

TES3 and TES5

**Multi-Standard VBI Processors
Software User Manual**

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TES3 and TES5 Software User Manual

- Ross Part Number: TES3DR-004B-03
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Patents

Patent numbers US 7,034,886; US 7,508,455; US 7,602,446; US 7,802,802 B2; US 7,834,886; US 7,914,332; US 8,307,284; US 8,407,374 B2; US 8,499,019 B2; US 8,519,949 B2; US 8,743,292 B2; GB 2,419,119 B; GB 2,447,380 B; and other patents pending.

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To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed out wheelie bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Ross Video for more information on the environmental performance of our products.

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Introduction

In This Chapter

This chapter contains the following sections:

- Overview
- About this Manual
- Documentation Terms and Conventions

A Word of Thanks

Congratulations on choosing an TES3 and TES5 Multi-standard VBI Processors. Your TES3 and TES5 is part of the Ross Terminal Equipment family of products, backed by Ross Video's experience in engineering and design expertise since 1974.

You will be pleased at how easily your new TES3 and TES5 fits into your overall working environment. Equally pleasing is the product quality, reliability and functionality. Thank you for joining the group of worldwide satisfied Ross Video customers!

Should you have a question pertaining to the installation or operation of your TES3 and TES5, please contact us at the numbers listed on the back cover of this manual. Our technical support staff is always available for consultation, training, or service.

Overview

This manual describes the software interface for two new models in Ross Video's family of encoders. The TES3 and TES5 RoHS models comply with the European Union's Restrictions on Hazardous Substances. If the model number of your encoder is TES3-UNI-380 or TES5-UNI-580, this manual describes its controls and operation.

VBI Data Distribution Overview

The TE encoder is part of a system that allows data from a transmit computer to be inserted into the VBI (vertical blanking interval) of a television signal for distribution through an analog video channel. The television signal is then received and the data is extracted and processed. **Figure 1.1** shows the pieces of equipment involved in a typical VBI data distribution system. The video distribution network, between the TE encoder and the TV data receiver, is omitted from the drawing for clarity. Each of the pieces in this system is described briefly in the following sections.

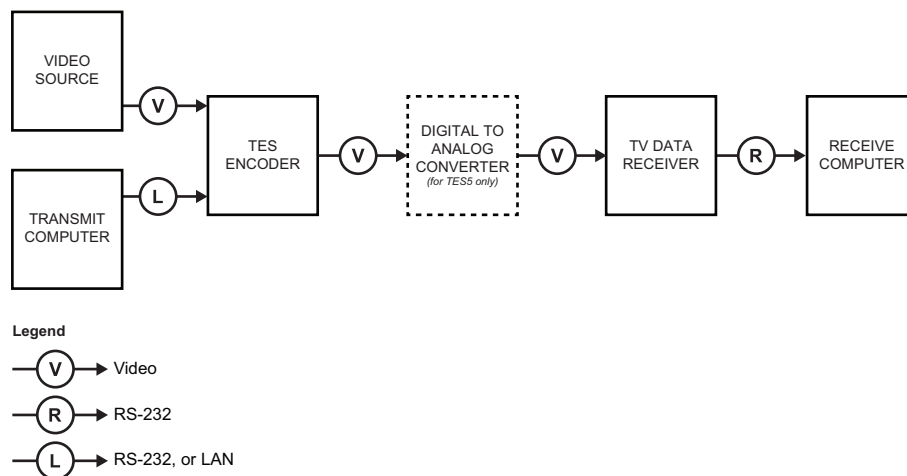


Figure 1.1 VBI Data Distribution

Transmit Computer

The transmit computer executes application programs that

- configure the encoder; and
- supply data to the encoder

The application program used to configure the encoder, SETTE32, is supplied with your TE encoder.

Data is sent to the encoder by one of the Ross Video application programs or an application program written specifically for the VBI data distribution system.

Transmit Computer-Encoder Link

The link between the transmit computer and encoder can be either a LAN or a serial connection, depending on a setup parameter.

The LAN system is Ethernet 10BASE-T using TCP/IP.

In a serial system, there can be up to 4 serial feeds connected to the encoder. Three of these serial connections are RS232 operating at speeds up to 115200 baud. The fourth serial feed is a modem connection.

Video Generator

There are two common formats for standard-definition video: analog and digital. The TES3 encoder is used with composite analog video. The TES5 encoder is used with component serial digital video (SDI), complying with SMPTE 259M.

Both the TES3 and TES5 can accept either 525 or 625 line video signals.

TES Encoder

The TES Multi-Standard TV Data Encoder/Inserter Family of products are highly flexible platforms for encoding, inserting, receiving and multiplexing digital data in the vertical blanking interval (VBI) of any television signal.

An encoder can be loaded with up to eight software modules for encoding/inserting of eight different input data streams into a single VBI. TES units can operate in any television and AC power standard, and can encode and insert in any VBI data format. The software module (or modules) in the encoder determine(s) which format of VBI data is inserted. The software modules available for the encoder are:

- NABTS
- WST
- Closed Captioning
- WST IDL Format A / IDL Format B
- Universal Data
- VITC

Table 1.1 shows the combinations of video signal type and module type which were available when this manual was published.

Table 1.1 Supported Signal Types

Module	525	625
NABTS	Yes	Yes
WST		Yes
CAPTION	Yes	Yes
IDLA/IDLB		Yes
UNIVERSAL	Yes	Yes
VITC	Yes	Yes

Each module allows you to provide 1 service. However, when you are using the NABTS, WST, or IDLA /IDLB modules you may want more than 1 service, i.e. more than 1 “packet address”. In this case, more services can be added by adding more modules.

TV Data Receiver

The form of the data receiver depends on the source of the signal. If the signal is being received from a satellite feed, then the receiver and decoder are two entities. The satellite receiver is needed to convert the signal into a video signal that can be connected to the decoder. If the source of the signal is from an antenna or a cable TV feed, then no receiver is needed; the antenna or cable TV signal can usually be connected directly to the decoder.

The form of the decoder depends on the type of VBI data being decoded. If the VBI data is closed captioning, then the decoder is typically in a TV set. Otherwise, the VBI data is meant to be decoded and then processed by a Receive computer. In this case, the decoder is a stand-alone box with a built in TV tuner, such as the Ross Video TTX74x series of decoders, a PC card with a

built in TV tuner, such as the Ross Video TTX8xx series of decoders or a rack mounted decoder, such as the TTX85x series.

The stand-alone and rack-mount decoder boxes are connected to the Receive computer by a serial port.

The PC card (TTX8xx) is installed in the Receive computer.

Receive Computer

The Receive computer processes the decoded VBI data. The program that processes the data can be either a Ross Video application program or a user written program.

About this Manual

This manual is divided into several chapters and appendices. The chapter number and a brief explanation of what the chapter is about is given below.

- Chapter 2 describes how to connect the various cables and video for each type of encoder
- Chapter 3 describes the part of the configuration program that applies to all modules
- Chapter 4 describes the configuration of the NABTS streams
- Chapter 5 describes the configuration of the WST streams
- Chapter 6 describes the configuration of the WST IDL Format A / IDL Format B streams
- Chapter 7 describes the configuration of the Captioning streams
- Chapter 8 describes the configuration of the UNIVERSAL streams
- Chapter 9 describes the configuration of the VITC streams
- Chapter 10 describes the configuration of the NABTS module parameters
- Chapter 11 describes the configuration of the WST module parameters
- Chapter 12 describes the configuration of the WST IDL Format A / IDL Format B module parameters
- Chapter 13 describes the configuration of the Captioning module parameters
- Chapter 14 describes the configuration of the VITC module parameters
- Chapter 15 describes a troubleshooting procedure
- Appendix A describes the pin-out of the null modem cable required between a transmit computer and the encoder, the data modes available for the encoder, the steps required in software to use a LAN encoder, and how to measure the start time and data amplitude.

You should read chapters 2 and 3 and the chapters for the software modules that you have installed in your encoder. The Troubleshooting should be consulted if you are having problems with your encoder.

Documentation Terms and Conventions

The following terms and conventions are used throughout this manual:

- All references to the **TES3 and TES5** also includes all versions unless otherwise indicated.
- “**Operator**” and “**User**” refer to the person who uses TES3 and TES5.
- “**System**” and “**Video system**” refer to the mix of interconnected production and terminal equipment in your environment.
- The “**Operating Tips**” and “**Note**” boxes are used throughout this manual to provide additional user information.

Installation

In This Chapter

This chapter covers how to install an encoder and some items to check when the encoder does not seem to be operating correctly. In some cases it may be useful to set up your VBI Data Distribution system in a controlled environment first. Do all your testing and once you are confident that the system is working, do the field installation of the system.

The following topics are discussed:

- Before You Begin
- Connections

Before You Begin

The installation of the encoder consists of the following steps:

- installing the chassis in a rack
- video connections
- data source connections

Installing the encoder chassis in a rack is covered in the *TES3 and TES5 Hardware Manual*.

Connections

This section provides a general overview of the connections for the TES3 and TES5.

Video Connections

The TES3 or TES5 is usually installed directly into the video path (**Figure 2.1**). However, a TES3 can be connected via a VITS Inserter, such as the Tektronix 1910 (**Figure 2.2**). When the encoder is being installed directly in the video path, it can be put anywhere in the video path. When using a VITS inserter, the VITS inserter may have to be set up. For example, the VITS input that the encoder is connected to must pass the lines that the encoder is using for data insertion. All equipment downstream from the encoder must pass the VBI lines the encoder is using for insertion.

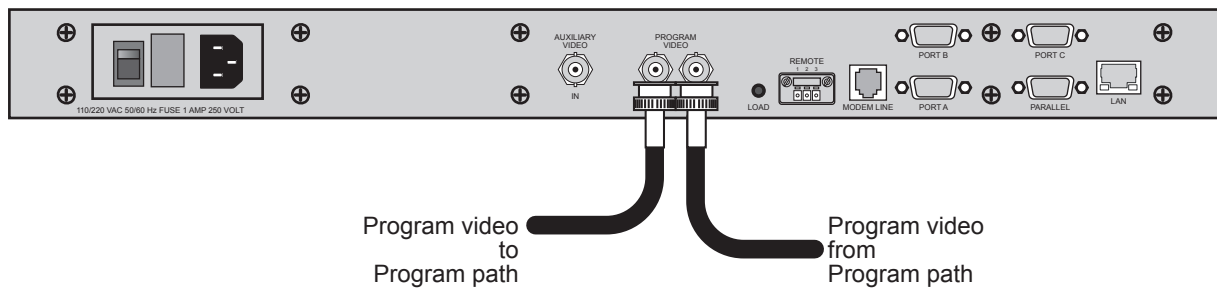


Figure 2.1 Video Path

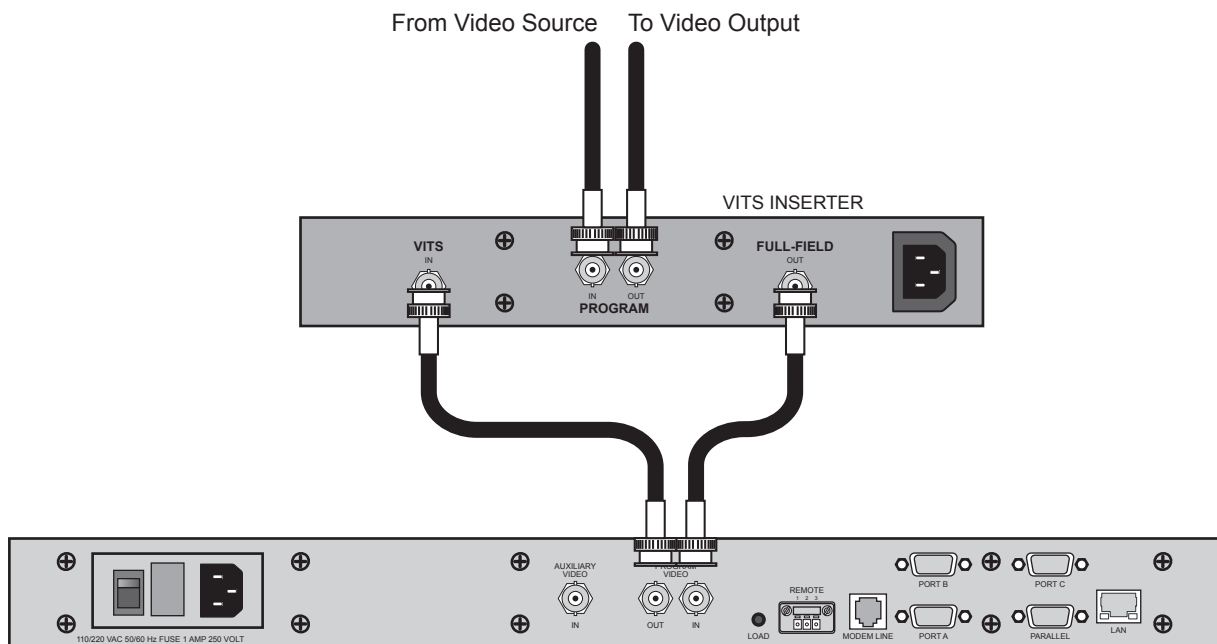


Figure 2.2 TES3 — Example of VITS Inserter Connections

Data Sources

The connection of the data sources depends on the software modules installed in the encoder. It is not practical to cover all possible module combinations, so two examples are used. From these examples, you should be able to determine the connections for other module combinations.

The first example, shown in **Figure 2.3**, is a serial TES3 or TES5 which has two NABTS or WST modules, and one captioning module. All serial connections use an RS232 “null modem” cable such as the one supplied with the encoder. Additional cables are available from Ross Video, or can be manufactured using the information in “**Appendix A.**” on page 16-1.

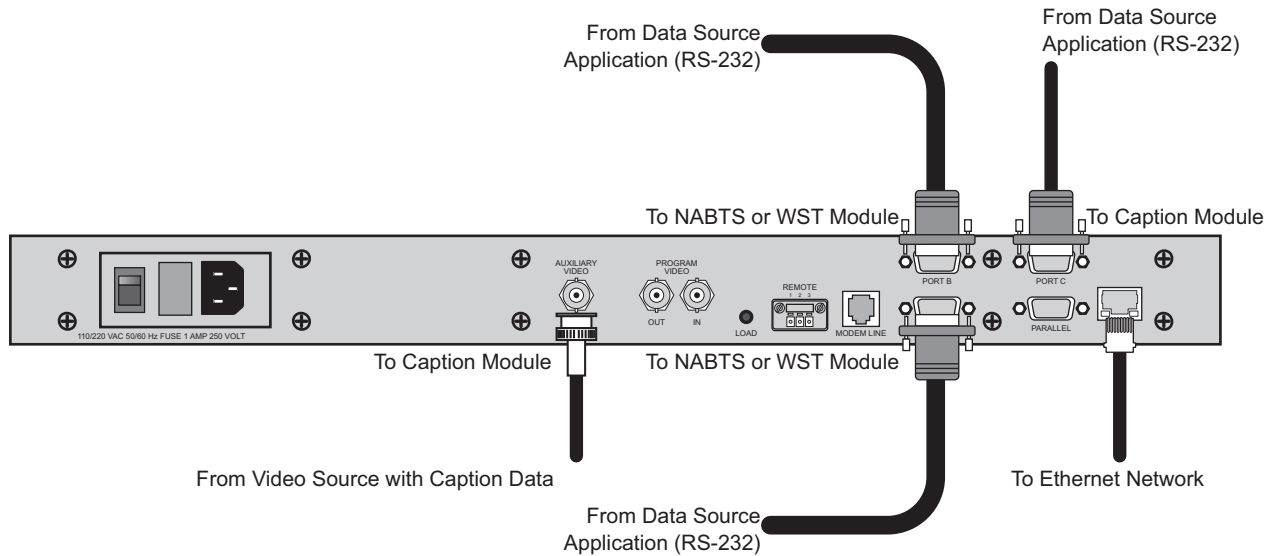


Figure 2.3 Serial with Two NABTS or WST Modules and One Captioning Module

The second example, shown in **Figure 2.4**, is a LAN TES3 or TES5 which has two NABTS or WST modules.

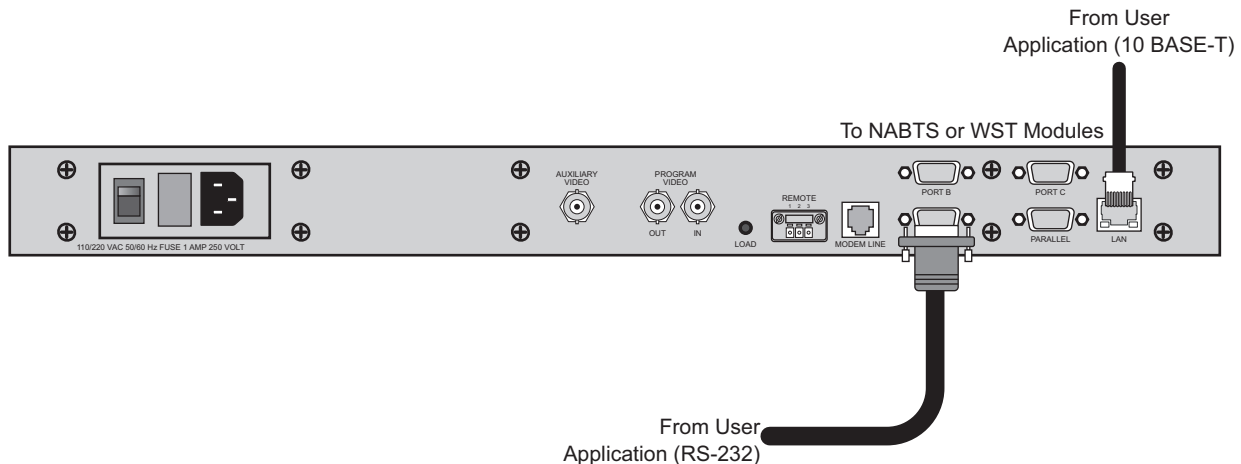


Figure 2.4 LAN TES3 or TES5 with Two NABTS or WST Modules

Encoder Configuration

In This Chapter

This chapter provides a general overview of configuring the Encoder on the TES3 and TES5.

The following topics are discussed:

- Installing SETTE32
- Starting SETTE32
- LAN Configuration Menu

Installing SETTE32

A transmit computer, executing the **SETTE32** configuration program, is required to configure the encoder. The transmit computer and the encoder can be connected directly, using a cable or indirectly, using the modem or LAN card.

In a direct connection, the encoder's **PORT A** connector is used to connect a null modem cable between the encoder and the transmit computer. The encoder is shipped with a 9 pin female to 9 pin female null modem that is to be used for this purpose. Refer to "**Appendix A.**" on page 16-1 for the null modem wiring details.

A modem or LAN connection is convenient for changing the encoder's configuration remotely or if **PORT A** is permanently wired as a data input.

The configuration program, **SETTE32**, is available from Ross Video.

You may find it to be desirable to configure and test the encoder before installing it in a rack.

To install SETTE32

1. Ensure that you have the latest setup software from Ross Video copied to the computer to be used to configure the TES.
2. Click **start** on the Task Bar and select the **Run** option.
3. Click **Browse** in the **Open** box.
4. Locate the SETUP.EXE saved from the website.
5. Click **OK**.
6. Follow the **Install Shield** instructions.
7. There are three methods involved in configuring the encoder:
 - Connect a null modem cable between the transmit computer and PORT A. Note: The first time you configure the encoder, you should use PORT A. On subsequent connections, you have the choice of three types of connection; or
 - Connect the transmit computer's and the encoder's modems to phone lines; or
 - Connect the transmit computer's LAN card and the encoder's LAN card to a LAN.
 - › Put the encoder in setup mode (this is not necessary for the LAN connection if the encoder's IP address has already been set up).
 - › Run SETTE32.
8. Continue to the next section. The last steps are explained in more detail in the following sections.

Configuring the Encoder for Setup Mode

The encoder is designed to power up and run with the parameters stored in configuration memory. To initially set the configuration or to change it, you must place the encoder in setup mode.

To place the encoder into setup mode

1. Ensure the unit is powered-up with the **LOAD** switch pressed in. The **LOAD** switch is located on the rear panel, and can be pressed with a small pointed object such as a pencil.
2. Press and hold the **LOAD** switch, then turn on the encoder's power switch, and hold the **LOAD** switch in for about five seconds.
3. While powering up, the encoder performs diagnostic tests. These tests take approximately a minute and during this time the front panel **STATUS** LED is red. When the **STATUS** LED turns green the encoder is ready to be configured with SETTE32. The encoder waits for SETTE32 to communicate with it using either **PORT A** or the modem.
4. The encoder leaves setup mode when SETTE32 is exited or the encoder is powered off and on again.



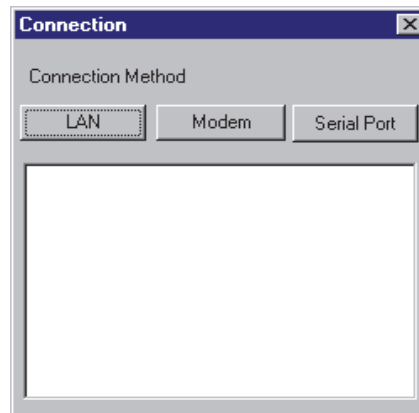
Note — A LAN-based encoder's IP address must be set through PORT A using the above method before it can communicate through the LAN. After this initial setup, the encoder's setup can be changed via the LAN connection without using the LOAD switch. Data sources must stop sending data to the encoder before running SETTE32.

Starting SETTE32

This section outlines how to start the SETTE32 program and the possible types of connections to use.

To start SETTE32

1. Select the **SETTE32** icon from the **Start > Programs** menu.
2. Select the source you wish to connect with from the **Connection** dialog.



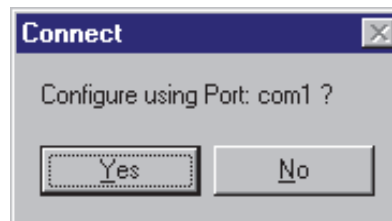
Connection Dialog

Types of Connections

This section outlines the connection types available in the Connection dialog.

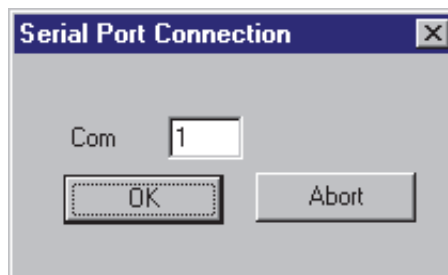
Serial Port Connection

After selecting serial port as the method of connection the following dialog displays.



Connect Confirmation Dialog

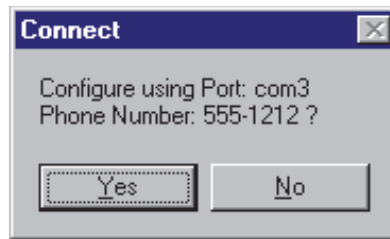
Selecting **No** displays the following dialog and allows you to change the port to be used to connect with the encoder.



Serial Port Connection Dialog

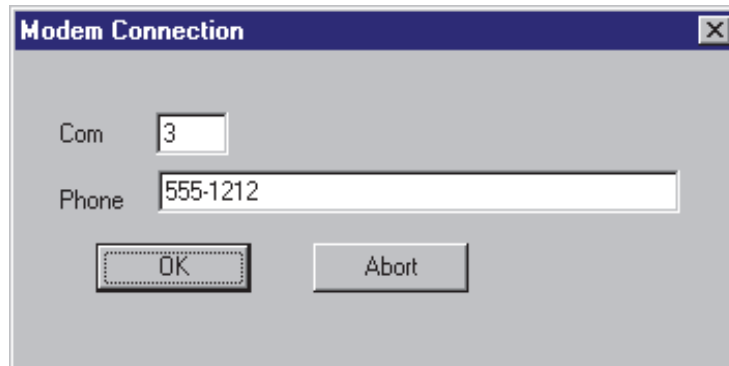
Modem Connection

Selecting the modem as the configuration method displays the following dialog.



Connect Modem Dialog

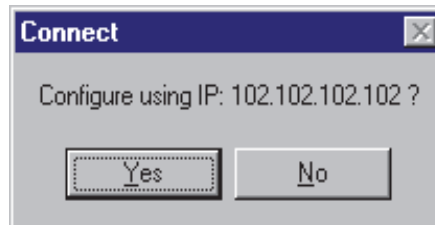
Selecting **No** displays the following dialog and allows you to specify the modem 's COM port and the phone number to dial.



Modem Connection Dialog

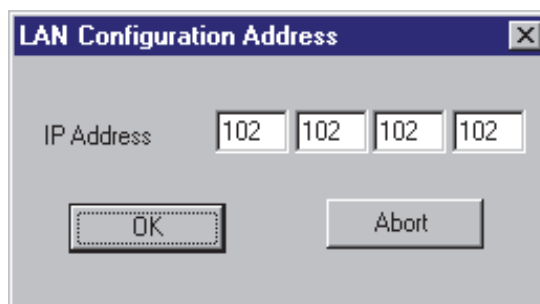
LAN Connection

Selecting **LAN** as the configuration method displays the following dialog.



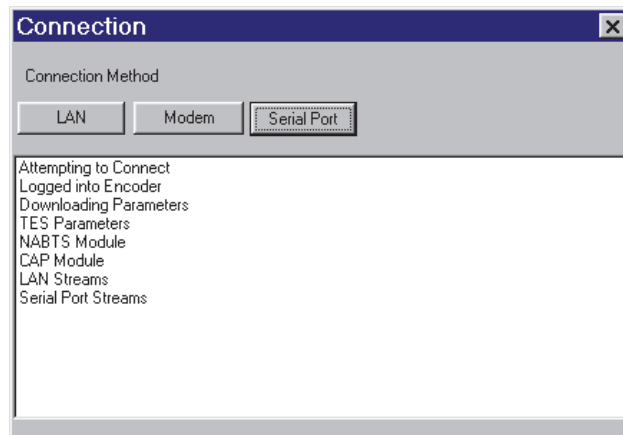
Connect LAN Dialog

Selecting **No** displays the following dialog and allows you to select the IP address of the encoder to be configured.



LAN Configuration Address Dialog

After a connection has been established, SETTE32 downloads the encoder's module and stream settings. The **Connection** display is updated with periodic progress reports. The list of modules loaded depends on the modules purchased. The figure below shows a typical connection display.



Connection Dialog

Main SETTE32 Menu

After the settings are downloaded from the encoder, the main SETTE32 window displays.

TES Setup (86-10302-01) Version 2.2			
ID		Encoder	
Encoder Type	TES5 Encoder	625 Line	
Serial Number	35458	Insert Block	5-22 & 318-335
Firmware Number	86-10527-01	Configure	
Rev	A		
Stream Setup			
		Data Source	Factory Reset
Stream 1	Closed Caption Encoder	2000	Configure
Stream 2	none		Configure
Stream 3	none		Configure
Stream 4	none		Configure
Stream 5	none		Configure
Stream 6	none		Configure
Stream 7	none		Configure
Stream 8	none		Configure
TCP/IP Address			
IP Address	223	223	223 206
Netmask	255	255	000 000
DHCP	OFF	Properties	
		Exit + Save Permanently	
		Exit + Save Temporarily	
		Exit + Lose Changes	

TES Setup Menu

SETTE32 is intended to provide a simple means of configuring the encoder. The following is a brief description of the controls on the main SETTE32 window.

ID Area

The ID section contains general information about the encoder being configured. The 'Encoder Type' and serial number describe the encoder's hardware. The 'Firmware Number' and 'Rev' describe the software that is currently running on the encoder.

Encoder Area

The encoder section describes VBI related parameters that the encoder uses when operating. The first box shows the type of video input (525 or 625 lines). The insert block displays the block of 16 lines that are currently available for the encoder to insert into. The **Configure** button allows these values to be altered as described in the **General Encoder Configuration** Menu section in this chapter.



Note — The first time you run SETTE32 with a new encoder, it is imperative to select 'Configure' and set up the Encoder Type (LAN or Serial) and Line Mode (525 or 625 lines) before using the Stream Setup area of this menu to define data streams

Stream Setup Area

The stream setup section allows you to attach a data source to a module.

- **Module** column — includes boxes in which the different modules available on the encoder can be selected. The **Module** boxes, depending on which modules have been purchased, can contain: NABTS Data Broadcast Software, WST Data Broadcast Software, Closed Caption Encoder, WST IDLA / IDLB, Universal Module Software, or VITC Module.
- **Data Source** column — includes boxes that show the data source that the selected module is connected to. The available data sources for an encoder that is set up for serial operation are: Port A, Port B, Port C, and Modem. The encoder that is set up for LAN operation has LAN1 to LAN8 as valid data sources.

To set up a stream

1. Select the module you wish to configure from the 'Module' box.
2. Click the **Configure** button for that stream. The **Stream Configuration** menu for the module selected is displayed, allowing you to select the data source and other stream related parameters.

The **factory reset** button resets all streams, removes all BERT data sources and resets other data related settings to the factory presets.



Important — All streams are lost if this option is selected. The reset does not adjust the video type, TCP/IP parameters or the LAN/SERIAL choices.

TCP/IP Address Area

This section is applicable when the encoder is set up for LAN operation or if you plan to use the LAN for setup. This area is for display purposes only; to change any of the values, select the '**Properties**' button.

- **IP Address** — the IP address of the encoder.
- **Netmask** — The Netmask used by the encoder.
- **DHCP** — This box indicates whether DHCP is being used to determine the encoder's IP address. 'ON' indicates DHCP is used and 'OFF' indicates that the encoder is using the static IP address displayed in the 'IP Address' area.
- **Properties** — This button allows the displayed items in the TCP/IP Address section to be altered using the TCP/IP Configuration menu.

Exit Buttons

The following Exit buttons are available:

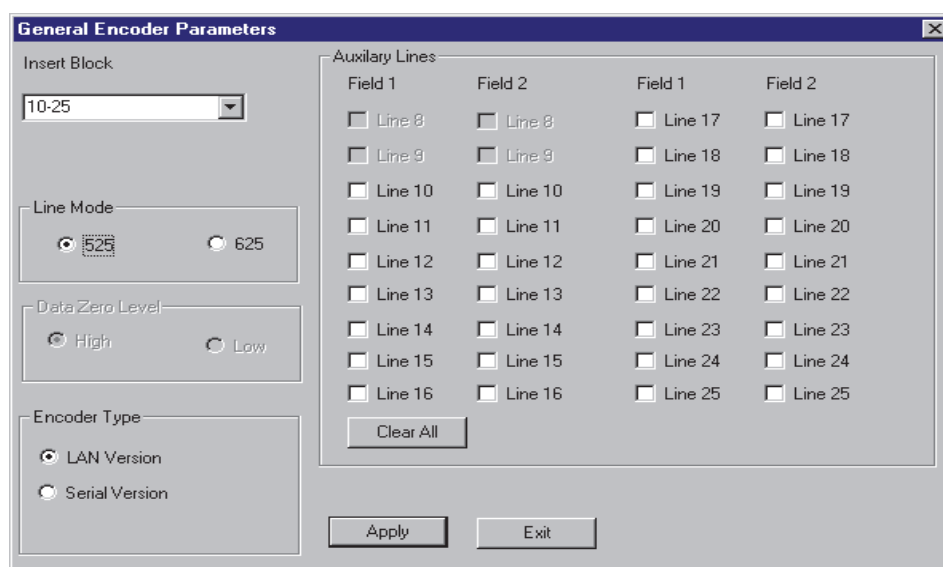
- **Exit and Save Permanently** exits SETTE32 and saves the current changes in non-volatile storage in the encoder. This is the normal method of exiting.
- **Exit and Save Temporarily** exits SETTE32 and saves the current changes to temporary storage in the encoder. When the encoder is powered off and back on again, the changes are erased and the previously saved values are restored. This method of exiting may be useful when experimenting with setup options.
- **Exit and Lose Changes** abandons changes and exits SETTE32.



Caution — A brief delay occurs when saving parameters permanently in the encoder. It is very important to leave the encoder's power turned on at least until this menu disappears. Failure to do so could cause damage that would require a return to the factory for repair.

General Encoder Parameters

Selecting the **Configure** button in the Encoder section of the main SETTE32 menu displays the General Encoder Configuration menu shown below. A brief description of the controls follows.

The dialog box is titled "General Encoder Parameters". It contains several sections: "Insert Block" with a dropdown menu showing "10-25"; "Line Mode" with two radio buttons, "525" (selected) and "625"; "Data Zero Level" with two radio buttons, "High" (selected) and "Low"; and "Encoder Type" with two radio buttons, "LAN Version" (selected) and "Serial Version". On the right, there is a section titled "Auxiliary Lines" with a grid of checkboxes for "Field 1" and "Field 2" across lines 8 to 25. A "Clear All" button is located below the grid. At the bottom are "Apply" and "Exit" buttons.

General Encoder Configuration Menu

Line Mode

The 'Line Mode' option indicates the type of video signal that will be connected to the encoder. It can be set to either 525 line or 625 line. This setting affects any menu items that deal with line numbering, such as the Insert Block and Auxiliary Lines items in this menu. This setting must be set to 625 to successfully select the WST Configuration or WST IDLA IDLB module for configuration, if the module is installed on your encoder, otherwise an error message is displayed.

The line mode must be selected to match the format of the input video signal that you plan to use. The encoder automatically detects the video type that is connected. However, you must specify it here, since it will allow you to correctly select the insertion lines even if there is no video input connected.

Insert Block

The 'Insert Block' option allows you to select which block of lines the encoder is able to insert into. The insert block can be moved in 8 line increments. For 525 line video, the first line of the insert block must be in the range of 10 to 250; 10 would be a normal value for most applications. In 625 line video, the first line of the insert block must be in the range of 5 to 303 (318 to 616 for field 2); 6 or 7 would be a normal value for most applications.



Caution —If the last insertion block is selected, you must make sure that you do not select lines that cause the encoder to insert over the next field's vertical blanking interval.

If you alter the insert block you must exit this menu and then click on the '**Configure**' button again.

Data Zero Level

This option is only useful on a TES5 operating in 525 line mode.

The zero level for all VBI data bits should be at blanking level (0 IRE units). However, some video digital-to-analog converters (DACs) add a 7.5 IRE NTSC pedestal (sometimes called “setup”) to VBI lines when processing 525-line video.

In the normal case, the downstream DAC does not add a pedestal, and the default “High” setting for this option should be used. If the downstream DAC does add pedestal, the “Low” setting of this option can be used to pre-correct for the DAC’s behavior.

If the DAC allows you to control whether the pedestal is on or off for VBI lines, you should turn it off and use the default “High” setting for Data Zero Level.

If the DAC allows you to specify the end of the vertical blanking interval, set it to end after the last TV line you are using for your data, in order to ensure that all your data lines have the same zero level.

To adjust the Data Zero Level, examine the analog signal at the output of the DAC, using a waveform monitor or oscilloscope, and select a TV line containing your VBI data. If the standard “High” setting results in a data zero level that is within a few IRE units of blanking, keep this setting. If, on the other hand, the data zero level is well above blanking, try changing the setting to “Low”.



Caution — *You should not allow the data zero level to go below blanking, as this can disrupt downstream equipment. If the characteristics of your DAC are such that you are faced with a choice between a slightly positive zero level and a negative one, always select the safer positive one.*

Encoder Type

This option is retained for compatibility with previous encoder models that had either a modem or a LAN interface, but not both. This is used to specify whether data streams will be transported through serial ports or the LAN. Any streams that have been defined must be disabled before changing the encoder type. To disable a stream select ‘No Source’ from the appropriate Stream Configuration menu. After disabling all streams and changing the Encoder Type, exit SETTE32 using the **Exit and Save Permanently** button. After the SETTE32 menu disappears from your PC screen, wait 1 minute then turn off power to the encoder. Wait at least 10 seconds, then turn the power back on. The encoder will now have changed types.



Caution — *A brief delay occurs when saving parameters permanently in the encoder. It is very important to leave the encoder’s power turned on at least until this menu disappears. Failure to do so could cause damage that would require a return to the factory for repair.*

Auxiliary Lines

A feature of the TES3/TES5 is that it can key the active portion of a video line from the video signal connected to the Auxiliary In BNC into the video signal connected to the Program In BNC. The two video signals must be vertically and horizontally synchronized for this feature to work properly. The encoder can not use these lines for insertion and as a result you can not select these lines when you are setting the operating parameters for a stream. The reverse is also true, you can not select a line as auxiliary if it is already used by a stream.

Apply / Exit Buttons

The **Apply** button causes changes to the Data Zero Level and Auxiliary Lines to take effect immediately.

The **Exit** button returns to the main SETTE32 menu.

LAN Configuration Menu

The menu below is displayed when the **Properties** button within the TCP/IP address section of the main **SETTE32** menu is selected for a LAN encoder. The **LAN Configuration** menu allows you to set the TCP/IP related parameters used by the LAN encoder.

LAN Card Configuration

Lan Card Settings

IP Address: 111 112 113 114

Subnet Mask: 255 255 255 000

TCP/IP Ports

LAN 1: 2000 LAN 5: 2040

LAN 2: 2010 LAN 6: 2050

LAN 3: 2020 LAN 7: 2060

LAN 4: 2030 LAN 8: 2070

DHCP

☐ ON ☒ OFF

Cancel OK

LAN Card Configuration Menu

LAN Card Settings

The 'IP Address' and 'Subnet Mask' are assigned to the encoder so it can communicate over a TCP/IP network with other computers. The IP Address and Subnet Mask values are controlled by your network administrator.

TCP/IP Ports

The TCP/IP ports are similar to serial ports on a serial encoder, as they are used as data sources. The port numbers can be specified by the user and are used by computers sending data to the encoder. The valid range for TCP/IP port numbers is 1 to 65535. However, it is recommended that the port numbers used be greater than 1024, as many lower numbers have been assigned specific functions within a TCP/IP network. Using one of these numbers could adversely affect the operation of a TCP/IP network. Ross Video uses port numbers 1080 and 1090 for configuration of the encoder, so these port numbers can not be used for a stream.

DHCP

The DHCP ON/OFF section allows the encoder to get an IP address assigned to it by a DHCP server, as opposed to using a fixed number. Consult your network administrator as to whether your network uses DHCP. In the event of a DHCP failure, the encoder uses the 'IP Address' and 'Subnet Mask' displayed as a default.

NABTS Stream Configuration

In This Chapter

This chapter provides a summary of the menus available for the TES3 and TES5.

The following topics are discussed:

- NABTS Stream Configuration Overview
- Lines Enabled vs. Transmit Computer Baud Rate

NABTS Stream Configuration Overview

When a NABTS module is selected for configuration in the main SETTE32 window, the menu below is displayed.

NABTS Stream Configuration

Byte Sync:

Packet Address:

Priority:

Data Pacing: ☐ on ☒ off

Data Mode:

- ☒ Bundle FEC
- ☐ Packet FEC
- ☐ 30 Byte Transparent
- ☐ 33 Byte Transparent
- ☐ 28 Byte Transparent
- ☐ 27 Byte Transparent

Source:

- ☒ Port A
- ☐ Port B
- ☐ Port C
- ☐ Modem
- ☐ Btest data
- ☐ no source

Insertion Lines:

Field 1	Field 2
☐ Line 10	☐ Line 10
☐ Line 11	☐ Line 11
☐ Line 12	☐ Line 12
☐ Line 13	☐ Line 13
☒ Line 14	☒ Line 14
☒ Line 15	☒ Line 15
☒ Line 16	☒ Line 16
☐ Line 17	☐ Line 17
☐ Line 18	☐ Line 18
☐ Line 19	☐ Line 19
☐ Line 20	☐ Line 20
☐ Line 21	☐ Line 21
☐ Line 22	☐ Line 22
☐ Line 23	☐ Line 23
☐ Line 24	☐ Line 24
☐ Line 25	☐ Line 25

Frames Enabled:

☒ Frame 0	☒ Frame 15
☒ Frame 1	☒ Frame 16
☒ Frame 2	☒ Frame 17
☒ Frame 3	☒ Frame 18
☒ Frame 4	☒ Frame 19
☒ Frame 5	☒ Frame 20
☒ Frame 6	☒ Frame 21
☒ Frame 7	☒ Frame 22
☒ Frame 8	☒ Frame 23
☒ Frame 9	☒ Frame 24
☒ Frame 10	☒ Frame 25
☒ Frame 11	☒ Frame 26
☒ Frame 12	☒ Frame 27
☒ Frame 13	☒ Frame 28
☒ Frame 14	☒ Frame 29

NABTS Stream Configuration Menu

Each of the menu items is described in further detail in the following sections.

NABTS Stream Parameters

This section discusses the programming of the NABTS streams.

Byte Sync

The Byte Sync is used as the framing code for NABTS decoders. This synchronization byte precedes the data. The normal hexadecimal value for NABTS data is E7. This parameter is not usually modified. By default, a stream is initialized with a byte sync of E7. If this value is to be changed, select the Byte Sync menu item and type in the new byte sync.

Packet Address

The packet address is a three hexadecimal digit address to be added to the data being received from this stream's source. The packet address is also known as the magazine number. This field cannot be specified if the data mode is set to 33 byte transparent, since in this mode the data received from the transmit computer contains the packet address to be used.

Priority

The priority field selects the priority the current stream has in relation to other streams. A stream with a priority of 0 has the highest priority. The priority determines which stream gets to insert data on a specific TV line when two or more streams have that TV line enabled for insertion. The highest priority stream (priority = 0) always gets the first opportunity to fill all of its enabled TV lines. A stream which is unable to fill all of its lines with data offers its unused lines to the next highest priority stream. A stream may be unable to fill all of its enabled lines because it has not

received enough data to fill all these lines or it does not have all of its frames enabled for insertion. The choices for a priority value depend on the number of software modules installed in the encoder.

Data Pacing

In a VBI data distribution system, the group supplying data to customers must ensure that no data is lost at a customer's receive site. If the customer's data receiver passes data to a receive computer via a serial port, there is potential for a loss of data if the encoder allows a throughput greater than the decoder's serial port speed. **Table 4.3** and **Table 4.6** show the minimum baud rate that a data receiver must operate at, versus number of TV lines and data mode, to ensure that no data is lost for 525 and 625 line video respectively.

If you are using a serial encoder and it receives data from a transmit computer at the same speed as the data receiver outputs to a receive computer, then data pacing should be enabled. There is always a very small difference in the baud rates; if the data receiver is slightly slower, then over a long period of time the data receiver will lose data. Data pacing compensates for small differences in baud rate by limiting the maximum throughput of the NABTS module to be 2% less than the selected baud rate. When the data pacing field is in the Off state, data pacing is disabled and the NABTS module outputs data as fast as possible, given the number of lines and frames allocated for insertion. Data pacing may be turned off if the decoders are set to a higher baud rate than the encoder.

Data pacing should be turned off for a LAN encoder. Since a LAN encoder normally fills its enabled lines, it is important that a serial data receiver's baud rate meet or exceed the baud rate shown in **Table 4.3** and **Table 4.6** for the given number of TV lines and data mode for 525 and 625 line video respectively.

General Module Configuration

This button brings up the General NABTS Configuration Menu for setting the general NABTS parameters. Refer to the chapter “**NABTS Parameters**” on page 10-1 for further details.

Data Mode

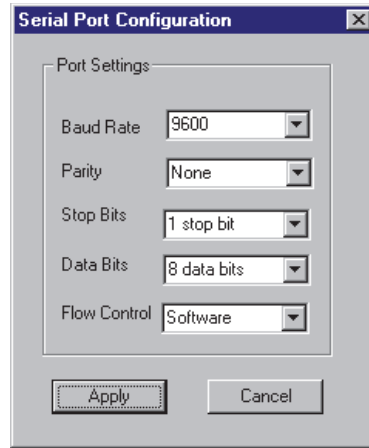
The NABTS module can insert data using one of six modes: 27 byte transparent, 28 byte transparent, 30 byte transparent, 33 byte transparent, packet FEC, and bundle FEC. In the two 8 bit FEC modes, data is protected by Ross Video's advanced forward error correction code. This FEC is built in to some Ross Video decoders to increase the data's integrity. The 30 byte transparent mode accepts data in 30 byte blocks and requires the first two bytes of the block to be Hamming encoded according to the NABTS standard. The 33 byte transparent mode accepts data in 33 byte blocks and requires the first five bytes of the block to be Hamming encoded according to the NABTS standard. The NABTS module discards any data that does not begin with the required number of Hamming perfect bytes. The 27 byte transparent mode requires the data to be 7 bit odd parity. The 28 byte transparent mode encodes 8 bit data and provides no data protection. These data modes are discussed in more detail in the section “**Data Modes**” on page 16-3.

Source (LAN Encoder)

The source field is used to select where the NABTS module is receiving data from, i.e. the source device. The black circle indicates the currently selected data source. The source device can be one of the eight user defined TCP/IP port numbers, or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. To configure the port numbers go back to the main SETTE32 menu and select the **Properties** button in the TCP/IP address section.

Source (Serial Encoder)

The Source field is used to select where the NABTS module is receiving data from, i.e. the source device. The black circle indicates the currently selected source device. The source device can be Port A, Port B, Port C, Modem, or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. Selecting the **Configure** button allows you to set the serial port parameters using the Serial Port Configuration menu shown below.



Serial Port Configuration Menu

The flow control can be either hardware (RTS/CTS) or software (XON/OFF). The null modem cable shipped with the encoder supports both hardware and software flow control.

Insertion Lines

The section is used to select the lines the encoder will insert data on. The lines available for insertion depend on the line mode and the insertion block selected. These options are explained in the chapter “**Encoder Configuration**” on page 3-1. There is an important relationship between the number of lines enabled and the baud rate of the data source. This relationship is discussed in the section “**Lines Enabled vs. Transmit Computer Baud Rate**” on page 4-6. Lines that have already been selected for bridging from the auxiliary video feed are not available for data insertion.



Note — *When using a TES5, the digital video signal must be converted to an analog signal. The equipment that does this conversion may not pass some lines in the VBI. For this reason, the analog output signal should be examined to verify that data is present on the TV lines expected.*

Frames Enabled

The section is used to select which frames will be used for insertion. Under most situations the encoder should be set to insert on all the frames. The frames are numbered from 0 to 29. Frames enabled for insertion apply to all the TV lines selected for insertion. Disabling frames for insertion can be used to guarantee that multiple streams sharing the same lines will get some frames to insert on. A stream that is using all of its allowed lines and frames never allows a lower priority stream using the same lines an opportunity to insert its data. The lower priority stream could be guaranteed some frames to insert on if the higher priority stream gave up some frames and the lower priority stream has these frames enabled.

Apply

This button saves the currently displayed selections and returns to the main SETTE32 menu. Any streams configured using the NABTS Stream Configuration menu, are not activated until SETTE32 is exited and the changes saved to non-volatile memory.

Cancel

This button exits the NABTS Stream Configuration menu and deletes any changes made.

Lines Enabled vs. Transmit Computer Baud Rate

This section pertains primarily to a serial encoder. However, there is one portion that applies to a LAN encoder as well.

In a VBI data distribution system, one wants to distribute the data as fast as possible. The speed of distribution depends on several factors:

- type of data decoder being used
- number of TV lines available in each field
- data mode
- transmit computer to encoder link speed

The data decoder receiving the VBI data must be able to decode, process and pass on the data to a receive computer without losing any data. This must be within a TV field time, i.e. 16.6 ms for a 525 line TV signal and 20 ms for 625 line TV signal. Ross Video has two types of data decoders that pass data to a receive computer. One is a PC card that is in the receive computer, a TTX8xx. The second is a stand alone unit that connects to the receive computer via a serial cable, a TTX74x. The TTX8xx can always process and pass data to an application program running in the receive computer without losing any data. The TTX74x is limited by the speed of the serial link. Thus, for a specific baud rate there is a maximum number of TV lines that can carry data such that data is not lost. Therefore, if you are using data decoders that are connected to a receive computer via a serial link, you must take into consideration the decoder's baud rate when setting up your system operating parameters.

An important consideration when determining the number of TV lines and baud rate to use is whether the transmit computer application program handles flow control. Flow control is a standard method of controlling the rate at which data is transmitted over an RS232 link. In this case, it allows the encoder to signal the transmit computer application program to temporarily stop sending data when the encoder is unable to process the data at the rate that it is being received (this situation would occur if too few TV lines were allocated for a particular stream). Once the encoder has inserted the "backlog" of data, it then signals the transmit computer application program to resume sending data. If the transmit computer application program does not handle flow control, then the number of TV lines allocated must be enough to ensure that the data can be inserted at the rate at which it is being received.

There are three situations which can affect how the number of TV lines and baud rate are chosen. The first situation is where data is to be sent to the encoder at a given baud rate, using a given data mode, and you want to determine the number of TV lines needed to handle the data without requiring the transmit computer to handle flow control. The second situation is where you have a specific number of available TV lines, and you want to determine the maximum baud rate, for a given data mode, which can be used without requiring the transmit computer to handle flow control. The third situation is where there is a specific number of available lines, and you want to completely fill the lines (i.e. fully utilize the available bandwidth), while using flow control to avoid losing data.

The first step in determining the appropriate number of lines and/or baud rate is to calculate, for each data mode, the serial port baud rate which causes 1 TV line to be completely filled with data without issuing flow control to the transmit computer. This value, referred to as bps/line, is as follows, assuming that the encoder is operating with a 525 line video input, the stream has all frames enabled, and both fields of each line are being used:

Table 4.1 Data Modes

Data Mode	bps/line
27 byte transparent	16183.8
28 byte transparent	16783.2
30 byte transparent	17982
33 byte transparent	19780.2
Packet FEC	15584.4
Bundle FEC	13636.35

The next step is to determine, for each data mode and baud rate, the number of TV lines which can be continuously filled with data, without issuing flow control to the transmit computer. This value is given by the expression:

$$\frac{\text{NABTS Baud Rate}}{\text{bps/line}}$$

For example, the number of lines required when the NABTS module is receiving data at 57600 baud in 8-bit bundle FEC mode is:

$$57600/13636.35 = 4.224$$

As mentioned on the previous page, there are different situations which determine how the number of TV lines and baud rate are selected. If you want to send data at a specific baud rate, and want to calculate the number of TV lines required to insert the data without issuing flow control to the transmit computer, the number given by the above equation must be rounded up to the next highest integer value (i.e. 5 lines in the above example). **Table 4.2** shows the number of TV lines required vs. baud rate for the various data modes.

Table 4.2 Number of TV Lines Required vs. Baud Rate for 525-line Video Signals

Baud Rate	Data Mode					
	27 Byte	28 Byte	30 Byte	33 Byte	Packet FEC	Bundle FEC
9600 and below	1	1	1	1	1	1
14400	1	1	1	1	1	2
19200	2	2	2	1	2	2
28800	2	2	2	2	2	3
38400	3	3	3	2	3	3
57600	4	4	4	3	4	5
15200	8	7	7	6	8	9

If you have a specific number of TV lines available and want to determine the appropriate baud rate to use, then **Table 4.3** can be used to determine the maximum baud rate which can be used to avoid causing the encoder to issue flow control to the transmit computer.

Table 4.3 is also used to determine the maximum number of TV lines that can have data if you are using data decoders that connect to a receive computer via a serial link. Using the lowest baud rate of all the data decoders in your service and your data mode, you can determine the maximum number of TV lines that can be used without data being lost. NOTE: the number of lines determined this way applies to both serial and LAN encoders.

Table 4.3 can also be used to determine the minimum baud rate to use to ensure that a specific number of available TV lines are completely filled (i.e. the available bandwidth is fully utilized), assuming that the transmit computer can handle flow control. This is done by finding the baud rate corresponding to the data mode and number of TV lines being used, then using the next higher baud rate in the list of possible baud rates (i.e. 9600, 14400, 19200, 28800, 38400, 57600 and 115200). For example, to completely fill 3 TV lines when 8-bit bundle FEC mode is being used, the baud rate should be 57600 or higher. If the baud rate in **Table 4.3**, for a given number of lines and data mode, is 115200, then the available TV lines cannot be fully utilized by one stream.

Table 4.3 Baud Rate Required vs. TV lines Available for 525-line Video Signals

Available TV Lines	Data Mode					
	27 Byte	28 Byte	30 Byte	33 Byte	Packet FEC	Bundle FEC
1	14400	14400	14400	19200	14400	9600
2	28800	28800	28800	38400	28800	19200
3	38400	38400	38400	57600	38400	38400
4	57600	57600	57600	57600	57600	38400
5	57600	57600	57600	57600	57600	57600
6	57600	57600	57600	115200	57600	57600
7	57600	115200	115200	115200	57600	57600
8	115200	115200	115200	115200	115200	57600
9	115200	115200	115200	115200	115200	115200

The throughput per VBI line in 625 line video is 50/59.94 times the values shown for 525 line video. Thus, the serial port baud rate which causes 1 TV line to be completely filled with data without issuing flow control to a transmit computer for a 625 line video signal for the various data modes is:

Table 4.4 Data Modes

Data Mode	bps/line
27 byte transparent	13500
28 byte transparent	14000
30 byte transparent	15000
33 byte transparent	16500
Packet FEC	13000
Bundle FEC	11375

Table 4.5 shows the number of TV lines required vs. baud rate, to insert data without issuing flow control for a 625 line video signal. **Table 4.6** shows the maximum baud rate vs. TV lines available to avoid causing the encoder to issue flow control for a 625 line video signal.

Table 4.5 Number of TV Lines Required vs. Baud Rate for 625-line Video Signals

Baud Rate	Data Mode					
	27 Byte	28 Byte	30 Byte	33 Byte	Packet FEC	Bundle FEC
9600 and below	1	1	1	1	1	1
14400	2	2	1	1	2	2
19200	2	2	2	2	2	2
28800	3	3	2	2	3	3
38400	3	3	3	3	3	4
57600	5	5	4	4	5	6
15200	9	9	8	7	9	11

Table 4.6 Baud Rate Required vs. TV lines Available for 625-line Video Signals

Available TV Lines	Data Mode					
	27 Byte	28 Byte	30 Byte	33 Byte	Packet FEC	Bundle FEC
1	9600	9600	14400	14400	9600	9600
2	19200	19200	28800	28800	19200	19200
3	38400	38400	38400	38400	38400	28800
4	38400	38400	57600	57600	38400	38400
5	57600	57600	57600	57600	57600	38400
6	57600	57600	57600	57600	57600	57600
7	57600	57600	57600	115200	57600	57600
8	57600	57600	115200	115200	57600	57600
9	115200	115200	115200	115200	115200	57600
10	115200	115200	115200	115200	115200	57600
11	115200	115200	115200	115200	115200	115200

WST Configuration

In This Chapter

This chapter provides a summary of the WST Configuration menus available for the TES3 and TES5.

The following topics are discussed:

- WST Stream Configuration Overview
- Packet Format
- Lines Enabled vs. Transmit Computer Baud Rate

WST Stream Configuration Overview

When a WST module is selected for configuration in the main SETTE32 window, the following menu shown below is displayed.

WST Stream Configuration

Framing Code (27) 27

Packet Address 242

Priority 1

Data Channel 8

General Module Configuration

Data Mode

- ☒ Bundle FEC
- ☐ Packet FEC
- ☐ 30 Byte Transparent
- ☐ 28 Byte Transparent
- ☐ 27 Byte Transparent

Source

- ☐ Port 2000
- ☒ Port 3000
- ☐ Port 4000
- ☐ Port 5000
- ☐ Port 6000
- ☐ Port 7000
- ☐ Port 8000
- ☐ Port 9000
- ☐ Btest Data
- ☐ no source

Insertion Lines

Field 1	Field 2
☐ Line 5	☐ Line 318
☐ Line 6	☐ Line 319
☐ Line 7	☐ Line 320
☐ Line 8	☐ Line 321
☐ Line 9	☐ Line 322
☒ Line 10	☒ Line 323
☐ Line 11	☐ Line 324
☐ Line 12	☐ Line 325
☐ Line 13	☐ Line 326
☐ Line 14	☐ Line 327
☐ Line 15	☐ Line 328
☐ Line 16	☐ Line 329
☐ Line 17	☐ Line 330
☐ Line 18	☐ Line 331
☐ Line 19	☐ Line 332
☐ Line 20	☐ Line 333
☐ Line 21	☐ Line 334
☐ Line 22	☐ Line 335

Frames Enabled

☒ Frame 0	☒ Frame 15
☒ Frame 1	☒ Frame 16
☒ Frame 2	☒ Frame 17
☒ Frame 3	☒ Frame 18
☒ Frame 4	☒ Frame 19
☒ Frame 5	☒ Frame 20
☒ Frame 6	☒ Frame 21
☒ Frame 7	☒ Frame 22
☒ Frame 8	☒ Frame 23
☒ Frame 9	☒ Frame 24
☒ Frame 10	☒ Frame 25
☒ Frame 11	☒ Frame 26
☒ Frame 12	☒ Frame 27
☒ Frame 13	☒ Frame 28
☒ Frame 14	☒ Frame 29

Cancel Apply Set All Clear All Set All Clear All

WST Stream Configuration Menu

Each of the menu items is described in further detail in the following sections.

WST Stream Parameters

This section discusses the programming of the WST streams.

Framing Code

The Framing Code is used as the framing code for WST decoders. This synchronization byte precedes the data. The normal hexadecimal value for WST data is 27. This parameter is not usually modified. By default, a stream is initialized with a framing code of 27. If this value is to be changed, select the Framing Code menu item and type in the new framing code.

Packet Address

The packet address is a three hexadecimal digit address to be added to the data being received from this stream's source.

Priority

The priority field selects the priority the current stream has in relation to other streams. A stream with a priority of 0 has the highest priority. The priority determines which stream gets to insert data on a specific TV line when two or more streams have that TV line enabled for insertion. The highest priority stream (priority = 0) always gets the first opportunity to fill all of its enabled TV lines. A stream which is unable to fill all of its lines with data offers its unused lines to the next highest priority stream. A stream may be unable to fill all of its enabled lines because it has not received enough data to fill all these lines or it does not have all of its frames enabled for

insertion. The choices for a priority value depend on the number of modules installed in the encoder.

Data Pacing

In a VBI data distribution system, the group supplying data to customers must ensure that no data is lost at a customer's receive site. If the customer's data receiver passes data to a receive computer via a serial port, there is potential for a loss of data if the encoder allows throughput greater than the decoder's serial port speed. **Table 5.4** shows the minimum baud rate that a data receiver must operate at, versus number of TV lines and data mode, to ensure that no data is lost.

If you are using a serial encoder and it receives data from a transmit computer at the same speed as the data receiver outputs to a receive computer, then data pacing should be enabled. There is always a very small difference in the baud rates; if the data receiver is slightly slower, then over a long period of time the data receiver will lose data. Data pacing compensates for small differences in baud rate by limiting the maximum throughput of the WST module to be 2% less than the selected baud rate. When the data pacing field is in the Off state, data pacing is disabled and the WST module outputs data as fast as possible, given the number of lines and frames allocated for insertion. Data pacing may be turned off if the decoders are set to a higher baud rate than the encoder.

Data pacing should be turned off for a LAN encoder. Since the LAN encoder fills all its enabled lines, it is important that a serial data receiver's baud rate meet or exceed the baud rate shown in **Table 5.4** for the given number of TV lines and data mode.

Data Mode

The WST module can insert data using one of five modes: 27 byte transparent, 28 byte transparent, 30 byte transparent, Packet FEC, and Bundle FEC. In the two 8 bit FEC modes, data is protected by Ross Video's advanced forward error correction code. This FEC is built in to some Ross Video decoders to increase the data's integrity. The 30 byte transparent mode accepts data in 30 byte blocks and requires the first two bytes of the block to be Hamming encoded according to the NABTS standard. The WST module discards any data that does not begin with the required number of Hamming perfect bytes. The 27 byte transparent mode requires the data to be 7 bit odd parity. The 28 byte transparent mode encodes 8 bit data and provides no data protection. These data modes are discussed in more detail in the Appendix that covers Data Modes.

Data Channel

The WST stream can insert on one of four channels (8,9,10, and 11). The default data channel is 8.

General Module Configuration

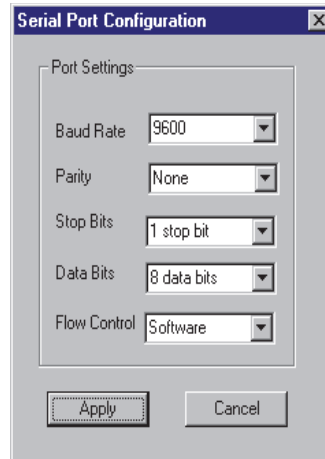
This button brings up the General WST Configuration Menu for setting the general WST parameters. Refer to the chapter, "**WST Configuration**" on page 5-1 for further details.

Source (LAN Encoder)

The source field is used to select where the WST module is receiving data from, i.e. the source device. The black circle indicates the currently selected data source. The source device can be one of the eight user defined TCP/IP port numbers, or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. To configure the port numbers go back to the main SETTE32 menu and select the **Properties** button in the TCP/IP address section.

Source (Serial Encoder)

The source field is used to select where the WST module is receiving data from, i.e. the source device. The black circle indicates the currently selected source device. The source device can be Port A, Port B, Port C, Modem, or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. Selecting the **Configure** button will allow you to set the serial port parameters using the Serial Port Configuration menu shown below.



Serial Port Configuration

The flow control can be either hardware (RTS/CTS) or software (XON/OFF). The null modem cable shipped with the encoder supports both hardware and software flow control.

Lines Enabled

The section is used to select the lines the encoder will insert data on. The lines available for insertion depends on the line mode and the insertion block selected. These options are explained in the section “**Encoder Configuration**” on page 3-1. There is an important relationship between the number of lines enabled and the baud rate of the data source. This relationship is discussed in the section “**Lines Enabled vs. Transmit Computer Baud Rate**” on page 5-7. Lines that have already been selected for bridging from the auxiliary video feed are not available for data insertion. Auxiliary lines are explained in the General Encoder Configuration section.



Note — When using a TES5, the digital video signal must be converted to an analog signal. The equipment that does this conversion may not pass some lines in the VBI. For this reason, the analog output signal should be examined to verify that data is present on the TV lines expected.

Frames Enabled

The section is used to select which frames will be used for insertion. Under most situations the encoder should be set to insert on all the frames. The frames are numbered from 0 to 29. Frames enabled for insertion apply to all the TV lines selected for insertion. Disabling frames for insertion can be used to guarantee that multiple streams sharing the same lines will get some frames to insert on. A stream that is using all of its allowed lines and frames never allows a lower priority stream using the same lines an opportunity to insert its data. The lower priority stream could be guaranteed some frames to insert on if the higher priority stream gave up some frames and the lower priority stream has these frames enabled.

Apply

This button saves the currently displayed selections and returns to the main SETTE32 menu. Any streams configured using the WST Stream Configuration menu are not activated until SETTE32 is exited and the changes saved to non-volatile memory.

Cancel

This button exits the WST Stream Configuration menu and deletes any changes made.

Packet Format

The WST module uses the World System Teletext and Data Broadcasting System (CCIR Teletext System B), Packet-31 to provide the same functionality, minus 33-byte transparent mode, as the NABTS (NABTS Data Broadcast Software) module.

The WST specification provides for the transmission of a 45-byte packet in a TV line in the VBI. The structure of this packet, as generated by the WST module, is shown in **Table 5.1**. Note that the values for bytes 1 to 3 are given in hexadecimal. Since bytes 4 to 13 are Hamming encoded, the values given for these bytes are the binary values of the 4 information bits in each byte.

Table 5.1 Structure of 45-byte Packet

Byte	Value	Description
1-2	55	Clock Run-In (2 bytes)
3	27	Framing Code
4	1000	Data Channel = 8
5	1111	Designation = Independent Data Service Packet
6	0	Format Type (Repeat Indicator not used, Continuity Indicator not used)
7	110	Service Packet Address Length = 6 bytes
8-10	0	Most significant 3 bytes of Service Packet Address (not used)
11-13		Least significant 3 bytes of Service Packet Address
14-43		Data (30 bytes)
44-45		Cyclic Redundancy Check Word

The values of bytes 14 to 43 (the 30 data bytes) are the same as the last 30 bytes in a NABTS packet for the NABTS module, and are formatted according to the Data Mode selected.

Lines Enabled vs. Transmit Computer Baud Rate

This section pertains primarily to a serial encoder. However, there is one portion that applies to a LAN encoder as well.

In a VBI data distribution system, you want to distribute the data as fast as possible. The speed of distribution depends on several factors:

- type of data decoder being used
- number of TV lines available in each field
- data mode
- host computer to encoder link speed

The data decoder receiving the VBI data must be able to decode, process and pass on the data to a receive computer without losing any data. This must be within a TV field time, i.e. 20 ms for a 625 line TV signal. Ross Video has two types of data decoders that pass data to a receive computer. One is a PC card that is installed in the receive computer, a TTX8xx. The second is a stand alone unit that connects to the receive computer via a serial cable, a TTX74x. The TTX8xx can always process and pass data to an application program running in the receive computer without losing any data. The TTX74x is limited by the speed of the serial link. Thus, for a specific baud rate there is a maximum number of TV lines that can have data such that data is not lost. Therefore, if you are using data decoders that are connected to a receive computer via a serial link, you must take into consideration the decoder's baud rate when setting up your system operating parameters.

An important consideration when determining the number of TV lines and baud rate to use is whether the transmit computer application program handles flow control. Flow control is a standard method of controlling the rate at which data is transmitted over an RS232 link. In this case, it allows the encoder to signal the transmit computer application program to temporarily stop sending data when the encoder is unable to process the data at the rate that it is being received (this situation would occur if too few TV lines were allocated for a particular stream). Once the encoder has inserted the "backlog" of data, it then signals the transmit computer application program to resume sending data. If the transmit computer application program does not handle flow control, then the number of TV lines allocated must be enough to ensure that the data can be inserted at the rate at which it is being received.

There are three situations which can affect how the number of TV lines and baud rate are chosen. The first situation is where data is to be sent to the encoder at a given baud rate, using a given data mode, and you want to determine the number of TV lines needed to handle the data without requiring the transmit computer to handle flow control. The second situation is where you have a specific number of available TV lines, and you want to determine the maximum baud rate, for a given data mode, which can be used without requiring the transmit computer to handle flow control. The third situation is where there is a specific number of available lines, and you want to completely fill the lines (i.e. fully utilize the available bandwidth), while using flow control to avoid losing data.

The first step in determining the appropriate number of lines and/or baud rate is to calculate, for each data mode, the serial port baud rate which causes 1 TV line to be completely filled with data without issuing flow control to the host computer. This value, referred to as bps/line, is as follows, assuming that the encoder is operating with a 625 line video input, the stream has all frames enabled, and both fields of each line are being used:

Table 5.2 Data Modes

Data Mode	bps/line
27 byte transparent	13500
28 byte transparent	14000
30 byte transparent	15000
Packet FEC	13000
Bundle FEC	11375

The next step is to determine, for each data mode and baud rate, the number of TV lines which can be continuously filled with data, without issuing flow control to the host computer. This value is given by the expression:

$$\frac{WST \text{ Baud Rate}}{\text{bps/line}}$$

For example, the number of lines required when the WST module is receiving data at 57600 baud in 8-bit bundle FEC mode is:

$$57600/11375 = 5.06$$

As mentioned on the previous page, there are different situations which determine how the number of TV lines and baud rate are selected. If you want to send data at a specific baud rate, and want to calculate the number of TV lines required to insert the data without issuing flow control to the host computer, the number given by the above equation must be rounded up to the next highest integer value (i.e. 5 lines in the above example). **Table 5.3** shows the number of TV lines required vs. baud rate for the various data modes.

Table 5.3 Number of TV Lines Required vs. Baud Rate for 625-line Video Signals

Baud Rate	Data Mode				
	27 Byte	28 Byte	30 Byte	Packet FEC	Bundle FEC
9600 and below	1	1	1	1	1
14400	2	2	1	2	2
19200	2	2	2	2	2
28800	3	3	2	3	3
38400	3	3	3	3	4
57600	5	5	4	5	6
15200	8	9	8	9	11

If you have a specific number of TV lines available and want to determine the appropriate baud rate to use, then **Table 5.4** can be used to determine the maximum baud rate which can be used to avoid causing the encoder to issue flow control to the transmit computer.

Table 5.4 is also used to determine the maximum number of TV lines that can have data if you are using data decoders that connect to a receive computer via a serial link. Using the lowest baud rate of all the data decoders in your service and your data mode, you can determine the maximum number of TV lines that can be used without data being lost.



Note — *The number of lines determined this way applies to both serial and LAN encoders.*

Table 5.4 can also be used to determine the minimum baud rate to use to ensure that a specific number of available TV lines are completely filled (i.e. the available bandwidth is fully utilized), assuming that the transmit computer can handle flow control. This is done by finding the baud rate corresponding to the data mode and number of TV lines being used, then using the next higher baud rate in the list of possible baud rates (i.e. 9600, 14400, 19200, 28800, 38400, 57600 and 115200). For example, to completely fill 4 TV lines when 8-bit bundle FEC mode is being used, the baud rate should be 57600 or higher. If the baud rate in **Table 5.4**, for a given number of lines and data mode, is 115200, then the available TV lines cannot be fully utilized by one stream.

Table 5.4 Baud Rate Required vs. TV lines Available for 625-line Video Signals

Available TV Lines	Data Mode				
	27 Byte	28 Byte	30 Byte	Packet FEC	Bundle FEC
1	9600	9600	14400	9600	9600
2	19200	19200	28800	19200	19200
3	38400	38400	38400	38400	38400
4	38400	38400	57600	38400	38400
5	57600	57600	57600	57600	38400
6	57600	57600	57600	57600	57600
7	57600	57600	57600	57600	57600
8	57600	57600	115200	57600	57600
9	115200	115200	115200	115200	57600
10	115200	115200	115200	115200	57600
11	115200	115200	115200	115200	115200

WST IDL A/B Configuration

In This Chapter

This chapter provides a summary of the WST IDL A and IDL B Configuration menus available for the TES3 and TES5.

The following topics are discussed:

- Overview
- Lines Enabled vs. Transmit Computer Baud Rate

Overview

When a WST IDL Format A / IDL Format B module is selected for configuration in the main SETTE32 window, the following menu is displayed.

WST IDL Format A / IDL Format B Stream Configuration

Priority: 0

Data Pacing: ☒ on ☐ off

Framing Code (27): 27

Data Mode:

- ☒ IDL Format A
 - Packet Address: 242
 - Data Channel: 8
 - ☐ Add Norpak Bundle FEC
- ☐ IDL Format B
 - PMAG: [dropdown]
 - Packet Address Group: [dropdown]
 - Auxillary Address: [dropdown]
 - ☐ Pad on loss of data

☒ 45 Byte Transparent

General Module Configuration

Source:

- ☒ Port A ☐ Btest data
- ☐ Port B ☐ no source
- ☐ Port C ☐ Modem

Configure

Insertion Lines:

Field 1	Field 2
☐ Line 5	☐ Line 318
☐ Line 6	☐ Line 319
☐ Line 7	☐ Line 320
☐ Line 8	☐ Line 321
☐ Line 9	☐ Line 322
☐ Line 10	☐ Line 323
☐ Line 11	☐ Line 324
☐ Line 12	☐ Line 325
☐ Line 13	☐ Line 326
☐ Line 14	☐ Line 327
☐ Line 15	☐ Line 328
☐ Line 16	☐ Line 329
☒ Line 17	☒ Line 330
☐ Line 18	☐ Line 331
☐ Line 19	☐ Line 332
☐ Line 20	☐ Line 333
☐ Line 21	☐ Line 334
☐ Line 22	☐ Line 335

Set All Clear All

Frames Enabled:

☒ Frame 0	☒ Frame 15
☒ Frame 1	☒ Frame 16
☒ Frame 2	☒ Frame 17
☒ Frame 3	☒ Frame 18
☒ Frame 4	☒ Frame 19
☒ Frame 5	☒ Frame 20
☒ Frame 6	☒ Frame 21
☒ Frame 7	☒ Frame 22
☒ Frame 8	☒ Frame 23
☒ Frame 9	☒ Frame 24
☒ Frame 10	☒ Frame 25
☒ Frame 11	☒ Frame 26
☒ Frame 12	☒ Frame 27
☒ Frame 13	☒ Frame 28
☒ Frame 14	☒ Frame 29

Set All Clear All

Apply Cancel

WST IDL Format A/IDL Format B Stream Configuration Menu

Each of the menu items is described in further detail in the following sections.

WST IDL Format A / IDL Format B Stream Parameters

This section discusses the programming of the WST IDL Format A / IDL Format B streams.

Priority

The priority field selects the priority the current stream has in relation to other streams. A stream with a priority of 0 has the highest priority. The priority determines which stream gets to insert data on a specific TV line when two or more streams have that TV line enabled for insertion. The highest priority stream (priority = 0) always gets the first opportunity to fill all of its enabled TV lines. A stream which is unable to fill all of its lines with data offers its unused lines to the next highest priority stream. A stream may be unable to fill all of its enabled lines because it has not received enough data to fill all these lines or it does not have all of its frames enabled for insertion. The choices for a priority value depend on the number of modules installed in the encoder.

Data Pacing

In a VBI data distribution system, the group supplying data to customers must ensure that no data is lost at a customer's receive site. If the customer's data receiver passes data to a receive computer via a serial port, there is potential for a loss of data if the encoder allows throughput greater than the decoder's serial port speed. **Table 6.3** on page 6-8 shows the minimum baud rate that a data receiver must operate at, versus number of TV lines and data mode, to ensure that no data is lost.

If you are using a serial encoder and it receives data from a transmit computer at the same speed as the data receiver outputs to a receive computer, then data pacing should be enabled. There is

always a very small difference in the baud rates; if the data receiver is slightly slower, then over a long period of time the data receiver will lose data. Data pacing compensates for small differences in baud rate by limiting the maximum throughput of the WST module to be 2% less than the selected baud rate. When the data pacing field is in the Off state, data pacing is disabled and the WST IDL Format A / IDL Format B module outputs data as fast as possible, given the number of lines and frames allocated for insertion. Data pacing may be turned off if the decoders are set to a higher baud rate than the encoder.

Data pacing should be turned off for a LAN encoder. Since the LAN encoder fills all its enabled lines, it is important that a serial data receiver's baud rate meet or exceed the baud rate shown in **Table 6.3** on page 6-8 for the given number of TV lines and data mode.

Framing Code

The Framing Code is used as the framing code for WST decoders. This synchronization byte precedes the data. The normal hexadecimal value for WST data is 27. This parameter is not usually modified. By default, a stream is initialized with a framing code of 27. If this value is to be changed, select the Framing Code menu item and type in the new framing code.

Data Mode

The WST IDL Format A / IDL Format B module can insert data using one of three modes: IDL Format A, IDL Format B or 45 Byte Transparent. IDL Format A can insert using Bundle FEC mode, protecting the data with Ross Video's forward error correction (FEC). This FEC is built in to some Ross Video decoders to increase the data's integrity. IDL Format A can also insert using WST Transparent mode, which provides no data protection. In IDL Format B mode the data is protected by either method 1 described by EACEM or by Ross Video's FEC. The 45 Byte Transparent mode accepts data in 45 byte blocks and requires the first two bytes of the block to be clock run in (0x55 0x55). This module discards any data that does not begin with the required number of clock run in bytes.

Packet Address

The packet address is a zero to six hexadecimal digit address to be added to the data being received from this stream's source. The range of valid packet addresses is 0 to FFFFFFFF. This control applies only when either Bundle FEC or Transparent mode is selected. To be compatible with older decoders a six byte packet address starting with the three byte packet address reversed and ending in 000 must be used. For example, 321000 corresponds to the packet address 123 in older Ross Video decoders.

Data Channel

The WST IDL Format A / IDL Format B stream can insert on one of four channels (8, 9, 10 or 11). The default data channel is 8. This option is valid for Bundle FEC and Transparent modes.

Add Ross Video FEC

Selecting this adds Ross Video's forward error correction scheme to the outgoing data.

PMAG

This control displays the possible combinations of magazine and packet addresses on which IDLB mode functions. The standards body has yet to settle on a fixed combination. When the final decision is made on IP over VBI's packet address and magazine this control will be eliminated. Until this time, use the default value of P30 / MAG0 or select an appropriate combination. For example, P30 / MAG3 specifies packet address 30 magazine 3. This option is only applicable to the IDL Format B mode.

Packet Address Group

The Packet Address Group is IDL Format B modes method of addressing data packets. Valid range for the Packet Address Group are 0 to 15.

Auxiliary Address

Two addressing bits used to increase the address length. Valid entries 0-3 (Hex).

Pad on Loss of Data

The encoder can deal with loss of data two ways. If padding is not selected the encoder will wait to get data before transmitting the packet. If padding is selected the encoder, after a small delay, pads out the packet and transmits it.



Note — *If padding is not selected the sending program must be sure to send sufficient data to cause the packet to be filled for transmission, otherwise data will be delayed in the encoder until enough data has accumulated for a packet.*

General Module Configuration

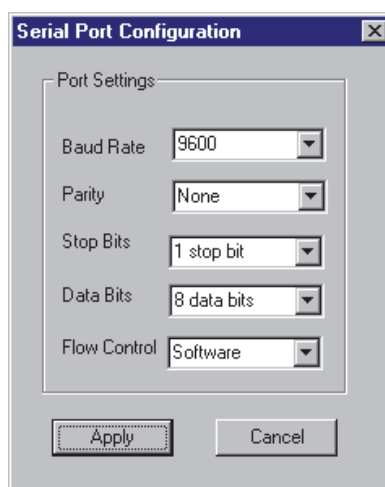
This button brings up the General WST IDL Format A / IDL Format B Configuration Menu for setting the general WST IDL Format A / IDL Format B parameters. Refer to the chapter “**WST IDLA / IDLB Parameters**” on page 12-1 for further details.

Source (LAN Encoder)

The source field is used to select where the WST IDL Format A / IDL Format B module is receiving data from, i.e. the source device. The black circle indicates the currently selected data source. The source device can be one of the eight user defined TCP/IP port numbers, or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. To configure the port numbers go back to the main SETTE32 menu and select the **Properties** button in the TCP/IP address section.

Source (Serial Encoder)

The source field is used to select where the WST IDL Format A / IDL Format B module is receiving data from, i.e. the source device. The black circle indicates the currently selected source device. The source device can be Port A, Port B, Port C, Modem, or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. Selecting the **Configure** button will allow you to set the serial port parameters using the Serial Port Configuration menu.



Serial Port Configuration

The flow control can be either hardware (RTS/CTS) or software (XON/OFF). The null modem cable shipped with the encoder supports both hardware and software flow control.

Lines Enabled

The section is used to select the lines the encoder will insert data on. The lines available for insertion depends on the line mode and the insertion block selected. These options are explained in the chapter “**Encoder Configuration**” on page 3-1. There is an important relationship between the number of lines enabled and the baud rate of the data source. This relationship is discussed in the section “**Lines Enabled vs. Transmit Computer Baud Rate**” on page 6-6. Lines that have already been selected for insertion of data found in the auxiliary video feed are not available for data insertion.



Note — *When using a TES5, the digital video signal must be converted to an analog signal. The equipment that does this conversion may not pass some lines in the VBI. For this reason, the analog output signal should be examined to verify that data is present on the TV lines expected.*

Frames Enabled

The section is used to select which frames will be used for insertion. Under most situations the encoder should be set to insert on all the frames. The frames are numbered from 0 to 29. Frames enabled for insertion apply to all the TV lines selected for insertion. Disabling frames for insertion can be used to guarantee that multiple streams sharing the same lines will get some frames to insert on. A stream that is using all of its allowed lines and frames never allows a lower priority stream using the same lines an opportunity to insert its data. The lower priority stream could be guaranteed some frames to insert on if the higher priority stream gave up some frames and the lower priority stream has these frames enabled.

Apply

This button saves the currently displayed selections and returns to the main SETTE32 menu. Any streams configured using the WST Stream Configuration menu, are not activated until SETTE32 is exited and the changes saved to non-volatile memory.

Cancel

This button exits the WST IDL Format A / IDL Format B Stream Configuration menu and deletes any changes made.

Lines Enabled vs. Transmit Computer Baud Rate

This section pertains primarily to a serial encoder. However, there is one portion that applies to a LAN encoder as well.

In a VBI data distribution system, you want to distribute the data as fast as possible. The speed of distribution depends on several factors:

- Type of data decoder being used
- Number of TV lines available in each field
- Data mode
- Host computer to encoder link speed

The data decoder receiving the VBI data must be able to decode, process and pass on the data to a receive computer without losing any data. This must be within a TV field time, i.e. 20 ms for a 625 line TV signal. Ross Video has two types of data decoders that pass data to a receive computer. One is a PC card that is installed in the receive computer, a TTX8xx. The second is a stand alone unit that connects to the receive computer via a serial cable, a TTX74x. The TTX8xx can always process and pass data to an application program running in the receive computer without losing any data. The TTX74x is limited by the speed of the serial link. Thus, for a specific baud rate there is a maximum number of TV lines that can have data such that data is not lost. Therefore, if you are using data decoders that are connected to a receive computer via a serial link, you must take into consideration the decoder's baud rate when setting up your system operating parameters.

An important consideration when determining the number of TV lines and baud rate to use is whether the transmit computer application program handles flow control. Flow control is a standard method of controlling the rate at which data is transmitted over an RS232 link. In this case, it allows the encoder to signal the transmit computer application program to temporarily stop sending data when the encoder is unable to process the data at the rate that it is being received (this situation would occur if too few TV lines were allocated for a particular stream). Once the encoder has inserted the "backlog" of data, it then signals the transmit computer application program to resume sending data. If the transmit computer application program does not handle flow control, then the number of TV lines allocated must be enough to ensure that the data can be inserted at the rate at which it is being received.

There are three situations which can affect how the number of TV lines and baud rate are chosen. The first situation is where data is to be sent to the encoder at a given baud rate, using a given data mode, and you want to determine the number of TV lines needed to handle the data without requiring the transmit computer to handle flow control. The second situation is where you have a specific number of available TV lines, and you want to determine the maximum baud rate, for a given data mode, which can be used without requiring the transmit computer to handle flow control. The third situation is where there is a specific number of available lines, and you want to completely fill the lines (i.e. fully utilize the available bandwidth), while using flow control to avoid losing data.

The first step in determining the appropriate number of lines and/or baud rate is to calculate, for each data mode, the serial port baud rate which causes 1 TV line to be completely filled with data without issuing flow control to the host computer. This value, referred to as bps/line, is as follows, assuming that the encoder is operating with a 625 line video input, the stream has all frames enabled, and both fields of each line are being used:

Table 6.1 Data Modes

Data Mode	bps/line
45 byte transparent	22500
IDL B	17500

The next step is to determine, for each data mode and baud rate, the number of TV lines which can be continuously filled with data, without issuing flow control to the host computer. This value is given by the expression:

$$\frac{WST \text{ Baud Rate}}{\text{bps/line}}$$

For example, the number of lines required when the WST module is receiving data at 57600 baud in IDLB mode is:

$$57600/17500 = 3.29$$

As mentioned on the previous page, there are different situations which determine how the number of TV lines and baud rate are selected. If you want to send data at a specific baud rate, and want to calculate the number of TV lines required to insert the data without issuing flow control to the host computer, the number given by the above equation must be rounded up to the next highest integer value (i.e. 4 lines in the above example). **Table 6.2** shows the number of TV lines required vs. baud rate for the various data modes.

Table 6.2 Number of TV Lines Required vs. Baud Rate for 625-line Video Signals

Baud Rate	Data Mode	
	IDLB	45 Byte
9600 and below	1	1
14400	1	1
19200	2	1
28800	2	2
38400	3	2
57600	4	3
15200	7	6

If you have a specific number of TV lines available and want to determine the appropriate baud rate to use, then **Table 6.3** on page 6-8 can be used to determine the maximum baud rate which can be used to avoid causing the encoder to issue flow control to the transmit computer.

Table 6.3 on page 6-8 is also used to determine the maximum number of TV lines that can have data if you are using data decoders that connect to a receive computer via a serial link. Using the lowest baud rate of all the data decoders in your service and your data mode, you can determine the maximum number of TV lines that can be used without data being lost.



Note — The number of lines determined this way applies to both serial and LAN encoders.

Table 6.3 on page 6-8 can also be used to determine the minimum baud rate to use to ensure that a specific number of available TV lines are completely filled (i.e. the available bandwidth is fully utilized), assuming that the transmit computer can handle flow control. This is done by finding the baud rate corresponding to the data mode and number of TV lines being used, then using the next higher baud rate in the list of possible baud rates (i.e. 9600, 14400, 19200, 28800, 38400, 57600 and 115200). For example, to completely fill 3 TV lines when IDLB mode is being used, the baud rate should be 57600 or higher. If the baud rate in **Table 6.3** on page 6-8, for a given number of lines and data mode, is 115200, then the available TV lines cannot be fully utilized by one stream.

Table 6.3 Baud Rate Required vs. TV lines Available for 625-line Video Signals

Available TV Lines	Data Mode	
	IDLB	45 Byte
1	19200	38400
2	38400	57600
3	57600	115200
4	115200	115200
5	115200	115200
6	115200	115200

Captioning Configuration

In This Chapter

This chapter provides a summary of the Captioning Configuration menus available for the TES3 and TES5.

The following topics are discussed:

- Captioning Module Overview
- Caption Stream Configuration Menu
- Captioning Commands

Captioning Module Overview

The Captioning module decodes captioning data in the incoming video stream, referred to as upstream data, and can discard or reinsert all or portions of the decoded data into the video signal. It also provides a command (i.e. N_T, Start Encoding Text Data) for inserting Internet URL information into one of the Text channels (T1 - T4) on a periodic basis, conforming to specification EIA-746.

With the ability to pass upstream captioning information, the possibility exists that data sent to the Captioning module is to be inserted at the same time as the upstream data. If this situation occurs, the Captioning module applies a priority based on data type to determine which data gets inserted. **Table 7.1** shows this priority, with the highest priority data type listed first:

Table 7.1 Data Priority

Field 1	Field 2
C1 C3	
C2 C4	
URLs	URLs
T1T3	
T2T4	
	XDS (Interval Packets)
	XDS (Fill Packet)

This means that the insertion of URL information may be delayed by a caption channel data which must be inserted (in the same field), but takes precedence over other text channel data and XDS data (in the same field).

In **Table 7.1**, URLs refers to any Text channel data being inserted using the N_T command (Start Encoding Text Data). URL data received from upstream is treated the same as any other upstream Text channel data.

The Captioning module differs from the other encoder modules in that one Captioning module can be used to control two streams of data. This is because the captioning specification, CEA-608, allows data sent to the Captioning module to be associated with one of four caption channels (C1, C2, C3 and C4), one of four text channels (T1, T2, T3 and T4) or the XDS data channel. Caption channels C1 and C2 can only occur in field 1 of the video signal, while C3 and C4 can only occur in field 2. Similarly, Text channels T1 and T2 can only occur in field 1, and T3 and T4 can only occur in field 2. The XDS data can only occur in field 2.

Since the Captioning module can receive data from two sources, it can be configured to receive, for example, closed caption data via PORT A, and XDS data from a different host computer via PORT B. Since the data from both of these streams will be inserted on the same video line (usually line 21), it is necessary for the software to place some restrictions on the type of data that can be received from the second stream. The first stream, referred to as the “Caption stream” in this manual, can receive and insert data in any of the nine channels defined by CEA-608 (C1 through C4, T1 through T4, and XDS). However, the second stream, referred to as the “XDS stream” in this manual, can only receive and insert data in the XDS channel. This means that a number of the Captioning commands, such as <CTRL-A>2 and <CTRL-A>3, can only be used in the Caption stream. As well, if only one stream is being used, it must be the Caption stream.

Ross Video has software to exercise the XDS abilities of the TES. This software is available from Ross Technical Support. This software may prove useful in testing the operation of XDS data.



Note — *All caption data sent to the caption module should be in 7 bit odd parity format. This is a requirement of the CEA-608 specification. Although the encoder will accept incorrectly formatted data it is strongly recommended the data have the correct parity. Parity checking, in the general caption parameters menu, must be turned off if the incoming parity will not be 7 bit odd parity.*

Caption Stream Configuration Menu

When a Captioning module is selected for configuration in the main SETTE32 window, the menu shown above is displayed. This section discusses the programming of caption streams.



Caption Stream Configuration Menu

General Module Configuration

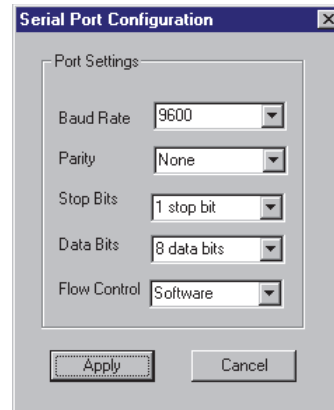
This button brings up the General Caption Configuration Menu for setting general caption parameters. Refer to the section “**Caption Parameters**” on page 13-1 for further details.

Sources (LAN Encoder)

The source fields in the Caption and XDS streams are used to select where the Caption module is receiving data from (i.e. the source device) for each stream being used. The black circle indicates the currently selected data source. The source device can be one of the eight user defined TCP/IP port numbers or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. To configure the port numbers go back to the main SETTE32 menu and select the **Properties** button in the TCP/IP address section.

It is important to note that the XDS stream is only used if the Caption stream is already used. If the Caption stream is disabled (i.e. set to No Source, then the XDS stream is disabled as well.

Sources (Serial Encoder)



Serial Port Configuration

The source fields in the Caption and XDS streams are used to select where the Caption module is receiving data from (i.e. the source device) for each stream being used. The black circle indicates the currently selected source device. The source device can be Port A, Port B, Port C, Modem or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. Selecting the **Configure** button allows you to set the serial port parameters using the Serial Port Configuration menu shown to the right.

The flow control can be either hardware (RTS/CTS) or software (XON/OFF). The null modem cable shipped with the encoder supports both hardware and software flow control.

It is important to note that the XDS stream is only used if the Caption stream is already used. If the Caption stream is disabled (i.e. set to No Source), then the XDS stream is disabled as well.

Insert Line

This section allows you to specify the line to be used for the Captioning data stream insertion. The lines available for insertion depend on the line mode and insertion block selected.

Lines 21 and 22 should be used for 525 and 625 line video signals respectively. If other lines are selected, caption decoders may not decode caption data. The field used for insertion is controlled by commands received from the transmit computer.

Echo Commands

This option determines, for each stream, whether commands received from the transmit computer for the stream in question are echoed as they are received. The setting for this option depends on the software running on the transmit computer. If the transmit computer does not expect commands that it sends to be echoed, then this option should be set to OFF. However, if the transmit system is a terminal, with an operator entering the commands manually, then it is useful to set this option to ON.

Input Mode

The main caption stream can receive data in one of two formats: Field marked or normal mode. In normal mode, the caption module accepts the set of commands described in the section “**Captioning Commands**” on page 7-7. In field marked mode, the encoder accepts raw caption data and inserts it. This raw data is in the same format as the caption module outputs, refer to the chapter “**Caption Parameters**” on page 13-1. This allows the raw data from one encoder to be reinserted by another encoder, effectively bridging caption data. If using field marked input mode, you can select bridge on data loss, this allows the encoder to revert to upstream data when no data is present on the input.

Apply

This button saves the currently displayed selections and returns to the main SETTE32 menu. Any streams configured using the Caption Stream Configuration menu are not activated until SETTE32 is exited and the changes saved to non-volatile memory.

Cancel

This button exits the Caption Stream Configuration menu and deletes any changes made.

Captioning Commands

On power up, the Captioning module enters Command mode. In this mode, the Captioning module is controlled by a set of commands. This set of commands is summarized below.

Table 7.2 Captioning Commands

Command	Format
Reset Encoder	<CTRL-F><CTRL-F>
Enter Realtime Mode	<CTRL-A> 2 {channel} {rows} {base row} <CR>
Enter Pass-Through Mode	<CTRL-A> 3 {n} {field} <CR>
Set Nul Mode	<CTRL-A> 6 {field} <CR>
Set Transparent Mode	<CTRL-A> 7 {field} <CR>
Turn Off Channels	<CTRL-A> 6 {channels} <CR>
Turn On Channels	<CTRL-A> 7 {channels} <CR>
Start Encoding Text Data	<CTRL-A> N_T {string} {text channel} I={interval} D={duration}<CR>
Stop Encoding Text Data	<CTRL-A> N_T <CR>
Start XDS (Interval Packets)	<CTRL-A>P {packet type} {repeat count} {data} {delay} <CR>
Start XDS (Fill Packets)	<CTRL-A>P {packet type} {duration} {data} {priority} P <CR>
Stop Encoding XDS Data	<CTRL-A>P {packet type} <CR>
Specify Upstream Priority	<CTRL-A>P {packet type} {priority} P <CR>
Store and Forward	<CTRL-A>N_U {packet type} {delay} <CR>
Set Operating States	<CTRL-A> N_SET ECHO={state} MR={state}<CR>
Set Baud Rate	<CTRL-A> I {baud rate} <CR>
Vendor and Version Inquiry	<CTRL-A> ? <CR>

The meaning of the parameters in the above commands are as follows:

Table 7.3 Commands Descriptions

Command	Description
{channel}	the channel to use to encode the Realtime data (C1, C2, C3, C4, T1, T2, T3 or T4)
{rows}	the number of rows (2, 3 or 4) to use for the roll-up captions
{base row}	the base row (specified as B1 to B15) to use for the roll-up captions
{n}	the optional degree of processing (from 1 to 4) to be performed on the received data. If the {n} parameter is not specified, then a default of 4 is used.
{field}	the optional field specification (F1 or F2). If the {field} parameter is not specified, then a default of F1 is used.
{channels}	the list of channels to turn on or off (C1, C2, C3, C4, T1, T2, T3, T4 or XDS)
{string}	the string of displayable characters representing the Text data to be encoded
{text channel}	the Text channel to use for encoding Text data (T1, T2, T3 or T4)

Table 7.3 Commands Descriptions

Command	Description
{interval}	the time interval, in seconds, between each insertion of the Text data
{duration}	the length of time for which the Text or XDS data is to be encoded, in the format “mmm:ss”
{packet type}	a 4-digit hex number, where the first two digits represent the class of the packet and the second two digits represent the type of the packet. Note that there must be no space between the ‘P’ and the packet type parameter.
{repeat count}	the number of times (in hex) to send the packet. A value of -1 or FFFF indicates that the packet should be repeated forever.
{data}	the ASCII-encoded hex values representing the data in the packet, or the actual displayable data enclosed in curly braces.
{delay}	the delay, specified as the decimal number of video frames, between each insertion of an XDS packet
{priority}	the decimal value which specifies the relative time interval between insertions of the packet, compared to other packets created with this format of the command. For example, the time between insertions of a packet with a priority of 10 would be twice the time between insertions of a packet with a priority of 5.
{state}	the state to set the specified operating state to (ON or OFF)
{baud rate}	the baud rate to set the serial port to (1200, 2400, 4800, 9600 or 192). Note: since the {baud rate} parameter must be 4 digits or less, a baud rate of 19200 is specified by the 3-digit value 192.

In the above commands, the space immediately after the <CTRL-A> and immediately before the <CR> is not required. For the <CTRL-A>P and <CTRL-A>N_U commands, however, there must be no spaces between the command type (i.e. P or N_U) and the {packet type}. Also, there is no space between the two <CTRL-F> characters in the Reset Encoder command, and there are no spaces on either side of the equal sign, in commands with parameters using this format.

When the encoder is ready to accept a command from the transmit computer, it sends the 3-character prompt sequence <CR><LF> * out the serial port being used for the Caption stream. The hexadecimal values for the bytes in this sequence are 0D, 0A, 2A. In order to ensure that no data is lost, the transmit computer should wait until it receives the prompt from the encoder before sending each new command.

The encoder handles most of the commands in the same way as Captioning Encoders designed by other manufacturers. However, the commands which begin with the letter “N” followed by an underscore are specific to the Ross Video Caption Encoder.

A description of each of the commands is given in the following sections.

Reset Encoder

Format:<CTRL-F> <CTRL-F>

This command resets all modes and operating parameters of the encoder (i.e. puts it into the power-up state), with the exception of the Echo and Monitor Ratings states, which are not changed. This includes resetting the baud rate to the value set in the Serial Port Configuration menu.

Enter Realtime Mode

Format: <CTRL-A> 2 {channel} {rows} {base row} <CR>

This command puts the encoder into Realtime mode, where data received is encoded using the specified channel. If a caption channel (C1 to C4) is specified, then the captions are encoded using the Roll-Up style, with the specified number of rows and base row. While in Realtime mode, the encoder receives and buffers a line of data at a time, encoding the line when a carriage return is received.

If any of the parameters are omitted, the default for the omitted parameter(s) is used: channel = C1, rows = 3, base row = 15.

While in Realtime mode, the channel being used is turned OFF (i.e. any upstream data for that channel is discarded).

While the encoder is in Realtime mode, it sends the 3-byte sequence <CR><LF> to the transmit computer each time it is ready to accept a new line of data. The hexadecimal values for the bytes in this sequence are 0D, 0A, 3E. If the transmit computer does not wait for this prompt before sending each line, then the encoder may issue flow control (i.e. send an XOFF character) to the transmit computer. In order to avoid losing data, the transmit computer must temporarily stop sending data until it receives the XON character, at which point it may continue.

Realtime mode is terminated by the sequence <CTRL-C> <CR>, at which point the encoder can once again accept commands from the host, and the channel being used for Realtime mode data is restored to its previous state (ON or OFF).

Enter Pass-Through Mode

Format:<CTRL-A> 3 {n} {field} <CR>

This command puts the encoder into Pass-Through mode, where all further data received is inserted into the video signal. The {field} parameter specifies which field of the video signal the data is to be inserted into. The {n} parameter is a value from 1 to 4 inclusive, and specifies the degree of processing which is applied to the received data, as follows:

Value of {n} Result

1. All data is inserted as it is received.
2. Legitimate caption control code pairs are aligned and delayed so that the 2 bytes are transmitted in the same field.
3. Provides the same processing as when {n} is 2, with the addition that all caption control codes are doubled (inserted twice).
4. Provides the same processing as when {n} is 3, but filters out all non-caption control codes and discards the character following a <CTRL-A>.

If the {n} parameter is not specified, then the default value of 4 is used.

While the encoder is in Pass-Through mode, it does not send any prompt sequence to the transmit computer. If the transmit computer sends data faster than the encoder can insert it (limited by the CEA-608 standard, and equal to 60 characters per second), the encoder issues flow control (i.e. sends an XOFF character) to the transmit computer. In order to avoid losing data, the transmit computer must temporarily stop sending data until it receives the XON character, at which point it may continue.

In all four settings for the degree of processing, the parity bit is stripped off on input and set to odd parity on output. Any occurrence of <CTRL-C> or <CTRL-F> in the data is interpreted as a command to the encoder and is not inserted. All line 21 data in the incoming video signal (in the field being used for insertion) is discarded.

Pass-Through mode is terminated by a <CTRL-C> character, at which point the encoder enters Null mode for the field being used in for Pass-Through mode.

Pass-Through mode is also terminated by two <CTRL-F> characters in a row, which resets the encoder and puts it into Command mode.

Set Null Mode

Format:<CTRL-A> 6 {field} <CR>

This command causes null bytes to be inserted in the video signal, for the field specified by the {field} parameter.

Set Transparent Mode

Format:<CTRL-A> 7 {field} <CR>

This command causes the video line selected for caption insertion, in the field specified by the {field} parameter, to be passed through the encoder unchanged.

Turn Off Channels

Format: <CTRL-A> 6 {channels} <CR>

This command causes all upstream data in the specified channels to be discarded.

Turn On Channels

Format: <CTRL-A> 7 {channels} <CR>

This command causes all upstream data in the specified channels to be encoded into the video signal.

Start Encoding Text Data

Format: <CTRL-A> N_T {string} {text channel} I={interval} D={duration} <CR>

This command starts the periodic insertion of data into a Text channel, and is designed to allow for the transport of Internet Uniform Resource Locator (URL) information using the T2 Text channel, according to specification EIA-746.

This command can also be used as a replacement for the N_V command, to insert V-chip ratings in the Canadian format.



Note — *This command cannot be used in combination with the Pass-Through mode command. When the command to enter Pass-Through mode is received, the periodic insertion of the string specified by the N_T command will be canceled*

The parameters are as follows:

Table 7.4 Commands Descriptions

Command	Description
{string}	string of displayable characters to be inserted, enclosed in delimiting characters (any printable characters can be used). The maximum length of this string is 256 characters.
{text channel}	text channel to use (T1, T2, T3 or T4)
{interval}	time interval, in seconds, between each insertion of the string
{duration}	length of time for which the string is to be inserted, in the format “mmm:ss”

After this command is received, all upstream data in the specified Text channel is discarded, and the specified string is inserted on a cyclic basis, with the specified time interval between successive insertions. The string is inserted until the time specified by the duration expires. If a duration with no colon is specified, then it is assumed to be in minutes. If a duration of -1 is specified, then the string will be inserted forever. If any of the {text channel}, {interval} or {duration} parameters are not specified, then the default for the omitted parameter will be used (channel = T2, interval = 5 seconds, duration = 240 minutes).

To insert the specified string in the proper Text channel, the encoder automatically precedes the string by a Text Restart command. The values used for the 2byte Text Restart command depend on the selected channel, as follows:

Table 7.5 2-Byte Text Restart Command

Channel	Text Restart Command (hexadecimal)
T1	14, 2A
T2	1C, 2A
T3	15, 2A
T4	1D, 2A

The Text Restart command clears the portion of the screen used for Text display and sets the cursor to the upper-left corner. This means that if the user of a caption decoder selects the Text channel being used for the insertion of the URL, the URL will be displayed in the upper-left corner, with the rest of the Text area remaining blank.

The URL being encoded can be changed at any time simply by sending another “N_T” command with the desired parameters, as described above.

It should be noted that the checksum at the end of the string, as described in EIA-746, is not generated by the encoder; it must be sent by the host computer.

Stop Encoding Text Data

Format: <CTRL-A> N_T <CR>

This command stops encoding the text data. After this command is received, the data channel which was being used for the text data is restored to its previous state (ON or OFF).

Start Encoding XDS Data (Interval Packets)

Format:<CTRL-A>P{packet type} {repeat count} {data} {delay} <CR>

This command starts inserting, on a cyclic basis, the specified XDS packet. The packet is referred to as an Interval packet since it is inserted once for every interval given by the {delay} parameter.

The parameters are as follows:

Table 7.6 Parameter Descriptions

Parameter	Description
{packet type}	4-digit hex number, where the first two digits represent the class of the packet and the second two digits represent the type of the packet. Note that there must be no space between the ‘P’ and the packet type parameter.
{repeat count}	number of times (in hex) to send the packet. A value of -1 or FFFF indicates that the packet should be repeated forever.
{data}	ASCII-encoded hex values representing the data in the packet, or the actual displayable data enclosed in curly braces.
{delay}	number of video frames (in decimal) to wait between each insertion of the packet.

If a command is received where the {data} parameter is not specified, then the packet will be inserted with no informational characters. This would be used for packet types 0110 to 0117 (Program Description) corresponding to a blank line.

Special Processing on Specific Packet Types

Special processing is performed on the following packet types, when received from the host computer or from upstream:

- **0701 (Time of Day)** — used to set the time in the encoder, according to Coordinated Universal Time
- **0102 (Length/Time-in-Show)** — used to set the elapsed time of the program

Special processing is performed on the following packet types as they are inserted:

- **0701 (Time of Day)** — data used is the current time of day, in Coordinated Universal Time
- **0102 (Length/Time-in-Show)** — data used is the current elapsed time of the program
- **010C (Composite Packet-1)** — data used in the Time-in-Show field is the current elapsed time of the program

Examples

The following command will insert, every 2 seconds (60 video frames), the XDS Program Name packet. The name used will be “National News” and the packet will be inserted forever.

```
<CTRL-A>P0103 -1 {National News} 60 <CR>
```

The following command will insert, every 5 seconds, the XDS Program Rating packet. The data defining the rating will be 4042 (hexadecimal) and packet will be inserted 360 times.

```
<CTRL-A>P0105 360 4042 150 <CR>
```

Start Encoding XDS Data (Fill Packets)

```
<CTRL-A>P{packet type} {duration} {data} {priority} P <CR>
```

When this format of the command is used, the packet is inserted as often as possible, based on the space available in field 2 of line 21, and the other XDS packets being inserted. The packet is referred to as a Fill packet since it fills the unused space in field 2 of line 21.

The parameters are as follows:

Table 7.7 Parameter Descriptions

Parameter	Description
{packet type}	same as for Interval packets
{duration}	length of time to insert the packet for, in the format “mmm:ss”
{data}	same as for Interval packets
{priority}	decimal value which specifies the relative time interval between insertions of the packet, compared to other packets created with this format of the command. For example, the time between insertions of a packet with a priority of 10 would be twice the time between insertions of a packet with a priority of 5.

The special processing performed on XDS Interval packets is also performed on Fill packets.

Example

The following command will insert the XDS Program Type packet, using values of 21 and 7F for the program type keywords. The packet will be inserted as often as possible, given a priority of 40, and will be inserted for 30 minutes.

```
<CTRL-A>P0104 30:00 217F 40 P <CR>
```

Stop Encoding XDS Data

Format: <CTRL-A>P{packet type} <CR>

When this format of the command is used, the Interval or Fill packet of the specified type is no longer inserted.

Specify Upstream Packet Priority

Format: <CTRL-A>P {packet type} {priority} P <CR>

When this format of the command is used, it does not cause the packet to be inserted; it simply specifies the priority with which upstream packets of that type will be passed through. This is necessary, since there may not be sufficient space in field 2 to re-insert (pass through) the packet as often as it is received from upstream. If upstream packets are received, and their priority has not been specified with this command, then a default of 50 is used.

“Store and Forward” Upstream Packets

Format: <CTRL-A>N_U {packet type} {delay} <CR>

This command provides a “Store and Forward” capability for upstream packets. This means that the encoder can receive and store an upstream packet, then continue to insert the packet, on a cyclic basis, in a period of time during which it is not being received. This would be useful in the case where a network affiliate wishes to insert information relating to the current program from the network feed when he is providing a local commercial containing captions.

When this command is received, no packets of the specified packet type will be inserted until that upstream packet is received. Each time the required packet is received, the data is stored in the encoder. When the time specified by the {delay} parameter expires, then the currently stored packet of this type will be inserted.

Set Operating States

Format: <CTRL-A> N_SET ECHO={state} MR={state} <CR>

This command sets the Echo state and/or the Monitor Ratings state to that specified (ON or OFF). Either one or both of the ECHO and MR parameters may be specified.

If the Echo state is ON, then commands and lines of Realtime mode data received by the encoder are echoed back as they are received. As well, the command or line of data being entered can be corrected using the Backspace key, before terminating the line with a Carriage Return. The default value for the Echo state, on power-up, is the setting in the Caption Stream Configuration menu.

If the Monitor Ratings state is ON, then the Caption module will send to the host computer all program rating packets (type 0105) that it receives from upstream. The packet sent to the host is in the following format:

<CTRL-A>P0105 {rating}

where {rating} is a 4-character string representing the ASCII-encoded hexadecimal value of the 2 program rating bytes received from upstream. The default value for the Monitor Ratings state, on power-up, is OFF. Note: This feature is only available on a serial encoder.

Set Baud Rate

Format: <CTRL-A> I {baud rate} <CR>

This command sets the baud rate of the serial port to the value specified by the {baud rate} parameter. To set the baud rate to 1200, 2400, 4800 or 9600, the appropriate 4-digit value is specified. To set the baud rate to 19200, the 3-digit value 192 is specified. The default value for the baud rate, on power-up or reception of the Reset Encoder command, is the setting selected in the Serial Port Configuration menu.

Vendor and Version Inquiry

Format:<CTRL-A> ? <CR>

This command returns the string “Ross Video TES? Caption Encoder Vx” to the host computer, where “?” is 3 or 5, depending on the type of encoder and “x” is the revision level.

Universal Configuration

In This Chapter

This chapter provides a summary of the Universal Configuration menus available for the TES3 and TES5.

The following topics are discussed:

- Overview

Overview

When the Universal module is selected for configuration in the main SETTE32 menu, the menu below is displayed.

The screenshot shows the 'Universal Stream Configuration' dialog box. It has a title bar with a close button. The main area is divided into several sections. On the left, there's a 'Priority' field with a value of 0. Below it is 'Data Pacing' with radio buttons for 'on' and 'off'. The 'Waveform Parameters' section includes a 'Waveform' dropdown menu set to 'nabts.wfm', an 'Amplitude' dropdown set to '70.2', a 'Start Time' dropdown set to '10.48', a 'Length' field set to '34', a 'Fixed Bytes' dropdown set to '1', and a text field containing '0xE7'. There's also an 'Add Protocol' checkbox which is checked. The 'Source' section has radio buttons for 'Port A', 'Port B', 'Port C', 'Modem', 'Btest data', and 'no source'. The 'Insertion Lines' section has two columns, 'Field 1' and 'Field 2', each with checkboxes for lines 10 through 25. The 'Frames Enabled' section on the right has checkboxes for frames 0 through 29, all of which are checked. At the bottom are buttons for 'Cancel', 'Apply', 'Set All', and 'Clear All'.

Universal Stream Configuration

Each of the menu items is described in further detail in the following sections.

Universal Stream Parameters

This section discusses the programming of the Universal streams.

Priority

The priority field selects the priority the current stream has in relation to other streams. A stream with a priority of 0 has the highest priority. The priority determines which stream gets to insert data on a specific TV line when two or more streams have that TV line enabled for insertion. The highest priority stream (priority = 0) always gets the first opportunity to fill all of its enabled TV lines. A stream which is unable to fill all of its lines with data offers its unused lines to the next highest priority stream. A stream may be unable to fill all of its enabled lines because it has not received enough data to fill all these lines or it does not have all of its frames enabled for insertion. The choices for a priority value depend on the number of software modules installed in the encoder.

Data Pacing

In a VBI data distribution system, the group supplying data to customers must ensure that no data is lost at a customer's receive site. If the customer's data receiver passes data to a receive computer via a serial port, there is potential for a loss of data if the encoder allows throughput greater than the decoder's serial port speed.

If you are using a serial encoder and it receives data from a transmit computer at the same speed as the data receiver outputs to a receive computer, then data pacing should be enabled. There is always a very small difference in the baud rates; if the data receiver is slightly slower, then over a long period of time the data receiver will lose data. Data pacing compensates for small differences in baud rate by limiting the maximum throughput of the UNIVERSAL module to be 2% less than the selected baud rate. When the data pacing field is in the Off state, data pacing is disabled and the UNIVERSAL module outputs data as fast as possible, given the number of lines and frames allocated for insertion. Data pacing may be turned off if the decoders are set to a higher baud rate than the encoder.

Data pacing should be turned off for a LAN encoder.

Waveform

This section selects the waveform to use for outputting data. The drop down list has all the available waveforms for the encoder.

Waveform Amplitude

This menu control allows you to adjust the waveform's amplitude. It may be necessary to modify the waveform amplitude if equipment after the encoder changes the waveform amplitude. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the waveform amplitude.

The nominal amplitude defined matching the corresponding waveform specification. The current waveform amplitude is displayed in the ‘Amplitude’ field. The amplitude can be changed in steps of approximately 0.4 IRE. To return to the default value press the **Nominal** button.

Start Time

This menu control allows you to adjust the waveform's start time. The start time determines where in a TV line the data begins. It may be necessary to modify the start time if equipment after the encoder alters the position of the data in the TV line. Modifying the waveform start time is not usually required. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the start time.

The nominal start time is defined by the corresponding standard. The current start time is displayed in the “start time” field. The start time can be changed in steps of approximately 0.07 microseconds. To return to the default value press the **Nominal** button.



Note — *When using a TES5, the digital video signal must be converted to an analog signal. The equipment that does this conversion may blank data being inserted before a certain point near the start of a line, or after a certain point near the end of a line. For this reason, the analog output signal should be examined to verify the start time of the data*

Nominal

This button sets the amplitude and start time to their default values.

Length

This menu control displays the actual data required to fill a line. This value includes any fixed header. So a value of 34 with a fixed header of 2 means a total of 32 bytes of data are required to fill a line.

Fixed Bytes

This menu option allows you to output a fixed header at the start of the data packet in order to avoid constantly having to retransmit it. Example: E7 for NABTS or 27 for WST always proceeds a packet so setting this as a fixed header avoid having to transmit these characters repeatedly.

Fixed Header

This is the actual header to be transmitted at the beginning of each data packet. The header is in hex form separated by spaces. Ex: 0xE7 0x15 0x55.....

Protocol

The protocol control turns on and off the data synchronization protocol. Certain data requires that data packets be transmitted on the same line. The protocol matches on the 0x55 character for sync and inserts one packet worth of data following the sync. Then resyncs on 0x55 and transmits another packet.

Example:

For CEA-608 waveform (2 data bytes):

0x55 0x80 0x80 0x55 0x70 0x60.....

Transmits 0x80 0x80

0x70 0x60

Insertion Lines

The section is used to select the lines the encoder will insert data on. The lines available for insertion depends on the line mode and insertion block selected. There is an important relationship between the number of lines enabled and the baud rate of the data source. This relationship is discussed in the Lines Enabled vs. Transmit Computer Baud Rate section later in this chapter. Lines that have already been selected for insertion of data found in the auxiliary video feed are not available for data insertion. Auxiliary lines are explained in the General Encoder Configuration section.

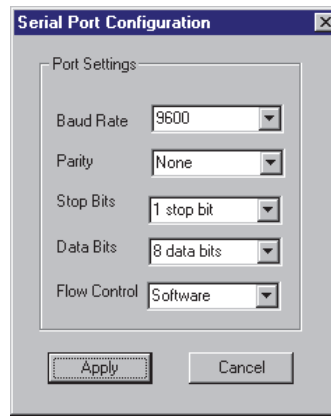
Note: When using a TES5, the digital video signal must be converted to an analog signal. The equipment that does this conversion may not pass some lines in the VBI. For this reason, the analog output signal should be examined to verify that data is present on the TV lines expected.

Source (LAN Encoder)

The source field is used to select where the module is receiving data from, i.e. the source device. The black circle indicates the currently selected data source. The source device can be one of the eight user defined TCP/IP port numbers or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. To configure the port numbers go back to the main SETTE32 menu and select the **Properties** button in the TCP/IP address section.

Source (Serial Encoder)

The source field is used to select where the module is receiving data from, i.e. the source device. The black circle indicates the currently selected source device. The source device can be Port A, Port B, Port C, Modem or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. Selecting the **Configure** button allows you to set the serial port parameters using the Serial Port Configuration menu shown below.



Serial Port Configuration

The flow control can be either hardware (RTS/CTS) or software (XON/OFF). The null modem cable shipped with the encoder supports both hardware and software flow control.

Apply

This button saves the currently displayed selections and returns to the main SETTE32 menu. Any streams configured using the **Stream Configuration** menu are not activated until SETTE32 is exited and the changes saved to non-volatile memory.

Cancel

This button exits the NABTS Stream Configuration menu and deletes any changes made.

VITC Configuration

In This Chapter

This chapter provides a summary of the VITC Module menus available for the TES3 and TES5.

The following topics are discussed:

- VITC Module Overview
- VITC Stream Commands

VITC Module Overview

When the VITC module is selected for configuration in the main SETTE32 menu, the following is displayed.

VITC Stream Parameters

Source

☐ Port 2000 ☐ Port 7000

☐ Port 3000 ☐ Port 8000

☒ Port 4000 ☐ Port 9000

☐ Port 5000 ☐ no source

☐ Port 6000

Line 1: 10

Line 2: 12

☒ Enable Frame Dropping

Default Time Code (00:00:00:00)

00:00:00:00

General Module Configuration

User Bytes

User Data 1: 0x0 User Data 5: 0x0

User Data 2: 0x0 User Data 6: 0x0

User Data 3: 0x0 User Data 7: 0x0

User Data 4: 0x0 User Data 8: 0x0

Apply Cancel

VITC Stream Parameters Menu

Each of the menu items is described in further detail in the following sections.

VITC Stream Parameters

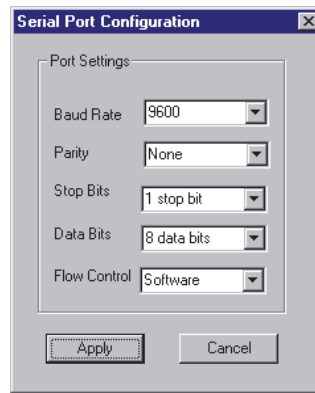
This section discusses the programming of the VITC streams.

Source (LAN Encoder)

The source field is used to select where the VITC module is receiving control data from, i.e. the source device. The black circle indicates the currently selected data source. The source device can be one of the eight user defined TCP/IP port numbers or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. To configure the port numbers go back to the main SETTE32 menu and select the **Properties** button in the TCP/IP address section.

Source (Serial Encoder)

The source field is used to select where the VITC module is receiving control data from, i.e. the source device. The black circle indicates the currently selected source device. The source device can be Port A, Port B, Port C, Modem or no source. To select a source, click its radio button and SETTE32 checks to see if that source is already in use. Selecting the **Configure** button allows you to set the serial port parameters using the Serial Port Configuration menu shown below.



Serial Port Configuration

The flow control can be either hardware (RTS/CTS) or software (XON/OFF). The null modem cable shipped with the encoder supports both hardware and software flow control.

General Module Configuration

This button brings up the General VITC Configuration Menu for setting general VITC parameters. Refer to the section “**VITC General Parameters**” on page 14-1 for further details.

User Data Bytes

The specification for VITC allows 8 user defined bytes to be transmitted with the time code data. Using the GUI you can input 8 hex bytes to be transmitted.

Line 1

First line to insert VITC data on. Note: the specification calls for two non consecutive lines for two line VITC. You may choose to use one or two line VITC by setting the second line to none.

Line 2

The second line to insert VITC data on. Note: the specification calls for two non consecutive lines for two line VITC. You may choose to use one or two line VITC. Setting this control to none puts the encoder in one line VITC mode.

Frame Dropping

Due to the fact that frequency is not quite 60 frames a second for NTSC it is necessary to drop a frame occasionally to keep the seconds, minutes etc. reading accurately. To enable this feature check the box. This control has no effect in 625 line operation.

Default Timecode

The encoder starts up encoding timecode. The default value is typically 00:00:00:00 but the encoder allows you to specify another default. Input for this control should be in the form HH:MM:SS:FF. (Hours: Minutes: Seconds: Frames)

Apply

This button saves the currently displayed selections and returns to the main SETTE32 menu. Any streams configured using the Stream Configuration menu are not activated until SETTE32 is exited and the changes saved to non-volatile memory.

Cancel

This button exits the NABTS Stream Configuration menu and deletes any changes made.

VITC Stream Commands

The VITC accepts input text commands to view and change VITC data. These commands can be inputted through a terminal in the case of a serial encoder or telnet in the case of a LAN encoder.

SMPTE time code

- H — Displays list of help commands.
- h — Displays list of help commands.
- v — Displays current VITC time code.
- u — Displays current VITC user bytes.
- V — Sets VITC time code, form 00:00:00:00
- U — Sets VITC user bytes, form 00000000

Time code switch

- L3 — Switch to inserting 3 line time code
- L1 — Switch to inserting SMPTE time code as set in setup software.

Three line time code command

- x — Displays production user bytes.
- p — Displays production time code.
- k — Displays keycode data bytes.
- X — Sets production user bytes, form 00000000
- P — Sets production time code, form 00:00:00:00
- K — Sets keycode data bytes, form 0000000000000000

When switching to 3 line time code the data is inserted on 3 consecutive lines starting with the line 1 set in the setup software. The production time code (line 3) will start at 00:00:00:00 and increment with the VITC time code on line 1.

Keycode data's (line 2) form is:

FFSSMMHHUUUUUUUU where UUUUUUUU represents user bytes 1 to 8.

Samples

V11:23:34:10 Set the VITC time code to 11 hours, 23 minutes, 34 seconds and 10 frames.

U0000AAAA Set user bytes 1 to 4 to 0xA and set user bytes 5 to 8 to 0x0.

NABTS Parameters

In This Chapter

This chapter provides a summary of the NABTS parameters for the TES3 and TES5.

The following topics are discussed:

- Overview

Overview

Selecting the General NABTS Configuration displays the menu shown below. Any changes made in these menu items affect all NABTS streams and take effect immediately after the **Apply** button is pressed.

Bert Lines		Bert Frames
Field 1	Field 2	
☐ Line 10	☐ Line 10	☒ Frame 13 ☒ Frame 26
☐ Line 11	☐ Line 11	☒ Frame 1 ☒ Frame 14 ☒ Frame 27
☐ Line 12	☐ Line 12	☒ Frame 2 ☒ Frame 15 ☒ Frame 28
☐ Line 13	☐ Line 13	☒ Frame 3 ☒ Frame 16 ☒ Frame 29
☐ Line 14	☐ Line 14	☒ Frame 4 ☒ Frame 17 Set All
☐ Line 15	☐ Line 15	☒ Frame 5 ☒ Frame 18 Clear All
☐ Line 16	☐ Line 16	☒ Frame 6 ☒ Frame 19
☐ Line 17	☐ Line 17	☒ Frame 7 ☒ Frame 20
☐ Line 18	☐ Line 18	☒ Frame 8 ☒ Frame 21
☐ Line 19	☐ Line 19	☒ Frame 9 ☒ Frame 22
☐ Line 20	☐ Line 20	☒ Frame 10 ☒ Frame 23
☐ Line 21	☐ Line 21	☒ Frame 11 ☒ Frame 24
☐ Line 22	☐ Line 22	☒ Frame 12 ☒ Frame 25
☐ Line 23	☐ Line 23	
☐ Line 24	☐ Line 24	
☐ Line 25	☐ Line 25	

NABTS General Parameters

Waveform Amplitude

This menu control allows you to adjust the NABTS waveform's amplitude. It may be necessary to modify the waveform amplitude if equipment after the encoder changes the waveform amplitude. To use this option you must be inserting data, either by having BERT Lines enabled, or by sending data to the encoder. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the waveform amplitude.

The nominal amplitude defined by the NABTS CEA-516 standard is 70 ± 2 IRE. The current waveform amplitude is displayed in the **Amplitude** field. The amplitude can be changed in steps of approximately 0.4 IRE. To return to the default value press the **Nominal** button.

Start Time

This menu control allows you to adjust the NABTS waveform's start time. The start time determines where in a TV line the data begins. It may be necessary to modify the start time if equipment after the encoder alters the position of the data in the TV line. Modifying the waveform start time is not usually required. To use this option you must be inserting data, either by having BERT Lines enabled, or by sending data to the encoder. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the start time.

The nominal start time defined by the NABTS CEA-516 standard is 10.48 ± 0.34 microseconds. The current start time is displayed in the “start time” field. The start time can be changed in steps of approximately 0.07 microseconds. To return to the default value press the **Nominal** button.



Note — When using a TES5, the digital video signal must be converted to an analog signal. The equipment that does this conversion may blank data being inserted before a certain point near the start of a line, or after a certain point near the end of a line. For this reason, the analog output signal should be examined to verify the start time of the data.

Nominal

This button sets the amplitude and start time to their default values.

BERT Lines

BERT (Bit Error Rate Test) data is generated on its enabled lines and frames only when there are no other data sources currently inserting on these lines. BERT data is always transmitted on packet address F00 and with a byte sync of E7. It is used to generate NABTS data when the output would otherwise be idle.

BERT Frames

The BERT Frames option allows you to select the frames for BERT data insertion. Typically this is all frames; selecting specific frames for insertion is more often done when configuring a data stream. The use of frames is further explained in the chapter “**NABTS Stream Configuration**” on page 4-1.

Apply / Exit Buttons

The **Apply** button sends the changes to the encoder which updates any NABTS data. This allows you to see the effects of the change on the inserted data.

The **Exit** button abandons the changes and returns to the previous menu. If BERT lines have been enabled, they will continue to be used for BERT data insertion.

WST Parameters

In This Chapter

This chapter provides a summary of the WST parameters for the TES3 and TES5.

The following topics are discussed:

- Overview

Overview

Selecting the General WST Configuration displays the menu shown below. Any changes made in these menu items affect all WST streams and take effect on the encoder immediately after the **Apply** button is pressed.

Bert Lines		Bert Frames	
Field 1	Field 2		
☐ Line 5	☐ Line 318	☒ Frame 0	☒ Frame 13
☐ Line 6	☐ Line 319	☒ Frame 1	☒ Frame 14
☐ Line 7	☐ Line 320	☒ Frame 2	☒ Frame 15
☐ Line 8	☐ Line 321	☒ Frame 3	☒ Frame 16
☐ Line 9	☐ Line 322	☒ Frame 4	☒ Frame 17
☐ Line 10	☐ Line 323	☒ Frame 5	☒ Frame 18
☐ Line 11	☐ Line 324	☒ Frame 6	☒ Frame 19
☐ Line 12	☐ Line 325	☒ Frame 7	☒ Frame 20
☐ Line 13	☐ Line 326	☒ Frame 8	☒ Frame 21
☐ Line 14	☐ Line 327	☒ Frame 9	☒ Frame 22
☐ Line 15	☐ Line 328	☒ Frame 10	☒ Frame 23
☐ Line 16	☐ Line 329	☒ Frame 11	☒ Frame 24
☐ Line 17	☐ Line 330	☒ Frame 12	☒ Frame 25
☐ Line 18	☐ Line 331		
☐ Line 19	☐ Line 332		
☐ Line 20	☐ Line 333		
☐ Line 21	☐ Line 334		
☐ Line 22	☐ Line 335		

WST General Parameters

A description of the different controls follows.

Waveform Amplitude

This menu item allows you to adjust the WST waveform amplitude. It may be necessary to modify the waveform amplitude if equipment after the encoder changes the waveform amplitude. To use this option you must be inserting data, either by having BERT Lines enabled, or by sending data to the encoder. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the waveform amplitude.

The nominal amplitude defined by the WST standard is 66 ± 6 IRE. The current waveform amplitude is displayed in the **Amplitude** field. The amplitude can be changed in steps of approximately 0.4 IRE. In this menu you scroll up and down to change the amplitude. To return to the default value press the **Nominal** button.

Start Time

This menu control allows you to adjust the WST waveform's start time. The start time determines where in a TV line the data begins. It may be necessary to modify the start time if equipment after the encoder alters the position of the data in the TV line. Modifying the waveform start time is not usually required. To use this option you must be inserting data, either by having BERT Lines enabled, or by sending data to the encoder. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the start time.

The nominal start time defined by the WST standard is $12.0 +0.4/-1.0$ microseconds, measured from the falling edge of sync to the peak of the penultimate '1' in the clock run-in. The current start time is displayed in the **Start Time** field. The start time can be changed in steps of approximately .07 microseconds. In this menu you scroll up and down to change the start time. To return to the default value press the **Nominal** button.



Note — *When using a TES5, the digital video signal must be converted to an analog signal. The equipment that does this conversion may blank data being inserted before a certain point near the start of a line, or after a certain point near the end of a line. For this reason, the analog output signal should be examined to verify the start time of the data.*

Nominal

This button sets the amplitude and start time to their default values.

BERT Lines

BERT (Bit Error Rate Test) data is generated on its enabled lines and frames only when there are no other data sources currently inserting on these lines. BERT data is always transmitted on packet address F00 and with a byte sync of 27. It is used to generate WST data when the output would otherwise be idle.

BERT Frames

The BERT Frames option allows you to select the frames for BERT data insertion. Typically this is all frames; selecting specific frames for insertion is more often done when configuring a data stream. The use of frames is further explained in the chapter “**WST Configuration**” on page 5-1.

Apply / Exit Buttons

The **Apply** button sends the changes to the encoder which updates any WST data streams being sent. This allows you to see the effects of the change on the inserted data.

Selecting **Exit** returns you to the previous menu. If BERT lines have been enabled, they will continue to be used for BERT data insertion.

WST IDLA / IDLB Parameters

In This Chapter

This chapter provides a summary of the WST IDLA / IDLB parameters for the TES3 and TES5.

The following topics are discussed:

- Overview

Overview

Selecting the General WST IDL Format A / IDL Format B Configuration displays the menu shown below. Any changes made in these menu items affect all WST streams and take effect on the encoder immediately after the **Apply** button is pressed.

WST IDL Format A / IDL Format B General Parameters

Amplitude (IRE)
65.9
Start Time (us)
11.99
Nominal
Exit
Apply

Bert Lines

Field 1	Field 2
☐ Line 5	☐ Line 318
☐ Line 6	☐ Line 319
☐ Line 7	☐ Line 320
☐ Line 8	☐ Line 321
☐ Line 9	☐ Line 322
☐ Line 10	☐ Line 323
☐ Line 11	☐ Line 324
☐ Line 12	☐ Line 325
☐ Line 13	☐ Line 326
☐ Line 14	☐ Line 327
☐ Line 15	☐ Line 328
☐ Line 16	☐ Line 329
☐ Line 17	☐ Line 330
☐ Line 18	☐ Line 331
☐ Line 19	☐ Line 332
☐ Line 20	☐ Line 333
☐ Line 21	☐ Line 334
☐ Line 22	☐ Line 335

Bert Frames

☒ Frame 0	☒ Frame 13	☒ Frame 26
☒ Frame 1	☒ Frame 14	☒ Frame 27
☒ Frame 2	☒ Frame 15	☒ Frame 28
☒ Frame 3	☒ Frame 16	☒ Frame 29
☒ Frame 4	☒ Frame 17	
☒ Frame 5	☒ Frame 18	Set All
☒ Frame 6	☒ Frame 19	Clear All
☒ Frame 7	☒ Frame 20	
☒ Frame 8	☒ Frame 21	
☒ Frame 9	☒ Frame 22	
☒ Frame 10	☒ Frame 23	
☒ Frame 11	☒ Frame 24	
☒ Frame 12	☒ Frame 25	

☒ Enable Padding Buffer

55 55 27 02 15 ea ea 15 c0 15 15 02 15 43 61 76 e5 6e 61 02 bc 75 62 f4 e9 f4 ec e9 6e 67 20 20 20 20 20

WST IDL Format A / IDL Format B General Parameters

A description of the different controls follows.

Waveform Amplitude

This menu item allows you to adjust the WST IDL Format A / IDL Format B waveform amplitude. It may be necessary to modify the waveform amplitude if equipment after the encoder changes the waveform amplitude. To use this option you must be inserting data, either by having BERT Lines enabled, or by sending data to the encoder. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the waveform amplitude.

The nominal amplitude defined by the WST standard is 66 ± 6 IRE. The current waveform amplitude is displayed in the **Amplitude** field. The amplitude can be changed in steps of approximately 0.4 IRE. In this menu you scroll up and down to change the amplitude. To return to the default value press the **Nominal** button.

Start Time

This menu control allows you to adjust the WST IDL Format A / IDL Format B waveform's start time. The start time determines where in a TV line the data begins. It may be necessary to modify the start time if equipment after the encoder alters the position of the data in the TV line. Modifying the waveform start time is not usually required. To use this option you must be inserting data, either by having BERT Lines enabled, or by sending data to the encoder. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the start time.

The nominal start time defined by the WST standard is $12.0 +0.4/-1.0$ microseconds. The current start time is displayed in the ‘Start Time’ field. The start time can be changed in steps of

approximately 0.07 microseconds. In this menu you scroll up and down to change the start time. To return to the default value press the **Nominal** button.



Note — *When using a TES5, the digital video signal must be converted to an analog signal. The equipment that does this conversion may blank data being inserted before a certain point near the start of a line, or after a certain point near the end of a line. For this reason, the analog output signal should be examined to verify the start time of the data.*

Nominal

This button sets the amplitude and start time to their default values.

BERT Lines

BERT (Bit Error Rate Test) data is generated on its enabled lines and frames only when there are no other data sources currently inserting on these lines. BERT data is always transmitted on packet address F00 and with a byte sync of 27. It is used to generate WST data when the output would otherwise be idle.

BERT Frames

The BERT Frames option allows you to select the frames for BERT data insertion. Typically this is all frames; selecting frames for insertion is more often done when configuring a data stream. The use of frames is further explained in the chapter “**WST Configuration**” on page 5-1.

Enable Padding Buffer

This option allows you to override the standard BERT data with a fixed packet supplied in SETTE32.

To use it add an entry similar to this in settes.ini under the [settes] section.

```
custom_B_str=55 55 27 02 15 ea ea 15 c0 15 15 02 15 43 61 76 e5 6e 61 02 bc 75 62 f4 e9 f4 ec  
e9 6e 67 20 20 20 20 20 20 20 80 80 80 80 80 80 80 80
```

Apply / Exit Buttons

The **Apply** button sends the changes to the encoder which updates any WST IDL Format A / IDL Format B data streams being sent. This allows you to see the effects of the change on the inserted data.

Selecting **Exit** returns you to the previous menu. If BERT lines have been enabled, they will continue to be used for BERT data insertion.

Caption Parameters

In This Chapter

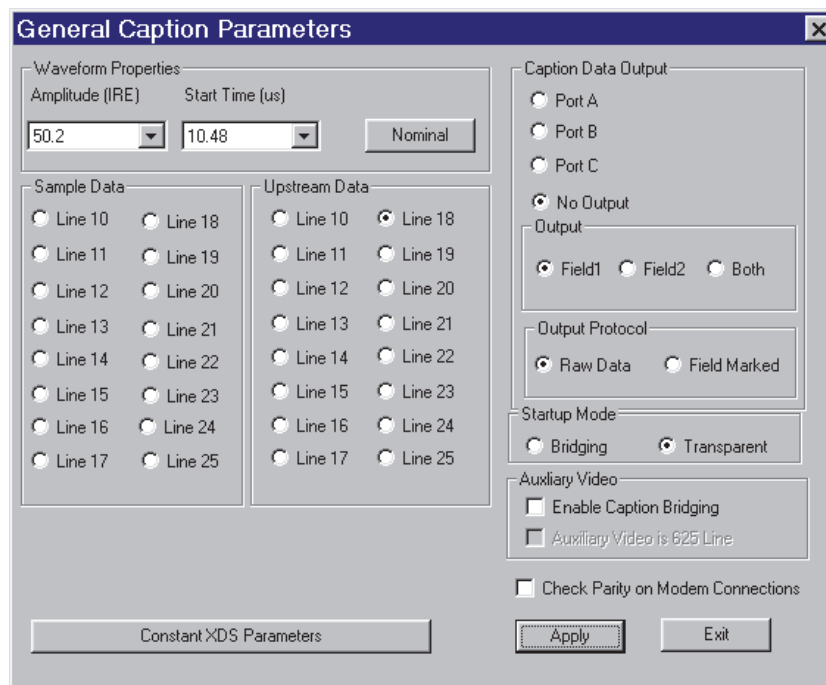
This chapter provides a summary of the Caption parameters for the TES3 and TES5.

The following topics are discussed:

- Overview
- Constant Data Transmission Menu

Overview

Selecting the General Captioning Configuration displays the menu shown below. Any changes made in these menu items, with the exception of Upstream Data, take effect on the encoder after the **Apply** button is pressed. If the line for Upstream Data is changed, then the encoder must be powered down and re-started in order for the change to take effect.

The image shows a software window titled "General Caption Parameters". It contains several sections: "Waveform Properties" with "Amplitude (IRE)" set to 50.2 and "Start Time (us)" set to 10.48, and a "Nominal" button; "Sample Data" and "Upstream Data" sections, each with radio buttons for lines 10 through 25; "Caption Data Output" with radio buttons for Port A, Port B, Port C, No Output, and an "Output" section with radio buttons for Field1, Field2, and Both; "Output Protocol" with radio buttons for Raw Data and Field Marked; "Startup Mode" with radio buttons for Bridging and Transparent; "Auxiliary Video" with checkboxes for "Enable Caption Bridging" and "Auxiliary Video is 625 Line"; and a checkbox for "Check Parity on Modem Connections". At the bottom are buttons for "Constant XDS Parameters", "Apply", and "Exit".

General Caption Parameters Menu

A brief description of the controls follows.

Waveform Amplitude

This menu item allows you to adjust the Captioning waveform amplitude. It may be necessary to modify the waveform amplitude if equipment after the encoder changes the waveform amplitude. While you are in the General Captioning Configuration menu, a line of sample captioning information is inserted on the line selected by the Sample Data menu item. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the waveform amplitude.

The nominal amplitude defined by the CEA-608 standard is 50 ± 2 IRE. The current waveform amplitude is displayed in the **Amplitude** field. The amplitude can be changed in steps of approximately 0.4 IRE. In this menu you scroll up and down to change the amplitude. To return to the default value press the **Nominal** button.

Start Time

This menu control allows you to adjust the caption waveform's start time. The start time determines where in a TV line the data begins. It may be necessary to modify the start time if equipment after the encoder alters the position of the data in the TV line. Modifying the waveform start time is not usually required. While you are in the General Captioning Configuration menu, a line of sample captioning information is inserted on the line selected by the Sample Data menu item. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the insert time.

The nominal start time defined by the CEA-608 standard is 10.5 ± 0.25 microseconds. The current start time is displayed in the 'Start Time' field. The start time can be changed in steps of approximately 0.07 microseconds. In this menu you scroll up and down to change the start time. To return to the default value press the **Nominal** button.



Note — *When using a TES5, the digital video signal must be converted to an analog signal. The equipment that does this conversion may blank data being inserted before a certain point near the start of a line, or after a certain point near the end of a line. For this reason, the analog output signal should be examined to verify the start time of the data.*

Nominal

This button sets the amplitude and start time to their default values.

Sample Data

This menu entry allows you to select the line on which sample caption data is to be inserted. The line numbering is affected by the value selected for the line mode and Insert Block options in the General Encoder Configuration menu. Selecting a line and then pressing **Apply** button puts sample data on that line. Exiting the General Caption Configuration menu stops the sample data encoding.

Upstream Data

This menu entry specifies the line (in the Program In video signal) which contains upstream caption data. This should normally be set to 21 if using 525-line video, or 22 if using 625-line video. The field used for the re-insertion of the upstream data is controlled by commands received from the transmit computer.

Caption Data Output

The Caption module can be configured to output all upstream caption data using one of the serial or LAN ports, if desired. This menu entry specifies the port to be used for this purpose. If a port is selected (i.e. this menu entry is set to something other than 'No Source'), then all upstream caption data (including null bytes), in the specified line and field, is output exactly as it is received. The communications parameters of the serial port are fixed (i.e. cannot be changed) at 9600 baud, 8 data bits, no parity, 1 stop bit, and no flow control.

Output

This menu entry specifies the video field (1, 2 or both) which is to be output using the serial port, if the Caption Data Output feature is being used. If both is selected the marking protocol must be used.

Output Protocol

Data being output by the serial or LAN port can be either raw or use a marking protocol. The marking protocol uses 0x81 and 0x82 to mark the data being output. 0x81 indicates field 1 and 0x82 indicates field 2. If no data is present the encoder outputs 0x11 or 0x12, depending on the field, followed by 0x80 0x80.

Startup Mode

The startup mode can either be Bridging or Transparent. This selection is the mode of operation which the Caption module assumes after the encoder is turned on or configured using the setup program.

In Transparent mode, no caption data is decoded or inserted by the encoder. The video signal on the upstream data line and the line selected for insertion is simply passed through unchanged.

In Bridging mode, data arriving on the upstream data line is decoded, then re-inserted on the line selected for insertion in the Caption Stream Configuration menu. The bridging of data from the upstream data line to the insert line begins after the encoder has completed its initialization sequence, after being turned on or configured using the setup program.



Note — *When bridging, it is possible to use the encoder to prevent the upstream caption data from being passed through the encoder on the same line, while still allowing the upstream caption data to be re-inserted on the selected insert line. To do so, connect black-level input video to the auxiliary input (This video source must be gen-locked to the program video input). Then select the line containing the upstream caption data as an auxiliary input line in the General Encoder Configuration Menu. The black-level line of the auxiliary input will then replace the line containing the captioning data.*

Enable Caption Bridging

Checking this box allows the caption module to use the auxiliary input video as the data source for upstream captions. Allowing the captions on the auxiliary input to be reinserted on the program video.



Note — *Enabling caption bridging disables caption data Output.*

Auxiliary Video is 625

Checking this box means the upstream video on the auxiliary input is 625 line format.

Check Parity on Modem Connections

This option allows the encoder to check the incoming parity on caption stream modem connections. The CEA-608 specification requires all caption data to be in 7 bit odd parity. Checking the incoming data allows the encoder to hang up the modem if too many parity errors occur over a period of time. This prevents a noisy phone line from stopping the modem from hanging up, thus requiring a manual reboot of the unit. Parity checking must be turned off if the incoming parity will not be 7 bit odd parity.

Constant XDS Parameters

This button brings up a menu that allows the encoder insert a constant URL string and several XDS data packets of different types.

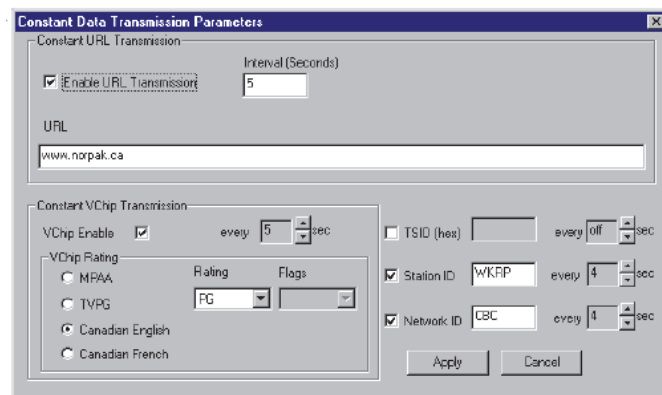
Apply / Exit Buttons

The **Apply** button sends the changes to the encoder which updates any Sample data streams being sent. This allows you to see the effects of the change on the inserted data.

Selecting **Exit** stops the insertion of the sample captioning data and returns you to the previous menu.

Constant Data Transmission Menu

Selecting the **Constant XDS Parameters** button displays the menu shown below. Any changes made in these menu items takes effect on the encoder after the **Apply** button is pressed.



Constant Data Transmission Parameters Menu

A brief description of the controls follows

Constant URL Insertion

This feature configures the encoder to insert, on a periodic basis, a Uniform Resource Locator, in Text channel T2, according to the specification EIA-746. This feature provides the same functionality as the "N_T" command (Start Encoding Text Data) but allows the encoder to be configured to automatically start inserting the string on power-up (i.e. it is not necessary to send the "N_T" command to the encoder) and to continue inserting the string forever. Checking "Enable URL" turns on this feature. The Interval is the time interval, in seconds, between each insertion of the URL.

When this feature of SETTE32 is used, the checksum for the string to be inserted (specified in the URL field) is automatically generated by the encoder (according to EIA-746) and appended to the string.

Constant Vchip Insertion

This feature configures the encoder to insert, on a periodic basis, a Vchip (Program Rating) XDS packet, according to the specification EIA-744. This feature provides the same functionality as the "P0105" command, but allows the encoder to be configured to automatically start inserting the packet on power-up. Checking "Vchip Enable" turns on this feature.

Constant TSID Insertion

This feature configures the encoder to insert, on a periodic basis, a TSID (Transmission Signal Identifier) XDS packet, according to the specification EIA-752. This feature provides the same functionality as the "P0504" command, but allows the encoder to be configured to automatically start inserting the packet on power-up. The 16-bit value for the TSID is specified as four hexadecimal digits, with the left-most digit corresponding to bits 12 to 15 of the TSID. Checking "TSID" turns on this feature.

Constant Station ID Insertion

This feature configures the encoder to insert, on a periodic basis, an XDS packet containing the Call Letters (Station ID) of the local broadcasting station, according to the specification CEA-608. This feature provides the same functionality as the "P0502" command, but allows the

encoder to be configured to automatically start inserting the packet on power-up. Checking “Station ID” turns on this feature.

Constant Network ID Insertion

This feature configures the encoder to insert, on a periodic basis, an XDS packet containing the Network Name (affiliation) of the local broadcasting station, according to the specification CEA-608. This feature provides the same functionality as the “P0501” command, but allows the encoder to be configured to automatically start inserting the packet on power-up. Checking “Network ID” turns on this feature.

Apply / Exit Buttons

The **Apply** button stores the changes to the constant XDS Parameters. These changes will take effect when the encoder parameters are saved temporarily or permanently.

Selecting **Exit** returns you to the previous menu abandoning any changes.

VITC General Parameters

In This Chapter

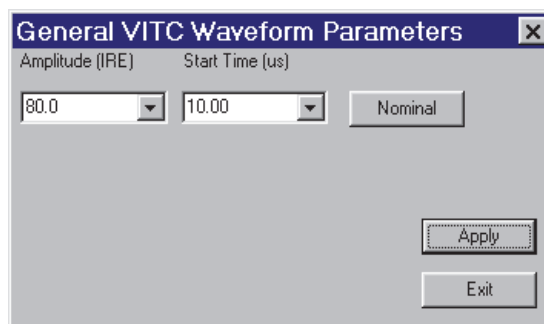
This chapter provides a summary of the VITC General parameters for the TES3 and TES5.

The following topics are discussed:

- Overview

Overview

Selecting the General VITC Configuration displays the menu shown below. Any changes made in these menu items affect all VITC streams and take effect immediately after the **Apply** button is pressed.



General VITC Waveform Parameters Menu

A brief description of the controls follows.

Waveform Amplitude

This menu item allows you to adjust the VITC waveform's amplitude. It may be necessary to modify the waveform amplitude if equipment after the encoder changes the waveform amplitude. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the waveform amplitude.

The nominal amplitude standard is 80 ± 2 IRE. The current waveform amplitude is displayed in the **Amplitude** field. The amplitude can be changed in steps of approximately 0.4 IRE. In this menu you scroll up and down keys to change the amplitude. To return to the default value press the **Nominal** button.

Start Time

This menu control allows you to adjust the VITC waveform's start time. The start time determines where in a TV line the data begins. It may be necessary to modify the start time if equipment after the encoder alters the position of the data in the TV line. Modifying the waveform start time is not usually required. Refer to the section “**Measuring Start Time and Data Amplitude**” on page 16-8 for details on how and where to measure the start time.

The nominal start time standard is 10.48 ± 0.34 microseconds. The current start time is displayed in the “start time” field. The start time can be changed in steps of approximately 0.07 microseconds. In this menu you scroll up and down keys to change the start time. To return to the default value press the **Nominal** button.

The Nominal Start Time selection sets the start time to its default value.



Note — When using a TES5, the digital video signal must be converted to an analog signal. The equipment that does this conversion may blank data being inserted before a certain point near the start of a line, or after a certain point near the end of a line. For this reason, the analog output signal should be examined to verify the start time of the data.

Nominal

This button sets the amplitude and start time to their default values.

Apply / Exit Buttons

The **Apply** button sends the changes to the encoder which updates any streams being sent. This allows you to see the effects of the change on the inserted data.

Selecting **Exit** returns you to the previous menu. If BERT lines have been enabled, they will continue to be used for BERT data insertion.

Troubleshooting

In This Chapter

This chapter is intended to help you determine the cause of problems you may have with your encoder. This chapter is divided into three sections. The first section contains a brief set of troubleshooting questions to aid you in determining the cause of problems that you may have. The second section explains how to interpret the Status LED when it is flashing. The third section explains how to use Ross Video's test software to verify system setup and operation if your encoder has a NABTS or WST module.

The following topics are discussed:

- Troubleshooting Questions
- Status LED
- Using the Test Software

Troubleshooting Questions

This section presents a list of questions in the form of “if..then..else” statements to help you in determining the source of problems you may be having with your encoder. These questions are similar to ones you would be asked if you contacted Ross Video for help in determining the source of your problem.

1. if STATUS LED is off then
 - is unit plugged into AC outlet?
 - is power switch on?
 - is fuse blown?
2. if STATUS LED is red for more than 1 minute then
 - power unit off and on
 - if STATUS LED is red for more than 1 minute then
 - contact Ross Video
3. if STATUS LED is not green & a LAN Encoder then contact Ross Video
4. if STATUS LED is flashing red and/or yellow then
 - refer to section on STATUS LED for more information
5. if INSERT LED is off then
 - is the Program VIDEO LED on?
 - is at least one of the following LEDs on: Port A, B, C, LAN/MODEM or NABTS?
6. if Program VIDEO LED is off,
 - if BYPASS LED is red then
 - › is Active/Bypass switch in bypass position (out)?
 - › is connector attached to rear panel Remote connector?
 - › is a video signal connected to Program In BNC?
 - if Program VIDEO LED is blinking then
 - › incoming video is unstable
 - › if TES5 then
 - › is the cable connected to the Program In longer than 200m (= 600 ft)?
7. if serial encoder and using PORT A as data source and PORT A LED is off then
 - is the cable connected to PORT A connector a null modem (as shown in “**Appendix A.**” on page 16-1)?
 - is the cable securely attached to the connector on the encoder?
 - is other end of cable connected to correct serial port connector on transmit computer?
 - is transmit computer sending data?
 - is transmit computer in a flow controlled state?
8. if serial encoder and using PORT B as data source and PORT B LED is off then
 - is the cable connected to PORT B connector a null modem?
 - is the cable securely attached to the connector on the encoder?
 - is other end of cable connected to correct serial port connector on transmit computer?

- is transmit computer sending data?
 - is transmit computer in a flow controlled state?
- 9.** if serial encoder and using PORT C as data source and PORT C LED is off then
- is the cable connected to PORT C connector a null modem?
 - is the cable securely attached to the connector on the encoder?
 - is other end of cable connected to correct serial port connector on transmit computer?
 - is transmit computer sending data?
 - is transmit computer in a flow controlled state?
- 10.** if serial encoder and using modem as data source and LAN/MODEM LED is off then
- is phone cable plugged into rear panel phone jack?
 - is other end of phone cable plugged into phone jack?
 - is the transmit computer connected to phone line correctly?
 - has the transmit computer dialed the Encoder's number to establish a connection?
- 11.** if serial encoder and using modem as data source and LAN/MODEM LED was on and now off then
- lost phone line connection, have transmit computer establish connection again
- 12.** if serial encoder and PORT A or B or C LED flicker unexpectedly then
- is number of lines enabled for insertion sufficient for serial port speed ?
- 13.** if LAN encoder and LAN/MODEM LED is off then
- is a LAN cable connected to LAN/MODEM connector?
 - is transmit software using the IP mask and Port Number that the encoder is configured for?
 - is the transmit software sending data?
- 14.** if data inserted on incorrect lines then
- check lines enabled in encoder

Status LED

On power up, the Status LED is red. The LED remains red while the system is booting up and performing self diagnostic tests. The booting and tests take about 30 seconds to complete. When the encoder has finished booting, and if the encoder passed all the tests, the LED turns green. If the LED does not turn green, contact Ross Video for technical assistance. On a LAN encoder, after turning from red to green, this LED remains green thereafter.

However, on a serial encoder this LED can help identify some configuration problems with the serial ports. During normal operation the Status LED is green, but when error conditions occur, the LED is used to indicate errors. There are two types of errors that can occur: one turns the Status LED red and the other turns it yellow then flashes red.

The first type of error indicates problems with the serial ports and can be generated by any module. The number of times that the LED flashes red indicates which source device is having the problem. One flash to five flashes indicates a problem with the modem, Port A, Port B, Port C and NABTS decoder respectively. There is about a 2 second delay after the flashing before the flashing cycle is repeated again. The serial port errors that cause the LED to flash are: a framing error or a receive buffer overrun error. A framing error usually indicates that the encoder and the transmit computer are not operating at the same baud rate. A framing error usually causes the LED to begin flashing as soon as data is sent to the encoder. A receive buffer overrun error is usually caused by the transmit computer not recognizing flow control. This error usually takes a few seconds to occur after the start of data. These are the most common errors encountered with the serial ports. They are solved by making sure the configuration of the ports is correct.

The second type of error indicates an input buffer overflow on upstream captions and can be generated by the Captioning module only. When the encoder is inserting caption or text data in Real-time mode, or when text data is being encoded using the N_T command, and upstream line 21 data is being re-encoded, it is important to ensure that there is enough free space (in the line 21 field being used) to encode the new data. If there is not enough free space, then any upstream data in channels having a lower priority than the channel(s) being encoded is stored until it can be encoded. If a lot of data is received, however, it is possible for one or more of the input buffers to overflow. The LED flickers yellow for about 1 second, then flashes red a specific number of times to indicate the channel whose input buffer has overflowed, as given in **Table 15.1**.

Table 15.1 Channel Overflow

Number of Flashes	Channel Overflow
1	C2
2	T1
3	T2
4	C4
5	T3
6	T4
7	XDS

The input buffers for channels C1 and C3 never overflow, since they are the highest-priority channels in their respective fields. If data in one of these channels is being received (in Realtime mode) from the transmit computer faster than it can be encoded, then flow control is issued to the transmit computer to prevent the input buffer from overflowing. The method of indicating input buffer overflows is only used by the Captioning module of the encoder. It is therefore not necessary to indicate which serial port the overflow occurred on. If this error occurs report its occurrence to the group responsible for providing the information to the Caption module.

Using the Test Software

This section applies only if your encoder has a NABTS or WST module installed.

To use the test software you must have data decoders as well as the encoder. A typical setup is shown in **Figure 15.1**. Ross Video's test software can be used in many different circumstances, for example:

- allows you to become familiar with the equipment
- check out system without using user written software
- carry out performance measurements at receiver sites

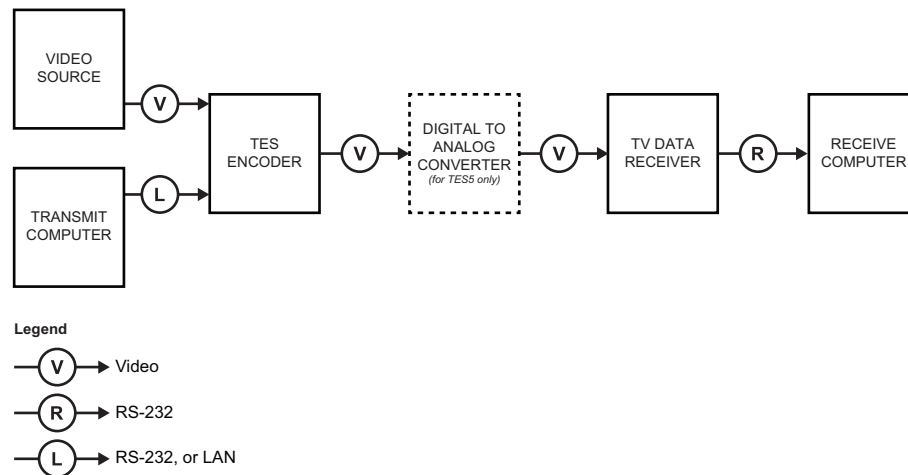


Figure 15.1 Setup Example

Ross Video's test software package encodes data and allows it to be processed and the results displayed at a receive computer.

The receive software allows you to use either an external decoder with a serial connection to the receive computer (TTX74x) or an internal decoder (TTX8xx). When you are using the external decoder, the only program required is the windows based SETTX16 or SETTX32 depending on your operating system. These programs are used to setup the decoder's operating parameters and display the quality of the data contained in the VBI. When you are using the internal decoder, there is a Windows based program, BWIN that allows you to set up the operating parameters of the decoder and process and display the results. To install the software, follow the instructions given in the readme file on the floppy containing the test software.

BWIN and SETTX16 / SETTX32 compare the data they receive to the original data sent and report the results. The meaning of the error statistics are described below.

- **Bits** — the total number of bits received for the current sample.
- **Error Bits** — the total number of bits in error in the received data. Each missing bytes contributes 8 bits to this total.
- **Missing** — the number of bytes that were missing in the received data. Typically this number is a multiple of the number of data bytes in a packet (27 for 27 byte transparent mode, 28 for 28 byte transparent mode, 26 for packet and bundle FEC mode).
- **Extra** — extra bytes usually occur if a packet is captured but it is not an actual data packet. This occurs when video or other data is distorted enough with noise that it looks like the packet address for your data stream.
- **Null Bytes** — null bytes may appear in 8 bit bundle FEC mode only. When a bundle is received and is missing more than 2 packets, the missing packets are replaced with Null packets (26 null bytes per missing packet).

- **BER** — the Bit Error Rate for the current sample is the number of error bits divided by the total number of received bits.

Before you can use the test software both the encoder and decoder operating parameters have to be setup.

Encoder Setup

Set the encoder up using SETTE32 so the NABTS or WST stream is as follows:

- **Byte Sync:** E 7 (NABTS) OR 27 (WST)
- **Packet Address:** 242
- **Priority:** 0
- **Data Mode:** 28 Byte Transparent
- **Data Pacing:** ON
- **Lines Enabled:** 14, 15
- **Frames Enabled:** ALL

The data mode can be changed, but it is limited to 27 or 28 byte transparent, 8 bit packet FEC and 8 bit bundle FEC. Using 28 byte transparent results in a true bit error rate of the channel, since there is no error correction capability in this mode. The other 3 modes all have error correction capability. To use the test software to characterize the performance of a system, typically you use 28 byte transparent first and obtain performance numbers, then you select the data mode you intend to use in your system and obtain performance numbers for it.

Decoder Setup

The corresponding set of parameters for the decoder are:

- **Packet Address:** 242
- **Data Mode:** 28 Byte Transparent
- **Video Source:** external
- **Baud rate:** 38400(external decoder)
- **Stop Bits:** 1 (external decoder)
- **Data Bits:** 8 (external decoder)
- **Parity Type:** none (external decoder)

If you are using an external decoder and the number of TV lines used for insertion or the data mode is changed, check to see if the baud rate needs to be altered.

Using the Test Software

1. Connect all the various pieces in the system you want to test.
2. Set up the encoder using SETTE32.
3. Set up the decoder using SETTX16 / SETTX32 or BWIN for an external and internal decoder respectively.
4. Check the quality of the data in the incoming video signal, i.e. SETTX16 / SETTX32 or BWIN for an external and internal decoder respectively. The quality indicator should be at the top before proceeding to the next step.

5. Start the accumulation of the BERT statistics. For an external decoder select Receiver, then BER Test then the **Start** button in SETTX16 / SETTX32. For an internal decoder select the **Start** button in BWIN.
6. Analyze results and make any changes (if desired)

Normally, with the encoder connected directly to the decoder, there should be no bit errors, missing bytes or extra bytes and the BER should be 0. With a transmission channel between the encoder and decoder, the BER is a measure of the quality of the channel. If the BER is not 0, it may be possible to adjust some characteristic of the channel to reduce the BER.

Appendix A.

In This Appendix

This appendix contains additional information for the TES3 and TES5.

The following topics are discussed:

- Null Modem Cable
- Data Modes
- Software Interface for LAN
- Measuring Start Time and Data Amplitude

Null Modem Cable

The encoder has a 9-pin RS232 male serial port connector for each of its three serial ports. All of these ports can use either hardware or software flow control. To connect a transmit computer to one of the serial ports, a null modem cable is required. A 9-pin to 9-pin null modem cable is included with the encoder. If the transmit computer uses a 25-pin connector for its serial port, then a cable must be constructed according to the wiring diagram in **Figure 16.1**. This cable supports both hardware and software flow control, but requires the transmit computer to assert both the DTR and RTS signals. On power up the software module asserts the RTS pin on the serial port that it uses. As a result of the null modem cable, this appears as the CTS pin on the serial port being used by the transmit computer being asserted. In the (hardware) flow control state the module negates its RTS pin, which in turns appears as the transmit computer's CTS pin being negated.



Note — A LAN based encoder uses serial Port A to configure the encoder. The null modem cable supplied with the encoder should be used for this purpose.

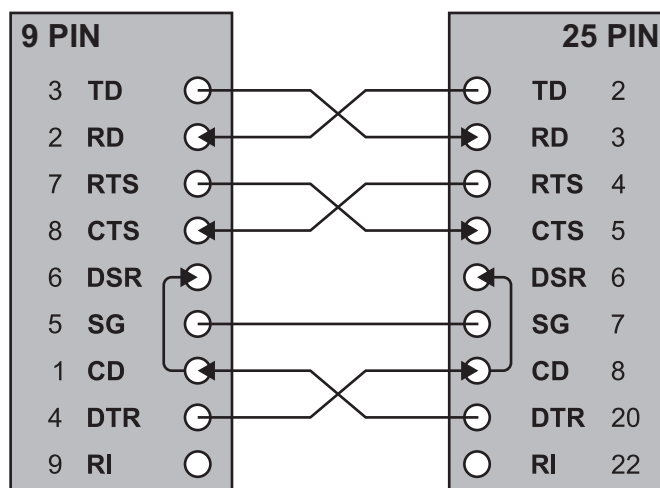


Figure 16.1 Null Modem — Pinouts

Data Modes

The encoder has six data formats: 27 byte transparent, 28 byte transparent, 30 byte transparent, 33 byte transparent, 8 bit packet FEC (Forward Error Correction), and 8 bit bundle FEC. All the modules do not support all the formats. The first four modes are explained in separate sections below. The two 8 bit FEC modes are similar and are discussed in one section which explains the difference between the modes.

27-Byte Transparent

In 27 byte transparent mode all the data must be 7 bits with odd parity. The encoder buffers data until it receives 27 bytes, at which point it inserts 5 prefix bytes, the 27 data bytes, and a suffix byte into one of the TV lines enabled for insertion. The suffix byte is a longitudinal parity-check byte which allows the data receiver to correct a single bit error in a packet. This data format is defined in the NABTS specification.

28-Byte Transparent

In 28 byte transparent mode, the encoder buffers data until it receives 28 bytes, at which point it inserts 5 prefix bytes and the 28 data bytes into one of the TV lines enabled for insertion (there is no suffix byte). The data should be 7 bits with odd parity to be compliant with the NABTS specification, however, this is not enforced. Transmitting 8 bit data in this mode prolongs the time required for a receiver to adapt to the teletext signal and renders the Quality indicator meaningless. It is preferable to use one of the Ross Video FEC modes to transmit 8 bit data.

30-Byte Transparent

In 30 byte transparent mode data is received in 30 byte blocks. The first two bytes (NABTS Continuity Index and Packet Structure) of each 30 byte block must be Hamming perfect. If the encoder does not receive Hamming perfect bytes when it is expecting them, it discards data until it finds two Hamming perfect bytes. Once all 30 bytes are received, the encoder inserts the 3-byte packet address and the 30 received bytes into one of the TV lines enabled for insertion. This mode is used with applications such as VBinet, where total control of NABTS formatting is required.

33-Byte Transparent

This mode is similar to 30 byte transparent mode, except that the 3 byte packet address is also included in the data received from the transmit computer. This has the advantage of offering you complete control over the packet address, allowing data with different packet addresses to be inserted from one stream. As a result, when this mode is selected, the entry displayed in the Packet Address field is changed to --- and cannot be altered. In this mode, the first 5 bytes of each 33 byte packet (3 byte packet address, 1 byte continuity index and 1 byte packet structure byte) must be Hamming perfect, in order to allow the encoder to synchronize to the incoming data stream.

8-Bit Packet and Bundle FEC

The two 8-bit FEC modes have many functional similarities. Both are discussed in this section. These data modes, using the advanced Ross Video FEC, permit 8 bit data to be sent to Ross Video decoders. The decoders can then perform error correction on the received data and pass the corrected data to the receive computer. The same data stream that enters the encoder, exits the decoder, if the bit error rate is low enough for the FEC to correct all errors.

These modes have a data flushing feature in which the encoder flushes incomplete packets, or bundles, upon a pause of 1/6th of a second in the incoming data. The decoders remove the extra flushing data from the data and only pass on the data received by the encoder. If in bundle FEC mode, the encoder flushes to the end of the current bundle, as well as one empty bundle. When

flushing data packets, packets are output at approximately half of the maximum throughput permitted by the baud rate selected. If any data is received while the encoder is flushing a bundle, the flushing process is terminated immediately. The next packet transmitted contains the new data.

The 8-bit packet FEC mode protects 26 data bytes with two suffix bytes. The FEC is capable of correcting a single bit error within the data bytes. This mode is used to transmit 8 bit data transparently with some error correction. The packet FEC requires less decoder processing power to check and correct the data and therefore normally allows for a higher maximum speed. The packet FEC also has the advantage of requiring fewer lines to transmit the data than the bundle FEC mode.

The 8-bit bundle FEC mode groups 14 data packets together and then adds on two FEC packets. This provides a data block (bundle) with both horizontal and vertical error correction. This interleaving allows the correction of many more bit errors. The decoder can also replace up to two packets in a bundle. Packets could require replacement if they were not received by the decoder or the packet was horizontally uncorrectable. The level of error correction is substantially higher than that of the 8-bit packet FEC. The decoders may be limited to a lower maximum speed for bundle FEC data because of the increased load on the decoder's processor. The bundle FEC also requires more TV lines to transmit the same amount of data. The bundle FEC is the mode normally selected because of its superior data protection. The main reason to choose the packet FEC is if the application requires a baud rate only supported by the packet FEC for a decoder. Another reason would be if there is a need for short bursts of data to be transmitted with minimum delay.

Software Interface for LAN

This appendix is intended to provide guidance to developers of transmit software used to send data to a LAN encoder. To interface to the LAN encoder, the sending computer must be equipped with an Ethernet LAN card and TCP/IP must be added to the computer's networking abilities. The encoder responds to TCP packets sent to its IP address and port addresses. This determines which encoder stream receives the data.

The LAN encoder makes use of the TCP/IP protocol to transfer data. Better error free data transmission is ensured since the encoder uses TCP packets as opposed to UDP packets. This eliminates the possibility of lost data during transmission.

The basic steps to establish a connection and send data to the encoder using the winsock static library are:

1. Initialize winsock using the *WSAStartup* command.
2. Get the name of the sending computer using *gethostname* command.
3. Get the IP address of the sending computer using *gethostbyname* command.
4. Copy the IP address part of the HOSTENT structure to another structure of type IN_ADDR.
5. Create a socket for making a connection using *socket* command.
6. In order to improve efficiency and make it possible to run multiple copies at once, it is necessary to use the non-blocking commands available in the winsock static library. This makes use of the Microsoft® Windows® message processing loop. Do this by issuing the *WSAAsyncSelect* command
7. Bind the socket created in the step above to the TCP/IP protocol and accept connections for any port number using the *bind* command.
8. Fill structure SOCKADDR_IN with the destination information.
9. Establish a connection using the *connect* command.
10. When connection has been established the WM_USER + 100 message is sent to the Microsoft® Windows® message loop.
11. After all data transmission is finished, the sockets must be shut down using the following commands: *shutdown*, *closesocket*, *WSACleanup*.

Example of Winsock Command

The following code snippets are intended to demonstrate the use of winsock to communicate with a LAN encoder.

```
/* declarations */
SOCKET s;
extern unsigned char rndata[1024];
char hostname[50];
char description[50];
char maxsockets[6];
char portnum[5];
char ipsend[20];
WORD wVersionRequired = 17;      /* 17 for winsock 1.1 or 2 for winsock 2.0 */
WSADATA wdata;
HOSTENT FAR *phostentm;
IN_ADDR in;
SOCKADDR_IN addr;
SOCKADDR_IN clientIn;

case WM_INITDIALOG:
{
    WSASStartup(wVersionRequired,&wdata);    /* initialize winsock */
    gethostname (hostname,sizeof(hostname)); /* get your computer's name */
    phostentm = gethostbyname(hostname);     /* get your computer's IP number */
    _fmemcpy(&in,phostentm->h_addr,4);      /* copy IP address of HOSTENT */
    s = socket(AF_INET,SOCK_STREAM,0);      /* create socket */
    WSAAsyncSelect(s,hWnd,WM_USER +100,FD_CONNECT); /* Non-blocking winsock */
    addr.sin_family = AF_INET;
    addr.sin_port = 0;
    addr.sin_addr.s_addr = htonl(INADDR_ANY); /* accept connection from any port number */

    /* Bind the socket to our specifications */
    bind(s,(LPSOCKADDR)&addr,sizeof(addr)); /* bind socket to above criteria */
    strcpy(portnum,"2000");
    strcpy(ipsend,"102.102.102.102");
    clientIn.sin_family = AF_INET;
    clientIn.sin_port = htons(atoi(portnum)); /*fill in port number to send to */
    clientIn.sin_addr.s_addr = inet_addr(ipsend); /*fill in IP address to send to */

    /* make a connection on this socket */
    connect(s, (LPSOCKADDR)&clientIn, sizeof(clientIn)); /* connect to destination */
}
```

```

case (WM_USER + 100):
{
switch (WSAGETSELECTEVENT(IParam))
{

case FD_CONNECT:
{
result = WSAAsyncSelect(s,hWnd,WM_USER +100,FD_WRITE);
x=send(s,(const char *) rndata,sizeof(rndata),0); /* send predefined data */
}

case FD_WRITE:
{
x=send(s,(const char *) rndata,sizeof(rndata),0); /* send predefined data */
result = WSAAsyncSelect(s,hWnd,WM_USER +100,FD_WRITE);
break;
}
}
break;

WM_CLOSE:
{
shutdown(s,1); /* shut down connection on socket */
closesocket(s); /* close the open socket */
WSACleanup(); /* clean up residue left by winsock */
}

```

Measuring Start Time and Data Amplitude

When using a TES5, an additional piece of equipment will be required to convert the serial digital output of the TES5 to an analog signal. The horizontal blanking time of the equipment may put limitations on the maximum and minimum start times. Depending on the video format being used (525 or 625 lines), the equipment may blank data being inserted before a certain point near the start of the line, or after a certain point near the end of the line. As well, the vertical blanking time of the equipment may put limitations on the lines which can be used for insertion. For this reason, the output signal should be examined (after it has been converted to analog form) to verify that the selected start time and lines to use can be handled by the equipment and that the full line of data is present.

As a video signal passes through the various pieces of equipment in a TV station the characteristics of data in the VBI may be altered. If the data is altered too much, equipment trying to receive the data may encounter problems. Typically, two parameters that may cause problems if they are altered too much are the start time and the data amplitude.

This appendix describes how to measure the start time and data amplitude using equipment with cursors (oscilloscope and some waveform monitors) or without cursors (some waveform monitors). The measurement points for the start time depends on the data type.

Before performing the measurements there are two pieces of information you need to know. First, the number of a TV line that is carrying the data whose start time you want to measure. Secondly, you must identify where in the video chain you are going to perform the measurement, using the list given below.

Equipment Required

To perform these two measurements you need:

- an oscilloscope with TV triggering; or
- a waveform monitor

Where to Measure

These measurements should be taken as far as possible down the video path. Thus, the places to perform the measurements are, in order of preference:

- from a demodulated off-air signal
- return feed from the transmitter
- just before the studio to transmitter link
- at the output of the VITS inserter (if the encoder feeds a VITS inserter)
- at the output of the encoder

Using an Oscilloscope or Waveform Monitor with Cursors

1. Connect the video signal from the location in the video chain you have decided to use to the oscilloscope.
2. Set the oscilloscope to display the TV line containing the data.
3. Adjust the oscilloscope such that you can see from the front porch of the previous line up to the rising edge of the data.
4. Select the oscilloscope to use vertical cursors.
5. Change the horizontal position so you are looking at the falling edge of sync.

6. Adjust the time base so that the fall time of the sync edge is obvious.
7. Use **Table 16.1** to determine the points to use to measure the start time for your type of data. The start point is always the specified point of the falling edge of sync of the TV line containing the data.

Table 16.1 Start Time Measurement Points

Data Type	Start Point	End Point
Captioning, NABTS	midpoint	50% of rising edge of first clock run in pulse
WST	midpoint	Peak point of second last clock run in pulse

8. Adjust the positioning of one of the vertical cursors such that it is positioned at the start point for your data type as determined from **Table 16.1**.
9. Change the horizontal position so you are looking at the clock run in portion of the data.
10. Adjust the positioning of the other vertical cursor such that it is positioned at the end point as determined from **Table 16.1** for your type of data.
11. The value displayed for the delta-t corresponds to the start time. The start times for the various types of data are given in **Table 16.2** in microseconds (us).

Table 16.2 Start Time Specifications

Data Type	Start Point (us)
NABTS	10.48± 0.34
WST	12.0 +0.4/-1.0
Captioning	10.5± 0.25

Using a Waveform Monitor without Cursors

1. Connect the video signal from the location in the video chain you have decided to use to the waveform monitor.
2. Select the waveform monitor to display the TV line containing the data.
3. Adjust the waveform monitor such that you can see from the front porch of the previous line up to the first rising edge of the data.
4. Adjust the vertical position such that the start point determined from **Table 16.1** is positioned on the vertical graticule line that has horizontal markings (typically the 0 IRE line).
5. Note the position of the end point on the horizontal scale.
6. Adjust the vertical position such that the end point determined from **Table 16.1** is positioned on the same vertical graticule you used in step 4.
7. Note the position of the end point on the horizontal scale.
8. The difference between the two values noted in steps 7 and 5 is the start time. The start times for the various types of data are given in **Table 16.2**.

Using an Oscilloscope or Waveform Monitor with Cursors

1. Select the oscilloscope to use horizontal cursors.
2. Adjust the horizontal positioning and time base such that the oscilloscope displays part of color burst and the first part of the data.
3. Adjust the two horizontal cursors so they are positioned at the 1 level of the first data bit after clock-run-in and at the 0 level of the next data bit.
4. The value displayed for the delta-V corresponds to the data amplitude in volts. The data amplitudes for the various data types are given in **Table 16.3**.

Table 16.3 Data Amplitude Specifications

Data Type	Data Amplitude	
	mV	IRE
NABTS	500 ± 14	70 ± 2
WST	471 ± 43	66 ± 6
Captioning	357 ± 14	50 ± 2

Using a Waveform Monitor without Cursors

1. Adjust the vertical position such that the first 0 level after clock run in is positioned on the 0 IRE line.
2. Note the amplitude level of the first 1 level after clock run in. This amplitude level is the data amplitude. Refer to **Table 16.3** for the Data Amplitude specifications.

Notes:

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