANT NOTE**: never shut off unit without first running the "Shutdown" procedure (see section 5.8.1 "Shutdown Menu").

2. Reset. The HDE-3000 contains a reset button which is recessed inside the front panel. Pushing this button will cause the HDE-3000 to perform a power-on reset.

3. USB ports, for using USB drives to load jobs into unit or to upgrade the unit.

4. Program Video LED. Illuminates when HDE-3000 detects proper incoming video.

5. Encoding LED. Illuminates when HDE-3000 is actively encoding data into the VANC portion of the incoming HD-SDI video.

6. Data In LED. Illuminates when HDE-3000 detects data at its RS-232 or modem inputs.

7. Time code LED. Illuminates when LTC time code is detected.

8. Hard Disk LED. Illuminates when HDE-3000 reads or writes from its hard drive.

9. Setup LED. The red Setup LED illuminates when you are in setup mode. In setup mode, on-screen menus are displayed on the decoder monitor.

10. Floppy Drive. The HDE-3000 can read closed caption, subtitle, and scripts via this drive. Graphics files should be loaded using the network because of their large size.

11. Cursor keys. Press ENTER to bring-up the on-screen menu. Press the left, right, up, down cursor keys together with the ENTER key to move through the menus and make selections.

2.7 Operating the HDE-3000

Power on

When power is first applied, the HDE-3000 will boot its operating system and will then run its HDE-3000 application program. This process takes about 15 seconds. After the application program has started, an HDE-3000 status screen will appear at the VGA output; nothing appears at the monitor output other than the video source which is connected to the monitor input.

User interface

HDE-3000 may be controlled in three ways:

1. via the front panel
2. via a PC keyboard
3. via the network with the “HDE-3000 Remote” program

1. Front Panel

Front panel control of the HDE-3000 is accomplished using the cursor keys and on-screen menus. The menus appear at the VGA output only. Pressing ENTER brings-up the main menu. Pressing the left and right arrow keys brings you to other menus. Pressing the up and down arrow keys allows you to scroll through choices within a menu. Pressing ENTER within a menu allows you to make changes to settings. Every menu screen has help messages to guide you.

2. PC keyboard

PC control of the HDE-3000 is accomplished by plugging in a PS/2-style keyboard into the rear of the unit. The menus appear at the VGA output. Emulating the font panel keys, pressing ENTER brings-up the main menu. Pressing the left and right arrow keys brings you to other menus. Pressing the up and down arrow keys allows you to scroll through choices within a menu.

3. HDE-3000 Remote

You may control the HDE-3000 over an IP network connection using the Windows utility “HDE-3000 Remote” program that is supplied with each unit (you will find a copy of this program in the directory c:\dv3000). HDE-3000 Remote gives you the same screens and control that you have with the front panel or PC keyboard. The HDE-3000 Remote program is also used to configure certain “job” and network settings (see section 3.5 Configuring the Jobs Folder on a Network Server).

3. Network Configuration

3.1 Network Setup

The HDE-3000 will run normally with no network connection, but the ability to load and run Interactive TV, caption, subtitle or script jobs from a network server will not be available.

The HDE-3000 networking is configured at the factory as follows:

Client: Microsoft Network Client
Protocol: TCP/IP
IP address: Automatically obtain IP address via DHCP
Computer Name: HDE3000-xxxx (where xxxx is the serial number of the HDE-3000)
Workgroup Name: WORKGROUP

For many customers this configuration is acceptable and no adjustments to the HDE-3000 network configuration are necessary. If your HDE-3000 network configuration requires modification then perform the following procedure:

1. Connect a VGA monitor, keyboard, and mouse (a mouse is not necessary but recommended) to the HDE-3000. Note that if the unit was booted without a mouse connected then it may be necessary to re-boot the unit with the mouse connected to get the mouse to function.

2. The HDE-3000 displays several status items on the VGA monitor via an On-Screen Display Application. Hold down the ALT key and press TAB to minimize the display application and reveal the Windows desktop. You can switch back to the display application at any time by clicking the “HDE3000 Remote” icon in the task bar.

3. Select the Start Menu, then Settings, then Control Panel. Then double click the Network icon.

4. You may now change the computer name, workgroup name, or TCP/IP protocol properties as required for your network.

3.2 Network Administration

The following accounts are set up on an HDE-3000 when it is configured at the factory: **Administrator account: login = Administrator, password = Administrator Operator account: login = Operator, password = blank (no password)**

For many customers these accounts are acceptable and no adjustments are necessary. If these accounts need to be modified or new accounts need to be added then refer to the following procedures.

3.3 Changing the Administrator account password

Extreme care must be observed when changing the Administrator account password. If you change the Administrator password and forget what you changed it to then the operating system will have to be reinstalled at the factory.

The following procedure must be followed exactly to change the Administrator password.

1. Connect a VGA monitor, keyboard, and mouse (a mouse is not necessary but recommended) to the HDE-3000. Note that if the unit was booted without a mouse connected then it may be necessary to re-boot the unit with the mouse connected to get the mouse to function.

2. The HDE-3000 displays several status items on the VGA monitor via an On-Screen Display Application. Hold down the ALT key and press TAB to minimize the display application and reveal the Windows desktop. You can switch back to the display application at any time by clicking the "HDE3000 Remote" icon in the task bar.

3. There are two ways to change the Administrator password: with the Windows User Manager utility (Start Menu – Programs - Administrative Tools - User Manager) or via the Windows NT Security Dialog (press Cntl-Alt-Del then select Change Password). Use these methods to change the Administrator password.

4. Now you must change the password for the Auto-Logon utility. Select the Start Menu and then Run. Enter the following path into the "Open" box: c:\winnt\system32\Autolog.exe, and then click "OK". "Set Auto Logon" must be selected, and then type the new Administrator password into the "password" box and click "OK".

IMPORTANT! Do not add any clients or protocols to the HDE-3000 network configuration. Doing so will require the re-application of the service pack which cannot be done in the field, so the operating system will have to be reinstalled at the factory.

IMPORTANT! The standard HDE-3000 configuration does not include the necessary components to log on to a Windows Domain. If you need to log your HDE-3000 on to a Windows domain, please contact LINK technical support for assistance.

3.4 Adding User Accounts

The following user account is set up on an HDE-3000 when it is configured at the factory.

Operator account: login = Operator, password = blank (no password)

For most customers this is adequate and no other user accounts are necessary. If it is necessary to add additional accounts to the HDE-3000, they can be added using the Windows User Manager utility (Start Menu – Programs - Administrative Tools - User Manager) exactly the same as adding accounts on a "normal" Windows XP workstation. Refer to the Windows XP documentation and help.

3.5 Configuring the Jobs Folder on a Network Server

The HDE-3000, once properly configured, can load caption, subtitle and script jobs from a shared folder on a network server. This eliminates the need to use floppies or USB flash drives to load jobs onto the HDE-3000, and it is required for very large jobs that will not fit on a floppy.

How to configure

First you must create a shared folder on a PC on your network to contain your HDE-3000 job files. The shared resource must be a shared folder, not a shared drive. After you create the shared folder, copy at least one job file into the folder. Once the shared folder has been created, you will need the following information to configure the HDE-3000:

1. The computer name of the PC where the shared folder resides.
2. The shared folder name.
3. The login and password required to access the shared folder on the PC.

The "HDE-3000 Remote" utility program is used to configure the jobs folder for an HDE-3000. Note that HDE-3000 Remote can be run locally (on the HDE-3000) or it can be run remotely (on another Windows PC on the network). Since the HDE-3000 Remote program can be executed on any Windows machine, and it can connect to any HDE-3000 on your network, you must specify the particular HDE-3000 that you want to configure when you execute the HDE-3000 Remote program. The following procedure describe how to configure the jobs folder on an HDE-3000.

If you want to run HDE-3000 Remote on a Windows PC on the network:

1. Execute the HDE-3000 Remote program on the Windows PC.
2. Proceed to step 4 below.

If you want to run the HDE-3000 Remote program on the HDE-3000:

1. Connect a VGA monitor, keyboard, and mouse (mouse not necessary but recommended) to the HDE-3000. Note that if the unit was booted without a mouse connected then it may be necessary to re-boot the unit with the mouse connected to get the mouse to function.
2. The HDE-3000 displays several status items on the VGA monitor via an On-Screen Display Application. Hold down the ALT key and press TAB to minimize the display application and reveal the Windows desktop. You can switch back to the display application at any time by clicking the "On-Screen Display" icon in the task bar.
3. Double click the HDE-3000 Remote icon on the desktop.

4. The first time you run HDE-3000 Remote it will ask for the host name (the computer name) of the HDE-3000 that you want to access. You can enter the computer name of the HDE-3000 (when shipped from the factory the computer name is HDE3000-xxxx where xxxx is the serial number of the HDE-3000), the IP address of the HDE-3000, or the reserved word "localhost" (this only works when you run HDE-3000 Remote on the HDE-3000). If you make a mistake entering the host name the program will not be able to connect to the HDE-3000, so select File – Close then File – New to try again. When you successfully connect to an HDE-3000, the LINK HDE-3000 on-screen menu will be displayed in the main window.

5. IMPORTANT! Verify that you are connected to the HDE-3000 that you think you are connected to by selecting the "Window" menu and inspecting the computer name with a check next to it at the bottom of the menu. The computer name with a check next to it is the name of the HDE-3000 that you are connected to.

6. Select the "Tools" menu then select "Config Server".

7. In the "Server" box, enter the following: \\ServerName\ShareName. The "ServerName" is the computer name of the PC where the shared folder is located, and the "ShareName" is the name of the shared folder. For example, if the computer name of the PC where the shared folder is located is "Production Server" and the shared folder name is "Jobs" then you would enter \\Production Server\Jobs. Note: If you click the little "globe" icon to the right of the "Server" box, the HDE-3000 will search the network for shared folders that contain jobs (caution: this can take several minutes on large networks).

8. In the "Connect As" box, enter the login used to access the shared folder, and in the "Password" box enter the password for this login. Click "OK".

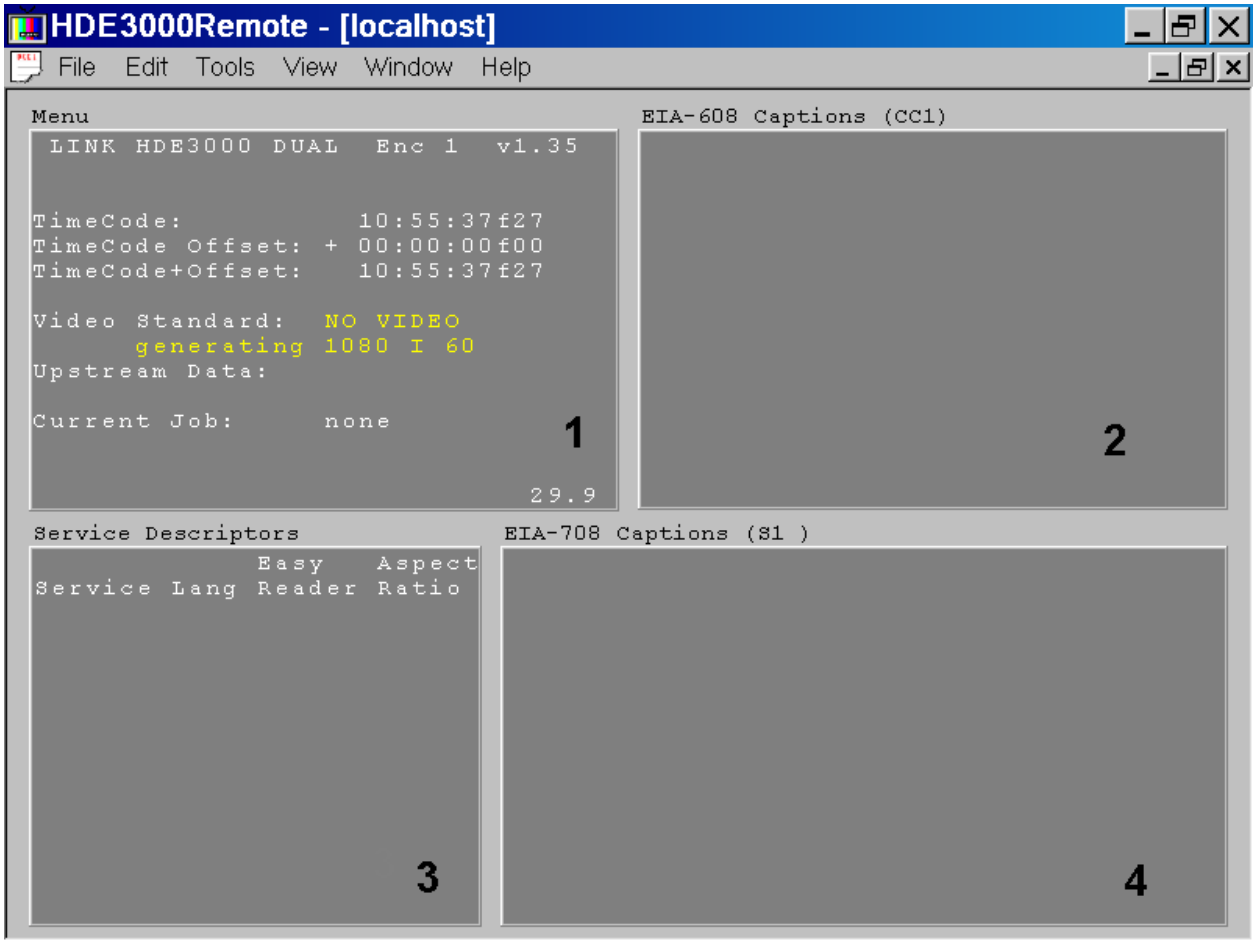
9. Test the configuration by executing the "load and run job from server" menu. Press the ENTER key (on your keyboard or on the front panel of the HDE-3000). Use the up/down arrow keys to select "load and run job from server" and press the ENTER key. If the configuration information was entered correctly then a list of the jobs contained in the shared folder should be displayed.

   Note: HDE3000 Remote — Config Server only enters & stores server, folder, and logon info, i.e. it does not attempt to connect at this time. If one or more entries are wrong, or if some other problem prevents HDE-3000 from connecting to the server, you will not know until you try to "Load job from Server" in the HDE-3000 main menu.

4. HDE3000Remote Window

4.1 Remote Window Screens

Once the 3000 is powered up you will get a window that looks like the one below. This is the same window that you would use to control the 3000 remotely.



1) This is the Status screen or the setup menus. The Status screen is explained on the following page. Pressing enter on the front panel or keyboard will bring up the setup menus. This will also turn on the front panel Setup LED, the setup menus are explained in the following section.

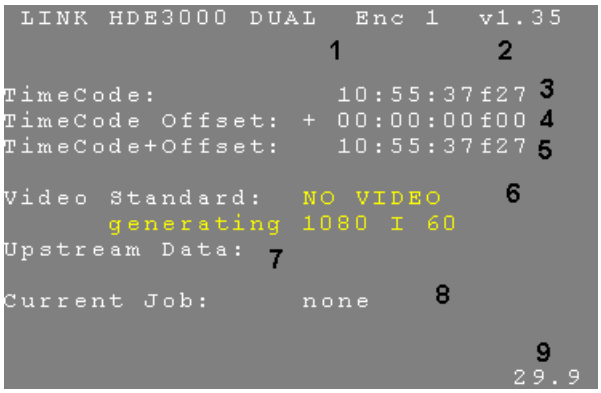
2) This is the EIA - 608 captions screen. This screen will show captions in there location relative to a 4:3 screen in SD video.

3) This is the service descriptor screen. This screen shows the EIA - 608 and 708 descriptors that are encoded into the HD SDI stream.

4) This is the EIA - 708 captions screen. This screen will show captions in there location relative to a 16:9 screen in HD video.

Note: Screens 2 - 4 will display what is being encoded when the front panel Encode LED is on. When the Front panel Encode LED is off, screens 2 - 4 will display what is being decoded from the input video.

4.2 Status Screen



1) This shows the currently selected encoder either Enc 1 or Enc 2. A dual unit will act as if it is two encoders built in one unit. Nothing will show up here if the unit is a standard single unit.

2) This shows the current firmware version that the unit is running.

3) This shows the current time code sent to the encoder card.

4) This shows the time code offset that has been set for the encoder card.

5) This shows the new time code which is time code sent to the encoder card ± time code offset.

6) This shows the format of the video input to the encoder card. If no input is detected then it will show the format of the black burst that it is generating.

7) This shows the line or field location of the captioning data from the video input of that encoder card.

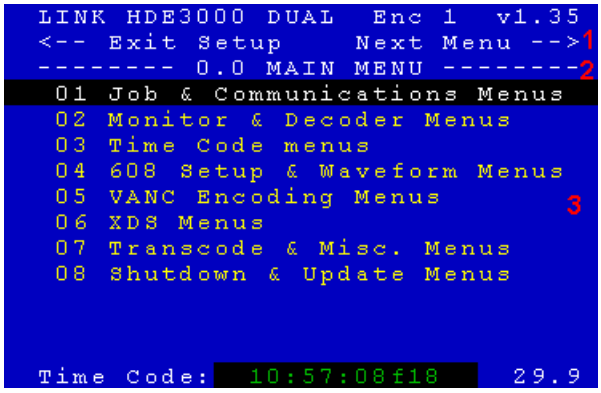
8) This shows the job that is running for that encoder card.

9) This shows the current frame rate of the video of that encoder card.

5. Setup Menus

5.0.0 Main Menu

The HDE - 3000 setup uses a menu system with a main menu that allows you to jump to a series of submenus. Here is the main menu that shows up the first time you press enter on the front panel or keyboard.



1) Menu Navigation, in this case, the left front panel button (left on the keyboard) would exit the setup menus and return to the status screen or the right front panel button (right on the keyboard) would go to the next menu.

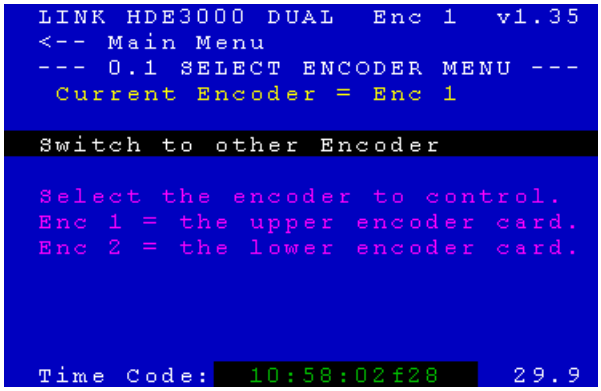
2) Menu Title this is self explanatory.

3) Menu selection or change, use the front panel up and down buttons (up and down on the keyboard) with the front panel enter button (enter on the keyboard) will change or make a selection.

Basically this is how all the setup menus work. The submenus are all numbered to correspond with the list in the above menu selection.

5.0.1 Select Encoder Menu

This menu allows you to switch to the other encoder card. Only one encoder card can be displayed at one time, however, the other one will still function even though it is not selected. This menu will not show up if the unit is a standard single encoder card unit.



Example Dual Card Applications

- Use one card to encode and the other to monitor. Just turn on the open caption decoder for one card, and use the other card normally as if the unit were a single card unit.
- Encode two SDI streams simultaneously or independently.
- Re-encode captions after they are lost in a SDI stream such as a “Video Squeezer” or a frame rate converter.

5.1.1 Jobs Menu

HDE-3000 users typically deal with “jobs”, so the HDE-3000’s menu system is designed to handle jobs. A job may be a closed caption encoding session, it may be a subtitle mastering session, or it may be a graphics insertion session. Jobs are more natural for post production users than broadcast users. In post production, the HDE-3000 is used exclusively on a job by job basis. For example, in one day, a tape duplicator may encode closed captions for two movies, and create subtitles for a third. Each of these activities is considered a separate *job*. Broadcasters, on the other hand, may use the HDE-3000 for real-time closed caption encoding only. In that case, they may not have a “job” or they may only have one “job” configured, and it may be named “Live Closed Captioning”.

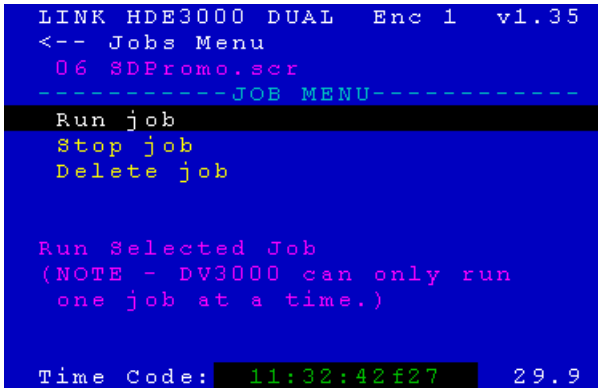
The first three are commands to load and run a job from a certain locations. Other jobs that appear on the jobs menu are loaded by the user or they are the default test jobs that came with the unit. When load and run job is selected the 3000 displays the jobs at that location. Only script, caption, subtitle, and graphics files are copied; all other files are ignored. Once you select a job from that location the 3000 will automatically load and run that job.

The HDE-3000 can only run one job at a time per encoder card. So you must stop one job before you run another job. The HDE-3000 can only see up to 50 jobs at once, so you should limit the number of jobs in a folder to 50, otherwise you will not be able to see all of the jobs.

The HDE-3000 allows you to change certain parameters associated with closed captioning, such as waveform amplitude and time code offset. When a caption job is ran as described above, the menu settings are in effect. A user may create a script file that changes some of the settings, and then executes the caption job. In that case, the script file settings are used.

Job Menu

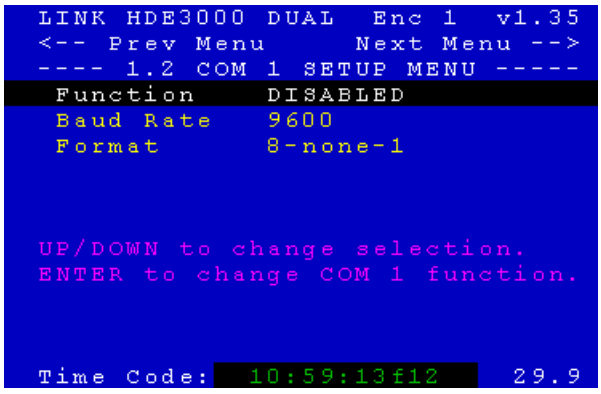
The job menu allows you to work with a particular job. You can run the job, cancel the job (if it is already running), or delete the job. Each job resides in its own subdirectory under *DV3000\jobs* that has the same name as the main job file. When you delete a job from the hard drive, all of the files contained in the job's subdirectory are erased, and the subdirectory is removed.



Important: The jobs menu will only display 47 jobs at once, so when you are done with a job you should delete it thru the job menu. Never manually delete a job from the HDE-3000's hard drive, this will corrupt the program and the hard drive will have to be re-imaged, only delete jobs thru this menu.

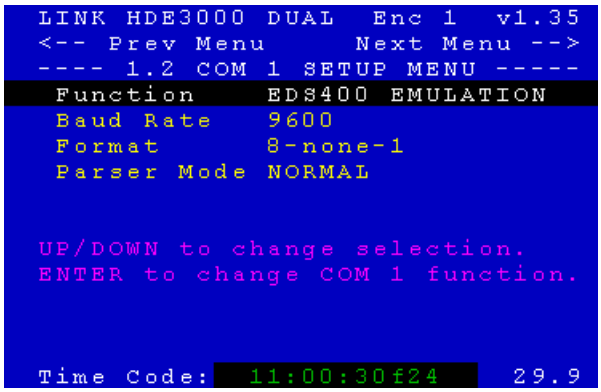
5.1.2 Com 1 Setup Menu

This menu lets you set the HDE-3000 to receive or send closed caption data via its RS-232 serial interface, com port 1. To support existing software, HDE-3000 provides an EDS400 "emulation" mode for caption encoding via the HDE-3000 serial port(s). Closed caption data can be sent to or from Com port1 and Com port 2 simultaneously or independently.



EDS400 Emulation

This enables the emulation of the commands and functionality of the EDS400. The EDS400 is able to merge local caption data with upstream data, as well as multiplex locally inserted XDS data with upstream data. You can read time code in EDS400 emulation mode by way of the serial port.



You can set the baud rate to 1200, 9600, 19.2K, 38.4K, 57.6K, and 115.2K bits per second on this menu. You can set the port parameters to 8-none-1 (Sets the Com 1 serial port to 8 bits, no parity, 1 stop bit) or 7-odd-1 (Sets the Com 1 serial port to 7 bits, odd parity, 1 stop bit) on this menu. Please consult your applications software manual or your caption provider for the preferred settings.

The parser mode parameter is used to tell the HDE-3000 how to interpret the data being received on its serial port. There are five possible settings for this parameter:

1. In “NORMAL” mode, the HDE-3000 expects “normal” caption encoder commands (also known as “control-A” commands) as transmitted by typical caption authoring and encoding software.

2. In “BRIDGE ULT F1” mode, the HDE-3000 expects raw EIA-608 field one data, and it encodes all of this data verbatim, directly into EIA-608 field one.

3. In “BRIDGE ULT F2” mode, the HDE-3000 expects raw EIA-608 field two data, and it encodes all of this data verbatim, directly into EIA-608 field two.

4. In “BRIDGE ULT F1+F2” mode, the HDE-3000 expects raw EIA-608 data for field one and field two, and it encodes all of this data verbatim, directly into EIA-608 field one and field two. To distinguish the field one and field two data, the HDE-3000 expects the data to be formatted as follows. First a “sync byte” (hex 0x80, decimal 128), then two bytes of EIA-608 field one data, then two bytes of EIA-608 field two data. Note that for this mode to work properly, the format must be set to “8-none-1”

5. In “BRIDGE EVERTZ” mode, the HDE-3000 expects raw EIA-608 for field one and field two, and it encodes al of this data verbatim, directly into line EIA-608 field one and field two. To distinguish the field one and field two data, the HDE-3000 expects the data to be formatted as follows. For all field one data, the most significant bit (bit 7) of each data byte is zero or “cleared”, and for field two the bit is one or “set”. In other words, byte values from hex 0x00 to 0x7F (decimal 0 to 127) represent field one data bytes, and byte values from hex 0x80 to 0xFF (decimal 128 to 255) represent field two data bytes. The HDE-3000 clears the most significant bit in the field two data before encoding the data. Note that for this mode to work properly, the format must be set to “8-none-1”.

Example 1: Bridging with two HDE-3000s

In this example, it is desired to bridge the field one CC1 captions around a piece of equipment that doesn’t pass EIA-608 (hereafter referred to as just “the box”). The video being fed to the box is also fed to HDE-3000 #1 so that this injector can read the EIA-608 data from the video and pass the data out its serial port. The video output from the box is passed through HDE-3000 #2 so that this injector can encode the EIA-608 data back into the video.

To connect the com port from one HDE-3000 to the com port of another HDE-3000, a standard 15 pin female to female “null modem” serial cable is required.

HDE-3000 #1 needs to be configured for “com port redirection” from field one. In the com port setup menu, set the function to “redirect data”. For this example, the baud rate will be set to 9600 and the format will be set to “8-none-1”. Then set the “source” parameter to “F 1”.

HDE-3000 #2 needs to be configured to encode the raw EIA-608 field one data. In the com port setup menu, set the function to “EDS400 Emulation”, the baud rate to 9600, the format to “8-none-1”, and the parser mode to “BRIDGE ULT F1”.

Example 2: Bridging from an Evertz decoder to an HDE-3000

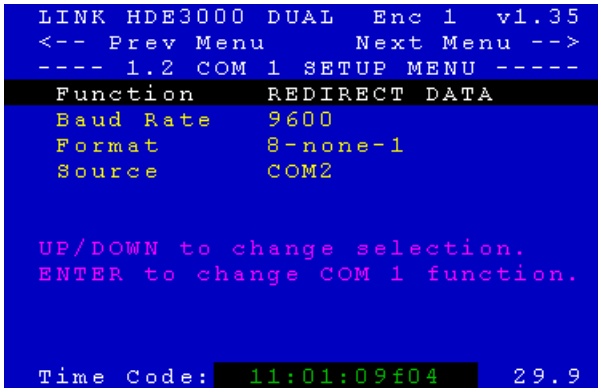
In this example, it is desired to bridge all of the EIA-608 data (field one and field two) around a piece of equipment that doesn’t pass EIA-608 (hereafter referred to as just “the box”). The video being fed to the box is also fed to an Evertz decoder so that it can read the EIA-608 data from the video and pass the data out is serial port. The video output from the box is passed through an HDE-3000 so that it can encode the line EIA608 data back into the video.

Refer to the manuals for the Evertz decoder to determine how to configure it for this function, and to determine the serial cable configuration required. Note that a baud rate of 9600 or higher is recommended and the format must be 8-none-1.

The HDE-3000 needs to be configured to encode the raw EIA-608 field one and field two data transmitted by the Evertz decoder. In the com port setup menu, set the function to “EDS400 Emulation”, the baud rate to match the Evertz decoder, the format to “8-none-1”, and the parser mode to “BRIDGE EVERTZ”.

Redirect Data

This function configures com port 1 for data redirection. Note that when the HDE-3000 performs com port redirection, the selected source of data is redirected to the selected com port without disturbing any of the normal operations of the HDE-3000. The data being redirected continues to flow through its normal path in the HDE-3000 in addition to being transmitted out the com port.



The Source parameter is used to tell the HDE-3000 where to get the data to be sent out its serial port. These are the possible settings for this parameter:

1. COM: This setting causes everything received by the other com port to be redirected to this com port. This function can be used to “daisy chain” two encoders together to simultaneously encode two separate video feeds.

2. Upstream F1: This setting causes all upstream field 1 caption data to be redirected to this com port. Note that the upstream data is the data already encoded into the video being received by the HDE3000. It is not the “downstream” data that has been encoded into the video by the HDE-3000. The HDE-3000 will redirect all field 1 caption data to this serial port. There will be two bytes transmitted for each frame of video (59.94 bytes per second).

3. Upstream F2: Exactly the same as the F1 setting above except that the upstream caption data from field 2 will be redirected to this com port.

4. Upstream F1+F2: This setting will cause all upstream caption data from both fields to be redirected to this com port. To differentiate the field 1 data from the field 2 data, the HDE-3000 will insert a frame sync character (0x80, 128 decimal) just before the field 1 data, so there will be five bytes of data transmitted for each frame of video: a frame synch char followed by two bytes of field 1 data then two bytes of field 2 data (149.85 bytes per second). Note that when this source is selected for this comport, the baud rate of this com port must be set higher than 1200 baud (120 bytes per second) to avoid overrunning the serial transmit buffer in the HDE-3000, and the format must be set to “8-none-1” to properly transmit the frame sync characters.

5. Upstream TC+F1+F2: This does the same as # 4, except time code is added. Three “marker characters” are used to identify the data being transmitted: 90h (144d), A0h (160d), and B0h (176d). When the time code changes, the following is transmitted: 90 hhmmssff (where hhmmssff is an ASCII character string representing the time code value). When field 1 caption data is decoded, the following is transmitted: A0 bb (where bb is two bytes of caption data, and each byte can be 00h to 7Fh). When field 2 caption data is decoded, the following is transmitted: B0 bb (where bb is two bytes of caption data, and each byte can be 00h to 7Fh). Examples output (hex):

   90 30 31 30 30 30 30 30 30 = 01:00:00:00
   (No caption data transmitted, so both fields were “null”)
   90 30 31 30 30 30 30 30 31 = 01:00:00:01
   A0 14 20 = field 1 data: 14 20 (RDC CC1)
   B0 15 26 = field 2 data: 15 26 (RU3 CC3)
   90 30 31 30 30 30 30 30 32 = 01:00:00:02
   A0 14 70 = field 1 data: 14 70 (PAC)
   B0 14 70 = field 2 data: 14 70 (PAC)

6. Encoded F1: Same as # 2, except that the caption data comes from outgoing video instead of incoming video.

7. Encoded F2: Same as # 3, except that the caption data comes from outgoing video instead of incoming video.

8. Encoded F1+F2: Same as # 4 except that the caption data comes from outgoing video instead of incoming video.

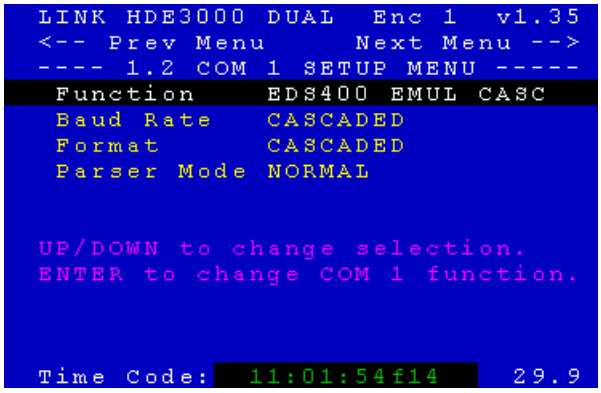
9. Receive: This selection directs the HDE3000 to receive data on this com port and pass the received data to the function running on the other com port. This function is only required to support running “source = Time Taylor” on the other com port.

10. Time Taylor: This selection directs the HDE3000 to receive commands from the Time Taylor. When this source is selected, this function takes control of the encoder, buffers the caption data received on the other com port (the other com port must be set to “source = receive”), and encodes the buffered caption data at the proper time codes.

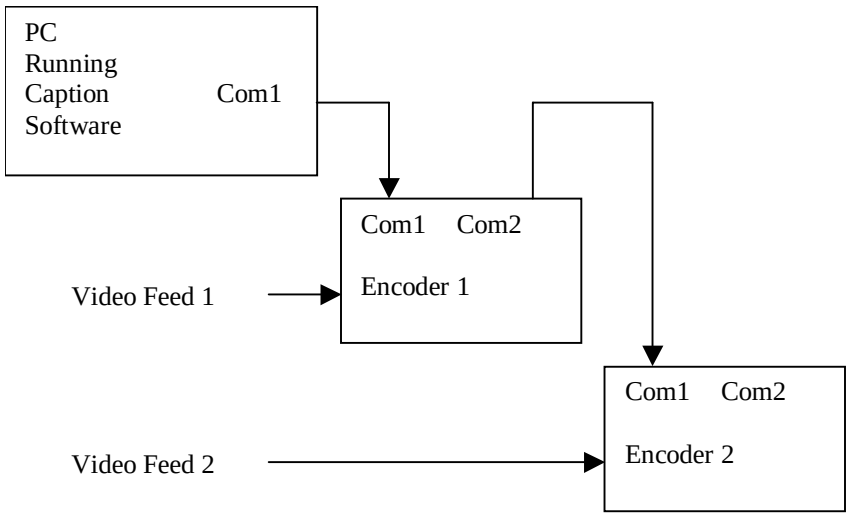
For more information on setting up the HDE-3000 for the Time Taylor see section 7 “Time Taylor” of this manual.

EDS400 Emulation Cascading

This function allows both encoders in a dual unit to be driven by one com port so that two video feeds can be encoded with the same captions simultaneously. To use this function set one encoder card (ENC 1) to EDS400 emulation and the other encoder card (ENC 2) to EDS400 emulation cascading using the same com port setup menu for both. Now both encoder cards will be set to encode from the same data stream. Of course this function will not be available with a standard single unit.

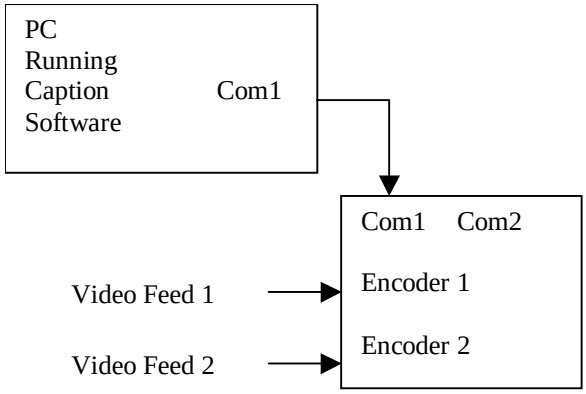


This feature allows both encoders in a dual unit to be driven by one com port so that two video feeds can be encoded with the same captions simultaneously. This is commonly done with two separate encoders as follows:



In this scenario, encoder 1 com 1 is set to “EDS400 Emulation”, encoder 1 com 2 is set to “Redirect Data” with the source set to “com 1”, and encoder 2 com 1 is set to “EDS400 Emulation”. Encoder 1 echoes all the commands it receives from the PC on com 1 out com 2 so that the second encoder receives the same commands.

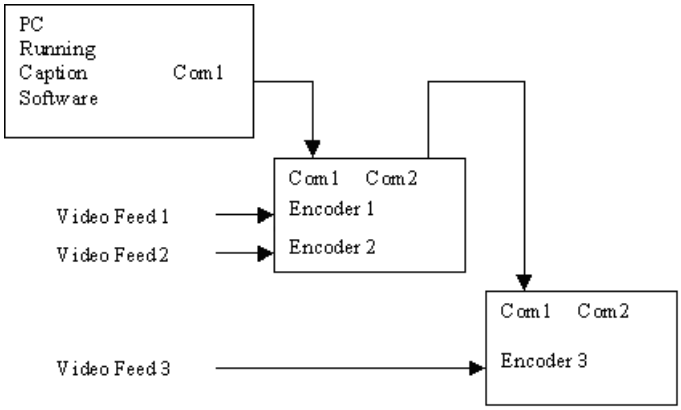
In a dual unit, both encoders are contained in one chassis with only two com ports, so the same scenario using a dual unit is as follows:



The serial connection between the encoders in a dual unit has to be implemented internally. This is done thru the “com setup menu” function called “EDS400 Emul Casc”.

To configure the dual unit, set encoder 1 com1 to “EDS400 Emulation” to receive commands from the PC. Then set encoder 2 com 1 to “EDS400 Emul Casc”. This enables an internal connection between encoder 1 and encoder 2 so that both encoders receive the commands from the PC simultaneously.

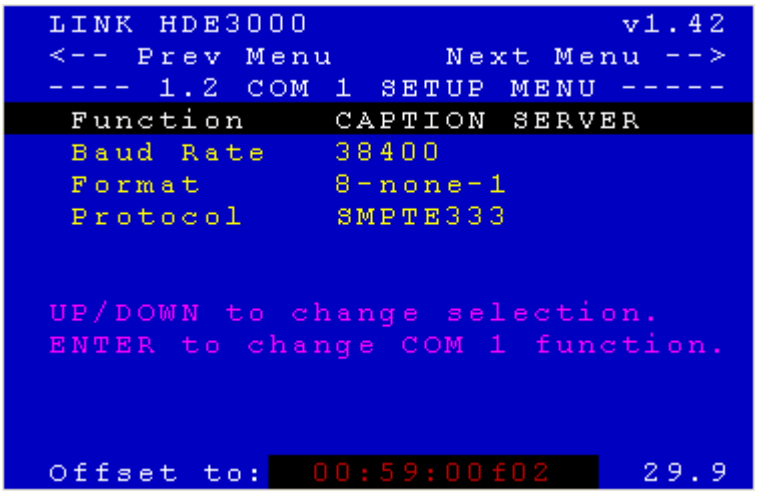
A dual unit can be connected to another encoder, allowing three video streams to be encoded simultaneously when connected as follows:



Set the com ports to cascade as described at the bottom of the previous page. Then set encoder 1 com 2 to redirect data from com 1.

Caption Server

Caption Server is a device that sends caption data to another device like a MPEG emission encoder. The HDE-3000 can be set up to be a caption server using one of the two following protocols: The “Grand Alliance” protocol (SMPTE RP 2007) is a serial communications protocol for transmitting caption data from a “caption server” to an MPEG emission encoder. This protocol is sometimes referred to as “the old 19200 protocol” or “the push protocol”. The “SMPTE333” protocol (SMPTE 333M) is similar to “grand alliance”, but SMPTE333 is more complex. The SMPTE333 protocol is sometimes referred to as “the pull protocol”.



NOTE! IMPORTANT!

The required baud rate and format for **SMPTE333** is **38400 baud** and **8-none-1**. The required baud rate and format for **Grand Alliance** is **19200 baud** and **8-none-1**. You must manually select the correct baud rate and format for the selected protocol.

When using an HDE3000 as a “caption server”, it is necessary to **turn off the open caption decoder**. In the menu “2.2 OPEN CAP DECODER SETUP MENU”, set both items to “OFF”. Failure to turn off the open caption decoder will cause serial communication problems between the HDE3000 and the MPEG emission encoder.

Using an HDE3000 as a “Caption Server”

A typical caption server is a relatively simple device that has only an SD video input and a serial port. SD video containing line 21 EIA608 captions is fed to the caption server, and it up-converts (or “transcodes”) the EIA608 caption to EIA708 and transmits the EIA608 and EIA708 captions to an MPEG encoder via serial (SMPTE333).

The HDE3000 is a full featured HD/SD caption encoder, so it has many more video input options, caption decoding/encoding options, and “transcoding” options. The following sections describe how to configure the HDE3000 for several different scenarios. The caption data that the HDE3000 transmits to the MPEG encoder is the exact same caption data that the HDE3000 displays on the VGA monitor.

Scenario 1: HD video input with VANC captions

This is the simplest scenario for the HDE3000. Just make sure the HDE3000 is not encoding (the “encoding” LED on the front panel is not lit), and it will decode the existing EIA608 and EIA708 captions from the input video and transmit them to the MPEG Encoder.

Scenario 2: SD video input with VANC captions

The HDE3000 must be configured to decode the VANC captions from the SD input video (as opposed to decoding the line 21 captions from the SD input video) using menu “2.4 SD DECODER MODE”. Then just make sure the HDE3000 is not encoding (the “encoding” LED on the front panel is not lit), and it will decode the existing EIA608 and EIA708 captions from the input video and transmit them to the MPEG Encoder.

Scenario 3: SD video input with Line 21 captions and no VANC captions

The HDE3000 must be configured to decode the line 21 captions from the SD input video (as opposed to decoding the VANC captions from the SD input video) using menu “2.4 SD DECODER MODE”.

If the HDE3000 is not encoding, (the “encoding” LED on the front panel is not lit), then the HDE3000 will only decode the EIA608 caption from the SD input video and transmit them to the MPEG encoder.

To up-convert (or “transcode”) the EIA608 captions to EIA708 and transmit both EIA608 and EIA708 captions to the MPEG encoder:

1. In the menu “4.1 EIA-608 SETUP”, field 1 and/or field 2 must be set to “REENCODE”. This will make the HDE3000 encode (and light the “encoding” LED on the front panel).

2. In the menu “5.2 NTSC VANC LINES SETUP”, the “NTSC VANC Encoder” must be set to “ENABLED”. This will turn on the transcoders so that the EIA608 captions will be up-converted to EIA708.

Additionally, the “TRANSCODER SETUP” menus (7.1 and 7.2) must be configured to transcode the desired EIA608 services to the desired EIA708 services.

Once the HDE3000 is configured properly as described above, it will read the EIA608 line 21 captions from the input video, up-convert them to EIA708, and transmit the EIA608 and EIA708 captions to the MPEG encoder.

Scenario 4: Caption server while encoding via Caption File or Serial/Modem

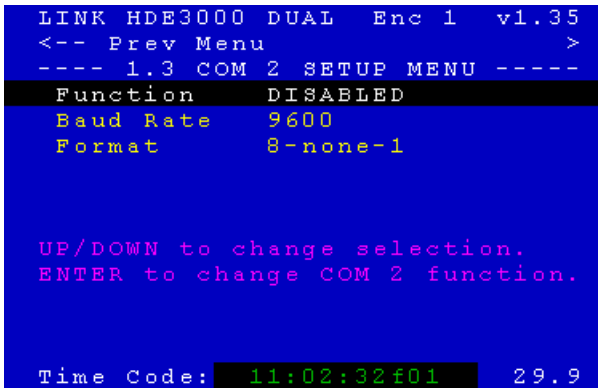
Make sure the “Transcoder” menus 7.1 and 7.2 are set up they way you want then to be. Usually Transcoder 1 set to CC1 and Trancoder 2 set to CC2 or CC3. These two menus will transcode the 708 service 1 and 708 service 2.

If you are encoding SD video and you want to send 708 captions as well as 608 captions then in the menu “5.2 NTSC VANC LINES SETUP”, the “NTSC VANC Encoder” must be set to “ENABLED”. If the format is PAL then use the PAL menu. This will turn on the transcoders so that the EIA608 captions will be up-converted to EIA708.

Note that if you do not have to apply video because when no input video is connected to the HDE3000 then it will generate its own video internally. Use the menu “7.4 GENERATOR STANDARD” to select the type of video to generate (SD/HD, etc.).

5.1.3 Com 2 Setup Menu

This menu lets you set the HDE-3000 to receive or send closed caption data via its RS-232 serial interface, com port 2. This menu has the same functions as com port 1 setup menu.



Warnings

- The raw data encoding modes take control of the field one and/or the field two data encoders in the HDE-3000, preventing any other function in the HDE-3000 from obtaining control of the field one and/or field two data encoders. To allow other functions (such as the caption file encoder) to operate properly, the raw data encoding functions must be disabled by setting the com port function to “disabled” or the “parser mode” to “normal”. If you attempt to run a caption file, and the raw data encoder has control of the encoder, then the caption file will not encode and you will receive the error “Error 170 Starting Job”.

- The bridging process causes a delay in the captions, and the delay is typically one frame (two fields). Typically there are a few milliseconds of delay caused by decoding equipment that reads the EIA-608 data from the video and transmits the data out a serial port. Then there is another few milliseconds of delay caused by the serialization of the data across the serial cable (dependant on the baud rate). Then there is another few milliseconds of delay in the HDE-3000 in the process of receiving the data and getting it ready to be encoded in the proper field. Typically, the raw data decoded from one frame of video makes it into the HDE-3000 in time to be encoded into the following frame of video.

- If the equipment being bridged causes more than two frames of delay then the video being fed to the EIA-608 decoder must also be delayed to prevent the line 21 captions from being re-encoded too early.

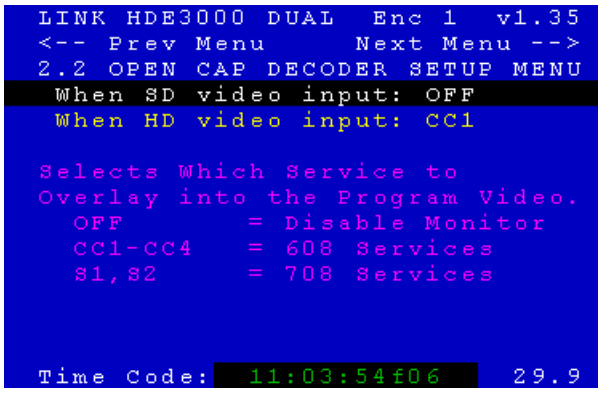
- There are four bytes of EIA-608 data per frame of video (two bytes in field one and two bytes in field two). For NTSC video there are 29.97 frames per second (59.94 fields per second). This equates to a serial baud rate of approximately 1200 baud (approximately 600 baud for field 1 plus 600 baud for field 2). In order to prevent serial port overruns, it is necessary to use a baud rate higher that 600 for one field of data and higher than 1200 for both fields. A baud rate of 9600 or higher is generally recommended for bridging to minimize the delays described above.

5.2.1 CC Monitor Setup Menu

The monitor menu lets you determine which captioning services to monitor from the VGA monitor or remote software, it will not show up in the video. For 608 captions you can choose CC1-CC4 or XDS. For 708 captions you can choose S1-S2.

5.2.2 Open Cap Decoder Setup Menu

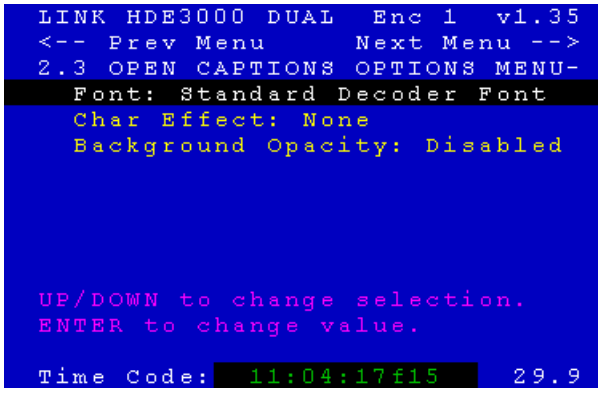
An “open caption decoder” is a device that decodes closed captions and overlays (or “burns”) the caption characters into the video. This feature is used by post houses to create “open caption demo tapes” for their customers to inspect. This menu allows the user to control the open caption decoder for SD and for HD video. When SD video is fed to the HDE-3000, the top setting is used to control the open caption decoder. When HD video is fed to the HDE-3000, the bottom setting is used to control the open caption decoder. For SD video your options are CC1 – CC4 and for HD you options are CC1 – CC4 or S1 – S2.



WARNING! When you are not creating an open caption demo tape, set the open caption decoder to “OFF” to prevent the HDE-3000 from overlaying open captions into your video when you are encoding closed captions.

5.2.3 Open Captions Options Menu

This menu allows you to change the appearance of the rendered captions (caption "burnt" into the video) so that they appear as subtitles instead of captions. You may choose a different font other than the standard decoder font, force the background box to be semi-transparent or transparent, and you can enable character outlines. If you are using the open caption decoder to create "open caption demo tapes", you should always configure the settings as follows: Standard Decoder Font, None, and Disabled.



Font: Allows you to choose the font used by the open caption decoder to render the caption text. Currently there are two fonts available: Standard Decoder Font and Courier New. Additional font selections will be added in the future. Currently, the open caption decoder is only compatible with mono-spaced (fixed width) fonts. Support for proportionally spaced (variable width) fonts will be added in the future.

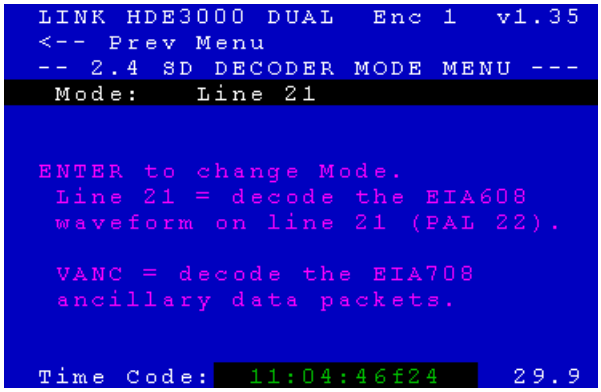
Char Effect: Allows you to enable/disable special character rendering effects. Currently the available settings are: None and Outline. This is necessary when the background opacity is set to 0% (transparent) to allow the characters to be visible when rendered over bright areas of the background video.

Background Opacity: Allows you to make the background boxes transparent, semi-transparent, or opaque. The allowable settings are: Disabled or 0% to 100%. These values will override the background opacity of the caption data. A value of 0% will cause the background box to be transparent. A value of 100% will cause the box to be opaque. Values from 10% to 90% will cause the box to be semi-transparent (from very translucent to almost opaque).

Note that when the background opacity is set very low (0% to 20%), it is highly recommended that you enable the "outline" character effect.

5.2.4 SD Decoder Mode Menu

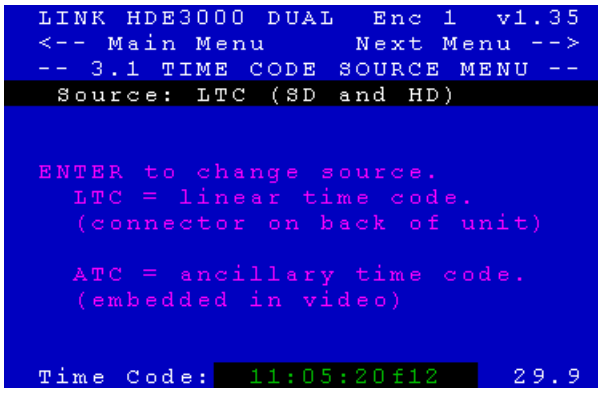
The HDE3000 supports decoding of EIA-608 (line 21) and EIA-708 (VANC (vertical ancillary) captions for SD. The HDE3000 cannot decode SD line 21 and VANC captions at the same time, so this menu allows you to select which captions to decode from the input video. When “Line 21” is selected then the line 21 captions are decoded, and when “VANC” is selected then the VANC captions are decoded.



Important note! The captions decoded by the selected decoder are fed to the VGA caption monitors, the open caption decoder, and the input of the caption encoder module (which performs re-encoding and multiplexing). It is recommended that you always keep the SD decoder set to “Line 21” except for when you need to decode SD VANC captions (for example, to verify that the VANC captions were properly encoded on a tape by playing the tape back through the HDE3000).

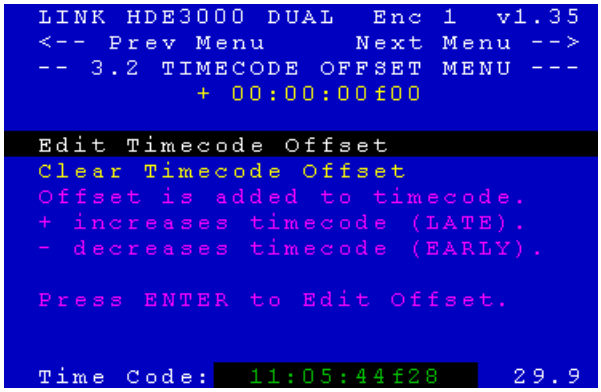
5.3.1 Time Code Source Menu

This menu allows you to choose your time code source as LTC or ATC (ancillary time code) as per SMPTE 12M-2-2008 (DID = 60h, SDID = 60h). NOTE: HD ONLY. The current implementation can only read ATC in HD video. It cannot read ATC in SD video.



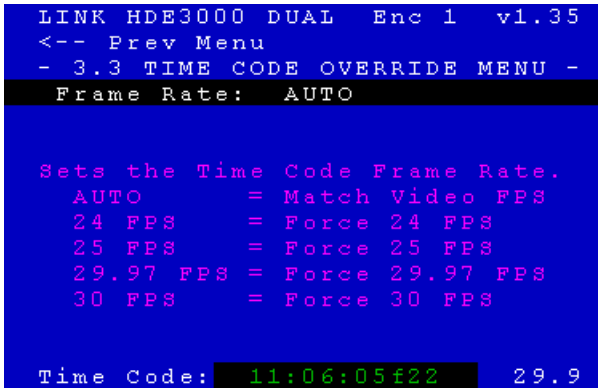
5.3.2 Timecode Offset Menu

HDE-3000 contains an internal time code reader. When an off-line closed caption or subtitle job is ran, captions or subtitles are processed when time code read from the LTC input port or ATC matches time code from the caption or subtitle file. The timing for caption or subtitle files is established from the time code provided to the caption agency. But when a job is run, the time code accompanying the program video may have changed. The time code offset menu lets you adjust time code read by the internal time code reader in increments of +/- 1 frame. The time code offset is added to the time read by the internal LTC reader. The time code displayed in the on-screen menu reflects the sum of incoming time code and the offset.



5.3.3 Time Code Override Menu

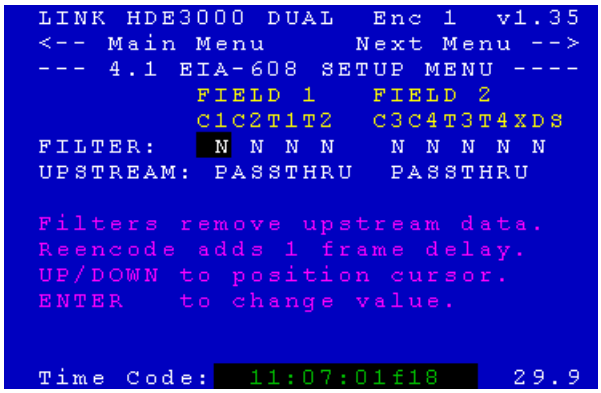
In HD encoding sessions, there is a chance for a time code mismatch which occurs when the frame rate of the time code does not match the frame rate of the video. Typically, time code is always synchronized to the video, but it is possible to “stripe” a tape with time code that is not synchronized to the video. Normally, the HDE-3000 assumes that the time code is synchronized to the video, but the override menu allows the user to specify the frame rate of the time code if it is different than the frame rate of the video.



For example, suppose an HD tape containing a movie in 1080PsF/24 format must be captioned using an authoring system that must use NTSC (29.97) time code. It is possible to stripe the tape with NTSC time code and author the captions to these time codes. For the HDE-3000 to encode these captions properly, the time code override menu must be used to tell the HDE-3000 that the time code is 29.97 FPS instead of 24 FPS.

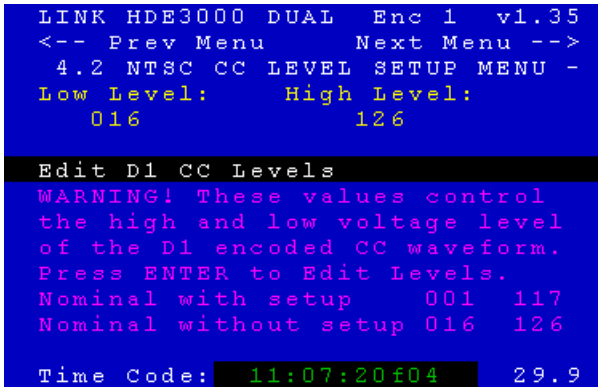
5.4.1 EIA – 608 Setup Menu

This menu allows the user to control encoding, filtering, and multiplexing of EIA-608 captions. Normally this menu is controlled by the caption jobs or the "^A" commands thru the com port.



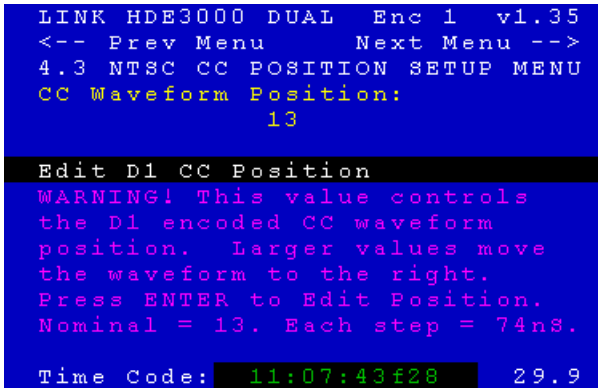
5.4.2 NTSC CC Level Setup Menu

This menu allows the user to change the pedestal and amplitude of the encoded SD NTSC line 21 waveform.



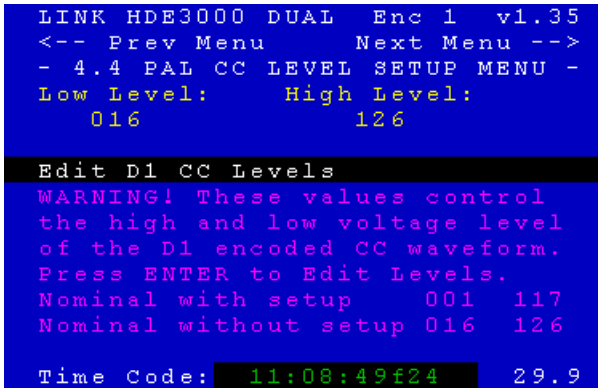
5.4.3 NTSC Position Setup Menu

This menu allows the user to change the position of the encoded SD NTSC line 21 waveform.



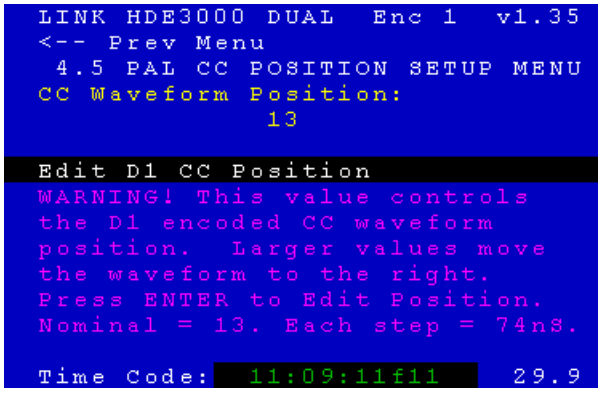
5.4.4 PAL CC Level Setup Menu

This menu allows the user to change the pedestal and amplitude of the encoded SD PAL line 22 waveform.



5.4.5 PAL Position Setup Menu

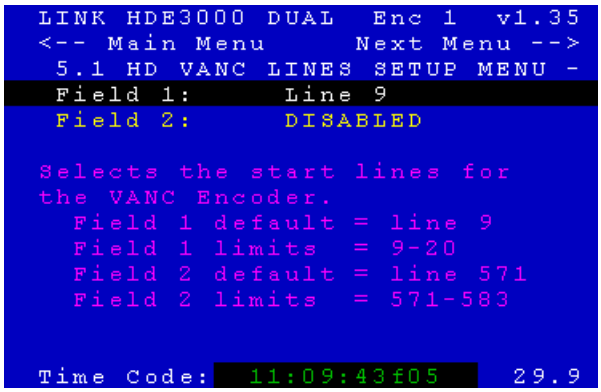
This menu allows the user to change the position of the encoded PAL line 22 waveform.



Note: To properly change the encoded line 21 or 22 waveform levels and positions, one should use a waveform monitor so they can measure the adjustments.

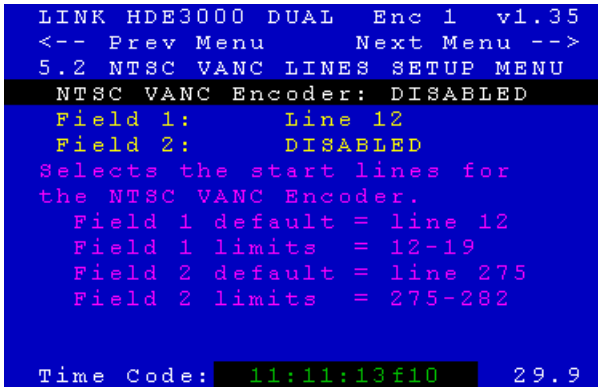
5.5.1 HD VANC Lines Setup Menu

This menu allows you to set the "start lines" of the HD VANC area. Typically this will cause the VANC caption packets to be encoded on the selected lines. But if the selected line is full (already filled up with other VANC data packets) then the VANC caption packets will be encoded on the next line (or the line after that if that line is full, etc.).



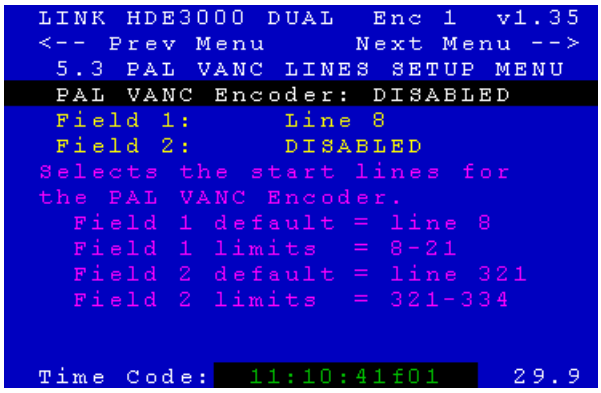
5.5.2 NTSC VANC Lines Setup Menu

The HDE3000 supports encoding of EIA-608(line 21) and EIA-708 (VANC, vertical ancillary) captions for SD NTSC. This menu allows the encoding of VANC captions for SD. Line 21 captions are always encoded in SD, and when enabled, VANC captions are also encoded simultaneously.



5.5.3 PAL VANC Lines Setup Menu

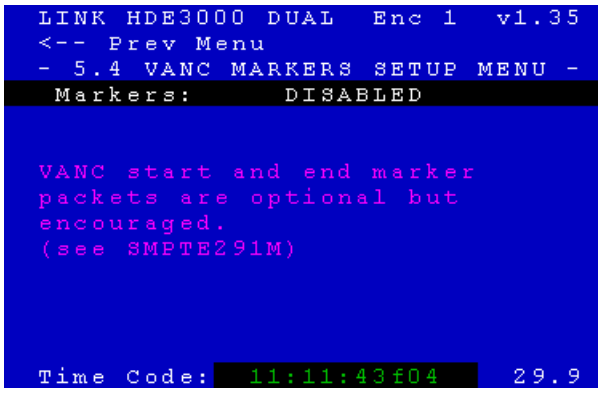
The HDE3000 supports encoding of EIA-608(line 22) and EIA-708 (VANC, vertical ancillary) captions for SD PAL. This menu allows the encoding of VANC captions for SD. Line 22 captions are always encoded in SD, and when enabled, VANC captions are also encoded simultaneously.



Note: Current SMPTE standards say that EIA – 708 VANC captions should only be on field 1 and not on field 2. Link recommends that you keep the VANC field 2 encoding disabled.

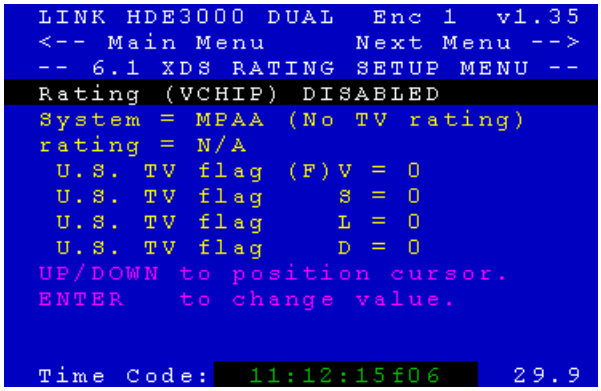
5.5.4 VANC Markers Menu

VANC markers are data packets that may be used to mark the beginning and end of any data service packet encoded in the VANC of HD-SDI video. VANC markers help downstream equipment identify the beginning and end of service packets. SMPTE specification 291 encourages equipment designers to include this feature in new equipment.



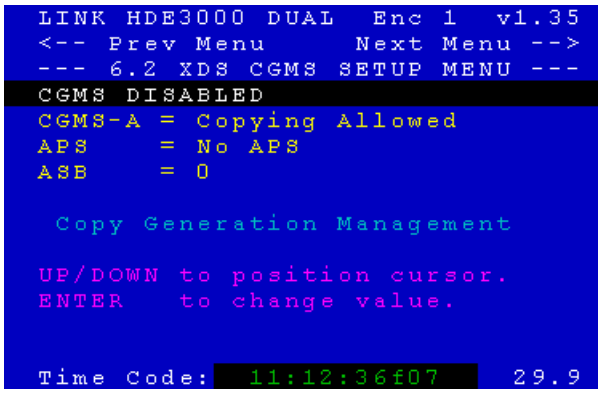
5.6.1 XDS Rating Setup Menu (VCHIP)

This menu allows you to encode VCHIP data as part of the XDS service. VCHIP data is used to set guidelines for the viewing of television programming or movies, whose ratings are determined by the U.S. TV Parental Guidelines rating system. HDE-3000 also supports the MPAA (Motion Picture Association of America) ratings as well as the Canadian English and Canadian French guidelines. When VCHIP mode is enabled, HDE-3000 continuously sends the selected rating at the repetition rate recommended by EIA-608. For more information on VCHIP, please refer to EIA document EIA-744-A or EIA/CEA-608B.



5.6.2 XDS CGMS Setup Menu

This menu allows you to encode CGMS data as part of the XDS service. CGMS (Copy Generation Management System) is described in section 9.5.1.8 of the EIA-608-B specification. The EIA-608-B specification also references “The Digital Video Recording Act” for more information about CGMS.



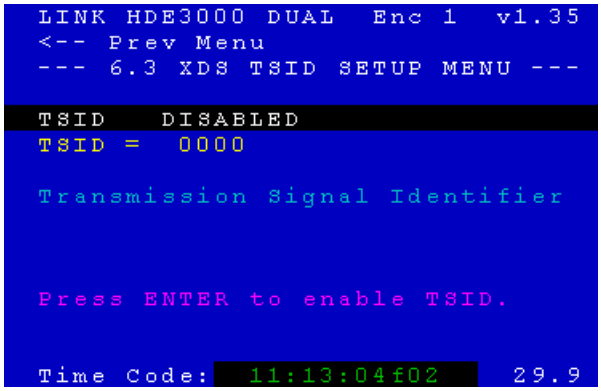
There are three possible settings for the “CGMS-A” (Copy Generation Management System – Analog) parameter as follows: “Copying Allowed”, “One Copy Allowed”, and “No Copying Permitted”.

When the above CGMS-A parameter is set to “No Copying Permitted”, then the “APS” (Analog Protection System) parameter is valid. There are four possible settings for the “APS” parameter as follows; “No APS”, “PSP on, Splt Brst Off”, “PSP on, 2 Ln Splt Brst”, and “PSP on, 4 Ln Splt Brst”. When “APS” is enabled, “PSP” (Pseudo Sync Pulse) is on, and the “Split Burst” can be set to “off”, “2 Line”, or “4 Line”. When the CGMS-A parameter is set to “Copying Allowed” or “One Copy Allowed”, then there is no APS, so the “APS” parameter should be set to “No APS”.

The “ASB” (Analog Source Bit) is specified in EIA-608-B. This bit can be on (“1”) or off (“0”).

5.6.3 XDS TSID Setup Menu

TSID (Transport Stream Identifier) is a service that identifies a transmission with a 32 bit code. The TSID is a unique identifier assigned to the licensee. The HDE-3000 allows you to enter the hex representation of the TSID. Once entered, the HDE-3000 will remember the setting, even when power is cycled to the unit.



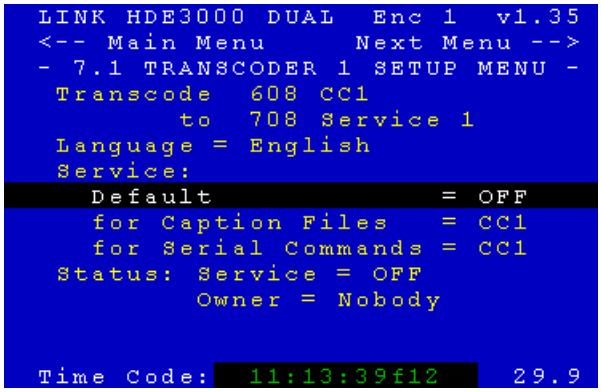
NOTE – to properly encode just XDS packets into HD video, the following menu settings are required.

In the “transcoder 1 setup” menu, the “default” setting must be “off”.
In the “transcoder 2 setup” menu, the “default” setting must be “off”.

Warning: The HDE-3000 will continuously encode XDS packets while these functions are enabled. The user is responsible for determining when to enable/disable XDS encoding and properly setting the XDS parameters.

5.7.1 Transcoder 1 Setup Menu

The transcoder 1 setup menu allows you to define the configuration of the primary language transcoder (transcoder 1: 608 CC1 to 708 service 1). It allows you to define three separate configurations; one for caption file encoding, one for encoding via serial, and another for when neither is being encoded. It also allows you to disable transcoder 1 when necessary.



"Default": This setting defines the configuration of transcoder 1 when not encoding a caption file and not encoding via serial.

"OFF" = the transcoder is disabled and existing 708 service 1 captions are passed through unaltered. This is necessary to allow adding vchip to HD video that has already been captioned.

"CC1" = the transcoder is enabled and it will transcode received 608 CC1 captions to 708 service 1. This allows adding 708 service 1 captions to video that only contains 608 captions.

"for Caption Files": This setting defines the configuration of transcoder 1 when a caption file is being encoded.

"OFF" = the transcoder is disabled and existing 708 service 1 captions are passed through unaltered.

"CC1" = the transcoder is enabled when CC1 captions are being encoded from a caption file. This is the recommended setting for all caption file encoding scenarios.

"for Serial Commands": This setting defines the configuration of transcoder 1 when captions are being encoded via serial.

"OFF" = the transcoder is disabled and existing 708 service 1 captions are passed through unaltered.

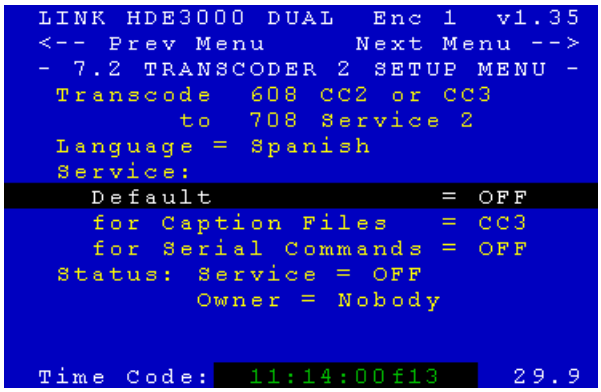
"CC1" = the transcoder is enabled when CC1 captions are being encoded via serial. This is the recommended setting for all serial encoding scenarios.

The "status" section at the bottom of the menu indicates whether or not the transcoder is enabled and which encoding function (caption file encoding or serial encoding) currently controls the transcoder.

NOTE: For situations where caption file encoding and serial encoding are performed simultaneously and both encoding functions are attempting to control a transcoder, the caption file encoder has higher priority.

5.7.2 Transcoder 2 Setup Menu

The transcoder 2 setup menu allows you to define the configuration of the secondary language transcoder (transcoder 2: 608 CC2 or CC3 to 708 service 2). It allows you to define three separate configurations – one for caption file encoding, one for encoding via serial, and another for when neither is being encoded.



"Default": This setting defines the configuration of transcoder 2 when not encoding a caption file and not encoding via serial.
- "OFF" = the transcoder is disabled and existing 708 service 2 captions are passed through unaltered. This is necessary to allow adding vchip to HD video that has already been captioned.
- "CC2" = the transcoder is enabled and it will transcode received 608 CC2 captions to 708 service 2. This allows adding 708 service 2 captions to video that only contains 608 captions.
- "CC3" = the transcoder is enabled and it will transcode received 608 CC3 captions to 708 service 2. This allows adding 708 service 2 captions to video that only contains 608 captions.

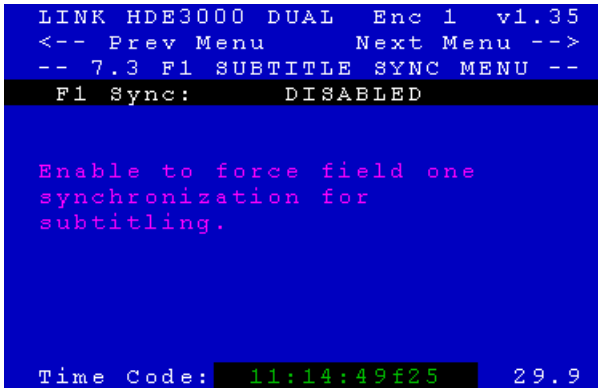
"for Caption Files": This setting defines the configuration of transcoder 2 when a caption file is being encoded.
- "OFF" = the transcoder is disabled and existing 708 service 2 captions are passed through unaltered.
- "CC2" = the transcoder is enabled when CC2 captions are being encoded from a caption file.
- "CC3" = the transcoder is enabled when CC3 captions are being encoded from a caption file.

"for Serial Commands": This setting defines the configuration of transcoder 2 when captions are being encoded via serial.
- "OFF" = the transcoder is disabled and existing 708 service 2 captions are passed through unaltered.
- "CC2" = the transcoder is enabled when CC2 captions are being encoded via serial.
- "CC3" = the transcoder is enabled when CC3 captions are being encoded via serial.

The "status" section at the bottom of the menu indicates whether or not the transcoder is enabled and which encoding function (caption file encoding or serial encoding) currently controls the transcoder.

5.7.3 F1 Subtitle Sync Menu

This menu allows the user to enable/disable the new field 1 synchronization feature. When enabled, the HDE3000 detects when a subtitling event is about to occur during field 2 and delays the event until field 1. The reason for this feature is to prevent any subtitle events from occurring during field 2 because this can cause problems for down converters with the progressive segmented frame video formats.



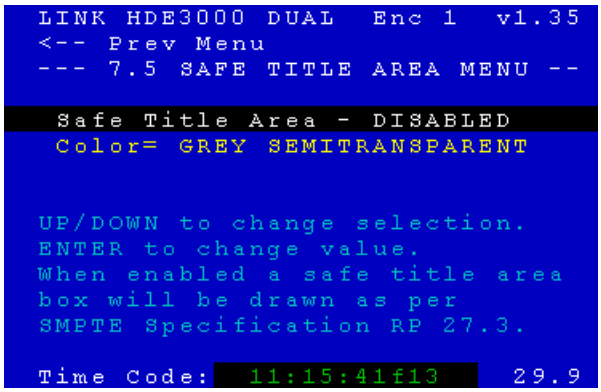
5.7.4 Generator Standard Menu

The HDE-3000 contains an internal video generator that is automatically enabled whenever there is no input video connected to the unit. The internal generator defaults to generating black 1080i 60 (“black burst”). The HDE-3000 “status display” (in the “menu” area of the VGA display when the menus are not being displayed) reports “No Video” in yellow to indicate when there is no input video connected and the internal generator is enabled.

This menu allows you to select a different default video standard to generate when there is no input video connected to the unit. The internal generator can generate all of the video standards that the HDE-3000 supports: 1080i, 1080PsF, 720P, NTSC, etc. Also, the HDE-3000 “status display” indicates the current standard being generated when the generator is enabled (in yellow, just below the yellow “No Video” indicator).

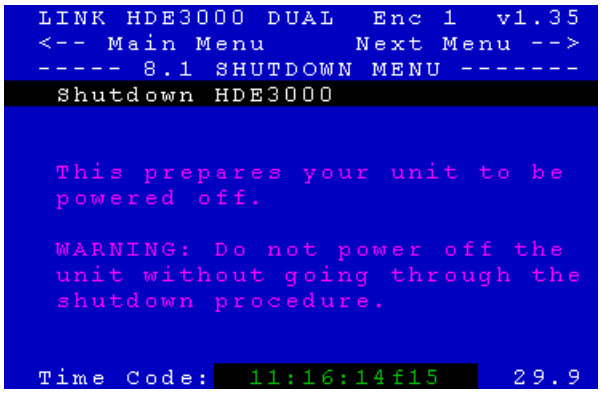
5.7.5 Safe Title Area Menu

This feature displays a safe title area test pattern per SMPTE Recommended Practice RP 27.3. The HDE-3000-generated pattern deviates from the SMPTE pattern in that it shows square corners as well as round corners. The pattern will "paint" after each subtitle when used with .usf subtitle scripts. This allows you to easily check each subtitle in a show for conformance to RP 27.3. You can set the safe title area pattern to several colors and transparencies by cycling through the color menu.



5.8.1 Shutdown Menu

The HDE-3000 runs under the Windows XP Embedded operating system and as such, it is highly advisable to shut the unit down in an orderly fashion by using this menu. This will ensure that all files and data are saved properly.



5.8.2 Software Upgrade Menu

The HDE-3000 allows you to perform firmware upgrades via the floppy drive or USB flash drive located on the front panel. The upgrade procedure runs automatically, you only have to insert the disk or USB flash drive containing the upgraded software and press ENTER while at this menu.

6. Script, Caption, and Subtitle Files

6.1 Introduction

The HDE-3000 is able to read and encode closed caption files in a number of formats. Likewise, it can read subtitle files and associated “bit mapped” image files to produce open subtitles. When reading a caption or subtitle file, the HDE-3000 processes each caption or subtitle single-mindedly until the file ends. Although this mode of operation is fine for simple captioning and subtitling jobs, the full potential of HDE-3000 is realized using *script* files.

6.2 Script Files

HDE-3000 VBI Encoder/Subtitle Inserter may be controlled by command sequences stored in script files. Script files may be loaded from the HDE-3000 floppy drive, USB drive, or local area network port. Scripts may be created and edited using a text editor such as Microsoft Notepad. LINK provides script templates for many different applications. The templates contain default settings for all of the changeable parameters.

HDE-3000 scripts contain sections for setting up closed captioning, teletext, Audio-in-VBI, and the graphics inserter. These sections correspond to HDE-3000 on-screen menus. The body of the script may contain commands to display text and graphics. The script may also contain commands to encode line 21 data such as closed captions and XDS. When a script is loaded, the user can scroll through the menus in order to verify settings. The user can also change settings, although some are awkward using just cursor keys (such as XDS fields with long names). HDE-3000 scripts have a file extension of “.scr”. In section 6.5, you will read about another script file format that is optimized for subtitle applications.

Details of Script Language

A script file is an ASCII text file that contains lines of commands. There are three categories of commands:

1. *Script Control Commands* which control the sequencing of the script files.

2. *Caption Commands* which affect HDE-3000 caption settings or generate closed caption/text/XDS data.

3. *GI Commands* affects graphics inserter settings or generate graphics on screen.

Only one command per line is allowed with a maximum of 132 characters per line. Script commands are case insensitive and leading spaces are allowed. Any text separated by a delimiter following a script command on the same line is considered a comment and is ignored except with the MSG command where the entire line following the command is used as a message.

Numeric command arguments can be entered in decimal or hexadecimal. A $ must prefix a hexadecimal number if used as a numeric command argument.

Valid delimiters - {space} {;} {,} {=} and are denoted by |

6.3 Script Control Commands

Delay|n n = [0..65535]

The Delay command waits for n milliseconds before further script commands will execute.

Msg|string string = [1..70 characters]

The Msf command displays a string in the osd window of the HDE-3000's monitor output. It is useful for cueing and aiding the HDE-3000 operator. Example; Msg This is a message

Pause

The Pause command waits for a front panel key or key press on the optional keyboard to be pressed before further script commands will execute. The message 'Press any key to continue...' will be displayed on the monitor output.

Rem|string string = [1..70 characters]

The Rem command is used for inserting comment lines into a script file. All characters following the Rem command will be ignored. This command is useful for displaying messages on the screen and adding comments to lines that contain no other commands.

Rerun

Reruns the script file from the beginning.

Script|filename (filename must conform to MS-DOS file naming conventions)

The Script command is used to pass control over to another script file. The extent of Control passing is unlimited. Example; Script c:\test\test1.uxf

RunSubtitle | filename (filename must conform to MS-DOS requirements)

The RUNSUBTITLE command is used to initiate the subtitle engine from a script. The subtitle engine will run simultaneously with the script engine, and the subtitle engine will continue running until the script finishes executing or the script job is cancelled. If the subtitle engine is already running when an RUNSUBTITLE command is executed then the current subtitle job is canceled and the new subtitle job is started. Caution must be observed so that the script engine does not use the GI memory while the subtitle engine is running or unpredictable results will occur.

WaitUntilBefore | n n = H:M:S:F

Wait until the time code is less than or equal to H:M:S:F before further script commands are executed. This command is used to force a script to wait until the tape is rewound (if the time code is coming from a tape machine) before re-running a script via the RERUN command. Time code is either read externally or is simulated with the HDE-3000's internal clock. If you are using simulated time code then you must precede the first WAITUNTILBEFORE command with a SETTIME command.

WaitUntil|n n = H:M:S:F

Wait until the time code is greater than or equal to H:M:S:F before further script commands are executed. Time code is either read externally or is simulated with the HDE-3000's internal clock. If you are using simulated time code then you must precede the first WaitUntil command with a SetTime command.

LoadPCX|X Y filename

Loads a YCrCb bitmap image in .yc or .uyc format to the non-displayed memory at location (X,Y). Location X,Y is with respect to the top-left corner of the screen. The bitmap image is in Y Cr Cb format. LINK provides a conversion program to convert from PCX, Tiff, PNG and BMP to Y Cr Cb (.yc or .uyc).

Flip

Flips frame buffer memories. The HDE-3000 contains two video frame buffers: one is considered the "displayed" memory, and the other the "non-displayed" memory. The Flip command causes the displayed memory to become the non-displayed memory and vice versa.

FlipE

Same as Flip but also erases the non-displayed memory.

EDM

Erases the displayed frame buffer memory.

ENM

Erases the non-displayed frame buffer memory.

Fade | ontime | offtime

The FADE command initiates a mechanism in the HDE-3000 GI hardware to perform fading when executing a FLIP or FLIPE command. Before the memories are flipped the GI overlay is faded off, and after the memories are flipped the GI overlay is faded on. The ONTIME and OFFTIME parameters specify how fast to fade on and how fast to fade off, and their values are expressed in number of fields (60 fields per second for NTSC and 50 for PAL). For example if ONTIME is set to 60 (50 for PAL) then it will take 1 second for the overlay to fade on. To disable fading set both ONTIME and OFFTIME to zero.

EncodeCC|filename

Starts a closed caption encoding session. The caption data file specified by *filename* can be in any format supported by the HDE-3000. The HDE-3000 will automatically determine which format is supplied by reading the file. Once started, the caption encoding job will run concurrently with subsequent HDE-3000 commands. The caption job will run until it is completed or the script file is aborted.

End

Marks the end of the script file.

6.4 Caption Files

Currently, HDE-3000 can read caption files in the following formats:

National Caption Institute (NCI) –
.CAP binary versions 1.p, 1.mx, 2.0, and PAL2
.FLC text

The Caption Center (WGBH) –
.TDS text
.0 text old “dot number” format (multiple files: name.0, name.1, etc.)

Captions Inc –
.CIN text

Cheetah Systems – CAPtivator Software
.CAP binary CAPtivator File Format versions 2.0and 2.1

Computer Prompting and Captioning (CPC) – CaptionMaker Software
.ONL binary CPC-715 Online CaptionMaker DataFile

ULTECH –
.TLS binary TV Link Creator Format
.ULT binary Line 21 services

Line of Sight -
.LOS text

DVD caption file formats
.CC text
.SCC text

The caption files may be loaded into the HDE-3000 via the front panel floppy drive, USB drive, or network interface.

The ULTECH caption file format (ULT file) is a compact binary file that stores captions with embedded EIA-608 control codes and time code data. It was designed as a fast intermediate file format for the HDE-3000, not for general purpose caption creation. As a result it is *not* readable by a text editor.

Note: The .ULT file must contain captions that have the appropriate control codes embedded with the text. Also the time code for each caption, should be equal to the desired appear time. HDE-3000 does not adjust the caption appear time.

The .ULT file format supports multi-stream captions. Multi-stream captions allow multiple data channels to be encoded at the same time. For example, bilingual captioning: English on CC1 and Spanish on CC2.

6.5 Subtitle Files

There are two ways to display text on screen. The “traditional” method involves sending commands and text to the graphics inserter (GI) by way of a serial communications port. The GI interprets the commands and turns the text strings into on-screen characters. The GI renders the characters in real time based on attributes you have specified, such as color, font, and position.

A more modern way of inserting text on screen is to create the subtitles off-line in the form of bit-mapped images. Each subtitle becomes an individual bit-mapped image file. The advantage of this approach is that the graphics inserter (GI) does not have to deal with fonts, nor does it have to deal with rules involving the conversion of commands and text strings into on-screen characters. With this method, subtitles are created on a PC using any font installed on the PC. You can see on the PC’s monitor how the subtitle will look when displayed on a TV screen.

Subtitling using the bit-mapped method involves two sets of files: a single subtitle “script” file and a series of bit-mapped files, one for each subtitle. In the DVD world, subtitle script files are known as “navigation” files. The HDE-3000 uses a simple file format that is optimized for subtitling. Files in this format have a file extension of “.usf”, and are therefore referred to as “USF” files, or simply “subtitle files”.

.USF File Format

LINK subtitle script files contain a single command, *subtitle*. The command takes the parameters *time code*, and optionally, *filename*, *x position* and *y position*. The first parameter is the time that the file is to appear on the display. If the filename is omitted, then the display is *erased* at the time code. Thus a subtitle command with a time code and a filename means “display this graphic file at time *t* at position *x,y*”; and a subtitle command with only a time code means “erase whatever is on the display at time *t*”. Note: The commands must appear in chronological order in the file.

Example:

```
SUBTITLE 00:01:00:09 nine.uyc 10 43
SUBTITLE 00:01:20:15 ten.uyc  10 43
SUBTITLE 00:01:28:00
```

This example displays the bitmap nine.uyc in position 10,43 at time code 00:01:00:09, at time code 00:01:20:15 ten.uyc is displayed, and finally at 00:01:28:00 the display is erased. This specialized command makes the creation and reading of subtitle files easy and intuitive. The subtitle application reads bit mapped graphics files in LINK’s “.uyc” format that is discussed later in this manual.

6.6 Subtitle applications information for software developers

The HDE-3000 encodes subtitle “jobs” by overlaying graphics files onto program video. A subtitle “job” consists of one usf file and multiple uyc files. A usf file is a text file with the extension “.usf”. It contains timing and location information to command the HDE-3000 to overlay specific uyc files at the proper time.

A uyc file is a custom graphics file with the extension “.uyc”. A uyc file is very similar to standard graphics files (such as gif, jpg, png, etc.), but the format of the information in the file is arranged to optimize the loading time of the graphics information into the HDE-3000.

To run a subtitle job on an HDE-3000, the usf file and the uyc files need to be copied to a network server folder that the HDE-3000 can access.

HDE-3000 File System

The file system of the HDE-3000 can only handle 512 files in the root directory, so the HDE-3000 will automatically search for uyc files in any sub folders included with the usf file. Most subtitle agencies have adopted a standard practice of putting the usf file in the root folder, with a subfolder (usually named “uycfiles”) containing all of the uyc files.

USF Files

The following is the syntax for each line of a usf file:

SUBTITLE TimeCode UycFileName xPosition yPosition

Each parameter must be separated by at least one space.

SUBTITLE	a keyword (it is required at the beginning of each line).
TimeCode	the time to display the uyc file.
UycFileName	the file name of the uyc file to display.
XPosition, yPosition	where to overlay the uyc file on the TV screen

The following is an example of the contents of a usf file:

```
SUBTITLE 01:00:41:09 biaa0001.uyc 86 196
SUBTITLE 01:00:44:10
SUBTITLE 01:00:44:18 biaa0002.uyc 103 218
SUBTITLE 01:00:47:18
```

The first line commands the HDE-3000 to display the file “biaa0001.uyc” at 01:00:41:09, and the “86” and the “196” are positioning parameters (see below). The second line commands the HDE-3000 to clear the screen at 01:00:44:10. These “clear the display” lines are optional—you can display one file after another without erasing if you want to.

UYC files

The uyc file format was developed to optimize the loading speed of the graphics information into the HDE-3000. A uyc file contains the color information and the alpha information for each pixel in the image. The color information for each pixel is stored in YCrCb format (Y = luminance, CrCb = chrominance). The alpha information consists of an 8 bit value for each pixel. The alpha information controls the transparency of each pixel independently from the color. An alpha value of zero means that the pixel will be transparent (you will only see background video for this pixel). An alpha value of 255 means that the pixel will be opaque (you will only see the overlaid image for this pixel—no video). Values from 1 to 254 mean that the pixel will be semi-transparent. For example, a value of 64 will cause the pixel to be 75% video / 25% image, and a value of 128 will cause the pixel to be a 50% video / 50% GI image.

UYC File Positioning Parameters for NTSC

The positioning parameters (xPosition and yPosition) tell the HDE-3000 where to overlay the uyc file on the TV screen. For NTSC, the TV screen is 720 pixels wide by 525 lines, but 40 lines are used for the VBI (vertical blanking interval), and two lines (line 21 of each field) are used for closed captioning. The HDE-3000 can overlay lines 23 to 263 in field 1 and lines 23-262 in field 2, so the total number of lines that the HDE-3000 can overlay is 481.

The xPosition parameter controls the left/right positioning of the uyc file on the TV screen. It tells the HDE-3000 where to place the left edge of the uyc file on the TV screen. Valid values are from 0 to 359. A value of 0 will place the left edge of the uyc file at the left edge of the TV screen. A value of 159 will place the left edge of the uyc file in the middle of the TV screen.

The yPosition parameter controls the up/down positioning of the uyc file on the TV screen. It tells the HDE-3000 where to place the top edge of the uyc file on the TV screen. The yPosition parameter is the video line number at which to place the top edge of the uyc file. Valid values are from 23 to 262. A value of 23 will place the top edge of the uyc file at the top edge of the TV screen. A value of 141 will place the top edge of the uyc file in the middle of the TV screen.

Full Frame UYC files for NTSC

For NTSC, the full frame uyc file size is 720 X 480. When full frame uyc files are used, then the xPosition parameter should always be 0 and the yPosition parameter should always be 23.

UYC File Positioning Parameters for PAL

For PAL, the TV screen is 720 pixels wide by 625 lines, but 42 lines are used for the VBI (vertical blanking interval), and two lines (line 22 of each field) are used for closed captioning. The HDE-3000 can only overlay 512 lines (because it only has 512 lines of video memory), so the HDE-3000 can overlay lines 40 to 255 in each filed. So the total number of lines the HDE-3000 can overlay is 512.

The xPosition parameter is the same for PAL as for NTSC.

The yPosition parameter valid values for PAL are from 40 to 295. A value of 40 will place the top edge of the uyc file as close to the top edge of the TV screen as possible. A value of 166 will place the top edge of the uyc file in the middle of the TV screen.

Full Frame UYC files for PAL

For PAL, the full frame uyc file size is 720 X 512. When full frame uyc files are used, the xPosition parameter should always be 0 and the yPosition parameter should always be 40.

Converting Graphics Files to UYC Files

Before a graphics file can be overlaid onto video by the HDE-3000, the file must be converted to a uyc file. The HDE-3000 cannot directly overlay other graphics files such as bmp or gif. LINK provides a number of converter utilities to convert other graphics files to uyc files. The following is a list of the available converter utilities:

From	converter name
BMP	BMP2UYC
PCX	PCX2UYC
TIF	TIF2UYC
PNG	PNG2UYC

Note that there is a problem with most graphics files: they do not contain transparency (alpha) information. The only graphics files that do contain alpha information are 32 bit BMP (RGB-alpha), and PNG.

To solve this problem, we have added a capability to our TIF and BMP converter utilities to define a “transparent color”. When a uyc file is created by the utilities, every pixel that is the “transparent color” is assigned an alpha value of 0 (transparent), and every pixel that is not the “transparent color” is assigned an alpha value of 255 (opaque). The next challenge is defining the “transparent color”. You can choose an RGB color value as the “transparent color”, or if your files use a color palette then you can define a color index as the “transparent color index” (for example, the first color in the palette). Unfortunately, no two HDE-3000 users agree on the definition of the “transparent color”, so LINK offers to customize the converter utilities for each user.

BMP2UYC.EXE

This utility converts 8, 24, and 32 bit BMP files to the UYC format. Note that "transparency" is only supported for 32 bit BMP files (RGBalpha). The command syntax is:

bmp2uyc inputfilename.bmp [outputfilename.uyc]

The [outputfilename.uyc] part is optional. If you leave it off then the output filename will be the same as the input filename. For example, to convert the file abc.bmp, type:

bmp2uyc abc.bmp

and the file abc.uyc will be created.

PNG2UYC.EXE

This converter works exactly the same as bmp2uyc except it converts PNG files. PNG files can contain alpha information.

TIF2UYC.EXE

This converter works exactly the same as bmp2uyc except it converts TIFF files. There is a problem associated with creating TIFF files for subtitling. A color has to be defined as the "transparent" color (for the transparent areas of the graphic that do not disturb the background video—typically everything except the subtitle characters). There are two basic types of TIFF files: RGB and color table. The RGB type contains an RGB color value for every pixel in the image. The color table type contains an indexed list of color values (a palette), and only an index number for each pixel in the image.

When you convert an RGB type TIFF, the transparent color is RGB value C0C0C0. Only pixels of this color will be transparent when the subtitle is displayed over the video. When you convert a color table type TIFF, the first color in the color table (color number 0) will be the transparent color. So any pixels assigned to color 0 will be transparent.

Using the UYC File Conversion Utilities in Batch Mode

The TIF2UYC, BMP2UYC, and PNG2UYC utilities only convert one file at a time, but they were designed so that they can be used in a batch file. A batch file is just a text file with its file name ending in .bat that contains DOS commands just as if they were typed in directly at the DOS prompt.

The contents of a batch file to convert three TIF files would look like this:

```
tif2uyc 0001.tif
tif2uyc 0002.tif
tif2uyc 0003.tif
```

The Safe Title Area

Normal consumer TV's do not display the whole video picture, and each TV is a little different, so SMPTE defined a standard called the "safe title area". The SMPTE document defining the safe title area is: SMPTE RP 27.3.

The safe title area is the area of the middle of the TV screen that is guaranteed to be displayed on all TV sets. In order to stay within the safe title area, you must be careful when calculating your xOffset and yOffset parameters so that your subtitles stay within the safe title area. The following table defines the safe title area for the HDE-3000 parameters.

PARAMETER	NTSC ALLOWED RANGE	NTSC SAFE TITLE RANGE	PAL ALLOWED RANGE	PAL SAFE TITLE RANGE
xOffset	0-359	36-322	0-359	36-322
yOffset	23-262	44-239	40-295	50-284

The viewUYC Utility

The viewUYC utility is a graphics viewer program for viewing uyc files. It is a single executable file, and it is a Windows application that will run under Windows 98/NT/2000/XP.

To execute viewUYC just double click viewUYC.exe from within Windows Explorer. You can associate uyc files with viewUYC.exe in Windows Explorer, and then you can just double click on uyc files and viewUYC will automatically be executed.

6.7 Graphics Files

HDE-3000 displays bit mapped graphics files in a format known as "YCrCb". YCrCb is the component video format inherent in serial digital video. ULTECH created a YCrCb file format known as "YC" format. Section 6.8 provides details about this file format. Software developers may choose to produce graphics files directly in YC format. Other HDE-3000 users may create files in several industry formats, then convert them to YC format. A future version of HDE-3000 software will convert all of the popular formats to YC format as the files are transferred to the HDE-3000. The current version of software requires a separate conversion step on a PC using graphics file converters supplied by LINK. LINK provides a Microsoft Windows program that lets you view YC files on a PC without requiring HDE-3000 hardware.

Graphics Files Supported

All of the files described in this section are comprised of Red, Green, and Blue color components ("RGB"). Combinations of RGB are mixed to produce all of the colors possible on a TV screen. The 8 bit RGB formats—the formats where RGB can each be 1 of 256 possible values—produce over 16 million colors. Not all can be conveyed with serial digital component video, though, as component video yields a color space that is a subset of RGB colors (11,137,500 colors out of 16,777,216).

Some of the formats below employ an "alpha" channel in addition to RGB channels. An alpha channel specifies transparency. Each pixel is made up of a Red, Green, and Blue component. Plus, there is an alpha component that specifies the *opacity* of the pixel. An alpha value of "0" means the pixel is transparent: only background video is seen. An alpha value of "255" means the pixel is 100% opaque. Values in between allow background video to mix with foreground text/graphics. The HDE-3000 provides an 8 bit alpha capability. Use of an alpha gradient between foreground images and background video is one of the secrets for producing perfect images on screen.

BMP Version 4

This is Microsoft's BMP format released for Windows 95, and is a 32 bit format containing 8 bits each of red, green, and blue, plus an 8 bit alpha channel. LINK supports the non-compressed, 32 bits per pixel version of this format. Use the file converter "BMP2UYC.EXE" to convert these files to LINK's "YC" format. Note, this converter also handles 8 bit and 24 bit BMP files.

PCX

PCX, also known as PC Paintbrush Format, is a popular graphics file format. PCX does not provide an alpha channel. LINK supports the 24 bit format. Use the file converter "PCX.EXE" to convert these files to LINK's "YC" format. Because PCX does not support alpha, the converter generates a fully opaque image in YC format.

PNG

PNG, pronounced "ping", is the format recommended by LINK for use with the HDE-3000. PNG files are compressed, so they require less disk space than the other formats. Plus, PNG offers a full alpha channel. Unlike 32 bit BMP, PNG files are handled by Adobe Photoshop, a leading graphics creation and editing program for the Mac and PC. Use the file converter "PNG2UYC.EXE" to convert PNG files to LINK's "YC" format. LINK's converter supports true color + alpha (type 6) PNG files (RGB + alpha).

TIFF

The TIFF format is important as one of its variants seems to be the format of choice for DVD subtitles. The LINK TIFF converter handles non-compressed 256 color "color map" type TIFF files in single or multiple strips. Like PCX, TIFF does not support alpha, so the converter considers the first entry in the color palette to be the transparent "color"; all other entrees in the palette are opaque colors. Use the file converter "TIF2UYC.EXE" to convert these files to "YC" format. Note, this converter also handles RGB TIFF files in which case the transparent color is C0C0C0.

DVD TIFF files come in two formats: *full size* and *cropped*. A full size TIFF file occupies the entire 720 x 480 pixel plane (720 x 512 for PAL), regardless of how big the actual subtitle is. A cropped TIFF file is just large enough to hold the subtitle image. For example, a cropped TIFF file may be 260 pixels wide by 80 pixels high. Full size TIFF files are normally very wasteful of disk space, and may require more time to transmit, load, and render on screen. Because of this, LINK has created a compressed version of the "UYC" format that drastically reduces file size and load time. This format has the extension "UYC". Use the file converter "TIF2UYC.EXE" to convert files to compressed "UYC" format.

YC File Viewer

LINK provides a utility program that enables you to view UYC graphics files on a PC. This allows users and software developers to inspect files without the need for HDE-3000 hardware. The program is called "ViewUYC.exe" and runs under Microsoft Windows. ViewUYC lets you view foreground RGB colors independently from the alpha channel.

6.8 UYC File Format

Digital Video (SMPTE 125M—4:2:2 Component) information consists of luminance (Y) and color difference (CR & CB) values. For each line of active video there are 720 luminance values and 360 pairs of color difference values. The information for each line is transmitted in the following order:

CB0, Y0, CR0, Y1, CB1, Y2, CR1, Y3, ... CB359, Y718, CR359, Y719

HDE-3000 groups this information into "pixel pairs". The first pixel pair of a line consists of the Y values for both pixels (Y0 & Y1) and the CB & CR values for the pixel pair (CB0 & CR0). The values are each 8 bits and are organized into two 16 bit words (Y0 is the least significant byte of the Y word and CB0 is the least significant byte of the C word). Alpha information is also used by HDE-3000 to control the opacity of the overlaid graphics. An 8 bit alpha value is assigned to each pixel and organized into a third 16 bit word (alpha0 is the least significant byte of the alpha word and aligns with the same pixel as Y0). There are 256 levels of opacity for each pixel. An alpha value of zero is transparent, so the pixel will be 100% background video. An alpha value of 255 is opaque, so the pixel will be 100% overlay. All of the values in between select levels of semi-transparency for the pixel.

The information for each pixel pair consists of 1 word of Y values, 1 word of color difference values, and 1 word of alpha values.

Image Positioning

When HDE-3000 inserts an image (UYC file) into the video, it must know where on the screen to position the image. So, the HDE-3000 command to display an image requires three parameters: the UYC file name, an X offset, and a Y offset.

The X offset parameter specifies how much to offset the left edge of the image from the left edge of the television screen. Since the HDE-3000 handles all image data in pixel pair format, the X offset parameter value can only be between 0 and 360. If the X offset is zero then the left edge of the image will align with the left edge of the television screen. If the X offset is 180 then the left edge of the image will be in the middle of the television screen.

The Y offset parameter specifies which video line will contain the first line of the image. Video lines are numbered 1 to 262 for NTSC (1 to 313 for PAL) for each video field with line 1 at the top. Note that video lines 1 to 20 are defined as the vertical blanking interval (VBI) and are not displayed on the television screen. Also, line 21 (22 for PAL) is used for the closed caption waveform. Because of this, the first displayed video line overlaid by the HDE-3000 GI is line 23 (lines 1 to 22 are overlaid by the VBI waveform generator and lines 23 to 262 are overlaid by the graphics inserter). Since the HDE-3000 performs image processing on a field by field basis, the Y offset parameter can only be between 23 and 262 inclusive for NTSC (40 - 295 for PAL). If the Y offset is 23 (in NTSC) then the top edge of the image will align with the top edge of the television screen. If the Y offset is 142 then the top edge of the image will be in the middle of the television screen.

X offset = Number of pixel *pairs* between left edge of image and left edge of television screen. Valid values are 0 to 360.

Y offset = Video line number (of odd field) of the top edge of the image. Valid values are 23 to 262 for NTSC and 40 to 295 for PAL.

The discussion talks about alignment with respect to a television “screen”. This, of course, does not take into consideration the fact that the image raster on televisions is overscanned. So a portion of the image will be “cut-off” if it is placed at the very edges of the image raster. HDE-3000 has a built-in safe title area generator to help you locate images in a location that will be visible on consumer television sets.

Details of the UYC File Format

All data contained in a UYC file is organized into words (unsigned 16 bit) with the low (least significant) byte first (Intel format). The first 16 entries (words) in a UYC file is defined as the header section. The header section contains image information such as width, height, etc. The remainder of the file is the image data section, and it contains three words of image data for each pixel pair (see introduction). The image data is arranged into lines to facilitate faster transfer to the HDE-3000. Each line of image data consists of a line of Y data, a line of C data, and a line of alpha data.

Header Section

Word	Description	Value
0	Signature 0	0x5955 (“YU”)
1	Signature 1	0x2043 (“ C”)
2	Version	0x0100 (1.00)
3	X size (image width)	0-0x02D0 (0-720)
4	Y size (image height)	0-0x0200 (0-512)
5	Compression type	0-1
6 - 15	Reserved for future use	(always zero)

Signature 0, 1 These two words are used by the HDE-3000 to indicate that this file is a UYC file. The words are arranged so that when a UYC file is viewed with a hex editor the first four bytes appear as “UYC<space>”.

Version This entry indicates the version of the UYC file.

X Size This entry indicates the width of the image in pixels. NOTE that this parameter MUST be an even number to conform to the pixel pair organization described in the introduction.

Y Size This entry indicates the height of the image in pixels (or lines). NOTE that the HDE-3000 can display up to 479 lines of image data in NTSC format and up to 512 lines of image data in PAL format (see HDE-3000 Image Positioning).

Compression This entry indicates if the image data has been compressed and which type of compression was used. Currently the only valid values are 0 for no compression and 1 for RLE compression (see UYC RLE Compression).

Note that X size must be even to conform to word boundaries. Graphic file converters, when converting a file with an odd width, should add a column of pixels to the right side of the picture and set the alpha values for these pixels to 0 (transparent).

Image Data Section of a UYC File

The image data section contains all of the Y, C, and alpha data (see *Converting RGB to YCRCB* that follows). The origin of the HDE-3000 coordinate system is the upper left (line 0 is at the top and pixel 0 is at the left edge). The image data is arranged into lines to facilitate faster transfer to the HDE-3000. Each line of image data consists of a line of Y data, a line of C data, and a line of alpha data. The order of the lines of data is dependent on the type of compression.

For uncompressed UYC files (compression = 0) the line of Y data is written first, then the line of C data, then the line of alpha data. The following pseudo code illustrates how to write an uncompressed UYC file.

```
write the file header

for L = 0 to (Y size - 1)
    for P = 0 to ((X size/2) - 1)
            write the Y data for line L and pixel pair P
    next P
    for P = 0 to ((X size/2) - 1)
            write the C data for line L and pixel pair P
    next P
    for P = 0 to ((X size/2) - 1)
            write the alpha data for line L and pixel pair P
    next P
next L
```

For compressed UYC files (compression != 0) the line of alpha data is written first, then the line of Y data, then the line of C data. Also each line of alpha, Y, and C data is compressed to reduce file size (see Appendix B - UYC RLE Compression). For simplicity, the compression is only applied to one line of data at a time so that the decompression algorithm doesn't have to find the boundaries between each line of compressed data. The following pseudo code illustrates how to write a compressed UYC file.

```
write the file header

for L = 0 to (Y size - 1)
    compress the line of alpha data for line L
    write the compressed line of alpha data
    compress the line of Y data for line L
    write the compressed line of Y data
    compress the line of C data for line L
    write the compressed line of C data
next L
```

Converting RGB to YCRCB

The following pseudo code illustrates how to convert RGB image information into YCRCB image information.

```
GREEN, BLUE, Yvalue, Cvalue, and Avalue are 8 bit unsigned values,
Yhi, Ylo, Chi, Clo, Ahi, and Alo are 8 bit unsigned values,
R0, G0, B0, A0, R1, G1, B1, and A1 are floating point values,
AVGR, AVGG, and AVGB are floating point values,
Y0, Y1, CR, and CB are floating point values,
Yarray, Carray, and Aarray are arrays of 16 bit unsigned values.

for L = 0 to (Y size - 1)
        for P = 0 to (Xsize - 1) step 2
            get RED, GREEN, BLUE. and alpha value for line L, pixel P
            R0 = RED / 255              (floating point value between 0 and 1)
            G0 = GREEN / 255  (floating point value between 0 and 1)
            B0 = BLUE / 255             (floating point value between 0 and 1)

            if (X size is odd) and (P = (Xsize - 1)) then
                R1 = R0                 (if image width is odd then make the
                G1 = G0                 image width even by adding a
                B1 = B0                 transparent pixel at the end of each line)
                A1 = 0
            else
                get RED, GREEN, BLUE. and alpha value for line L, pixel P+1
                R1 = RED / 255          (floating point value between 0 and 1)
                G1 = GREEN / 255 (floating point value between 0 and 1)
                B1 = BLUE / 255  (floating point value between 0 and 1)
            end if

            AVGR = (R0 + R1) / 2        (compute average color of pixel pair)
            AVGG = (G0 + G1) / 2
            AVGB = (B0 + B1) / 2

            Y0  =  0.299 R0  +  0.587 G0 +  0.114 B0
            Y1  =  0.299 R1  +  0.587 G1 +  0.114 B1
            CR  =  2 * (0.500 AVGR  -  0.419 AVGG  -  0.081 AVGB)
            CB  =  2 * (0.500 AVGB  -  0.169 AVGR  -  0.331 AVGG)
```

7 Time Taylor

7.1 Introduction

The Time Taylor is used to shorten video programs by selectively removing frames of video until the length of the program is reduced by the desired amount. But since the act of removing video frames also removes caption data, the captions must be “bridged” around the Time Taylor.

When the source is set to “Time Taylor”, a buffer is enabled to store the TC+F1+F2 data received on the other com port until it is time to encode it, and another line is displayed in the menu to indicate the status of this buffer. When a job is running (the source video is playing), the buffer must be running (not stopped). Normally, the Time Taylor commands received via serial will automatically control the buffer and this line will simply indicate the current status of the buffer. But you can manually change the status of the buffer by pressing “enter” when the status line is selected.

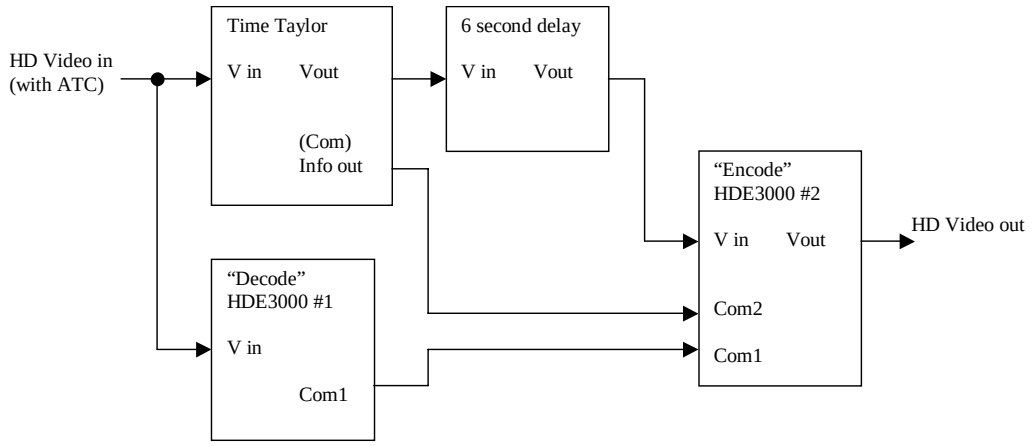
The HDE3000 expects to see the following two ASCII command strings transmitted by the Time Taylor:

“Start CR LF” (hex 73 74 61 72 74 0D 0A) – this command is transmitted by the Time Taylor when it starts a job (starts playing the source VTR), and it instructs the HDE3000 to reset its buffer and encode sequencer.

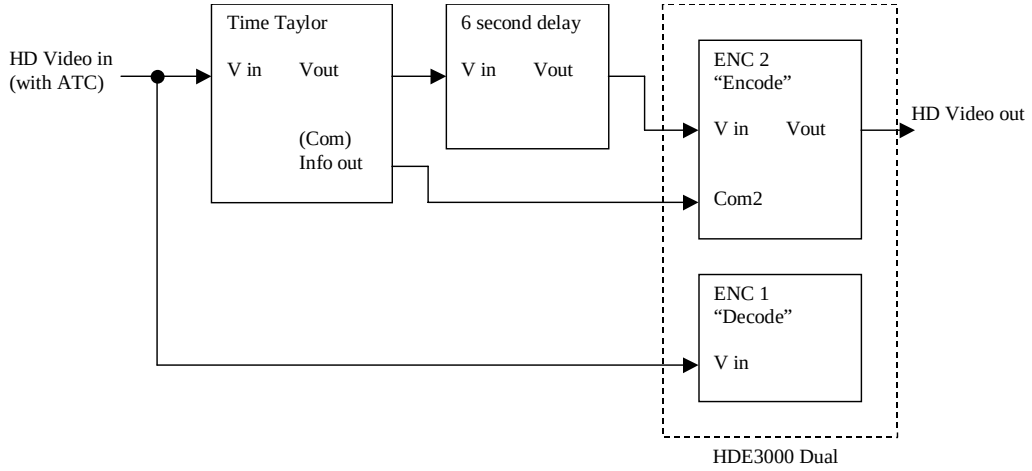
“End CR LF” (hex 65 6E 64 0D 0A) – this command is transmitted by the Time Taylor when it ends a job (stops the source VTR), and it instructs the HDE3000 to stop buffering. But the encode sequencer will continue running until all of the buffered data is encoded.

7.2 Example Setups

The following diagram illustrates the equipment connections to perform this using two HDE3000 units.



The HDE3000 Dual software has been enhanced to facilitate this using one dual unit instead of two single units. The following diagram illustrates the equipment connections.



7.3 Dual Configuration

ENC 1: Time Code Source Menu: set to "ATC" to use ancillary time code.

ENC 1: COM1 Setup Menu:
set function to "Redirect Data"
set Baud Rate to 9600
set Format to "8-none-1"
set source to "Upstream TC+F1+F2"

ENC 1: COM2 Setup Menu:
set function to "Disabled"

ENC 2: Time Code Source Menu: set to "ATC" to use ancillary time code.

ENC 2: COM1 Setup Menu:
set function to "Disabled"

ENC 2: COM2 Setup Menu:
set function to "Redirect Data"
set Baud Rate to 9600
set Format to "8-none-1"
set source to "TIME TAYLOR"
set status to "buffer stopped" (used to start/stop the job, see "operation")

7.4 Operation

If the Time Taylor sends the proper start/stop commands to ENC 2 (via COM2) then everything is automatic. If it does not, or if the serial cable from the Time Taylor to COM2 is not connected, then use the ENC 2 “COM2 Setup Menu” (the one with the source set to “TIME TAYLOR”) to start/stop the job.

1. Set the “status” to “buffer running”. This resets the decoded caption data queue and the encoder sequencer inside the “encode” HDE3000.
2. Start the job on the Time Taylor.
3. After the job is finished, set the “status” to “buffer stopped”.

Note that it is necessary to switch the status from “buffer stopped” to “buffer running” to trigger the start of a job. This is handled automatically when the Time Taylor Controller sends a start signal to ENC 2 via serial.

Important Note:

When a COM port is configured to “redirect data” and the “source” is set to “Time Taylor”, the encoder is completely controlled by the serial data. If you try to run a caption file you will get “error 170” (resource busy). To release the encoder so that you can run a caption file, set the COM ports to “disabled”.

7.5 Spanish Captions

The “encode” HDE3000 in the above diagrams cannot automatically detect the presence of Spanish captions. To properly bridge the Spanish captions, you must correctly configure the “encode” HDE3000 via the new “transcoder 2 setup” menu.

Note that the encoder that must be configured for Spanish captions is the “encode” HDE3000 in the above diagrams. The configuration of the “decode” HDE3000 does not have to be changed.

In the “encode” HDE3000, the “for serial commands” setting in the new “transcoder 2 setup” menu (see above) controls the “bridging” of the 708 service 2 captions:

- If only bridging one language (CC1 English) then set the “for serial commands” setting in the transcoder 2 setup menu to “OFF”.
- If bridging CC2 Spanish captions then set the “for serial commands” setting in the transcoder 2 setup menu to “CC2”.
- If bridging CC3 Spanish captions then set the “for serial commands” setting in the transcoder 2 setup menu to “CC3”.

8. Specifications

8.1 Supported Video Formats

The HDE-3000 supports the bit serial digital interface for high definition as defined by SMPTE292M. The HDE-3000 supports a single serial link, so it only supports the HDTV component signals operating at data rates of 1.485 Gb/s and 1.485/1.001 Gb/s. The HDE-3000 currently supports the 4:2:2 component YCbCr sampling structure. The HDE-3000 performs all of its functions using ten (10) bits per sample, so it is also 100% compatible with eight (8) bits per sample video. The HDE-3000 Passes embedded audio untouched.

The HDE-3000 supports the following HD video standards defined by SMPTE274.

Common Name	Description
1080i/60	1920x1080, interlaced, 60 fields per second
1080i/59.94	1920x1080, interlaced, 59.94 fields per second
1080i/50	1920x1080, interlaced, 50 fields per second
1080P/30	1920x1080, progressive, 30 frames per second
1080P/29.97	1920x1080, progressive, 29.97 frames per second
1080P/25	1920x1080, progressive, 25 frames per second
1080P/24	1920x1080, progressive, 24 frames per second
1080P/23.98	1920x1080, progressive, 23.98 frames per second

The HDE-3000 supports the following HD video standards defined by SMPTE RP211.

Common Name	Description
1080PsF/30	1920x1080, progressive segmented frame, 30 frames/second
1080PsF/29.97	1920x1080, progressive segmented frame, 29.97 frames/second
1080PsF/25	1920x1080, progressive segmented frame, 25 frames/second
1080PsF/24	1920x1080, progressive segmented frame, 24 frames/second
1080PsF/23.98	1920x1080, progressive segmented frame, 23.98 frames/second

The HDE-3000 supports the following HD video standards defined by SMPTE296M.

Common Name	Description
720P/60	1280x720, progressive, 60 frames per second
720P/59.94	1280x720, progressive, 59.94 frames per second
720P/50	1280x720, progressive, 50 frames per second
720P/30	1280x720, progressive, 30 frames per second
720P/29.97	1280x720, progressive, 29.97 frames per second
720P/25	1280x720, progressive, 25 frames per second
720P/24	1280x720, progressive, 24 frames per second
720P/23.98	1280x720, progressive, 23.98 frames per second

8.2 Connector Pin Outs

LTC Time Code

Pin	Function
1	Ground
2	Ground
3	Inverting Input (-)
4	Non-inverting Input (+)

Com Ports

Pin	Function	Notes
1	Data Carrier Detect	(not used)
2	Receive Data	(input to HDE-3000)
3	Transmit Data	(output from HDE-3000)
4	Data Terminal Ready	(output from HDE-3000, not used)
5	Ground	
6	Data Set Ready	(input to HDE-3000, ignored)
7	Request To Send	(output from HDE-3000, not used)
8	Clear To Send	(input to HDE-3000, ignored)
9	Ring Indicator	(input to HDE-3000, ignored)

VGA

Pin	Function	Pin	Function
1	Red	9	(no connect)
2	Green	10	Ground
3	Blue	11	(no connect)
4	(no connect)	12	(no connect)
5	Ground	13	Hsync
6	Ground	14	Vsync
7	Ground	15	(no connect)
8	Ground		

Keyboard/mouse connector

(HDE-3000 combines these two functions to save room on the CPU bracket)

Pin	Function
1	PS/2 Keyboard Data
2	PS/2 Mouse Data
3	Ground
4	+5VDC
5	PS/2 Keyboard Clock
6	PS/2 Mouse Data

8.3 Electrical/Mechanical

Front panel controls & indicators

Power on/off switch
Reset button
Program video LED
Encoding LED
Data in LED
Time code LED
Hard disk LED
Setup LED
Floppy drive
Cursor keys

Rear Panel controls & connectors

IEC power output connector, rated 120 VAC at 3A Max or 240 VAC at 2A Max
IEC power input connector for detachable three wire AC line cord
120 VAC / 240 VAC line voltage selection switch
PS-2-style keyboard/mouse connector, 6 pin mini-DIN
(2) RS-232 serial interface connector, DB9M.
VGA output connector, DB15F
(1) 800 mVpp serial digital video input BNC, terminated into 75 ohm
(2) 800 mVpp serial digital video output BNCs, with 75 ohm source impedance
LTC time code input, balanced, +4dBu nominal input level, 4 pin mini-DIN

Power

150 Watt, 50/60 Hz
90 VAC to 135 VAC (120 VAC setting)
180 VAC to 265 VAC (240 VAC setting)

Enclosure

Dimensions: 19" W (483) x 3.50" H (89) x 14.5" D (368)
Front panel: 0.125" aluminum, painted
Rear, tray, top: .042” steel, gold iridite
Weight: 18 lbs. (8.2 kg.)

* Specifications subject to change without notice

Appendix A. Discussion of HD Captioning

Definitions

SD = standard definition video (NTSC and PAL).
HD = high definition video (1080i, 1080PsF, 1080P, and 720P).
VANC = the vertical ancillary data area in a video signal.
HANC = the horizontal ancillary data area in a video signal.

Introduction

Closed captioning for HD represents a new paradigm in closed captioning. Instead of encoding the caption data as an analog waveform into a dedicated video line (21 for NTSC, 22 for PAL), HD caption data is encoded as ancillary data packets in the VANC area of the video. Along with the caption data, the VANC area may contain several other types of ancillary data packets.

The Important Specifications

EIA-608-B	specifies SD line 21 caption data authoring, encoding, and decoding.
EIA-708-B	specifies HD caption data authoring, encoding, and decoding.
SMPTE291M	specifies ancillary data packet formatting.
SMPTE334M	specifies the formatting of caption data into ancillary data packets to be encoded into the VANC area of the video.
SMPTE RP168	defines the switching point for synchronous video switching (referenced in SMPTE334M).
SMPTE274M	specifies all of the 1080 I and 1080 P formats.
SMPTE RP211	defines the 1080 PsF (progressive segmented frame) formats.
SMPTE296M	specifies all of the 720 P formats.

The VANC Area

The vertical ancillary space is specified for the 1080 formats in SMPTE274M and for the 720 formats in SMPTE296M. SMPTE334M specifies the VANC area as follows: “data may be located in any lines in the area from the second line after the line specified for switching to the last line before active video”. The “line specified for switching” is defined by SMPTE RP168 and summarized in the following table.

Format	RP168 switch lines	second line after the line specified for switching
720 P	7	9
1080 I	7 and 569(6)	9 and 571(8)
1080 PsF	7 and 569(6)	9 and 571(8)
1080 P	7	9

NOTE! For 1080 I and 1080 PsF: line 569 = field 2 line 6, and line 571 = field 2 line 8

The “last line before active video” is specified for the 1080 formats in SMPTE274M and for the 720 formats in SMPTE296M. The following table lists the VANC area definitions for each video format.

	field 1 VANC area		field 2 VANC area	
Format	first line	last line	first line	last line
720 P	9	25	-	-
1080 I	9	20	571(8)	583(20)
1080 PsF	9	20	571(8)	583(20)
1080 P	9	41	-	-

Ancillary data packets to be encoded into the VANC area are encoded contiguously starting at the beginning of the VANC area (see SMPTE291M section 4). Several types of data packets may be encoded into the VANC area. The following is a list of the types of ancillary packets that may be encoded into the VANC area.

Caption data (SMPTE334M)
MPEG2 recoding info (SMPTE353M)
Camera position metadata (SMPTE315M)
Ancillary timecode (SMPTE RP188)
DTV program description (SMPTE RP207)
VBI data (SMPTE RP208)
VANC key length value data (SMPTE RP214)
Film transfer info (SMPTE RP215)

Because the VANC area may contain several types of data packets, and they are packed contiguously in the order that they are encoded, there is no guarantee that any particular data packets will always be encoded on any particular video line. However, all of these data packets will always be encoded within the VANC area (space permitting), and the first data packet encoded will always be at the beginning of the VANC area.

Contents of the Caption Data Packets

To be fully compliant with all of the latest specifications, VANC caption encoders must encode three types of data: EIA-708 captions, EIA-608 captions, and caption service descriptors. All of this data is encapsulated within the caption data packet, so the VANC caption encoder only has to encode one ancillary data packet per field/frame. Note that the caption data packet can also contain time code, but this is not required because LTC time code is preferred.

The VANC caption encoder must encode EIA-708 captions for HDTV's and DTV receivers. HDTV's and DTV receivers are required to be capable of decoding and displaying EIA-708 captions. Some can also decode and display EIA-608 captions, but this is not required.

The VANC caption encoder must also encode EIA-608 captions for down converters. When a down converter (either a professional down converter or a consumer set top box) down converts HD video to NTSC video, the EIA-608 data must exist in the HD video so that it can be encoded into line 21 of the NTSC video. This is why the EIA-608 data encoded in the HD video is referred to as "compatibility data". Many set top boxes are available that can receive DTV transmissions and down convert to NTSC. These boxes allow the reception and viewing of DTV transmissions on a standard TV. These boxes encode the EIA-608 captions into line 21 of their NTSC video output so that a standard TV can display the EIA-608 captions, block programs with certain vchip ratings, etc.

The VANC caption encoder must also encode caption service descriptors (defined in EIA-708-B). The caption service descriptors provide a list of the caption services (EIA-608 and EIA-708) that are encoded into the HD video.

Caption Data Bandwidth Requirements

Sections 4.1 and 4.2 of EIA-708-B require the caption data to maintain a data rate of 9600 bits per second (1200 bytes per second). Note that 960 bits per second is used by the EIA-608 caption data which leaves 8640 bits per second available for the EIA-708 caption data. To achieve this required data rate, the size of the encoded caption data packets must be fixed for each video field/frame rate. EIA-708-B provides a method of filling up the unused portion of the caption data packets with "null" data. The following table lists the sizes of the caption data packets for each field/frame rate. Note that the CDP length is the size of the VANC packet payload, and it is also the value of the VANC packet DC (data count) word. Also note that the total VANC packet length includes the ancillary data flag words (000 3FF 3FF).

Field/Frame Rate	cc_count	CDP length	total VANC packet length
60/59.94	10	43	50
50	12	49	56
30/29.97	20	73	80
25	24	85	92
24/23.98	25	88	95

Current HDE-3000 Implementation

The HDE-3000 software release version 1.35 meets all of the requirements listed in the previous sections. The HDE-3000 can encode all current popular EIA-608 caption files, and it will easily be able to encode EIA-708 caption files when they emerge.

When the HDE-3000 encodes an EIA-608 caption file, it “up converts” or “transcodes” the EIA-608 captions to EIA-708. To do this, it interprets the EIA-608 captions and creates EIA-708 captions that will produce the same display on an EIA-708 decoder that the EIA-608 captions will produce on an EIA-608 decoder. The EIA-708 captions produced by this “up conversion” or “transcoding” process are referred to as “derived EIA-708 captions”.

The HDE-3000 also creates and encodes a list of caption service descriptors. It encodes one caption service descriptor for each encoded caption service.

As per the requirements of the specifications, the HDE-3000 encodes the EIA-608 captions, the “derived” EIA-708 captions, and the caption service descriptors into the VANC area of the HD video. The HDE-3000 also decodes and displays all of this data for monitoring purposes.

Appendix B. Discussion of HD Subtitling

Definitions

SD	standard definition video (NTSC and PAL).
HD	high definition video (1080i, 1080PsF, 1080P, and 720P).
USF	ULTECH subtitle file. A text file with the extension ".uyc" containing the "navigation" information for a subtitle job.
UYC	ULTECH luminance (Y) chrominance (C) image file. A specialized graphics file similar to common image files such as BMP, TIF, etc., but optimized for fast transfer speed into video overlay memory.
Subtitle job	a collection of files containing all of the information needed to subtitle a video program. A subtitle job for HDE-3000 consists of one USF file and multiple UYC files (one UYC file for each subtitle).
x_position	a parameter in a USF file that controls the horizontal positioning of a subtitle on the TV screen. The units of this parameter are *pixel pairs* (a side effect caused by the fact that 4:2:2 digital video only contains one color value for every two pixels). This parameter specifies the number of pixel pairs between the left edge of the TV screen and the left edge of the subtitle image.
y_position	a parameter in a USF file that controls the vertical positioning of a subtitle on the TV screen. This parameter specifies the video line number in field 1 at which to place the top edge of the subtitle image.

Introduction

Subtitling for HD is essentially the same as subtitling for SD. The only difference is the size of the TV screen. For example, the size of the TV screen for NTSC is 720 pixels by 485 lines, but for 1080i video it's 1920 pixels by 1080 lines.

The file formats of the USF and UYC files are exactly the same for SD and HD. The definitions of the x_position and y_position parameters in the USF file are the same for all video formats (SD and HD), but the values of these parameters are specific to the video format. In the past, subtitle authoring systems only had to calculate the values of these parameters for two video formats (NTSC and PAL), but now they must calculate these values for the HD formats also.

Since the resolution of HD is so much higher than SD, subtitle images created for SD will appear very small in HD. Subtitle authoring systems must use larger fonts for HD subtitles.

In the past, since the UYC files only had to contain images large enough for NTSC and PAL, it was not necessary for the size of the image in a UYC file to be any larger than 720 X 512. To support HD, it may now be necessary to create UYC files up to 1920 X 1080. The UYC file format can contain images up to 65535 X 65535, so this is not a problem. However, software designed to produce UYC files only up to 720 X 512 will have to be updated to produce files up to 1920 X 1080. All of Link's conversion utilities (BMP2UYC, TIF2UYC, etc.) have been updated to support images up to 1920 X 1080, as well as Link's UYC viewer utility.

Table of USF Positioning Parameters

The following tables list the position parameter value ranges for all video formats. The safe title area value ranges are compliant with SMPTE RP 27.3 and SMPTE RP 218.

NOTE that the NTSC and PAL values are only applicable to SD graphics inserters, and the other values are only applicable to the Link HDE-3000. All possible values were included here for comparison and to facilitate SD to HD conversion calculations.

x_position:

				safe title area		
Format	pixels	pixel pairs	min	min	max	max
NTSC	720	360	0	36	323	359
PAL	720	360	0	36	323	359
720 P	1280	640	0	64	575	639
1080 I	1920	960	0	96	863	959
1080 PsF	1920	960	0	96	863	959
1080 P	1920	960	0	96	863	959

y_position:

	active	active lines	last VBI		safe title area		
Format	lines	in field 1	line in field 1	min	min	max	max
NTSC	485	242.5	20	23	45	238	263
PAL	583	291.5	21	40	51	283	295
720 P	720	720	25	26	98	673	745
1080 I	1080	540	20	21	75	506	560
1080 PsF	1080	540	20	21	75	506	560
1080 P	1080	1080	41	42	150	1013	1121

Annex A: Example Conversion Calculation

The following calculation is a simple example showing how to convert an NTSC screen coordinate (x_position, y_position) into a 1080 P screen coordinate.

[1080P x_ position] = [NTSC x_position] * 960 / 360
[1080P y_position] = (([NTSC y_position] – 20) * 1080 / 242.5) + 41

Appendix C. Discussion of HD Time Code

Definitions

SD = standard definition video (NTSC and PAL).

HD = high definition video (1080i, 1080PsF, 1080P, and 720P).

FPS = frames per second.

Introduction

In the past, subtitle/caption authors only had to contend with two video standards (NTSC and PAL) and three time code frame rates (NTSC non-drop frame, NTSC drop frame, and PAL). Now for HD video, there are more video standards and more time code frame rates to manage. This results in time code issues that authors have to deal with in order to author subtitles and captions for HD video. The HDE-3000 compensates for several of these issues, but authors must be aware of what the HDE-3000 can and can't compensate for. The HDE-3000 will always encode syntactically correct subtitle/caption jobs, but if there are time code problems then the captions/subtitles will not be encoded at the correct times.

The Importance of Time Code

Time code provides the time source required for "offline" (post production) subtitle/caption authoring. The authoring systems produce the information to be encoded with reference to the time codes associated with the video. As it has always been for offline authoring, if the time code gets altered between the authoring and encoding processes (re-striped, frame rate converted, etc.) then the timing of the subtitles/captions will be encoded improperly.

With the array of HD format conversion features available on many pieces of HD video equipment, the chances of the time code being altered between the authoring and encoding processes is greatly increased. Extra care must be observed to insure the integrity of the time code during the subtitling/captioning process.

Rules for Successful Authoring

- Analyze and solve all time code issues before authoring.
- Insure that the time code integrity will be maintained through the authoring and encoding process.
- Insure that the time code values used in your subtitle/caption job match up with the time codes on the “master media”.
- Use “half rate” time code for HD video with frame rates above 30 FPS (see the section “Issues with Frame Rates Above 30 FPS” below).
- For captioning, only author NTSC caption files. PAL caption files are not compatible with EIA-708-B, so the HDE-3000 does not currently support the encoding of PAL caption files.

Authoring System Time Code Requirements for HD

At the current time, all of the subtitle/caption authoring systems in use were designed for NTSC and/or PAL time code. The good news is that most of these systems should have no problems authoring subtitle/caption jobs for HD, but the authors using these systems will have to understand the time code issues involved.

For example, suppose you need to caption a video at 1080Psf/23.98. The HDE-3000 requires LTC time code as specified by SMPTE12M. This standard specifies time code frame rates of 24, 25, 29.97, and 30 FPS. These frame rates cover almost all of the possible frame rates required for HD video, but there are a few issues that are not covered by the current version of the specification. The following two sections describe these issues and how to deal with them.

The Time Code Specification

The HDE-3000 requires LTC time code as specified by SMPTE12M. This standard specifies time code frame rates of 24, 25, 29.97, and 30 FPS. These frame rates cover almost all of the possible frame rates required for HD video, but there are a few issues that are not covered by the current version of the specification. The following two sections describe these issues and how to deal with them.

Issues with 23.98 FPS

The issue with 23.98 FPS does not cause any problems for the HDE-3000 or for authoring, but everyone in the industry should be aware of this issue. The SMPTE12M standard defines 24 FPS time code for use with film. A common practice in the industry is to slow down the film by .1% to 23.98 FPS when transferring it to HD video. This makes it simpler to convert the HD video to NTSC at 29.97 FPS. If the HD video is recorded at 23.98 FPS, 24 FPS time code can be used, but the time code will accumulate an error with respect to “wall clock” time. This situation also exists for NTSC video at 29.97 FPS, but SMPTE12M defines a “drop frame” mode to compensate for this. Currently, there is no “drop frame” mode specified for 23.98 FPS.

Issues with Frame Rates Above 30 FPS

The SMPTE12M standard does not specify time code frame rates above 30 FPS. This presents a problem for the 720 P formats with frame rates of 50, 59.94, and 60 FPS. There is one solution being used in the industry to work around this issue, and this solution is described below. There may be other solutions to work around this issue, but these have not as yet been brought to our attention.

The current work around supported by the HDE-3000 is to use LTC time code that has half the frame rate of the HD video. 25 FPS time code is used for 720P/50 video, 29.97 FPS time code for 720P/59.94, and 30 FPS time code for 720P/60. This causes there to be only one time code value for every two frames of video (very similar to NTSC where there is one time code value for every two fields of video).

SMPTE12M specifies LTC and VITC time code. VITC time code is encoded into both fields of interlaced video, so it includes a "field" indicator flag. This flag can be used to indicate each frame of progressive video at frame rates above 30 FPS. When used with HD video, to calculate the time code value for a particular progressive frame, the time code value is doubled, and one is added if the "field" flag is set. Since LTC time code is encoded only once per frame, it does not have a "field" flag, so when VITC is converted to LTC the "field" information is lost. So the LTC time code will only have one time code value for every two frames.

The HDE-3000 supports this work around by expecting the time code frame rate to be half of the video frame rate when the video frame rate is above 30 FPS. For example, when 720P/60 video is fed to the HDE-3000, it will expect the time code to be at 30 FPS.

Time Code Mismatch

A time code mismatch is caused when the frame rate of the time code does not match the frame rate of the video. Typically, time code is always synchronized to the video, but it is possible to "stripe" a tape with time code that is not synchronized to the video (including time code with a different frame rate than the video). Theoretically, this situation should not exist, but in the event that this is required by a particular authoring system, the HDE-3000 can compensate for this via a menu setting. Normally, the HDE-3000 assumes that the time code is synchronized to the video, but the "time code override" menu allows the user to specify the frame rate of the time code if it is different than the frame rate of the video.

For example, suppose an HD tape containing a movie in 1080PsF/24 format must be captioned using an authoring system that must use NTSC (29.97) time code. It is possible to stripe the tape with NTSC time code and author the captions to these time codes. For the HDE-3000 to encode these captions properly, the "time code override" menu must be used to tell the HDE-3000 that the time code is 29.97 FPS instead of 24 FPS.

Appendix D. EDS400 Command Set

Features/Definitions

- **Command syntax:**

An RS-232 command can have one of two formats:

1. [SOM][command number]<command parameters>[CR]

2. [SOM][command number]<command parameters>[CR]
   <caption/text data> [EOM][CR]

Spaces (20 hex), tabs (09 hex), or commas (2C hex) can be used to separate command parameters.

The encoder will acknowledge a valid command with [CR][LF]. If a command error occurs, it will respond with [CR][LF][error code]. If an invalid command number is received, it will respond with [CR][LF]1.

The encoder uses XOFF/XON flow control to prevent buffer overflow.

Definitions:

SOM	Start Of Message: ^A (01 hex)
EOM	End Of Message: ^C (03 hex)
ACK	Acknowledge: ^F (06 hex)
CR	Carriage Return: ^M (0D hex)
LF	Linefeed: ^J (0A hex)
XOFF	Flow control stop character: ^S (13 hex)
XON	Flow control start character: ^Q (11 hex)
[]	indicates a mandatory parameter
<>	indicates an optional parameter
Input	input channel: O0, O2. (O1 and O3 not allowed); default: O0.
Output	output channel: O0, O1, O2, O3; default: default: O0.
Dataservice	caption/text data service: C1, C2, T1, T2; default: C1.
Rows	height of caption roll-up window: 2, 3, 4; default: 3.
Mode	data preprocessing mode: 1, 2, 3, 4; default: 4. 0, 1;
Count	default: 1.
Text	ASCII text.
Class	XDS class id (2 digit ASCII hex #): 01,03,05,07,09,0B,0D.
Type	XDS type id (2 digit ASCII hex #): 01-7F.
Line	VBI line: 10 – 24(SD) 9-20(HD).
Error code	0 - 9, A - Z.

Data input

• Enter Text Article

Syntax: [SOM]0 <output> <dataservice>[CR]
<article text line>[CR]
<article text line>[CR]
[EOM][CR]

A text article is input into the encoder's article memory. The encoder can store one article per output channel. Data service is either T1 or T2.

Delays of 1 to 9 seconds may be included in the article as <^Bn> with n being the number of seconds to delay the output.

A color change may be input into the article text by including <^Dc> with c = W, G, B, C, R, Y, M, or I for White, Green, Blue, Cyan, Red, Yellow, Magenta or Italics. An uppercase character indicates no underline, a lower case characters indicates underline.

The valid data range is: 0, 2, 4, 20h - 7fh. Invalid data bytes are ignored. The article memory must be empty before sending this command, otherwise the encoder will return an error code. (See "Delete Text Article"). If the article exceeds the buffer size (1000 bytes), the encoder will return an error code and drop the article.

Errors:
1. Unrecognized command
2. Invalid command argument(s)
3. Article already exists
7. Article buffer size exceeded

• Delete Text Article

Syntax: [SOM]4 <output>[CR]

The text article in the specified output memory is deleted. If the article is currently being output, it is not removed until the current transmission has been completed.

Note: An article has to be deleted before a new one can be input into memory.

Errors:
1. Unrecognized command
2. Invalid command argument(s)
4. Article not accessible or does not exist

• Enter Newswire/Real Time Caption/Text

Syntax: [SOM]2 <output> <dataservice> <rows>[CR]
<caption/text line>[CR]
<caption/text line>[CR]
[EOM][CR]

The caption/text lines input through the serial port are output to <output>. Output delays may be included in the data portion as <^Bn> with n = 1-9 seconds.

If data service is T1 or T2, the display is in normal text (data is formatted for text and sent to the T1 or T2 output queue). If data service is C1 or C2, the display is in roll-up mode as specified by the <rows> parameter (data is formatted for roll-up caption and sent to the C1 or C2 output queue).

The valid data range is: 0, 2, 10h - 0x7fh. Invalid data bytes are ignored. All upstream caption/text data is lost while this command is active.

Errors: 1. Unrecognized command
2. Invalid command argument(s)

• Enter Pass Through Caption/Text

Syntax: [SOM]3 <mode> <output>[CR]
<caption/text data>[EOM][CR]

The caption/text data input through the serial port is output to <output> with varying degrees of processing as determined by <mode>.

mode = 1 All data is allowed and passed.

mode = 2 Legal caption control codes are transmitted in the same field.

mode = 3 Same as mode = 2, except that control codes are automatically doubled.

mode = 4 Same as mode = 3, except that no non-caption codes are transmitted.

The valid data range is: 0, 10h - 0x7fh. Invalid data bytes are ignored. All upstream caption/text data is lost while this command is active.

Errors: 1. Unrecognized command
2. Invalid command argument(s)

- **Enter XDS**

  Syntax: [SOM]* [class] [type] [CR]
  <XDS data packet>[CR]

  XDS data is entered as data packets preceded by their class and type identifiers.

  The valid data range is: 0, 20h - 7fh. The maximum packet size is 32 (excluding class and type identifiers).

  Errors: 1. Unrecognized command
  2. Invalid command argument(s)
  8. XDS data packet exceeds 32 characters

Data Filter

- **Disable Upstream Data**

  Syntax: [SOM]6 <input> <dataservice>...<dataservice>[CR]

  Deletes upstream caption/text data for specified input and data service(s). The status of any unspecified data service is unchanged.

  Errors: 1. Unrecognized command
  2. Invalid command argument(s)

- **Enable Upstream Data**

  Syntax: [SOM]7 <input> <dataservice>...<dataservice>[CR]

  Enables upstream caption/text data for specified input and data service(s) to be passed through to the encoder's output. The status of any unspecified data service is unchanged.

  Errors: 1. Unrecognized command
  2. Invalid command argument(s)

Data Output

• Output Text Article

Syntax: [SOM]1 <output> <count>[CR]

The text article for the specified output is transmitted <count> times. If <count> is 0, the article will be transmitted continuously until a second command with a different <count> is issued or the “Delete Text Article” command is sent.

The encoder will return an error if no article is in the specified article memory. Upstream text data only is lost while this command is active (upstream captions are passed through without delay).

Errors: 1. Unrecognized command
2. Invalid command argument(s)
4. Article not accessible or does not exist

Encoder Setup and Status

• Reset Encoder

Syntax: [ACK][ACK]

The encoder’s 4 output channels are reset. This will stop any local encoding and all upstream data will be passed through unfiltered.

• Set Output Channels

Syntax: [SOM]% [output][line][CR]

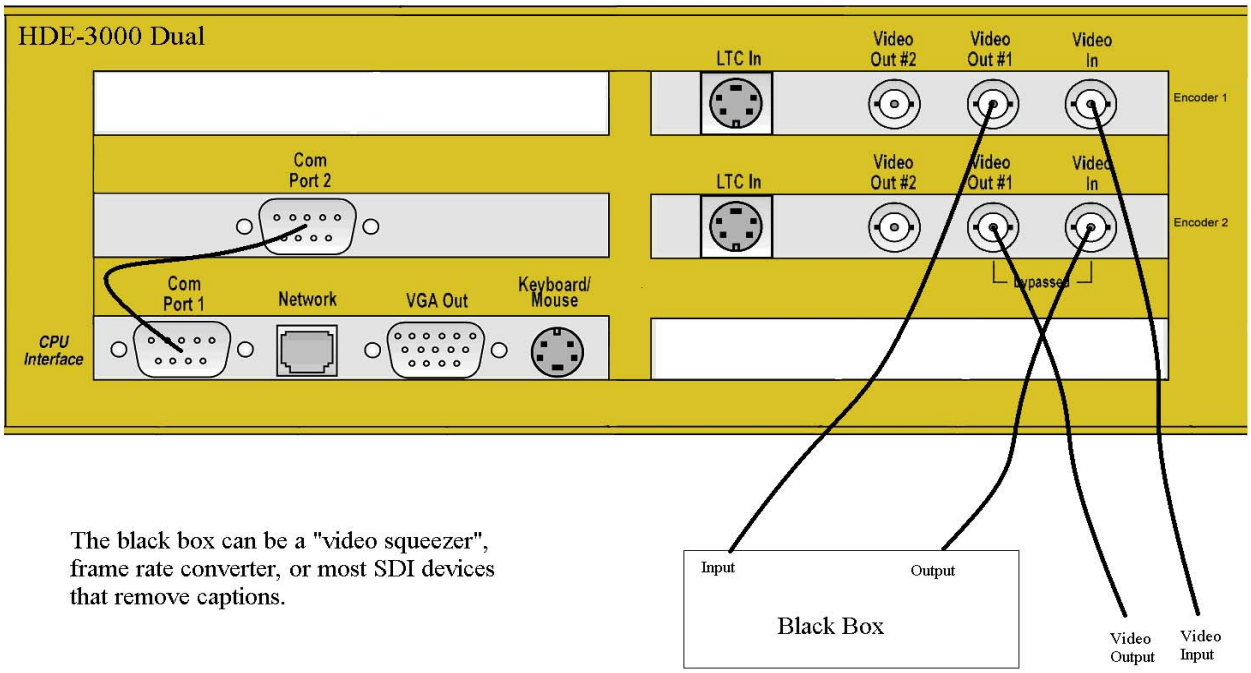
Assigns VBI lines to the four output channels (O0-O3). O0 and O1 are always field 1 lines; O2 and O3 are always field 2 lines. The status of any unspecified output is unchanged.

The VBI line range is 10-24. Setting line to 0 will disable an output channel.

Errors: 1. Unrecognized command
2. Invalid command argument(s) 9. Line already reserved

Note: The caption waveform for output channels O1 and O3 will only be present while the encoder is actively encoding data unless you set "Filter Upstream Data" to "On" in Setup Menu #1. Otherwise, the waveform is disabled and video is passed through whe n the encoder is idle.

Caption Re-encoding with a Dual



1. Connect video and com ports as shown above. Input Video will be the video that has captions on it to start with. Output Video will be the new video that has captions re-encoded on it.

2. In the 3000's menus set encoder 1 com 1 setup menu, function to redirect data and source from upstream F1, F2, or F1 & F2.

3. In the 3000's menus set encoder 2 com 2 setup menu, function to EDS400 emulation and parser mode to bridge Ult F1, F2, or F1 & F2.

4. Make sure that the above two com port menus have their baud rates and formats matched up.

Note: the captions will be advanced by the approximate amount of video delay through the "Black Box"

Sony HD VTR's

Many of our customers had issues with getting a Sony VTR to record captions. This is some of the steps that people have to do to get some Sony HD recorders to hold captions. You may have to call Sony to have them step you thru the menus it get their recorders setup properly.

Here are the basic steps described.

Set up your Sony HD VTR according to these instructions.

1. Go to the "maintenance menu" and set the "metadata settings" for "CC" to: line 1 = 9, line 2 = 572, DID = 61, SDID = 01.

2. Save the changes. This is a separate step that you have to perform before you exit the "maintenance menu".

3. Go to the "system menu" and set "metadata" to "CC".

Then follow these instructions to configure the HDE-3000:

There are two problems that we have run into with some Sony HD VTR's. The "vanc lines setup menu" was added to the HDE-3000 software to work around these problems.

1. For 1080i, some Sony VTR's can't record ancillary data packets on line 571. The caption data packets normally are encoded on lines 9 and 571 (line 571 = field 2 line 8). To work around this problem, use the "vanc lines setup menu" to encode on lines 9 and 572 (the Sony VTR can record ancillary data on line 572).

2. For 1080PsF (progressive segmented frame), some Sony VTR's can only record data packets on line 9. They can't record any data packets in field 2. To work around this problem, use the "vanc lines setup menu" to disable encoding into field 2. Leave field 1 set to line 9, and set field 2 to "disabled". This forces the HDE-3000 to encode all the caption data into line 9 only.

Firmware Maintenance Agreement

Link Electronics has implemented a Firmware Maintenance Agreement (FMA) for the HDE-3000, high definition closed caption encoder, and former Ultech DV3000. The Firmware Maintenance Agreement provides upgrades to the HDE-3000, or DV3000 as they become available. The FMA is included with each HDE-3000 for two years from date of purchase. The Link Electronics distributed firmware covers all version updates through the date of shipment. The FMA coverage entitles you to all firmware changes made up to twenty four months after the date of shipment to your company.

You will receive updates of new firmware releases as they become available, or at your request. Normally the FMA will be sent to the customer listed on the sales order on a Mini CD, including two zip files and two .doc files.

Firmware Maintenance Details

Each HDE-3000 includes free firmware updates for twenty four months from date of purchase; thereafter it is renewable on your anniversary date of the unit. After the internet system is setup, the FMA program will recognize, and each transaction has its own anniversary date that occurs twenty four full months after purchase.

We strongly recommend that customers continuously renew their FMA coverage because it will provide them with unbroken access to all new releases and versions of their HDE-3000. The Link Electronics technical support staff is available for consultation during normal working hours 8:00AM to 5:30PM, Monday through Friday, Central Standard Time. The cost of renewing FMA program after it has lapsed is greater than keeping current.

Customers will be notified of any pending Firmware Maintenance renewals approximately 75 days before the Anniversary date, and a quote for renewal will be sent to the customer. The FMA renewals can then be purchased directly from Link Electronics. Customers also have a choice in how to place their renewal order - it can be placed by sending a purchase order to Link Electronics, by email or US Mail.

The renewal order must be placed by the customer and received by Link Electronics before the anniversary expiration date. This will ensure that FMA coverage is not interrupted, and the customer avoids the additional costs of having to buy "FMA" after expiration date.

The FMA program shall include the name of the person to whom the updates are to be sent. If any personnel changes take place in your company, please notify Link Electronics at the following address

Link Electronics Inc.
2137 Rust Ave.
Cape Girardeau, MO 63703
Phone: 573-334-4433
Email: support@linkelectronics.com

Product Warranty

Link Electronics Inc. warrants its product to be free from defective material and workmanship for a period of TEN-YEARS from date of shipment, including parts and labor to the original customer who purchased the product. The length of the warranty may be different with some products, as noted in "Exclusion A" below, but the following restrictions apply to all products.

This warranty does not extend to products which have been subjected to misuse, neglect, accident or act of nature, incorrect wiring, alteration, improper installation, or used in violation of instructions from Link Electronics. Link Electronics makes no other warranties, express or implied, of merchantability, fitness for a particular purpose, or otherwise. Link Electronics liability for any cause, including breach of contract, breach of warranty, or negligence, with respect to products sold by Link Electronics is limited to repair or replacement by Link Electronics, at its sole discretion.

The product must be shipped to Link Electronics, freight costs prepaid. Labor will be performed at the Link Electronics factory in Cape Girardeau, Missouri. Repaired or replaced equipment shall be returned by surface freight, unless customer wants to pay for air freight. This warranty is in lieu of all other warranties, expressed or implied, with respect to the condition or performance of any Link Electronics products, its merchantability, or fitness for a particular purpose.

The product warranty will be null and void, if a specific component part should become obsolete by the parts manufacturer. If the component part becomes obsolete and not available through distribution, Link Electronics, Inc will not be responsible for repair or replacement of a Link Electronics manufactured product.

In no event shall Link Electronics be liable for any incidental or consequential damages, including loss of profits. This warranty supersedes all previous warranties, whether implied, written or verbal; Date September 1, 2010

SERVICE INFORMATION

In the event that the Link Electronics equipment should fail, you should contact the Customer Service Department and request a Return Authorization (RA) number. At that time, the details of how the repair should be processed will be discussed. All inquiries relating to either parts replacement or warranty service should be directed to:

LINK ELECTRONICS, INC.
Cape Girardeau, Missouri 63703
Phone: 573 334 4433

2137 Rust Avenue
Attention: Service Department
Fax: 573 334 9255

EXCLUSION A

Some of the product line is affected by outside factors that LINK ELECTRONICS cannot control. These products have a limited time for the parts and labor warranty. They are, but not limited to:

HDE-3000 HD/SD SDI Encoder/Decoder	1 year	762/763 Series Video Routers	2 years
HDC-925 HD/SD SDI Up/Down Converter	1 year	Cable Assemblies	2 years
860/861/862 Series Video Routers	7 years	Graphics software	2 years
Modems for Captioning Encoders	2 years	HAC-66/50	1 year