Model 5950
LTC / VITC Timecode Reader
Character Inserter

Instruction Manual

© Copyright 1994, 2006

EVERTZ MICROSYSTEMS LTD.
5288 John Lucas Drive, Burlington, Ontario, Canada, L7L 5Z9
Phone: 905-335-3700 Fax: 905-335-3573
Internet: Tech Support: eng@evertz.com
Sales: sales@evertz.com
Web Page: http://www.evertz.com

Revision 2.0 March 2006

The material contained in this manual consists of information that is the property of Evertz Microsystems and is intended solely for the use of purchasers of the model 5950 Time code Reader. Evertz Microsystems expressly prohibits the use of this manual for any purpose other than the operation of the 5950.

All rights reserved. No part of this publication may be reproduced without the express written permission of Evertz Microsystems Ltd. Copies of this guide can be ordered from your Evertz products dealer or from Evertz Microsystems.

INFORMATION TO USERS IN EUROPE

NOTE

CISPR 22 CLASS A DIGITAL DEVICE OR PERIPHERAL

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the European Union EMC directive. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

INFORMATION TO USERS IN THE U.S.A.

NOTE

FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WARNING

Changes or Modifications not expressly approved by Evertz Microsystems Ltd. could void the user's authority to operate the equipment.

Use of unshielded plugs or cables may cause radiation interference. Properly shielded interface cables with the shield connected to the chassis ground of the device must be used.

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original issue	May 94
1.1	Technical Description, Schematics and Parts Lists	Jun 94
1.2	Editorial Changes	Sep 94
2.0	Updated for Revision 2 hardware	Mar 06

Information contained in this manual is believed to be accurate and reliable. However, Evertz assumes no responsibility for the use thereof nor for the rights of third parties, which may be effected in any way by the use thereof. Any representations in this document concerning performance of Evertz products are for informational use only and are not warranties of future performance, either express or implied. The only warranty offered by Evertz in relation to this product is the Evertz standard limited warranty, stated in the sales contract or order confirmation form.

Although every attempt has been made to accurately describe the features, installation and operation of this product in this manual, no warranty is granted nor liability assumed in relation to any errors or omissions unless specifically undertaken in the Evertz sales contract or order confirmation. Information contained in this manual is periodically updated and changes will be incorporated into subsequent editions. If you encounter an error, please notify Evertz Customer Service department. Evertz reserves the right, without notice or liability, to make changes in equipment design or specifications.

This page left intentionally blank

TABLE OF CONTENTS

Figures

Tables

This page left intentionally blank

1. INTRODUCTION

The model 5950 LTC/VITC Timecode Reader combines the latest LSI technology with sophisticated microcontroller firmware to provide a powerful, flexible time code reader system. The model 5950 is an LTC/VITC reader and multi-function character inserter. Its power and flexibility are unsurpassed in time code reader applications. An alphanumeric display can be quickly delegated to show the required data. The model 5950 contains two separate readers that can be operated independent of each other, or can be linked to form an auto LTC/VITC reader. The model 5950 can be configured in one of three basic operating modes:

- Full speed (1/30 to 70 times play) LTC reader.
- 0 to 40X speed VITC reader
- Auto LTC/VITC reader automatically switches between LTC and VITC inputs reading whichever is valid.

The model 5950 provides a fully decoded and regenerated play speed LTC output, containing information related to the reader. In many VTR's, the position of the LTC time code head relative to the video signal can vary quite considerably from machine to machine, causing a code phase shift relative to the video frame. When the reader is configured to read LTC, the incoming LTC is fully decoded and regenerated. When incoming LTC is at normal play speed, the output code is re-phased to the video, thus compensating for any LTC code misalignments from the video. When the reader is configured to read VITC, the LTC output provides an LTC translation of the incoming VITC.

The recovery of recorded LTC time code at other than play speed has always presented some degree of difficulty, particularly with low end 3/4" and 1/2" recorders lacking a separate address track. The high speed reader in the model 5950 employs sophisticated input conditioning and clock and data separator circuits to reliably recover LTC over the full shuttle and wind speed ranges of most VTR's.

The VITC reader is designed for use with non time base corrected video signals. Although the use of time base correctors will enhance the recovery range of the VITC reader, the amount of improvement is dependent on the type of TBC and transport being used. The model 5950 contains all the necessary video processing circuits and therefore, requires no external signals other than the video signal itself. The VITC reader's line range can be easily programmed from the front panel, thus permitting recovery of specific VITC data where multiple sets have been recorded.

The high resolution character inserter provides two independently positionable windows to show time and user bits simultaneously. Three character sizes and the choice of white or black characters with or without contrasting background mask are selected from the front panel.

When displaying data recovered from a VITC source, the 'lookahead' compensation can be turned off, allowing field accurate burn-ins of edited material. The field number sequence will be displayed to the right of the frames display. When the data being read was recorded in the non colour frame mode, the field number sequence will be 1,2,1, etc. (1,2,3,4,1, etc. for PAL). When the reader data was recorded in the colour frame mode, the field number sequence will be 1,2,3,4,1, etc. (1,2,3,4,5,6,7,8,1, etc. for PAL).

The Character inserter provides an on screen programming menu system, which is used to configure the various operating modes. The use of drop down menus, and dedicated programming keys, allows the model 5950 to be conveniently configured for particular customer requirements.

There are two different versions of the 5950 hardware. Rev 1 versions have the rear panel layout shown in Figure 2-1 and rev 2 versions have the rear panel layout shown in Figure 2-2. The labels on the connectors are mostly the same, but many of the connectors have been relocated to better suit the layout of the new circuit board. The front panels of the units are similar except that the rev 1 units have a 12 digit alphanumeric display and the rev 2 units have a 16 digit alphanumeric display. Installation and operation of the two versions is similar except where specifically noted.

1.1. HOW TO USE THIS MANUAL

This manual is organized into 4 chapters : Introduction, Installation, Operation, and Technical Description.

Electrical safety warnings are marked with a double box with a warning symbol to the left.

Items of special note for all users are marked with a double box and a notation symbol to the left.

Figures

Tables

This page left intentionally blank

2. INSTALLATION

2.1. REAR PANEL CONNECTIONS

There are two different versions of the 5950 hardware. Rev 1 versions have the rear panel layout shown in Figure 2-1 and rev 2 versions have the rear panel layout shown in Figure 2-2. The labels on the connectors are mostly the same, but many of the connectors have been relocated to better suit the layout of the new circuit board. Installation and operation of the two versions is similar except where specifically noted.

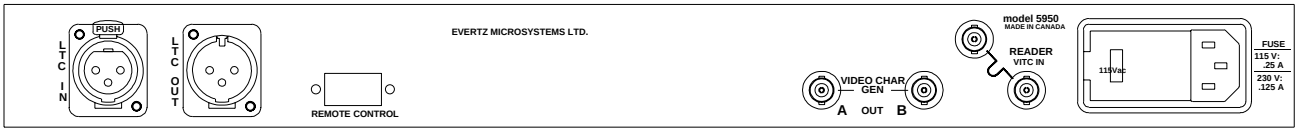


Figure 2-1: Rear Panel Layout – Rev 1 versions of 5950

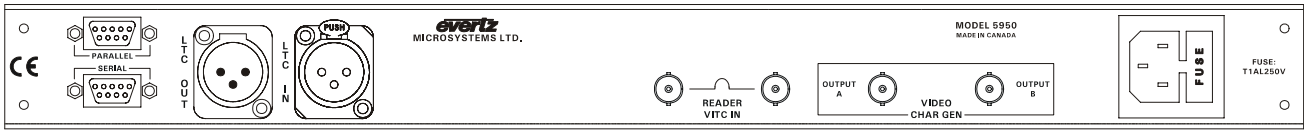


Figure 2-2: Rear Panel Layout – Rev 2 versions of 5950

The following sections describe the purpose of the rear panel connectors of the 5950. Figure 2.1 above shows the rear panel connectors provided on the model 5950. Sections 2.1.1 to 2.1.5 describe the specific signals that should be connected to the 5950. Figure 2-3 and Figure 2-4 give sample connection diagrams for connecting the model 5950.

2.1.1. Linear Time Code Connections

LTC OUT: A male XLR connector for output of SMPTE / EBU linear timecode from the translator.

LTC IN: A female XLR connector for input of SMPTE / EBU linear timecode for reader 1.

2.1.2. Video Connections

READER VITC IN A BNC loop for input of program video onto which characters are to be inserted. If the video contains vertical interval time code, it will be read by the reader when it is configured in the VITC or AUTO modes This signal is also used to provide a gen-lock reference for the LTC translator output.

VIDEO CHAR GEN OUT A & B Two isolated BNC connectors with identical outputs of program video with characters inserted. This output is also used to display the on screen programming menu and is normally connected to a video monitor.

2.1.3. Parallel Remote Control Connections

PARALLEL A 9 pin D connector located on the rear panel labeled PARALLEL (REMOTE CTL on Rev 1 versions) provides 6 parallel control inputs for remote control of some of the model 5950 functions. The pinout of the D connector is as follows:

Pin #	Name	Description
1	GND	Frame ground
2	VCG Ena	VCG On/Off
3	FRZ	Freeze Display
4	TM/UB	TM/UB display select
5	---	Not used
6	LTC Ena	LTC reader enable
7	VITC Ena	VITC reader enable
8	---	Not used
9	---	Not used

Table 2-1: Parallel Remote Control Pin Definitions

2.1.4. Serial Port Connections - Rev 2 versions only

SERIAL: Rev 2 versions of the 5950 are fitted with a 9 pin subminiature 'D' connector labeled **SERIAL**. This port is used to update the firmware in the 5950 and is configured at the factory for a ‘straight through RS-232 connection to a PC COM port. The pinout of the D connector is as follows:

Pin #	Name	Description
1	GND	Chassis ground
2	TxD	RS-232 Transmit Output
3	RxD	RS-232 Receive Input
4		
5	Sig Gnd	RS-232 Signal Ground
6		
7	RTS	RS-232 RTS Input
8	CTS	RS-232 CTS Output
9		

Table 2-2: Serial Port Pin Definitions

2.1.5. Power Connections

LINE: Rev 1 versions of the 5950 may be set for either 115v/60 Hz or 230v/50 Hz AC operation. The voltage selector switch is accessible on the rear panel. The line voltage connector contains an integral slow blow fuse (and a spare one).

Rev 2 versions of the 5950 have a universal power supply that auto detects input voltages in the range of 100 to 240VAC, 60 or 50 Hz.

CAUTION - To reduce the risk of electric shock, grounding of the centre pin of the mains plug must be maintained

2.2. MOUNTING

The 5950 Time Code Reader is equipped with rack mounting angles and fits into a standard 19 inch by 1 3/4 inch (483 mm x 45 mm) rack space. The mounting angles may be removed if rack mounting is not desired.

2.3. POWER REQUIREMENTS

2.3.1. Selecting the Correct Mains Voltage – Rev 1 versions

Power requirements for Rev 1 versions are 115 or 230 volts AC at 50 or 60 Hz, switch selectable on the rear panel. Power should be applied by connecting a 3 wire grounding type power supply cord to the power entry module on the rear panel. The power cord should be minimum 18 AWG wire size, type SVT marked VW-1, maximum 2.5 m in length.

Before connecting the line power, be sure to select the proper line voltage. Also, check that the line fuse is rated for the correct value marked on the rear panel.

The power entry module combines a standard IEC 320 power inlet connector, voltage selector switch, two 5 x 20 mm fuse holders and an EMI line filter.

To change the mains voltage setting on the earlier units, open the cover of the power entry module using a small screwdriver. Remove the drum selector switch, and re-insert it so that the desired voltage is visible through the opening on the mains connector cover. Check that the correct fuse is in use as shown in section below.

2.3.2. Power Requirements – Rev 2 versions

Power requirements for Rev 2 versions are 100 to 240 volts AC at 50 or 60 Hz. The later 5950 units have a universal power supply that automatically senses the input voltage. Power should be applied by connecting a 3-wire grounding type power supply cord to each of the power entry modules on the rear panel. The power cord should be minimum 18 AWG wire size; type SVT marked VW-1, maximum 2.5 m in length.

The power entry modules combine a standard power inlet connector, two 5 x 20 mm fuse holders and an EMI line filter.

2.3.3. Changing the Fuse – Rev 1 versions

The fuse holder in Rev 1 versions is located inside the power entry module. To change the fuse, open the cover of the power entry module using a small screwdriver. The fuse holder on the bottom contains the active fuse. The one at the top contains a spare fuse. Pull the bottom fuse holder out and place a fuse of the correct value in it. Use slo blo (time delay) 5 x 20 mm fuses rated for 250 Volts with the following current ratings:

For 115 Volt operation	250 mA
For 230 Volt operation	125 mA

Check that the line fuse is rated for the correct value marked on the rear panel. Never replace with a fuse of greater value.

Make sure that the arrow is pointing down when you replace the fuse holder. Close the door on the power entry module and connect the mains voltage.

2.3.4. Changing the Fuse – Rev 2 versions

The fuse holder is located inside the power entry module. To change the fuses, disconnect the line cord from the power entry module and pull out the fuse holder from the power entry module using a small screwdriver. The fuse holder contains two fuses, one for the line and one for the neutral side of the mains connection. Pull out the blown fuse and place a fuse of the correct value in its place. Use time delay 5 x 20 mm fuses rated for 250 Volts with a current rating of 1 amp. Carefully reinsert the fuse holder into the power entry module.

Check that the line fuse is rated for the correct value marked on the rear panel. Never replace with a fuse of greater value.

2.4. READER VIDEO INPUT

Video associated with the LTC code or video with VITC recorded on it is connected to the **READER VITC IN** loop. The video input has a high impedance input tapped off the loop through, therefore the input must be terminated with 75 ohms at the end of the line. The input video signal is also used as a reference for the LTC translator output when it is operated in regenerate mode, and the incoming code is at play speed.

2.5. CHARACTER INSERTER VIDEO

The input video on which the characters are to be displayed is the same video as the reader uses and is connected to the **READER VITC IN** loop. The video input has a high impedance input tapped off the loop through, therefore the input must be terminated with 75 ohms at the end of the line.

Two isolated character generator outputs labeled VCG OUT A and B, are provided to drive a preview monitor and a video recorder. Characters are keyed into the video connected to the **READER VITC IN** loop. Size, position, and style of the character displays are controlled from the on screen programming menu.

In order to use the on screen programming menu system, video must be applied to the **READER VITC IN** loop and one of the VCG outputs must be connected to a video monitor.

2.6. LINEAR TIME CODE IN/OUT

The LTC reader input connects to your head pre-amplifier output. When using an unbalanced input to the reader, the signal should be applied to pin 3 of the LTC reader input connector. Normally, the unused input, (pin 2) should be connected to ground (pin 1).

A fully decoded and regenerated play speed LTC output is provided containing information related to the Reader. In many VTR's, the LTC time code head position with respect to the video signal can vary quite considerably from machine to machine causing a code phase shift relative to the video frame. When the reader is configured to read LTC the translator output can be operated in the regenerate or reshape mode. (Reshape mode only available on Rev 1 versions) In reshape mode, incoming LTC is restored to the proper waveform and output in phase with the incoming LTC. In regenerate mode, the incoming LTC is fully decoded and regenerated. When incoming LTC is at normal play speed, the output code is re-phased to the video, thus compensating for any LTC code misalignments from the video. When the reader is configured to read VITC, the LTC output provides an LTC translation of the incoming VITC. When the reader assignment is set to AUTO, the LTC output provides a translated output of whichever reader is active.

When using the regenerated LTC output, the video from the tape being read must be looped through the READER VITC IN loop. (See Section 2.4) to ensure correct phasing of the LTC output to the video. In audio tape applications or other situations where video cannot be connected to the video input, the phase of the LTC out will be free running. On Rev 1 versions the user should use Reshape mode for audio applications.

2.7. SAMPLE CONFIGURATIONS

Two sample installation setups are diagrammed below to help properly connect the model 5950 into your system. For other applications contact the factory.

Figure 2-3 illustrates the basic set-up for reading LTC and VITC, making off-line cassette copies with character burn-ins, or for dubbing tapes with regenerated time code. Longitudinal code misalignments from the video frame are compensated and the regenerated LTC is properly timed to the video. The source video must be connected to the **READER VITC IN** loop of the model 5950 to ensure correct timing of the output LTC to the video.

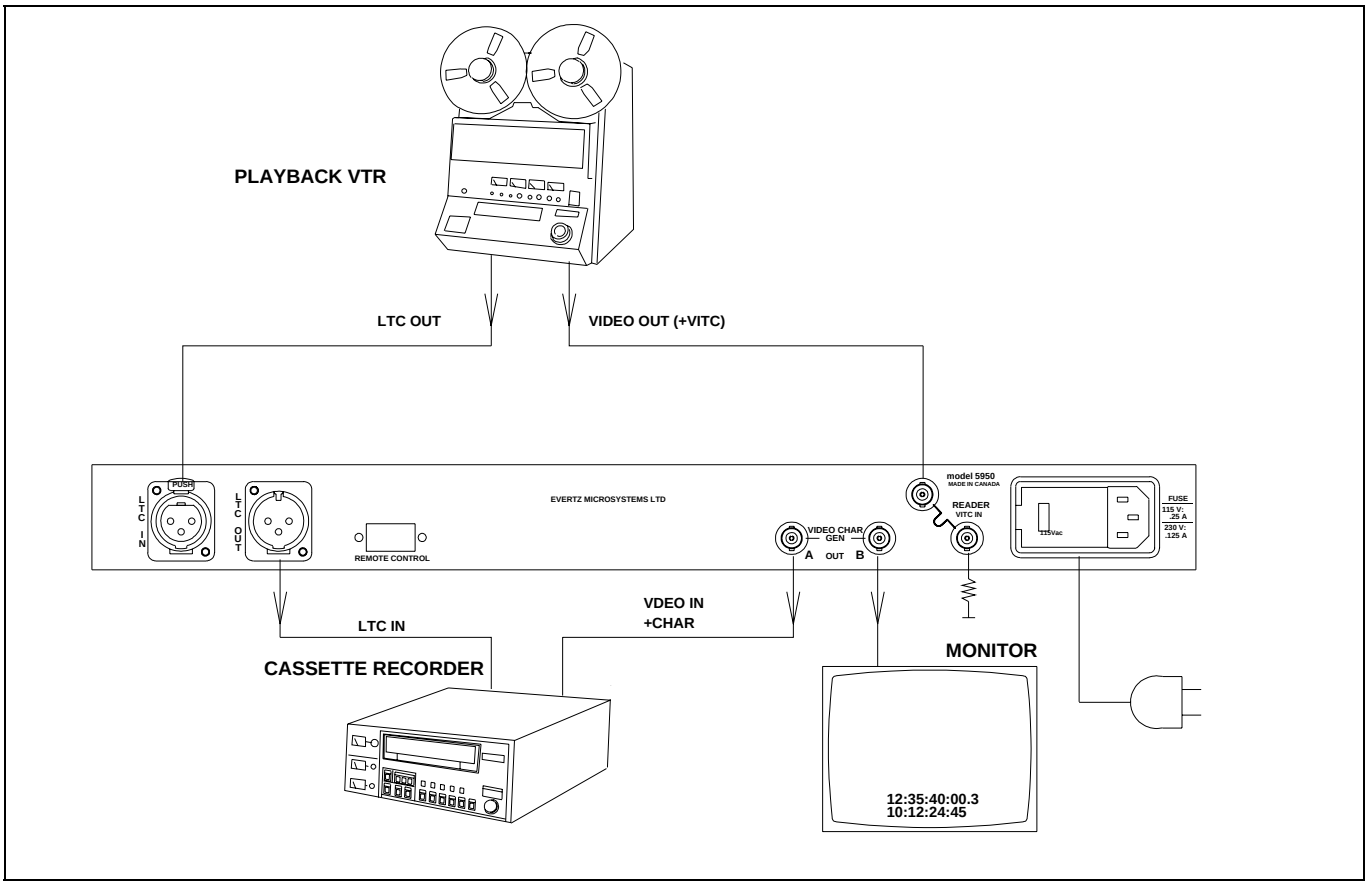


Figure 2-3: Dubbing and Off-line Character Burn In

Figure 2-4 illustrates the setup for a VITC/LTC editing system. Using the model 5950 your existing editing system can use LTC only, VITC only or both LTC and VITC together for both edit decision making and editing. The video from each source VTR is looped though the respective model 5950, which will read VITC whenever it is present on the video. It is important that the VITC is recorded on vertical interval lines that will be reproduced by your VTR in playback. See your VTR manual for further information. If a time base corrector is used, the video output should be fed to the model 5950 prior to TBC processing because many TBC's blank the vertical interval and eliminate the VITC. If it is desired to time base correct the video before the model 5950, make sure that the lines containing the VITC are passed through the TBC.

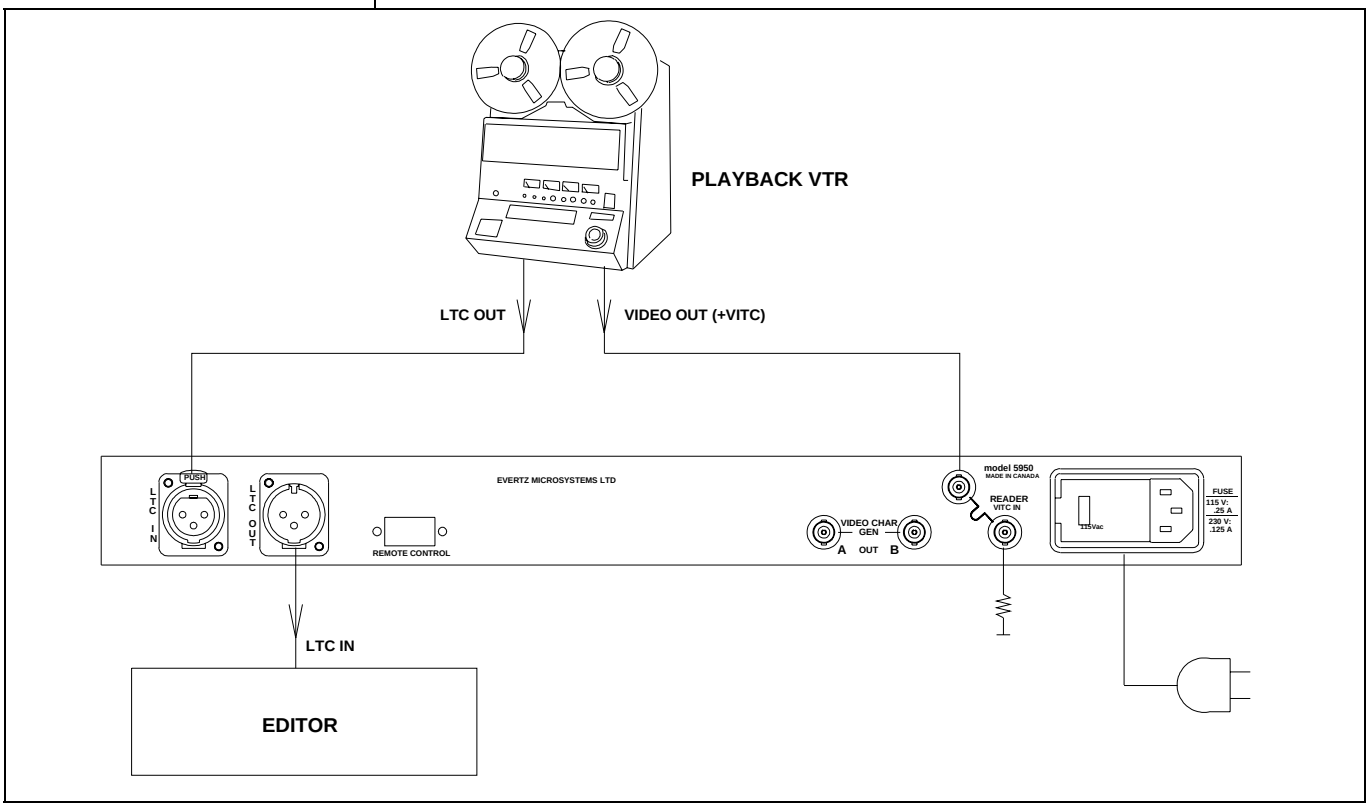


Figure 2-4: VITC Translation to LTC for Editing

The recovered VITC is translated to LTC by the model 5950, which can be read by the LTC reader in the edit controller. The new LTC is generated at approximately play speed so that the edit controller can read it during slow motion decision making and also for cueing and parking the VTR during editing. When the incoming code is at play speed, the LTC is synchronized to the video, so that the edit controller can use it to synchronize the playback and record VTRs during the edit pre-roll interval, just as if it would have used the original LTC from the VTR.

If it is desired to record VITC on the record VTR, a VITC/LTC jam-sync generator such as our 5010-VITC must be used in the place of the model 5950 on the record VTR. During the edit pre-roll, when the record VTR is in playback, the jam-sync generator will follow the numbers read from the record machine. When the record VTR switches from playback to record, the jam-synced VITC will be recorded in the video without interruption. See model 5010-VITC Instruction Manual for more detailed information.

Figures

This page left intentionally blank

3. OPERATING INSTRUCTIONS

The model 5950 is a LTC/VITC reader and multi-function character inserter. Its power and flexibility are unsurpassed time code reader applications. An alphanumeric display is quickly delegated to show the required data. The model 5950 can be configured in one of three basic operating modes:

- Full speed (1/30 to 70 times play) LTC reader
- 0 to 15X speed VITC reader
- Auto LTC/VITC reader automatically switches between LTC and VITC inputs reading whichever is valid.

The character inserter provides an on screen programming menu system, which is used to configure the various operating modes. The use of drop down menus and dedicated programming keys, allows the model 5950 to be conveniently configured for particular customer requirements.

3.1. FRONT PANEL OVERVIEW

The model 5950 Time Code Reader provides a display of time or user bit information from its reader using a 16 digit (12 digit on Rev 1 versions) alphanumeric display on the front panel, or using characters keyed into the input video. Operational control is handled by 10 front panel keys. Six LED's provide operational status at a glance.

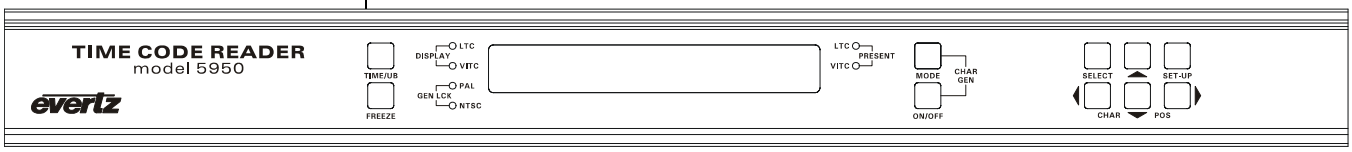


Figure 3-1: Front Panel Layout

3.1.1. Overview of the Pushbuttons

Ten front panel pushbuttons are used to control the operation of the 5950.

TIME/UB Is used to select whether time or user bit data is being displayed on the front panel alphanumeric display. On Rev 1 versions the left character of the front panel display indicates whther time or user bits is being displayed. (E.g: `t12:34:56:10` indicates that time is being displayed)

On Rev 2 versions the leftmost 3 characters of the front panel display whether time or user bits is being displayed, and whether the reader data is from the LTc or VITC reader. (E.g.: `LTM 12:34:56:10` indicates that time from the LTC reader is being displayed.)

CHAR GEN MODE Initiates VCG window select mode and highlights the selected window. Use the arrow keys to move the window, use the **CHAR GEN ON/OFF** key to turn the window on or off. Press the **MODE** key again to select the next VCG window. Press the **MODE** key a third time to return to the normal VCG display mode.

CHAR GEN ON/OFF Turns the character generator ON and OFF. When in the VCG window select mode the **CHAR GEN ON/OFF** key is used to turn individual windows ON and OFF.

SETUP Initiates SETUP mode and displays the on screen programming menu. Pressing the **SETUP** key again exits the SETUP mode.

SELECT When in the SETUP mode the **SELECT** key is used to choose items from within a drop down menu or sub menu.

← → ↑ ↓ When in the SETUP mode, the arrow keys are used to move between various items in the menu system.

When in the VCG window select mode, the arrow keys are used to position individual windows on the screen. See also section 3.3.1.

When not in either the SETUP or VCG window select modes, the arrow keys are used to position all the windows on the screen. See also section 3.3.2.

3.1.2. Status Indicators

There are six status indicators that show operational status at a glance.

DISPLAY LTC Indicates that the display data is from the LTC reader.

DISPLAY VITC Indicates that the display data is from the VITC reader.

GEN LCK PAL Indicates that the reader time is properly genlocked to a PAL video reference. If it is blinking, it indicates that the PAL video standard is selected, but a valid PAL video reference is not present.

GEN LCK NTSC Indicates that the reader time is properly genlocked to a NTSC video reference. If it is blinking, it indicates that the NTSC video standard is selected, but a valid PAL video reference is not present.

PRESENT LTC Indicates that the LTC reader is reading valid code.

PRESENT VITC Indicates that the VITC reader is reading valid code.

3.2. FRONT PANEL DISPLAY FUNCTIONS

The **TIME/UB** key is used to select which data is being displayed in the alphanumeric display. Press the **TIME/UB** to change from displaying time or user bits from the reader. On Rev 1 versions the left character of the front panel display indicates whether time or user bits is being displayed. (E.g: `t12:34:56:10` indicates that time is being displayed) On Rev 2 versions the leftmost 3 characters of the front panel display whether time or user bits is being displayed, and whether the reader data is from the LTC or VITC reader. (E.g.: `LTM 12:34:56:10` indicates that time from the LTC reader is being displayed.)

The **FREEZE** key is used to stop updating of the VCG and front panel displays at a particular point in time. When in the FREEZE mode, a **f** is displayed in the leftmost character of the front panel display. Press the **FREEZE** key again to release the FREEZE mode and begin updating of the data.

3.2.1. Special Front Panel Indicators

The following special indicators are used between the seconds and frames digits of the front panel time display to identify non drop frame and drop frame code (NTSC only)

Non Drop Frame Colon (:)
Drop Frame (NTSC) Period (.)

3.3. CHARACTER GENERATOR FUNCTIONS

Two separately positionable character windows displaying time or user bits from the reader are available. The four arrow keys (↑, ↓, ←, →) control the position of all the windows . THE **CHAR GEN ON/OFF** key selects whether the VCG keyer is on or off. The use of these keys in combination with the **CHAR GEN MODE** key selects which windows are displayed and their position on the screen. The VCG drop down menu of the on screen programming menu is used to select character size and style.

3.3.1. Selecting and Positioning the Individual Character Inserter Windows

Press **CHAR GEN MODE** to enable the window select mode. Both windows will appear on the character screen with the window for the reader Time highlighted. Use the arrow keys (↑, ↓, ←, →) to position the reader Time window on the screen. Press the **CHAR GEN ON/OFF** key to turn the window on or off. Press the **CHAR GEN MODE** key to highlight the reader User Bits window. Use the **CHAR GEN ON/OFF** key to turn it on or off and the arrow keys to move it to the desired location. Press the **CHAR GEN MODE** key to return to normal display mode. For example, to move only the Time window down, leaving the user bit window in the same place, press **CHAR GEN MODE** and press the ↓ key. Press the **CHAR GEN MODE** key twice to return to the normal display mode.

3.3.2. Positioning the Overall Character Display

In the normal VCG display mode, when neither of the windows is highlighted, the arrow keys (↑, ↓, ←, →) move all the displayed windows by the same relative amount. For example, to move the time and user bits windows both down by one line press the ↓ key.

3.3.3. Special VCG Indicators

The following special indicators are used between the seconds and frames digits of the time windows in the character inserter to identify non drop frame and drop frame code (NTSC only)

Non Drop Frame Colon (:) **Drop Frame (NTSC)** Period (.)

3.3.4. Field Identification

When reading VITC, the field number sequence will be displayed to the right of the reader time frames display. When the data being read was recorded in the non colour frame mode the field number sequence will be 1, 2, 1, etc. (1, 2, 3, 4, 1, etc. for PAL). When the reader data was recorded in the colour frame mode, the field number sequence will be 1, 2, 3, 4, 1, etc. (1, 2, 3, 4, 5, 6, 7, 8, 1, etc. for PAL) The field number display may be disabled using the VCG FIELDS item in the VCG menu.

3.4. ON SCREEN PROGRAMMING MENU - OVERVIEW

The key to the operational flexibility of the model 5950 lies in the powerful on screen programming menu system which uses the built in character generator. This method of configuring the model 5950 is quick, and simple, guiding you to the correct setup for your application. Six front panel push buttons (←, →, ↑, ↓, and **SELECT** and **SETUP**) are used to cycle through the various items on the programming menu.

The model 5950 menu system consists of three drop down menus. The titles of each of the drop down menus are shown on the top line of the character display. Selecting an item on one of the drop down menus reveals a sub-menu showing the choices for that item. Figure 3.2 is an overview of the on screen menu system and shows all the menu choices and where you will find the menu items. Note that some menu choices will be hidden depending on the programmed mode of operation.

Abbreviated menu descriptions are also shown on the front panel display, allowing the menu system to be used without a video monitor. Figure 3-3 shows an overview of the front panel menu descriptions. When the drop down menu items are selected, menu items are shown in UPPERCASE. When the sub menus are selected, the menu items are shown in lower case.

READER
- **ASSIGNMENT**
  - LTC
  - VITC
  - LTC/VITC
- **MODE**

TIME	USERBITS
TIME	DATA
TIME	TIME
DATA	DATA

- **VITC LINES**
  - LINE RANGE:

START	END
10	20

- **DISPLAY**
  - PROCESSED
  - DIRECT

VCG
- **CHAR SIZE**
  - TINY
  - SMALL
  - LARGE
- **CHAR STYLE**
  - WHITE
  - WHITE ON BLACK
  - BLACK
  - BLACK ON WHITE
- **VCG FRAMES**
  - DISPLAY
  - BLANK
- **VCG FIELDS**
  - DISPLAY
  - BLANK
- **VCG SYMBOLS**
  - DISPLAY
  - BLANK

CONFIGURATION
- **VIDEO TYPE**
  - AUTO
  - NTSC
  - PAL
- **HORZ CHAR SIZE**
  - HORIZONTAL
  - CHAR SIZE = 10
  - ← **OR** → **TO ADJUST**
- **DISPLAY LEVEL**
  - FRONT PANEL
  - BRIGHTNESS = 2
  - ↑ OR ↓ TO ADJUST
- **TRANSLATOR**
  - REGENERATE
  - RESHAPE
- **LTC OUT LEVEL**
  - LTC OUTPUT
  - LEVEL = 0.5
  - ↑ OR ↓ TO ADJUST
- **FACTORY RESET**
  - ** WARNING**
  - THIS COMPLETELY
  - RESETS UNIT
  - USE TIME/UB + SELECT
  - TO PROCEED

Figure 3-2: On Screen Programming Menu Overview

RDR ASSIGN
- ASSIGN LTC
- ASSIGN VITC
- ASSIGN AUTO

RDR MODE
- MODE TIM DAT
- MODE TIM TIM
- MODE DAT DAT

RDR LINES
- LINE STRT
- LINE END

RDR DISPLAY
- DISP PROCESS
- DSP DIRECT

VCG SIZE
- SIZE TINY
- SIZE SMALL
- SIZE LARGE

VCG STYLE
- STYLE WHITE
- STYLE WHT/BL
- STYLE BLACK
- STYLE BL/WHT

VCG FRAMES
- FRMS DISPLAY
- FRMS BLANK

VCG FIELDS
- FLDS DISPLAY
- FLDS BLANK

VCG SYMBOLS
- SYM DISPLAY
- SYM BLANK

CFG VIDEO
- VID TYP AUTO
- VID TYP NTSC
- VID TYP PAL

CFG HOR SIZE
- HOR SIZE 02

CFG DSPL LVL
- DSPLY LVL 1

CFG TRANSL
- TRANSL RESHAPE
- TRANSL REGEN

CFG LTC LVL
- LTC LVL 0

FACTORY RESET
- TM/UB + SELECT

Figure 3-3: Overview of Front Panel Menu

To enter the on screen programming menus, press the **SETUP** key. The character generator will show the last format screen that was used with the currently selected item highlighted. The two horizontal arrow keys (←, →) allow you to move horizontally to another drop down menu when the sub menu is hidden. Using these two keys you can quickly scan the entire menu system for the item you wish to change.

The two vertical arrow keys (↑, ↓) allow you to move vertically within the drop down menus. When you have selected the desired menu item, press the **SELECT** key to reveal the sub menu choices for that item. Use the two vertical arrow keys (↑, ↓) to move vertically within the sub menu. When you have selected the desired sub menu choice press the **SELECT** key to save your choice and return to the drop down menu.

When you have made all the desired changes, press the **SETUP** key to return to the normal display mode.

The READER drop down menu is used to program various reader modes such as selecting LTC or VITC operation, VITC Line numbers, whether user bits contain static numbers or time information, etc. (See section 3.6).

The VCG drop down menu is used to program the size and style of the character generator, and whether the time code frames will be displayed or not (See section 3.5). The CONFIGURATION drop down menu is used to select the video standard, set the mode and output level of the translator output (See section 3.7). The CONFIGURATION menu items are normally only required during installation. Each of the menu items are described in the following sections with an explanation of what each choice does.

ASSIGNMENT
LTC VITC LTC/VITC

To aid in finding the descriptions of the various menu items in sections 3.5 to 3.7, the drop down menu items and its sub menu items are shown in the margin of the manual, next to the description as shown.

3.5. PROGRAMMING THE READER SETUP FUNCTIONS

The READER drop down menu is used to program various reader modes such as selecting LTC or VITC operation for each reader, VITC Line numbers, whether user bits contain static numbers of encoded film edge number information, etc. Figure 3-4 shows the items on the READER drop down menu. The following descriptions appear in the order they appear on the menu.

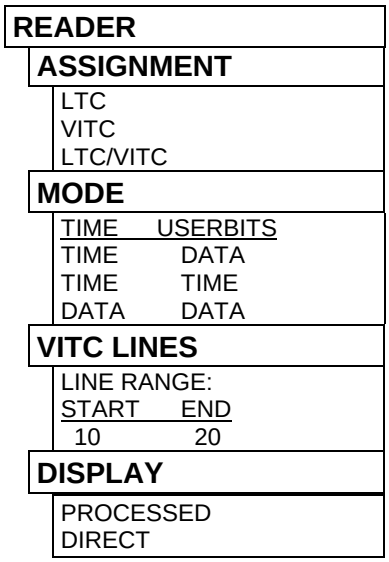
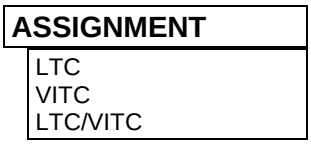


Figure 3-4: READER Drop Down Menu

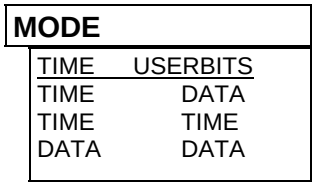


The **ASSIGNMENT** menu is used to select how the reader hardware is configured. The model 5950 can be configured in three different ways.

Select **LTC** to configure the reader for Linear Time Code (LTC) reading only.

Select **VITC** to configure the reader for Vertical Interval Time Code (VITC) reading only. The reader can be set to recover VITC from different ranges of video lines.

Select **LTC/VITC** to configure the reader to automatically switch between Linear Time Code (LTC) and Vertical Interval Time Code (VITC) reading. The reader can be set to recover VITC from a specific range of video lines.

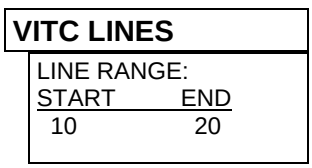


The **MODE** menu item is used to select the type of information that is contained in the time and user bits of the reader.

Select **TIME DATA** when the time contains normal time information and the user bits contain numeric data.

Select **TIME TIME** when both the time and the user bits contain time information.

Select **DATA DATA** when both the time and the user bits contain numeric data.



The **VITC LINES** menu item is used to select the lines which are enabled for VITC reading. VITC reading is enabled between the lower and higher line numbers shown (inclusive). If the reader is not assigned as a VITC reader then this menu item is not available.

When the **VITC LINES** sub menu is first selected, the START line number will be in reverse video indicating it can be changed. Press the up and down (↑, ↓) keys to change the starting line. Press the right (→) key to highlight the END line, indicating that it can be changed. Press the up and down (↑, ↓) keys to change the starting line.

DISPLAY
PROCESSED DIRECT

The **DISPLAY** menu item is used to select whether the normal 'lookahead' compensation for reader dropouts is active or not. Normally, the data is read in one frame and displayed with an 'add 1 frame' compensation. This method guarantees an 'on time' character display for LTC and also helps to cover any minor reader disturbances. In some operational modes it is desirable to disable this feature and to display exactly what is being read. When reading VITC, it is possible to read and display the information in the same video field, thus maintaining field accuracy even in DIRECT mode. The topmost positions of the character generator are not available when in the direct mode.

Select **PROCESSED** to enable normal 'lookahead' compensation. Displays from either the LTC or VITC readers will be 'on time' but will not follow code discontinuities immediately.

Select **DIRECT** to enable DIRECT display mode. Data is displayed exactly as it is read without 'lookahead' compensation. Displays from the VITC reader will be 'on time' but cannot be positioned at the very top of the raster. Displays from the LTC reader will be behind by two frames.

3.6. PROGRAMMING THE CHARACTER GENERATOR FUNCTIONS

The VCG drop down menu is used to select various characteristics of the VCG display. Figure 3-5 shows the items on the VCG drop down menu. The following descriptions appear in the order they appear on the menu.

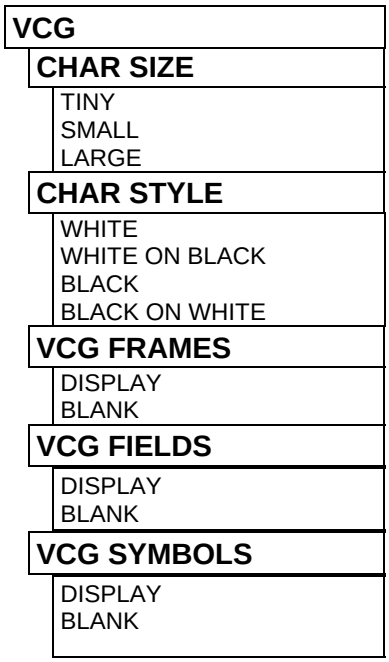
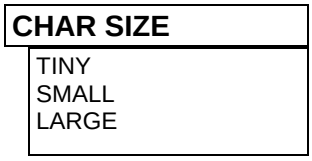


Figure 3-5: VCG Drop Down Menu

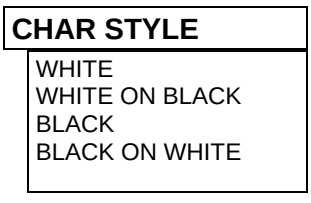


The **CHAR SIZE** menu item is used to select one of three sizes for the character generator's display. The on screen format menus always use the small character size.

The **TINY** character size occupies 8 lines per field for each character row. This permits 28 vertical positions on the raster in NTSC or 32 in PAL.

The **SMALL** character size occupies 16 lines per field for each character row. This permits 14 vertical positions on the raster in NTSC or 16 in PAL.

The **LARGE** character size occupies 32 lines per field for each character row. This permits 7 vertical positions on the raster in NTSC or 8 in PAL.



The **CHAR STYLE** menu item is used to select whether the background mask will be used and whether the characters will be white or black. The on screen format menus are always keyed into a black background mask.

Select **WHITE** to disable the background and key white characters directly into the picture.

Select **WHITE ON BLACK** to key white characters on a black background mask into the picture.

Select **BLACK** to disable the background and key black characters directly into the picture.

Select **BLACK ON WHITE** to key black characters on a white background mask into the picture.

VCG FRAMES
DISPLAY
BLANK

The **FRAMES** menu item is used to select whether the frames will be shown when the time is displayed.

Select **DISPLAY** to display the frames of the time displays
Select **BLANK** to blank the frames of the time displays

VCG FIELDS
DISPLAY
BLANK

The **FIELDS** menu item is used to select whether the fields will be shown when the time is displayed.

Select **DISPLAY** to display the fields of the time displays
Select **BLANK** to blank the fields of the time displays

VCG SYMBOLS
DISPLAY
BLANK

The **SYMBOLS** menu item is used to select whether the **T** and **U** symbols will be shown in front of the time and user bit displays of the VCG.

Select **DISPLAY** to display the VCG symbols.
Select **BLANK** to blank the VCG symbols.

3.7. PROGRAMMING THE OVERALL CONFIGURATION FUNCTIONS

The CONFIGURATION drop down menu is used to select the video standard, set the mode and output level of the translator output. The CONFIGURATION menu items are normally required only during installation.

Figure 3-6 shows the items on the CONFIGURATION drop down menu. The following descriptions appear in the order they appear in the menu.

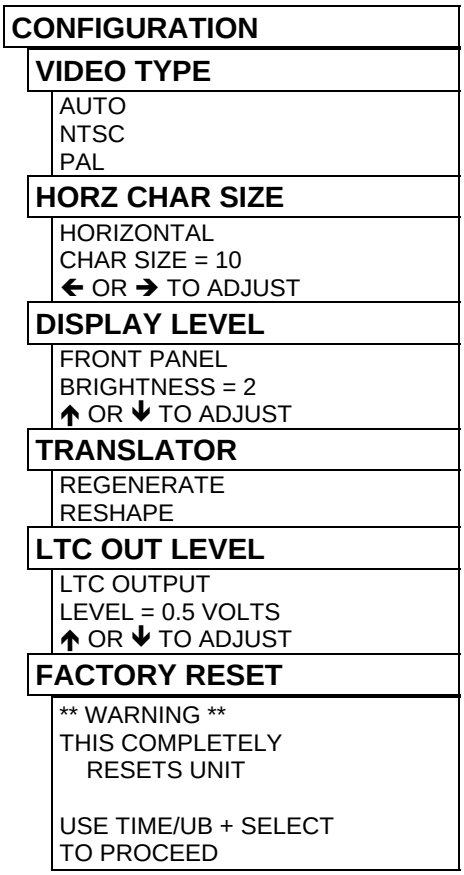


Figure 3-6: CONFIGURATION Drop Down Menu

VIDEO TYPE
AUTO
NTSC
PAL

The **VIDEO TYPE** menu item is used to select the video standard of the program video. Changing the video standard will affect the settings of the VITC LINE RANGE menu setting. Make sure that you re-check this setting when you change the video standard.

Select **AUTO** if you want to have the 5950 auto detect PAL and NTSC video.

Select **NTSC** if you are using NTSC video.
Select **PAL** if you are using PAL video.

HORIZ CHAR SIZE

The **HORIZ CHAR SIZE** menu item is used to adjust the character width. Use the ← & → keys to adjust the right side of the raster.

DISPLAY LEVEL

The **DISPLAY LEVEL** menu item is used to adjust brightness of the front panel display. Use the ↑ & ↓ keys to adjust.

TRANSLATOR
REGENERATE
RESHAPE

The **TRANSLATOR** menu item is used to select the function of the LTC translator output. When reader 1 is configured to read LTC the translator output can be operated in the regenerate or reshape mode.

In **REGENERATE** mode, the incoming LTC is fully decoded and regenerated. When incoming LTC is at normal play speed, the output code is re-phased to the video, thus compensating for any LTC code misalignments from the video. When reader 1 is configured to read VITC, the LTC output provides an LTC translation of the incoming VITC. When using the regenerated LTC output, the video from the tape being read must be looped through the video input (See Section 2.4) to ensure correct phasing of the LTC output to the video.

In **RESHAPE** mode, incoming LTC is restored to the proper waveform and output in phase with the incoming LTC. In audio tape applications or other situations where video cannot be looped through the video input, it is advisable to use the Reshape translator mode.

RESHAPE mode is only available on Rev 1 versions.

LTC OUT LEVEL
LEVEL = 35
↑ OR ↓ TO ADJUST

The **LTC OUT LEVEL** menu item is used to adjust the LTC translator output levels. Use the ↑ OR ↓ keys to change the level. The recommended output level setting is 35, which is approximately 1 volt peak to peak.

FACTORY RESET

The **FACTORY RESET** menu item Is used to reset the 5950 to the factory default parameters. Press the **TIME/UB + SELECT** keys when the sub menu screen is displayed to reset the 5950 to factory defaults. The 5950 will perform a power-on configuration before returning to the normal operating mode.

3.8. PARALLEL REMOTE CONTROL FUNCTIONS

A 9 pin D connector located on the rear panel labeled **PARALLEL** (**REMOTE CTL** on Rev 1 versions) provides 6 parallel control inputs for remote control of some of the model 5950 functions. The pinout of the D connector is shown in Figure 2-1.

LTC RDR Provides an alternate method of selecting the LTC reader. The LTC reader is selected by a high to low transition on this input, and deselected by a low to high transition.

VITC RDR Provides an alternate method of selecting the VITC reader. The VITC reader is selected by a high to low transition on this input, and deselected by a low to high transition.

When both the LTC RDR and VITC RDR inputs are the same, (either both grounded, or both open), the AUTO mode of the reader is selected.

VCG ENABLE Provides an alternate method of turning the character inserter generator On and Off. The character inserter is turned On by a high to low transition on this input, and turned Off by a low to high transition.

FREEZE Provides an alternate method of freezing the display. The Freeze display function is turned On by a high to low transition on this input, and turned Off by a low to high transition.

TIME/UB DISPLAY SELECT Provides an alternate method of displaying the Reader Time or User Bits on the front panel. The Time or User Bit display is changed by a high to low transition on this input.

This page left intentionally blank

This page left intentionally blank

4. TECHNICAL DESCRIPTION

4.1. OVERVIEW

The model 5950 LTC/VITC reader contains a full speed (1/30 to 70 times play) LTC reader and a VITC reader which can read at speeds from still frame to in excess of 40 times play speed. The model 5950 can be configured as an LTC reader, a VITC reader or as an AUTO LTC/VITC reader. In AUTO LTC/VITC mode, the reader automatically selects valid code from either source to provide accurate time code reading from still frame to 70 times play speed.

The recovery of recorded LTC time code at other than play speed has always presented some degree of difficulty, particularly with low end 3/4" recorders lacking a separate address track. The high speed LTC reader in the model 5950 employs sophisticated input conditioning and clock/data separator circuits to reliably recover LTC over the full shuttle and wind speed range of most VTR's.

The VITC reader is a full wind speed (still to over 40 times play speed) VITC reader designed for use with non time base corrected video signals. Although the use of time base correctors will enhance the recovery range of the VITC reader, the amount of improvement is dependent on the type of TBC and transport being used. The model 5950 contains all the necessary video processing circuits and therefore, requires no external signals other than the video signal itself.

The video character inserter contains a high resolution character inserter which provides white or black characters keyed into the video with or without a contrasting background. Character size and raster position are software selectable. The character display may be used to show time or user bits. Each of the windows can be turned on and off and positioned independent of each other.

When displaying time recovered from a VITC source, the field number sequence will be displayed to the right of the frames display. When the data being read was recorded in the non colour frame mode the field number sequence will be 1,2,1, etc. (1,2,3,4,1, etc. for PAL). When the reader data was recorded in the colour frame mode, the field number sequence will be 1,2,3,4,1, etc. (1,2,3,4,5,6,7,8,1, etc. for PAL).

The character inserter is also used for the on Screen Programming menus which are used to set up the various operational modes of the model 5950.

4.2. SPECIFICATIONS

4.2.1. LTC Reader

Standard SMPTE 12M, 25, 30 Fps Drop & Non Drop Frame
Connector XLR Type 3 pin female connector
Signal Level 0.2 to 4V p-p, balanced or unbalanced
Speed 1/30th to 70x play speed, forward and reverse, machine dependent

4.2.2. LTC Translator

Connector 3 pin male XLR type
Level Adjustable, 0.5V to 4.5V p-p
Rise Time 40 ±10µsec
Jitter < 2µsec
Genlock Reader input video

4.2.3. VITC Reader

Standards: SMPTE 170M (NTSC-M), ITU-R BT.470-6 (PAL-B)
Connector: BNC per IEC 60169-8 Amendment 2
Impedance: High impedance loop through
Speed Still frame to >40x play

4.2.4. Character Generator

Input Char. input from VITC Reader input
Output Input video with keyed in high resolution characters, selectable background and sizes
Number of Outputs: 2
Connector BNC per IEC 60169-8 Amendment 2
Output Level: 1.0V p-p (nominal)
Impedance: 75 ohms

4.2.5. Parallel Remote Control

Connector: Female DB-9
Input 6 TTL compatible inputs for control of selected functions

4.2.6. Serial Port - Rev 2 Version Only

Connector: Female DB-9
Level: RS232
Baud Rate: 9600 or 38400 baud
Format: 8 data bits, no parity, 2 stop bits
Protocol: XMODEM for firmware upgrades.

4.2.7. Electrical

Voltage 115/230V AC, 50/60Hz, 30 Watts
Safety ETL Listed, Complies with EU Safety Directive
EMI/RFI Complies with FCC Part 15 Class A, EU EMC Directive

4.2.8. Physical

Dimensions 19" W x 1.75" H x 7.75" D
(483mm W x 45mm H x 196mm D)
Weight 7 lbs. (3.5Kg)

4.3. DIP SWITCH FUNCTIONS

The main circuit board of the 5950 contains an 8 position DIP switch which is used to invoke various diagnostic and calibrations functions. On The 5200 main circuit card the DIP switch is closed when it is pressed down on the right side. On the 7700STM main circuit card the switch is closed when it is pressed down closest to the circuit card. The functions of each switch are described below.

Switch	Name	Normal	Function when Open	Function when Closed
1	Not used	Open		
2	Not used	Open		
3	Not used	Open		
4	Not used	Open		
5	Not Used	Open		
6	Factory Reset	Open	none	Resets 5950 to factory defaults on power up
7	Not used	Open	none	
8	Not used	Open		

Figure 4-1: DIP Switch Functions

4.4. USER ADJUSTMENTS AND DIAGNOSTICS

4.4.1. Front Panel Diagnostics

A 16 digit (12 digit on Rev 1 versions) alphanumeric display, and a 10 button keypad are contained on a separate circuit card (5220) which is connected to the main circuit board via a 20 conductor ribbon cable.

Keyboard diagnostics can be invoked by pressing any key during power up. The front panel display will show the message SCAN CODE and the the keyboard scan code. When no keys are depressed, the key scan code is ??. Pressing a key will show the corresponding key scan codes, as shown in the table below. To Exit the keyboard test, remove and re-apply power to the unit.

Key	Scan Code	Key	Scan Code
TIME/UB	41	SETUP	47
FREEZE	01	←	05
CHAR MODE	42	↓	06
CHAR ON/OFF	02	→	07
SELECT	45	↑	46

Figure 4-2: Keyboard Scan Codes

4.4.2. Calibrating the Character Generator

To calibrate the video keyer, connect colour bars from your sync generator to the **READER VITC IN** loop and to channel A of your oscilloscope and terminate it. Connect the character generator video output to channel B of your scope and terminate it. Adjust the **GAIN A** trimpot R120 for VCG output A or **GAIN B** trimpot R173 for VCG output B (GAIN trimpot VR3 on 5200 board) so that the output amplitude matches the input. Adjust the **CHR LVL** trimpot R211 on the 7700STM board (CHAR LEVEL trimpot VR2 on 5200 board) so that the inserted characters are approximately at the peak white video level.

The starting position of the characters at the left of the screen is adjusted by trimpot R105 on the 7700STM board (VR1 on the 5200 board). The horizontal character size is set in software using the HORIZONTAL SIZE menu item.

4.5. UPDATING TO A NEW FIRMWARE VERSION

Rev 1 versions of the 5950 have an EPROM program memory device that must be replaced in order to upgrade the firmware. Contact the Customer Serivce department at the factory for further information.

Rev 2 versions of the 5950 are equipped with an electrically erasable and re-programmable program memory device called a FLASH PROM. We will supply the software upgrade to you on floppy disk, or you may download the current version from our ftp site (http://www.evertz.com/ftp). This device may be reprogrammed by downloading the new firmware to the 5950 using a computer. This facilitates firmware upgrades in the field.

You can use a straight thru PC 9 pin cable serial extension cable or make the following cable in order to connect your 5950 to the computer.

5950 Rev 2 Version Serial I/O (Male) Description	DB-9		DB-9	Computer End (Female) Description
Shield Ground	Shield	----------	Shield	Shield Ground
RS 232 Transmit	2	----------	2	RS 232 Receive
Ground	5	----------	5	Signal Ground
RS 232 Receive	3	----------	3	RS 232 Transmit

Follow the procedure outlined in section 4.5.1 to upgrade the firmware. When the unit is successfully upgraded disconnect power from the unit.

4.5.1. Upgrading The Firmware

1. Connect the 5950 to the computer's serial port using the cable shown above. Most computers have two serial communications ports (known as COM1 and COM2). If you have both serial ports available, connect the 5950 to COM1.

2. If you received the firmware update on floppy disk, insert the reprogramming diskette in the drive of the computer. Change directories to the root of the reprogramming diskette's drive (A: or B:)

Copy files to Hard Disk before upgrade

If you downloaded the firmware from our Firmware FTP site, change to the directory of your hard disk where you have the upgrade files located. The upgrade files you downloaded have been compressed in the Zip format and will need to be expanded before you can proceed. Expand the upgrade files into this directory by running the WinZip utility (available from our FTP site)

3. To set up the 5950 for programming at 38400 baud hold down the **SETUP** key while you apply power to the 5950. When the 5950 completes its boot-up sequence, the front panel will display `LOAD FLASH - 38400`. The default baud rate for reprogramming is 38400.

   To set up the 5950 for programming at 9600 baud hold down the ➔ key while you apply power to the 5950. When the 5950 completes its boot-up sequence, the front panel will display `LOAD FLASH - 9600`

4. The 5950 firmware is contained in an Intel HEX format file. The file name will be AR57A1.HEX for Rev 2 versions of the 5950.

5. A Flash Loader software utility (called FL.EXE) was provided along with the upgrade files you received. This utility uploads the HEX file to the 5950. Run FL.EXE, with the appropriate '.hex' file as the first argument. For example:

   FL AR57A1.HEX

   This will run the Flash loader program in its default configuration: COM1, 38400 baud, software flow control.

   If you connected the computer using COM2 you will need to use additional command line parameter to specify the COM port as follows:

   FL AR57A1.HEX /p2

   If you set up the 5950 for programming at 9600 baud you will need to use additional command line parameter to specify the baud rate as follows:

   FL AR57A1.HEX /b9600

   Entering the FL with no file name will generate a usage message to show you all the available options for the Flash Loader program.

5. The Flash Loader will announce that it is erasing the FLASH PROM. The 5950 front panel display will show `FLASH ERASING...`

6. When the Flash PROM is erased, the Flash loader will start to send the new firmware to the 5950. The Flash loader will give a status report as it sends each line of the HEX file to the 5950. During programming the 5950 front panel display will show `LOADING - XXXXX`. The XXXXX will be the actual PROM address currently being programmed.

7. If there are programming errors an appropriate message will be shown on the 5950 front panel. You will need to abort the Flash loader program by pressing the ALT+x keys on your computer keyboard. (Hold the ALT key down while pressing the x key.) Repeat steps 3 to 6 to try to correct the problem. If you still have trouble, try programming at 9600 baud.

8. The reprogramming will be complete when the Flash Loader announces "Hex file transmitted successfully" and returns you to the DOS prompt. The 5950 will automatically switch to its FLASH program memory if programming is successful. As a part of the 5950 boot-up cycle it will say `SWITCH TO FLASH` to indicate that it is running on the FLASH EPROM now.