

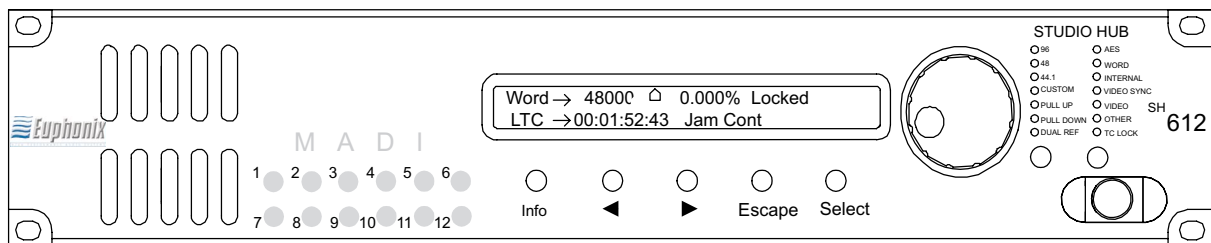
Euphonix SH612 Studio Hub User Guide

Part Number: 840-07577-03

SH612 Version: 3.06

S5 Version: 2.5

R-1 Version: 3.0



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Chapter 1: Getting Started

1.1 Introduction to the SH612

The SH612 provides the central point from which to send MADI and synchronization signals in System 5 and R-1 configurations. Since each SH612 is configured and installed by Euphonix for use with the R-1 and/or System 5, you will not often need to modify most of its parameters. This User Guide provides a technical reference for the SH612 but will not cover system hookup in general (see the *System 5 Technical Overview* in your manual binder).

All SH612 functions can be controlled from its front panel or through a software interface connected to System 5 or R-1. The SH612:

- provides the master clock signal for all digital audio components;
- routes and merges the 28-channel, 48 kHz MADI output streams from all connected digital audio devices and transmits them to the DF64 (System 5) or AudioDeck (R-1) MADI inputs as 56- or 28-channel MADI streams. At 96 kHz, signals are not merged but simply transmitted to the DF64.

1.1.1 Features

The SH612's sync sources, sample rates, and sample rate modes are listed in Table 1-1.

Table 1-1 SH612 Features

Sync Sources	Sample Rates	Sample Rate Modes
Word Clock	44.1 kHz	Output a specific sample rate
AES	48 kHz	Lock the system to an external sample rate
Blackburst or Composite video	88.2 kHz	Derive the sample rate from a lower resolution signal (i.e., LTC, MTC, or Video)
VITC, LTC, MTC	96 kHz	
Internal	Pull-Down and Pull-Up versions of each rate as well as custom rates in the range 31–100 kHz	

Synchronization signals are distributed via four AES Sync (AES/EBU), Word Clock, video, or MTC outputs to System 5 or R-1 components. The SH612 can generate or lock to Time code, or convert between different formats. All standard time code rates are supported:

- **Film:** 24 fps
- **PAL/SECAM:** 25 fps
- **Color NTSC:** 29.97 (drop and non-drop)
- **black and white video** rate
- **MIDI sequencers:** 30 fps (drop and non-drop)

The SH612 routes digital audio via 12 MADI In and 12 MADI Out ports, each with the capacity to receive or transmit up to 56 channels (up to 24-bit, 48 kHz). For sample rates exceeding 50 kHz, each MADI channel can carry only 28 digital audio channels.

1.1.2 Power On Sequence

Attach the provided IEC-compatible power cable to the IEC inlet. Connect the other end to a wall outlet with appropriate plug adapter if necessary. The SH612 power supply automatically adjusts to any voltage in the range 110–240 V.

We recommend powering up the SH612 before the digital devices to which it is connected. The SH612 conducts a brief self-test routine upon power-up and displays the firmware revision number. When the Main Menu is displayed, power up the attached converters.

NOTE: *Please refer to the power up routine for System 5 before attempting to power the DF64 Digital Frames and the Pilot Computers.*

1.2 MADI Connections for the R-1

These are the standard MADI connections for the R-1:

- MADI Ports 1–4 are for converter or I/O devices
- MADI Port 7 is for AudioDeck 1
- MADI Port 8 is for AudioDeck 2
- MADI Port 9 is for AudioDeck 3
- MADI Port 10 is for AudioDeck 4
- MADI Ports 5, 6, 11, and 12 are for additional MADI devices that require a custom route to be used with the R-1 (see Section 3.1.5 - *MADI Routing Menu*).

1.3 AES Sync

AES Sync signals originate from the SH612. AES Sync signals can be looped a maximum of four times. If additional AES signals are required, use an AES distribution amplifier.

The four AES sync outputs on the SH612 deliver AES sync to:

- The FC631 card on the DF64(s)
- AM713(s) and DM714(s)
- MA703(s) and MD704(s)
- Other devices that accept AES Sync whose sample rate needs to be locked to the System 5 sample rate.

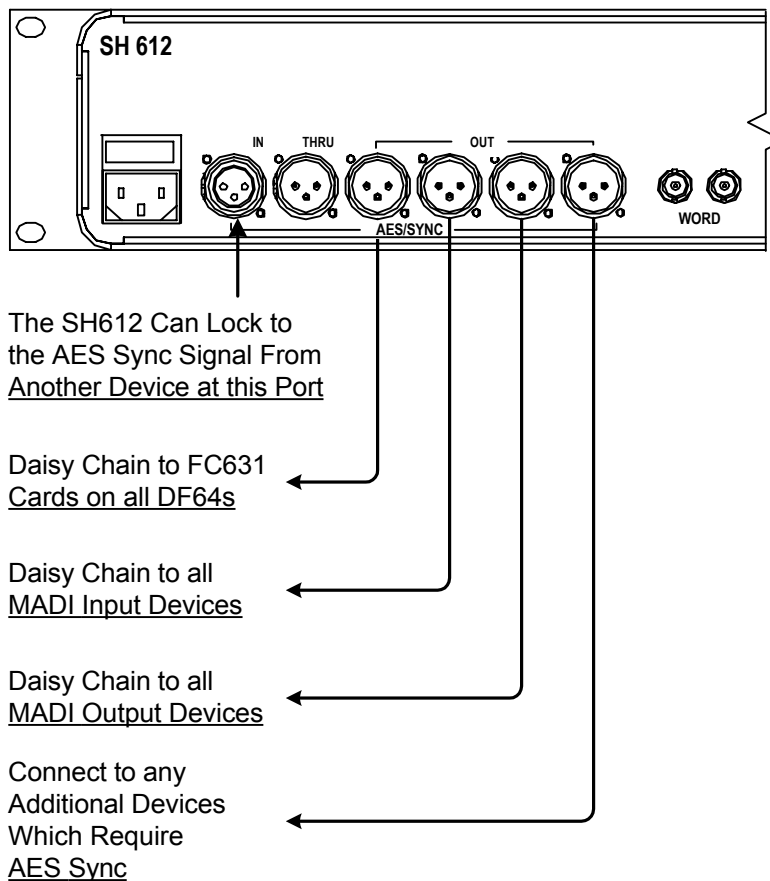


Figure 1-1 AES sync connections for the SH612

Make the following AES Sync connections:

- Attach the provided XLR-to-Lemo cable from one of the **AES Sync Out** connectors on the SH612 to the **AES Sync In** connector on the FC631 card of the first DF64.
- Attach the provided Lemo-to-Lemo cable from one of the **AES Sync Out** ports on the first DF64 to the FC631 card of the second DF64 (if present). Daisy chain this connection to additional DF64s.
- Attach the provided yellow XLR cable from one of the **AES Sync Out** connectors on the SH612 to the **AES Sync In** of the AM713 or DM714. Daisy chain this connection to other AM713(s), DM714(s), MD704, or other digital devices with an AES Sync input.
- Attach the provided yellow XLR cable from one of the **AES Sync Out** connectors on the SH612 to the **AES Sync In** of the MA703 or MD704. Daisy chain this connection to other MA703(s) or MD704(s).
- Attach the provided yellow XLR cable from one of the **AES Sync Out** connectors on the SH612 to the **AES Sync In** of other devices with AES Sync inputs whose sample clocks must be locked to System 5 (i.e., the R-1).
- The **Word Clock** output of the SH612 can also be used to sync to an external device or group of devices using daisy chain cabling.

NOTE: *The AES Thru port on the Euphonix converters is always active. If daisy chained devices are powered off, downstream devices will lose sync.*

Chapter 2: Front and Rear Panel Interface

2.1 Front Panel

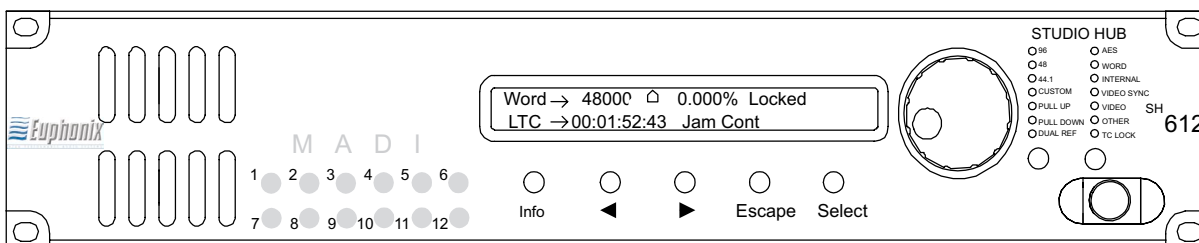


Figure 2-1 SH612 Front Panel

2.1.1 LCD Display

The LCD window uses two lines of 40 characters to display the status of current settings or the menu system.

Status Display

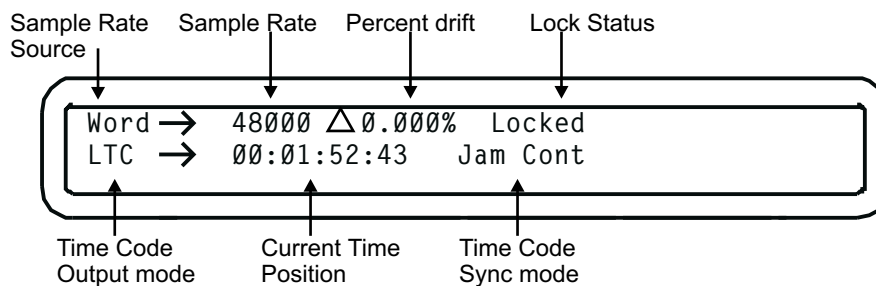


Figure 2-2 LCD Display

Menu Display

The Menu system has the following hierarchy:

Menu -> Submenu -> Parameter -> Parameter Value

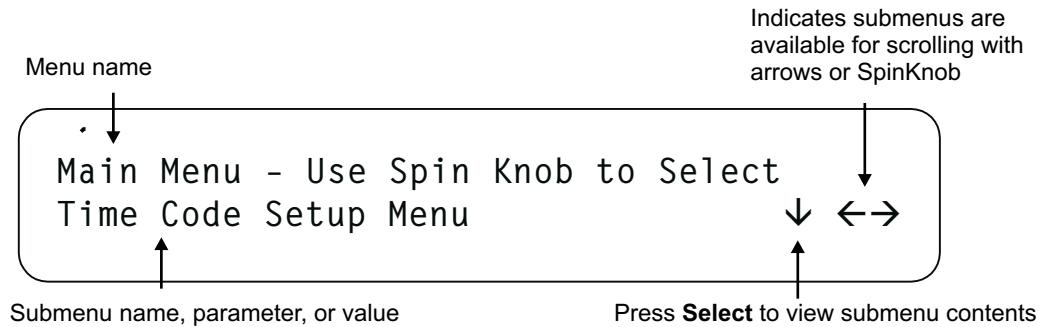


Figure 2-3 LCD Menu Display

2.1.2 Menu Controls

Six front panel controls interface to the menu system:



Figure 2-4 Menu Controls on Front Panel

Info

Press **Info** to display the current firmware version.

Arrow Keys

The arrow keys do one of the following three things depending on the context in which they are used:

- Scroll through menus and parameters
- Move the cursor through display fields
- Adjust parameter values

Escape

Press the **Escape** key to:

- move one menu level up;
- move from the Main Menu to the Status Display;
- cancel the current operation (but not previous selections).

Select

Press the **Select** key to:

- enter the menu system from the status display;
- display a submenu or parameter from a list;
- display parameter values;
- select the highlighted parameter value.

The menu display automatically reverts to the status display 15 seconds after the last menu action.

SpinKnob

The **SpinKnob** performs almost identical functions to the arrow keys, except when the display includes multiple fields that can be adjusted, in which case the arrow keys position the cursor and the **SpinKnob** sets values.

The **SpinKnob**:

- scrolls through the display fields, menus, submenus, parameters, and values;
- adjusts parameter values.

Rotate the **SpinKnob** clockwise to:

- increase the numeric value;
- move down through a list of menus, parameters, or values;
- move the cursor to the right across the display.

Rotate the **SpinKnob** counterclockwise to perform the inverse function of those listed above.

2.1.3 Sample Rate Controls/Indicators

The front panel has two keys dedicated to the **Sample Rate Source** and **Sample Rate** settings, and 14 LEDs that display their status. Since these controls and indicators are so frequently used, they have been included on the front panel for convenience without requiring access to the Menu tree (although they are available in the menus).

Sample Rate Source Key

Press the **Sample Rate Source** key to display the Sample Rate Source menu. Use the **SpinKnob** or arrow keys to highlight the appropriate Sample Rate Source value. Press **Select** to activate the displayed value and revert to Status Display mode. The LED corresponding to the selection illuminates.

Sample Rate Key

Press the **Sample Rate** key to display the Sample Rate menu. Use the **SpinKnob** or arrow keys to highlight the desired Sample Rate setting. Press **Select** to activate the displayed value and revert to Status Display mode. The LED corresponding to the selection illuminates.

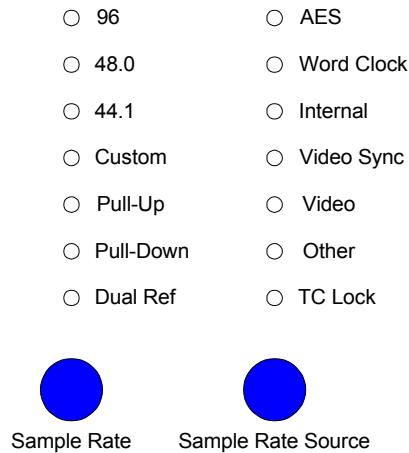


Figure 2-5 Sample Rate LEDs and Buttons

Sample Rate LEDs

96, **48**, and **44.1** (kHz) represent the nominal sample rates. The **Custom** LED illuminates to indicate other rates within the range 31–100 kHz.

The **Pull-Up** or **Pull-Down** LEDs illuminate when the sample rate is set to a Pull-Up or Pull-Down rate of one of the three nominal or Custom rates.

The **Dual Ref** LED illuminates to indicate that the time code and sample rate clock sources for the SH612 each reference a separate external signal. This means that synchronization must be accomplished externally to the SH612 or the signals may drift. The SH612's response to drift varies depending on the mode. Drift is allowed in the **Jam Continuous** (1% only) and **Jam Once** modes. It is only in either of these two modes that the **Dual Ref** LED lights. In all other cases the LED is not lit.

The **TC Lock** LED indicates time code lock status:

- Solid LED: Locked to valid time code signal
- Flashing LED: No lock because expected time code signal not present
- Unlit LED: SH612 is generating internal time code

2.1.4 MADI Indicators

Twelve back-lit buttons indicate the MADI input channel status.

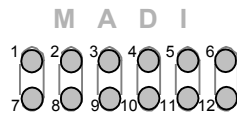


Figure 2-6 MADI Buttons

Each button corresponds to the physical MADI input/output port of the same number. The SH612 software detects the physical MADI ports connected upon startup and continuously monitors all MADI input ports to detect valid MADI signals. If the SH612 detects MADI input port activity, it lights the corresponding key (bright-solid). If MADI signal activity is not detected or is not valid, the key lights dim-solid.

Press any of the 12 buttons to view and edit the patch configuration for the corresponding MADI port in the display (Edit Route mode).

2.2 Rear Panel Connectors

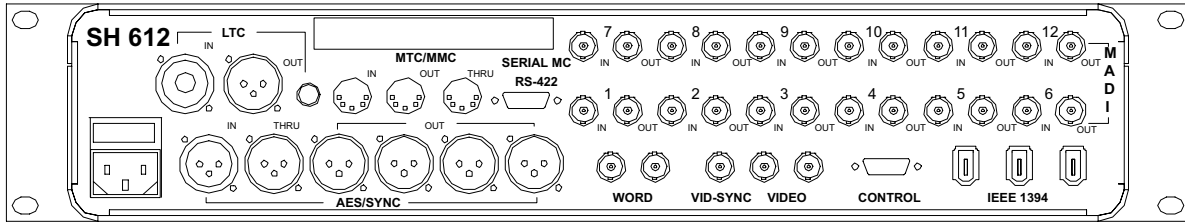


Figure 2-7 SH612 Rear Panel

AES Sync In (female XLR): Connect to house AES Sync source.

AES Sync Out Ports (four male XLR): Outputs AES Sync. We recommend using AES Sync for all System 5 MADI devices closer than 50 ft from the Studio Hub. Typically, Out 1 connects to the DF64s, Out 2 connects to MADI input devices, and Out 3 connects to MADI output devices. Out 4 is a spare for any additional devices requiring AES Sync.

Word In (BNC): Connect this port to the house Word Clock source.

Word Out (BNC): Connect this port to any device that requires Word Clock. Typically, MADI Converters located more than 50 ft from the Studio Hub use Word Clock instead of AES Sync. The Word Clock at this port is always locked to the selected sync source.

MADI In / Out Ports (24 BNC) Digital audio in and outs. These connect to the MADI Converters. See the MADI Hookup diagrams in the *System 5 Technical Overview* for details on these connections.

Vid-Sync In (BNC): The Vid-Sync In port can accept blackburst or composite video as a master clock signal. No output occurs at the Video Out port when using this port.

Video In (BNC): The Video In port can accept blackburst or composite video or anything with VITC embedded as a master clock signal. The signal input to Video In port is sent through to the Video Out port. VITC delivered to the input or internally created can be routed to Video Out.

Video Out (BNC): Outputs VITC time code when a video signal is present at the Video In port.

Control (9-pin DIN): Use this RS422 port for software control of the SH612 from System 5 (but not for the R-1).

IEEE 1394 ports (3): Use this IEEE 1394 high-speed communication protocol for software control of the SH612 from the R-1 (but not for System 5).

NOTE: *The SH612 can now be controlled by either its serial 9-pin Control port or by its IEEE-1394 port. The unit may appear to be disabled if the port selected for software control does not match the actual port currently connected. If software control is not working in System 5 version 2 or R-1 version 3 (and later versions of each), follow these steps:*

1. Start the SH612 and press **Select** once to enter the Main Menu.
If the SH612 does not display its Main Menu, press the **Escape** key several times until the status display is shown, then press **Select** again.
2. Turn the **SpinKnob** to highlight Utility Menu and press **Select**.
3. Turn the **SpinKnob** to highlight **Control Port** and press **Select**.
For System 5, turn the **SpinKnob** to highlight **RS422** and press **Select**.
For an R-1, turn the **SpinKnob** to highlight **(IEEE) 1394** and press **Select**.
4. Press **Escape** twice to show status again.
5. Reboot the SH612 to implement the control port change.

Serial MC RS422 (9-pin DIN): Input port for Machine Control signals. Not used in System 5.

MTC/MMC In (5-pin DIN): Input port for MIDI Time Code or MIDI Machine Control signals.

MTC/MMC Out (5-pin DIN): Output port for MIDI Time Code or MIDI Machine Control signals.

MTC/MMC Thru (5-pin DIN): Duplicates the signal applied to the MTC/MMC In port.

LTC In (1/4" phono and XLR): Input SMPTE LTC.

LTC Out (1/4" phono and XLR): Generates SMPTE LTC at the time code frame rate set by the System 5 software.

Power Connector (IEC): Accepts standard IEC power cord (provided). An autoranging switching supply accepts voltages between 100–240 V, 50–60 Hz.

Chapter 3: Menu Reference and Technical Specifications

3.1 Menu Reference

All menus are depicted but only those parameters that require description are discussed in the submenu sections.

The Main Menu's submenus are listed in this section. Each submenu contains parameters, values, and possibly additional submenus.

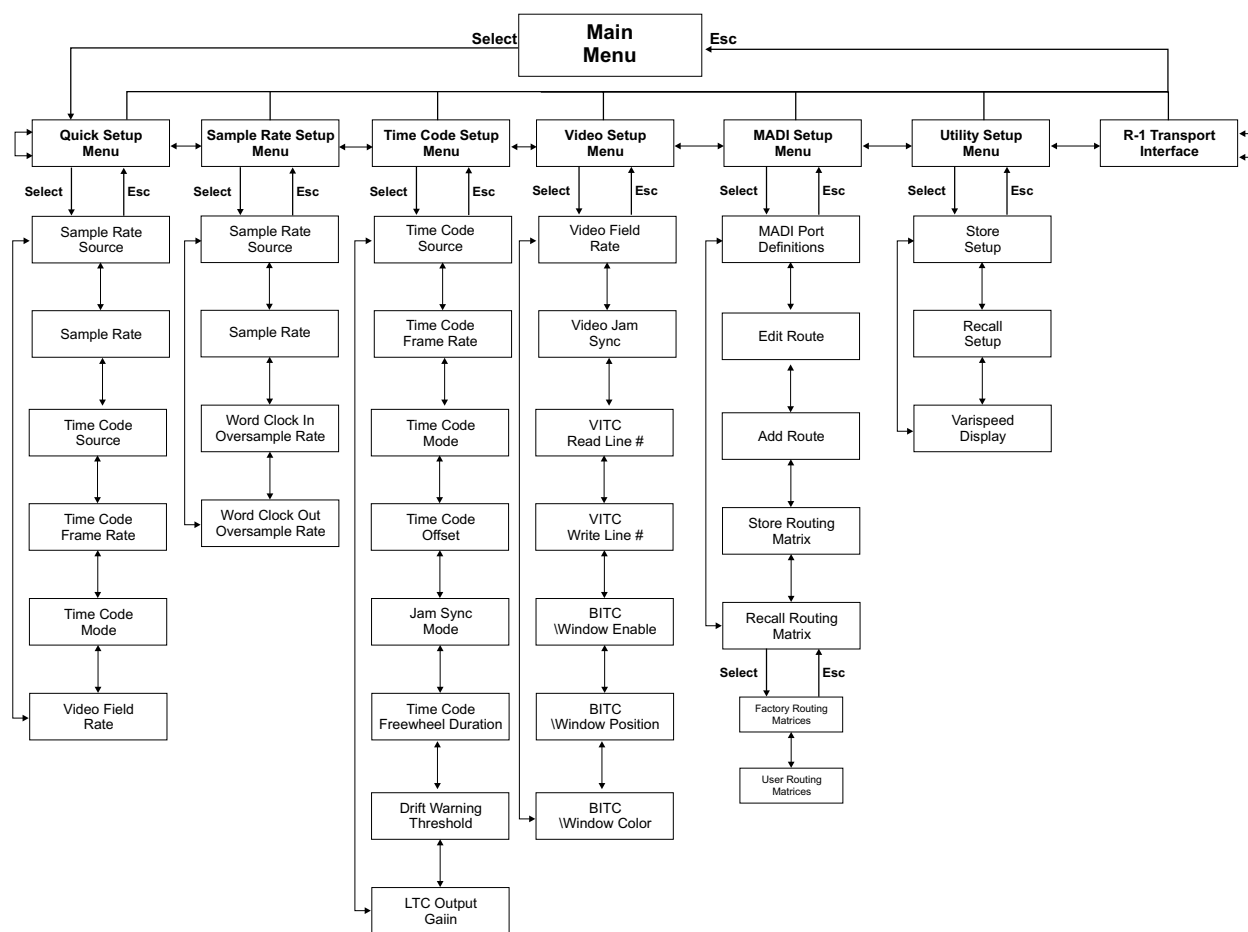


Figure 3-1 Main Menu

3.1.1 Quick Setup Menu

The Quick Setup menu has the most commonly used parameters gathered in one menu for quick and easy access. Refer to the individual menus for explanation of each parameter.

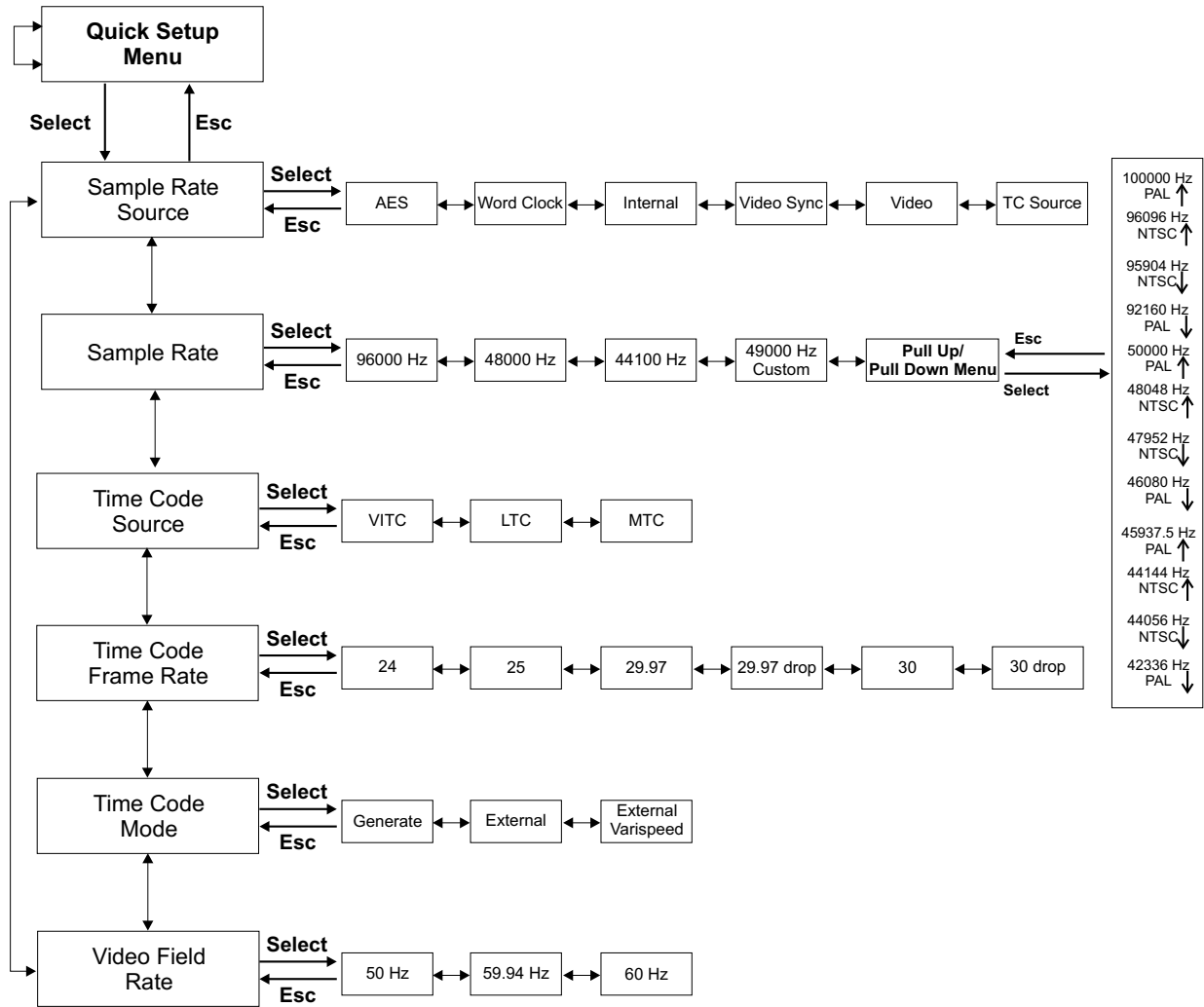


Figure 3-2 Quick Setup Menu

3.1.2 Sample Rate Setup Menu

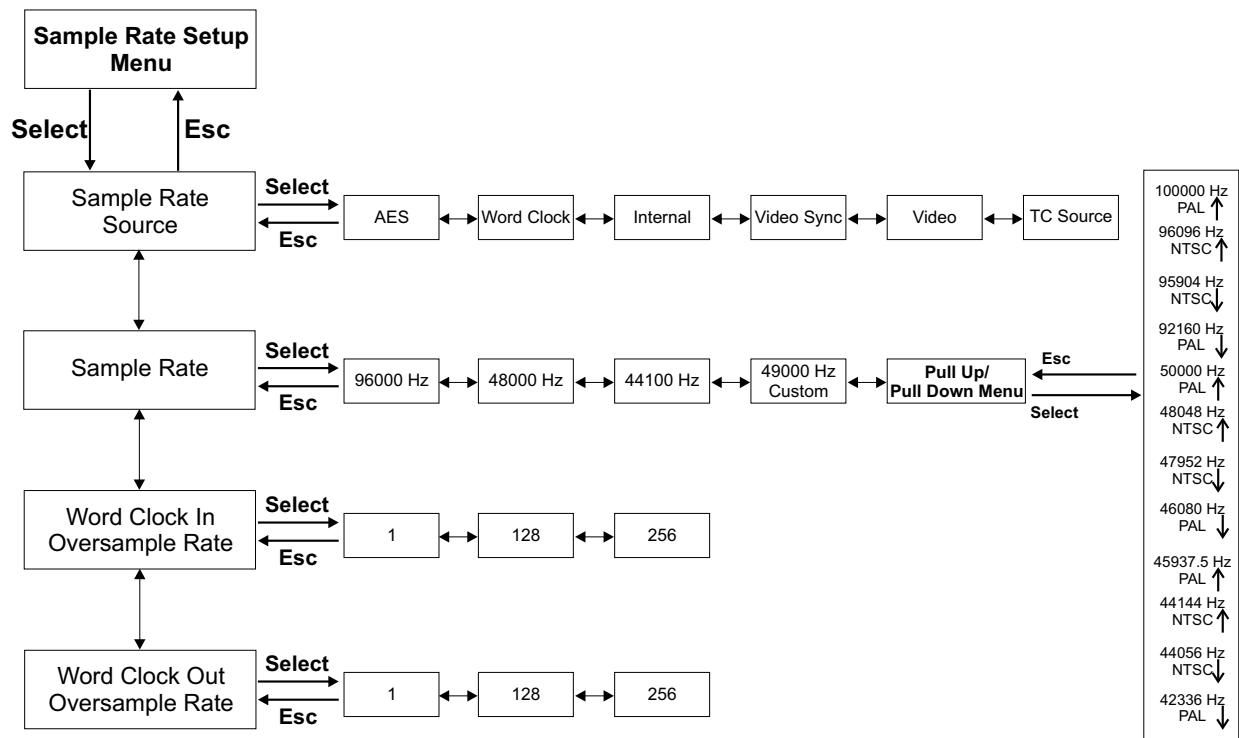


Figure 3-3 Sample Rate Setup Menu

Custom Sample Rate

This parameter allows a user-specified sample rate in the range 31–100 kHz (default value is 49000.0 Hz). To program a Custom sample rate:

1. Use the arrow keys to move the cursor under the sample rate digits. Each digit is a separate field.
2. Use the **SpinKnob** to set the sample rate.
3. Press **Select** when the desired sample rate has been set.

This parameter can also be set in the Quick Setup menu.

Word Clock In Oversample

This feature allows a higher resolution Word Clock input to the SH612. The Word Clock In Oversample value should match the incoming signal. The default is 1 which does not alter the incoming signal and assumes a normal Word Clock sample rate. The other options are 128 and 256 times the incoming rate.

Word Clock Out Oversample

Same options as Word Clock In Oversample.

3.1.3 Time Code Setup Menu

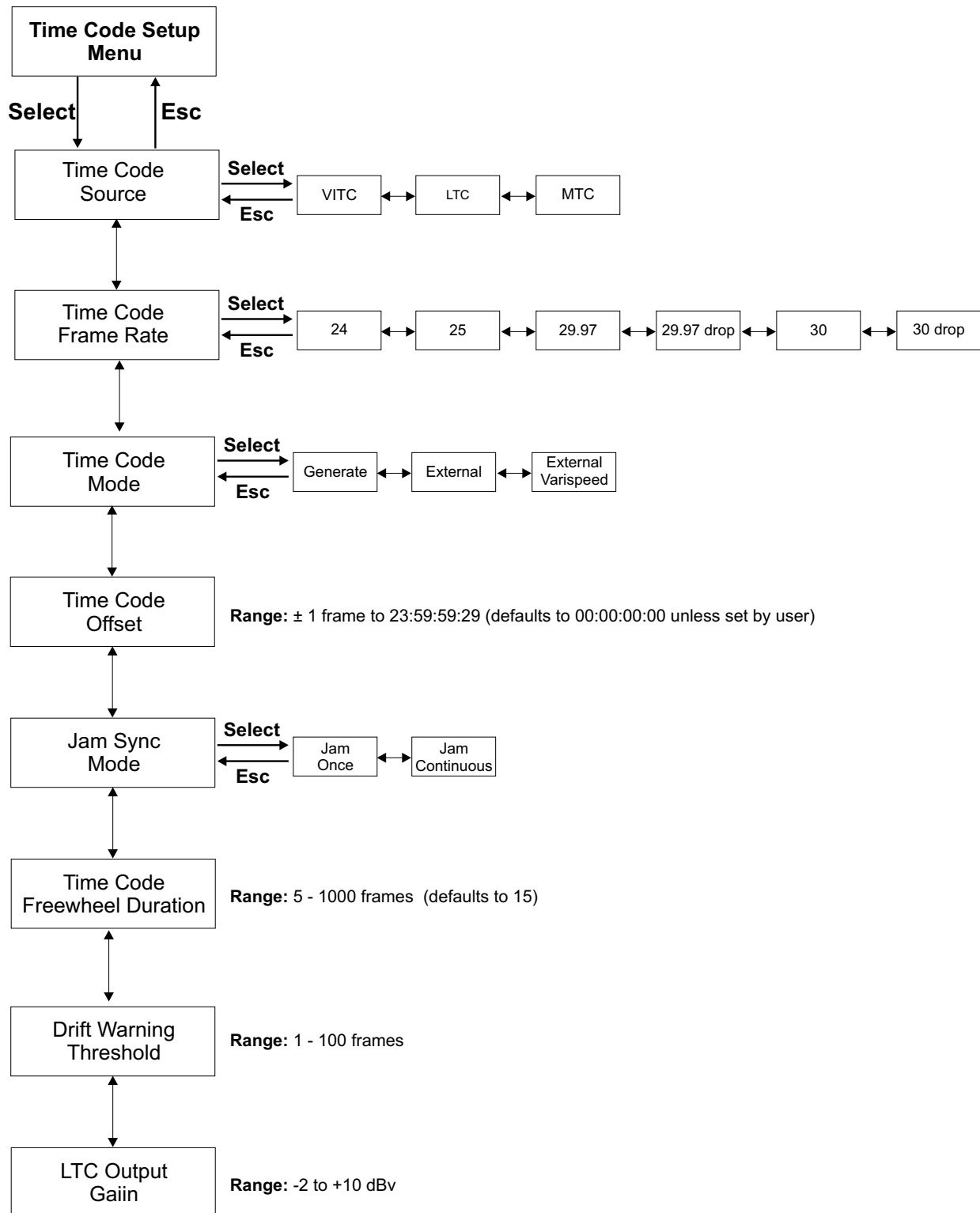


Figure 3-4 Time Code Setup Menu

Time Code Mode

The SH612 has three time code outputs: VITC, LTC, MTC. The time code outputs always represent the current time of the SH612.

Generate - This is the default mode for the SH612. Time code is internally generated, routed to the time code outputs, and sample-rate-resolved.

External - With this setting the SH612 is locked to an external time code source and generates the received time code position information at its outputs. This setting corresponds to the **Slave** key on the R-1 Remote.

External Varispeed - This feature is available only on SH612s configured for R-1 systems.

Time Code Offset

Time Code Offset is only relevant when the SH612 is slaved to an external device or an external device is slaved via LTC from the R-1. The R-1 does not output offset Timecode. The Time Code Offset can be positive or negative, and range from 1 frame to 23:59:59:29. A negative offset is subtracted from the Time Code Source value; a positive Offset is added to the Time Code Source value. The equation for Current Time is:

$$\text{TC Current Time} = \text{TC Source} \pm \text{TC Offset}$$

The Time Code Offset defaults to 00:00:00:00 unless specifically set by the user.

To set the offset:

1. Use the left/right arrow keys to position the cursor under each of four double-digit fields.
2. Use the **SpinKnob** to set the desired number.
3. To create a negative offset, position the cursor under the + sign and use the **SpinKnob** to change to the minus sign.

Jam Sync Mode

Jam Once - Locks when time code is first received and runs independent of incoming time code thereafter.

Jam Continuous - Locks continuously to incoming time code and resynchronizes whenever necessary.

Time Code Free Wheel Duration

When the incoming time code signal is interrupted, the SH612 continues to generate time code while it checks for the resumption of incoming time code within the period specified in the **Time Code Freewheel Duration** setting. If the time code source resumes before the **Time Code Freewheel Duration**, the SH612 checks to see if the difference between the current time code source frame value and the time code output frame value is within 1% deviation.

- If the difference is less than or equal to 1%, the SH612 resynchronizes to the new time code source without interrupting time code or sample rate lock.
- If the difference exceeds 1%, the SH612 drops time code and sample rate lock and locks to the new time code position.

Drift Warning Threshold

Specifies the amount of drift that triggers the drift warning (1–100 frames).

LTC Output Gain

Specifies the output level of LTC in the range -2 to +10 dBv.

3.1.4 Video Setup Menu

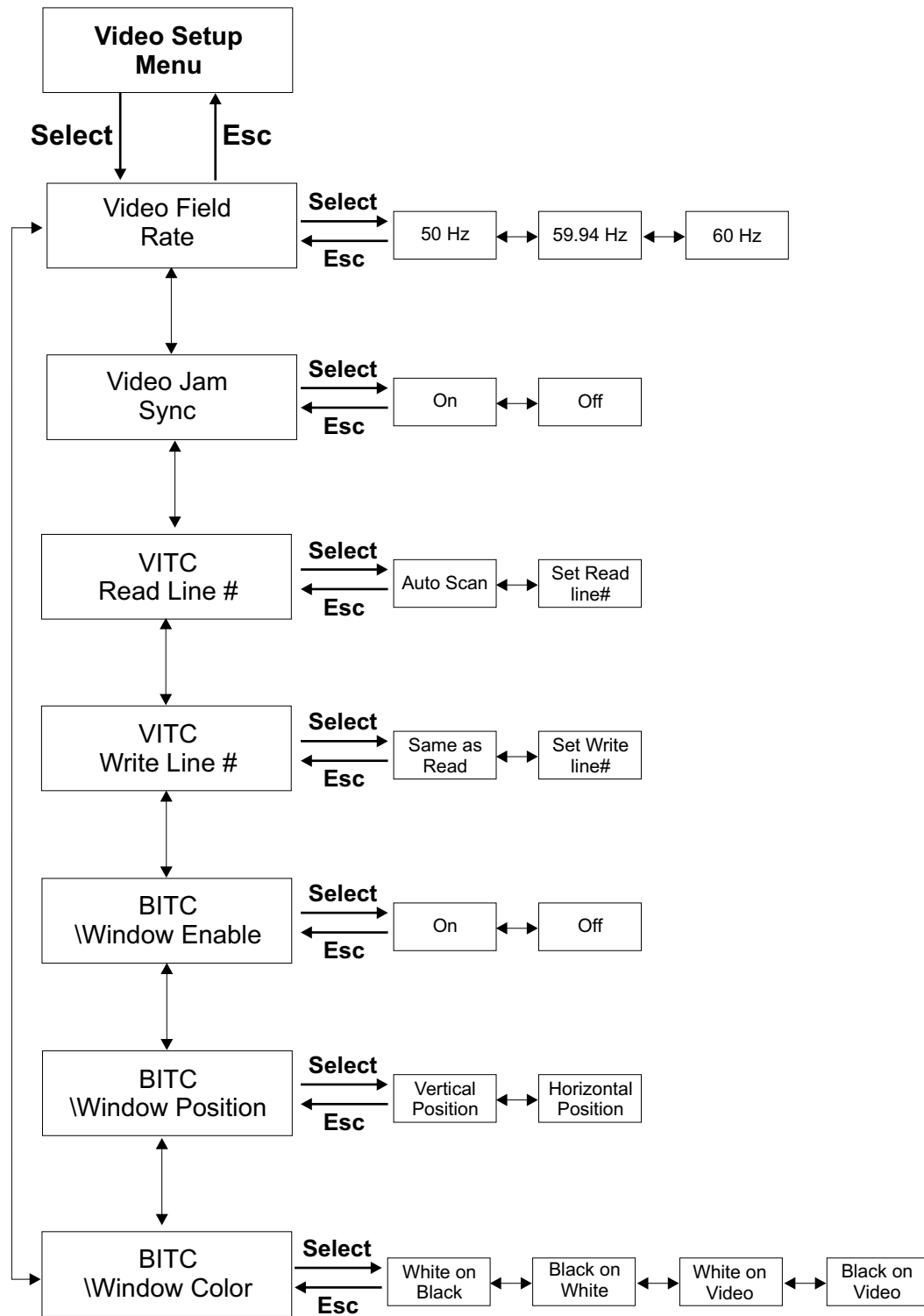


Figure 3-5 Video Setup Menu

Video Jam Sync

On - The SH612 automatically jams the start of the LTC and MTC output frames to be aligned to line 5, field 0 of the blackburst, composite video, or VITC signal.

Off - The time code outputs are not frame-edge aligned with line 5 field 0 of the video source.

VITC Read Line #

Auto Scan - Automatically scans for the lines that contain VITC.

Set Read line# - Directed to specific line number combinations in the range 10/12–38/40.

VITC Write Line #

Same as Read - Writes to the same lines specified in the **VITC Read Line #** settings.

Set Write Line# - Writes to specific line number combinations in the range 10/12–38/40.

BITC Window Enable

On - Displays a Time Code window on the video monitor.

Off - Does not display a Time Code window.

BITC Window Position

The **Vertical** and **Horizontal** coordinates can be set to position the burn in window.

BITC Window Color

White on Black

Black on White

White on video

Black on Video

3.1.5 MADi Routing Menu

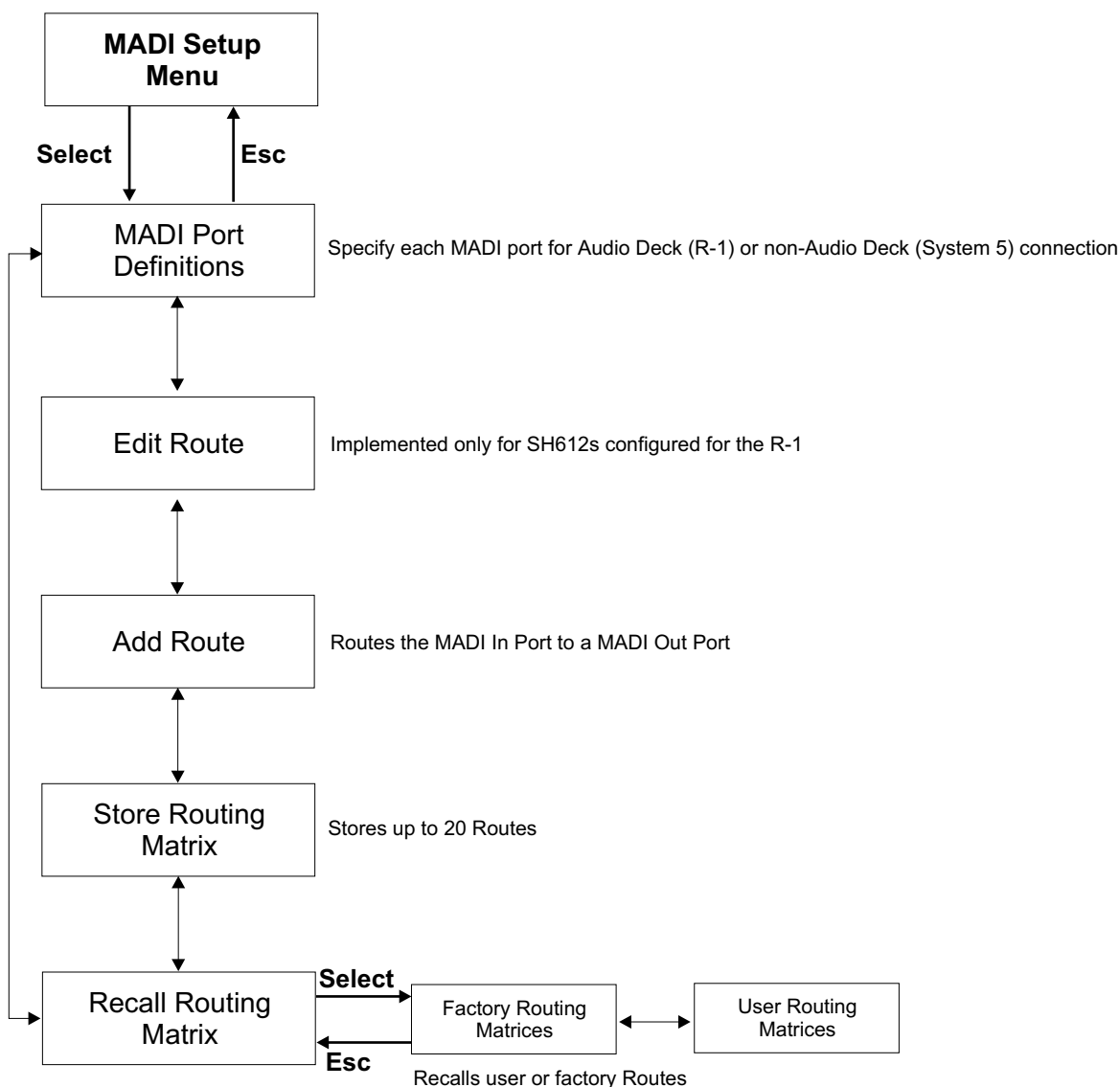


Figure 3-6 MADi Routing Menu

Input channels can be routed to any output channel using the MADi routing menu. A route can consist of entire MADi ports, groups of MADi channels, or a single MADi channel. An individual input can also be routed to one, multiple, or all outputs.

To create a route:

1. Press the MADI port button corresponding to the port to route to or from.

The **Add Route** submenu appears displaying the input and output ports and channels. You can also locate to the Add Route Menu through the menu system.

In: [1: 1 - 56] To Out: [1: 1- 56]

2. Use the arrow keys to move the cursor under the number to adjust and the **SpinKnob** to adjust the number.
3. Press **Select** to finalize the route.

NOTE: *The SH612 does not provide visual confirmation of the active routes so you must check that the route was correct by looking at the meters on the R-1 or System 5 console.*

MADI Port Definitions

This parameter can specify each MADI port for AudioDeck (R-1) or non-AudioDeck (System 5) connections. For the R-1 version 3, the MADI port definitions (AudioDeck vs. non-AudioDeck) are saved as part of a user routing preset and are not Global settings. If you change your port definitions, you need to update existing user presets with the new settings.

Edit Route

Modifies the mapping of MADI input ports to output ports.

Add Route

Press **Select** to display:

In: [1: 1 - 56] To Out: [1: 1- 56]

Use the arrow keys to move between the In/Out port numbers and the **SpinKnob** to set the port number.

NOTE: *Edit Route, Add Route, Recall Routing Matrix, and Store Routing Matrix are available only for SH612s configured for the R-1. These options are not available for SH612s configured for System 5.*

Store Routing Matrix

Stores up to 20 frequently used custom routes for instant recall.

Recall Routing Matrix

Recalls stored routes. The R-1 default route for sample rates in the range 32–50 kHz is **24 / 144 Track R-1 [56]**; for sample rates over 50 kHz, **R-1 24 / 48 / 96 Track [28]**.

Factory Routing Matrices Menu

- R-1 Through [56]
- Through [56]
- 24–144 Track R-1 [56]
- 3 x 48-Track Splitter/Merger [56]
- S-5 R-1.0

3.1.6 Utility Menu

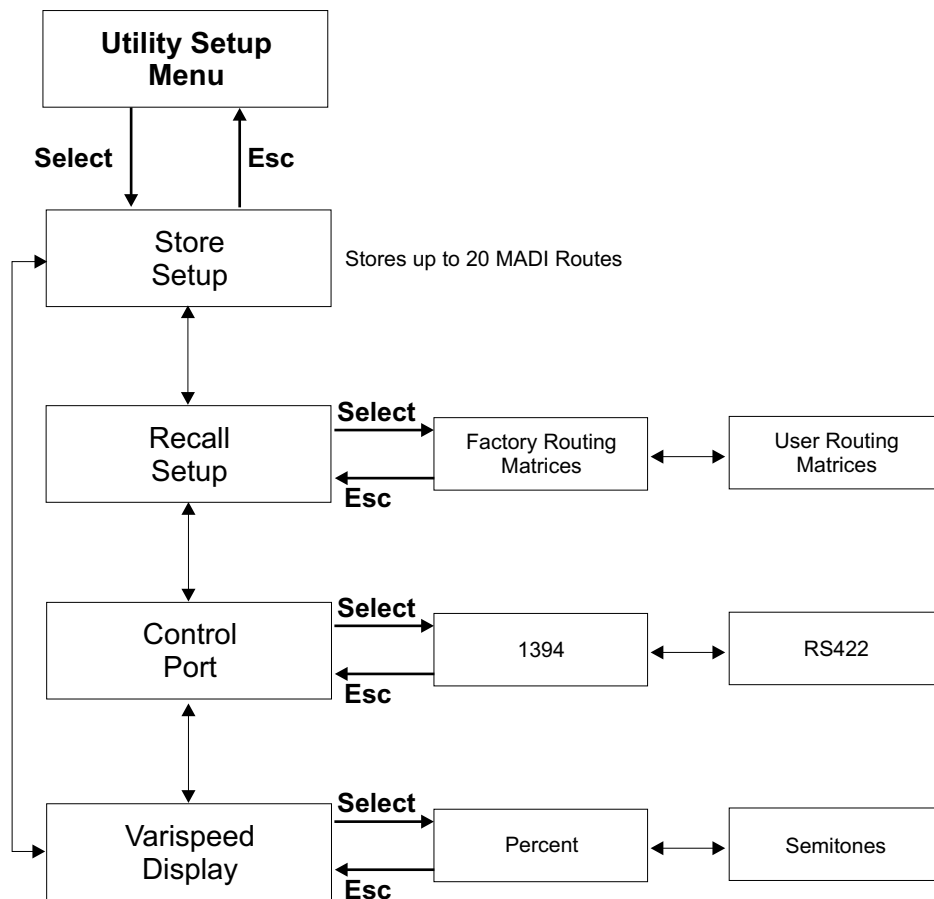


Figure 3-7 Utility Menu

Store Setup

Stores all SH612 parameters to one of 20 locations.

Recall Setup

Recalls all parameters from one of 20 locations.

Control Port

This must be set correctly to control the SH612 from the R-1 recorder or System 5 console. The SH612 can be controlled from System 5 from the RS422 Control port (serial 9-pin connector) or from the R-1 from the IEEE-1394 port. The unit may appear to be disabled if the control port selected here does not match the connected port.

Varispeed Display

Shows the extent to which playback speed is altered.

Percent: -12.5% to + 12.5%

Semitones: -2.32 to + 2.40 semitones

3.1.7 Transport

Used with the R-1, the Transport menu converts the SH612 front panel menu controls into Transport controls. This allows the SH612 to send Machine Control commands to other devices. *This feature is not implemented for use with System 5.*

The R-1 must be set to receive Machine Control commands from the SH612 and Machine Control must be turned on. Two menus provide different controls.

The first menu has:

- **Stop:** Menu marked by a square; controlled by the **Info** button
- **Forward Play:** Menu marked by a single right arrow; controlled by the button with a single, right arrow
- **Reverse Play:** Menu marked by a single left arrow; controlled by the button with a single, left arrow

The second menu has:

- **Stop:** Menu marked by a square; controlled by the **Info** button
- **Forward Shuttle:** Menu marked by a double, right arrow; controlled by the button with a single, right arrow
- **Reverse Shuttle:** Menu marked by a double, left arrow; controlled by the button with a single, left arrow

In the top of each menu the time and play/ stop /shuttle status is shown.

3.2 SH612 Technical Specifications

SH612 Technical Specifications	
Synchronization	
Inputs	Word Clock, AES, Internal, NTSC/PAL blackburst and composite video, Time Code
Word Clock Oversample Rate	1 BNC; 1x, 2x, 128x, and 256x
AES	1 female XLR
Internal Sample Rate	44.1, 48, 96 kHz \pm 10 ppm custom sample rates: 31–100 kHz
Video Sync Video	Two BNC connectors (NTSC/PAL blackburst or composite, VITC) 1 V peak-to-peak (75 Ω termination)
Video Frame Rates	50 Hz, 59.94 Hz, 60 Hz
External Sample Rate Range	Input Source = Word or AES: 31–100 kHz Input Source = Video, Video Sync, Time Code: selected sample rate \pm 1%
Outputs	Word Clock, AES, AES Thru
Word Clock Oversample Rate	1 BNC; 1x, 2x, 128x, and 256x
AES	4 male XLR
AES Thru	1 male XLR
Time Code	
Inputs	LTC (1/4" phono or female XLR), VITC (BNC), MTC (5-pin DIN)
Outputs	LTC (1/4" phono or male XLR), VITC (BNC), MTC (5-pin DIN)
Frame Rates	24 fps, 25 fps, 29.97 fps (drop and non), 30 fps (drop and non)
MADI	12 in x 12 out; 24-bit signal path; BNC 75 Ω (inputs and outputs)
Inputs	56-channel with nominal sample rates (31 and 50 kHz)
Outputs	28-channel with sample rate > 50 kHz
Control	
Machine Control Inputs	9-pin RS-422, 5-pin DIN MMC In
IEE1394	3 ports
Dimensions	
Size	3.5" (9 cm) x 19" (49 cm) x 18.5" (47 cm)
Weight	12 lb (5.5 kg)
Miscellaneous	
Power Requirements	110–240 V, 50–60 Hz (autoranging)
Power Consumption	100 W
Operating Temperature	5–35°C (41–95°F)