Tektronix®

SPG700
Multiformat Reference Sync Generator

User Manual

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User Manual

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Important safety information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

To safely perform service on this product, additional information is provided at the end of this section. (See page x, *Service safety summary*.)

General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

Comply with local and national safety codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

This product is not intended for detection of hazardous voltages.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.

To avoid fire or personal injury

Use proper power cord. Use only the power cord specified for this product and certified for the country of use.

Ground the product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, make sure that the product is properly grounded.

Power disconnect. The power cord disconnects the product from the power source. See instructions for the location. Do not position the equipment so that it is difficult to operate the power cord; it must remain accessible to the user at all times to allow for quick disconnection if needed.

Observe all terminal ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Do not operate without covers. Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.

Avoid exposed circuitry. Do not touch exposed connections and components when power is present.

Do not operate with suspected failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation.

Before use, inspect voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

Use only specified replacement parts.

Do not operate in wet/damp conditions. Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry. Remove the input signals before you clean the product.

Provide proper ventilation. Refer to the installation instructions in the manual for details on installing the product so it has proper ventilation.

Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.

Provide a safe working environment. Always place the product in a location convenient for viewing the display and indicators.

Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Use only the Tektronix rackmount hardware specified for this product.

Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this *Service safety summary* and the *General safety summary* before performing any service procedures.

To avoid electric shock. Do not touch exposed connections.

Do not service alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect power. To avoid electric shock, switch off the product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.

Use care when servicing with power on. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

Verify safety after repair. Always recheck ground continuity and mains dielectric strength after performing a repair.

Terms in this manual

These terms may appear in this manual:

⚠ *WARNING.* *Warning statements identify conditions or practices that could result in injury or loss of life.*

⚠ *CAUTION.* *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Symbols and terms on the product

These terms may appear on the product:

- ■ DANGER indicates an injury hazard immediately accessible as you read the marking.

- ■ WARNING indicates an injury hazard not immediately accessible as you read the marking.

- ■ CAUTION indicates a hazard to property including the product.

⚠ When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

The following symbol(s) may appear on the product:

⚠ CAUTION
Refer to Manual

⏚ Protective Ground
(Earth) Terminal

Environmental considerations

This section provides information about the environmental impact of the product.

Restriction of hazardous substances

Complies with RoHS2 Directive 2011/65/EU.

Product end-of-life handling

Observe the following guidelines when recycling an instrument or component:

Equipment recycling. Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. To avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.

This symbol indicates that this product complies with the applicable European Union requirements according to Directives 2012/19/EU and 2006/66/EC on waste electrical and electronic equipment (WEEE) and batteries. For information about recycling options, check the Tektronix Web site (www.tek.com/productrecycling).

Battery recycling. This product contains a small installed lithium metal button cell. Please properly dispose of or recycle the cell at its end of life according to local government regulations.

Perchlorate materials. This product contains one or more type CR lithium batteries. According to the state of California, CR lithium batteries are classified as perchlorate materials and require special handling. See www.dtsc.ca.gov/hazardouswaste/perchlorate for additional information.

Transporting batteries

The small lithium primary button cell contained in this equipment does not exceed 1 gram of lithium metal content per cell, and the cell type has been shown by the manufacturer to comply with the applicable requirements of the UN Manual of Tests and Criteria Part III, Sub-section 38.3. Consult your carrier to determine which lithium battery transportation requirements are applicable to your configuration, including to its re-packaging and re-labeling, prior to reshipment of the product by any mode of transport.

Preface

This manual provided detailed operating information about the SPG700 Multiformat Reference Sync Generator.

Refer to the *SPG700 Installation and Safety Instructions* manual for information about how to install the instrument, for descriptions of the front and rear panel controls and connectors, and for information about initial configuration.

Product description

The SPG700 is a precision multiformat video signal generator, suitable for master synchronization and reference applications. It provides multiple video reference signals, such as black burst, HD tri-level sync and serial digital test patterns, and provides time reference signals such as time code. Audio reference signals such as word clock and DARS are also provided.

The base configuration includes three sync outputs that can be configured with independent output formats (NTSC/PAL black burst and/or HD tri-level sync) and independently adjustable timing offsets. A high-accuracy, oven-controlled crystal oscillator provides a stable frequency reference for the system, or the loop-through genlock input can be used to lock to an external video reference or 10 MHz continuous wave signal. The Stay GenLock® feature avoids "synchronization shock" if the external reference suffers a temporary disturbance, by maintaining the frequency and phase of each output signal. When the external reference is restored, Stay GenLock® ensures that any accumulated clock drift is removed by slowly adjusting the system clock within standard limits instead of "jamming" back to the correct phase.

Time reference outputs are available in multiple formats. Three independent linear time code (LTC) outputs are available, and a fourth LTC connection can be used as input or output. Each LTC output has independent frame rate selection, time source (timeof- day or program time) and time zone offset. Vertical interval time code (VITC) is available on each NTSC or PAL black output, also with independent time sources and offsets.

Figure i: SPG700 front and rear panels

Test signal outputs

The SPG700 can be optionally configured with a variety of test signal outputs. Option SDI adds two fully independent serial digital video generator channels of two outputs each. Each channel can be configured to any standard SD/HD/3G-SDI format and frame rate. The selected test pattern can be generated on both outputs per channel, or one output can generate digital black. A wide variety of standard test patterns are included, such as color bars, convergence grid, step scales, ramps, multiburst, SDI pathological test matrix and a real-time programmable zone plate generator.

Bitmap images can be downloaded to the SPG700's flash memory for arbitrary user-defined test patterns. ID text, burn-in time code, circle, and color logo overlays can be added to any test pattern, and several ancillary data packet types, including ancillary time code and user-defined packets, can be inserted into the SDI output signal.

The four SDI outputs can be configured to support 4K/UHD full frame, 100% and 75% color bars for quad link square division mode. This allows simple verification of your 4K/UHD workflow within the production studio or mobile truck. Note: VPIDs are compliant only to HD and 3G formats in 4K/UHD formats.

Also included is an audio/video delay test sequence, which in conjunction with a Tektronix waveform monitor, can be used to ensure A/V delay compliance.

Audio reference signals

Several audio reference signals are available. The base configuration includes a 48 kHz word clock output and a dedicated Digital Audio Reference Signal (DARS) output. With Option SDI, audio tone generation is included as embedded audio on each of the SDI outputs.

Remote access

For remote access to the instrument, a 10/100/1000BASE-T Ethernet interface is included. A web-based user interface can be used for all configuration settings and for monitoring system status. Alarm and key status information is also available via Simple Network Management Protocol (SNMP) messaging, enabling easy integration with network management systems. Remote control and alarm reporting is also available via a general purpose interface (GPI). The front-panel USB port can be used to backup and restore presets and other user data, and to perform system firmware upgrades.

Optional backup power supply

For critical applications, the instrument can be configured with a second power supply module. Under normal operation, the designated backup supply is seldom used, ensuring that it has maximum remaining life should the primary supply fail. The backup supply is load-tested once each day to verify that it can serve as the primary supply if necessary. The usage time of each supply is logged as "temperature-weighted hours", a metric that best estimates the calculated life of the supply. A front-panel LED will indicate when the supply is nearing its end-of-life. If the primary supply is interrupted for any reason, the system will switch to the backup without any disruption to system operation. Power supply modules are hot-swappable for easy replacement, and feature a locking mechanism to prevent the power cable from accidental disconnection.

Key features

- Multiple independent black burst and HD tri-level sync outputs provide all the video reference signals required in a video broadcast or production facility

- Four LTC outputs, VITC on black burst outputs

- Stay GenLock® prevents synchronization shock when the external reference input signal is temporarily lost

- Wide selection of video test patterns in serial digital formats (SD, HD and 3G-SDI)

- 4K/UHD formats support with full frame 100% and 75% color bars (Quad Link Square Division)

- Dual hot-swappable power supplies ensure continuous availability of reference signals

- Easy to manage with Web-based interface for remote configuration and SNMP for status and alert information

Applications

- Sync pulse generator and time reference generator for broadcast, studio, mobile, and post-production facilities

- Master or slave (genlock) operation for distributed system architectures

- Video equipment verification, facility link testing, and display calibration

Methods of operation

This instrument can be operated using either the front panel or the SPG700 Web Interface. It is recommended that you use the SPG Web Interface to operate the instrument since it is easier to use and more intuitive. The majority of this manual describes how to operate the instrument using the SPG700 Web Interface. For your convenience, menu diagrams of the front-panel menus are also provided. (See page 141, *Front panel menu operation*.)

Product documentation

The following table lists the product documentation that is available for the SPG700 generator.

Table i: Product documentation

Document	Tektronix Part Number	Description	Availability	
			Print	**Web**
Installation and Safety Instructions	071-3480-xx (English)	Describes how to install the instrument and provides basic operating information	✓	✓
	077-1223-xx (Japanese)			✓
	077-1224-xx (Russian)			✓
User Manual	077-1225-xx (English)	Provides detailed operating information		✓
	077-1226-xx (Japanese)			
	077-1227-xx (Russian)			
Specifications and Performance Verification	077-1228-xx	Lists the product specifications and provides procedures for verifying the performance of the instrument		✓
Service Manual	077-1229-xx	Describes how to service the instrument to the module level (such as circuit boards and fuses)		✓
Declassification and Security Instructions	077-1230-xx	Describes how to clear or sanitize the data storage (memory) devices in the product for customers with data security concerns		✓
Release Notes	077-1231-xx	Describes the new features, improvements, and limitations of the instrument firmware		✓
SPG70UP Upgrade Instructions	075-1093-xx	Provides instructions for upgrading your SPG700 instrument		✓
Video Sync Pulse Generator and Electronic Changeover Unit System Integration Technical Reference	077-0563-xx (ECO422D) 077-0877-xx (ECO8000, ECO8020)	Provides information for system integrators who are designing systems for high-definition (HD) and standard-definition (SD) digital video content where Tektronix electronic changeover units and video sync pulse generators are to be deployed.		✓

System timing

Frame reset signals

The SPG700 uses the three frame reset signals described below to output different video formats simultaneously.

FRAME RESET 1   This frame reset signal runs at 2.997 Hz and supports the 1/1.001 system signal, and is used by the following video formats. These signals are synchronized with each other.

NTSC	1080 23.98sF	30 fps DF LTC
525-270	1080 29.97p	23.98 fps LTC
1080 23.98p	1080 59.94i	
	720 59.94p	

FRAME RESET 2   This frame reset signal runs at 6.250 Hz and is used only for PAL, 625, or HD / LTC formats with 50 Hz or 25 Hz frame rates. These signals are synchronized with each other.

| PAL | 1080 25p | 25 fps LTC |
| 625-270 | 1080 50i | |

FRAME RESET 3   This frame reset signal runs at 3.000 Hz and is used for HD / LTC formats with 60 Hz, 30 Hz or 24 Hz frame rates. These signals are synchronized with each other.

1080 24p	24 fps LTC
1080 24sF	25 fps LTC
1080 30p	30 fps LTC [1]
1080 60p	
1080 60i	
720 60p	

1   Not drop frame.

Frame reset signal 1 is not synchronized with frame reset signals 2 or 3.

Time flow block diagram

The following time flow diagram shows time information is used at different points in the system. In particular, it illustrates how the different user inputs and configuration settings combine with the time base to create the timecode. An asterisk (*) denotes points of possible user input.
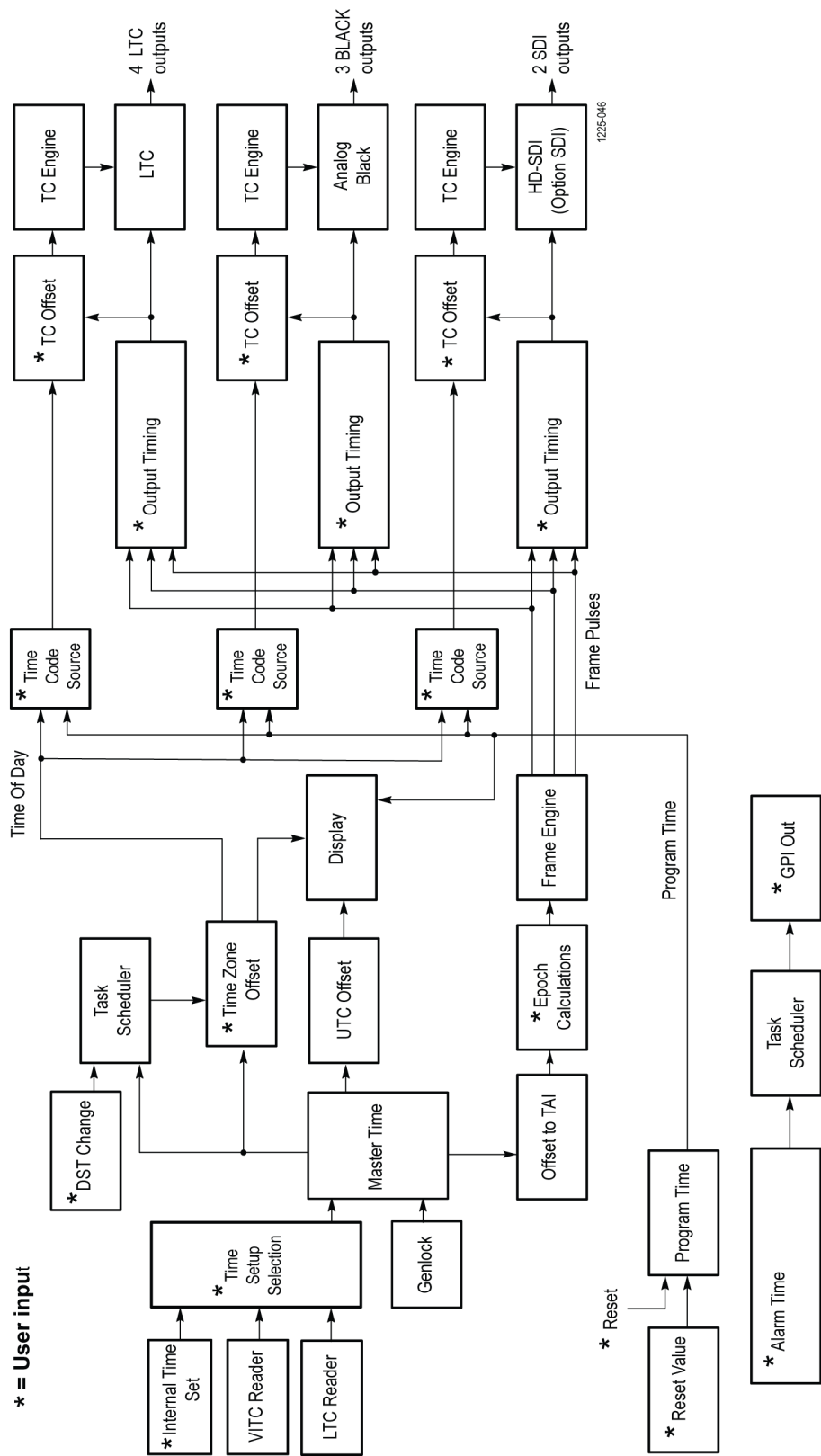
Figure 1: Time flow block diagram

The following paragraphs describe portions of the Time flow block diagram.

- **Internal Time Set ***. If you want to set Time Setup to internal mode, enter the current date and time and then set the Time Setup to Internal in order to transfer that time to the Master Time. The time zone offset information is used to convert local time to a master time. Set the local time zone offset before setting the internal time.

- **VITC Reader**. When the instrument is genlocked to NTSC or PAL, the Vertical Interval Timecode on the genlock reference input can be decoded and used as the time source. This time can be viewed on the status bar, and is used as the time source for all the time code outputs. Since the phase of the video signals are set by the genlock, the epoch system does not operate from the VITC input. If SMPTE309 date data is available, the time and date information on the VITC input will be used if enabled in the TIME OF DAY submenu. (See page 132, *Time of Day submenu*.)

- **LTC Reader**. When the reference source is set to INTERNAL, NTSC, PAL or HD SYNC, the LTC signal applied to the LTC 1 input can be used at the time source. This time can be viewed on the status bar and is used as a time source for all the time code outputs. If SMPTE309 date data is available, the time and date information on the LTC input will be used if enabled in the TIME OF DAY submenu. (See page 132, *Time of Day submenu*.)

- **Time Setup Selection**. The possible Time code sources depend on the selected Reference source. If Genlock is the selected reference source, then VITC, LTC, or internal time is available. If Internal is the selected reference source, then internal time is the time code source.

  If VITC or LTC is the time code source, then the time synchronization Mode needs to be set. There are three choices. Synchronize now sets the time when the user presses the ENTER button (if the incoming time is valid and stable). Synchronize once sets the time once when a valid and stable time code is detected. Follow sets the time every time a new stable and valid time is detected.

- **Genlock**. When NTSC or PAL is selected as the reference and the time source is LTC or VITC with ST309 date, then the timing of the reference sync may be used to improve the accuracy of the master time.

- **Master Time**. The Master Time is the basis for all timecode outputs and for the phase reference of all video outputs.

- **Offset to TAI**. TAI is the International Atomic Time, represented as the number of seconds since the epoch of 0:00:00 January 1, 1958. Proposed standard SMPTE 404M defines the SMPTE Epoch at that same moment. There are exactly 8040 days and 19 leap seconds between the SMPTE Epoch (TAI) and the GPS Epoch.

■ **Epoch Calculations ***. The number of seconds since the SMPTE Epoch is used to precisely align video frames with the Master Time clock. For example, an NTSC system operates at 29.97 frames per second (30 fps/1.001), so there are precisely 30,000 frames every 1001 seconds. By knowing the total number of seconds since the SMPTE Epoch, when all video frames were perfectly aligned, the instrument can determine "where" the pulse-per-second signal is located with respect to video framing. The Epoch adjustment is made in reference to the user-selected Epoch setting: January 1, 1958 or January 1, 1970.

■ **Frame Engine**. The frame engine supplies frame pulse signals based on the SMPTE Epoch to each video output. This ensures that they are properly aligned with respect to the calculated phase for the selected video format of each output.

■ **Output Timing**. Each video output has an independent offset that can be specified to shift that output in order to align the video and LTC signals in the studio. This time adjustment does not affect the timecode that is applied to that output; the signal and timecode stay together as the timing is changed. The timing offset range and resolution depend on the signal. See the specific output menu for details.

■ **Time Zone Offset ***. The SPG700 has a selectable offset between UTC and the local time, usually representing the local time zone. This offset can be specified in hours+minutes+seconds, allowing specification of time zones that do not align with the usual hours-only offset, or for other applications not related to time zones. You can also use this setting to set the internal time to calculate "backwards" to the Master Time.

When the input time source is set to VITC or LTC, the instrument works similar to how it works in internal mode, pre-correcting the master time of day by the time zone offset. This pre-correction assumes that the incoming time code has the correct local time, and causes the outgoing time codes to nominally match the incoming ones, regardless of time-zone offset. However, if the time code synchronization mode is set to "Synchronize now" or "Synchronize once", and the time-zone offset is changed after the time-code sync has occurred, then the time-zone change offsets the incoming and outgoing time codes until the user reasserts the time synchronization.

Additionally, if the time is being set by LTC or VITC with SMPTE309 date data, the system can be configured to use the time zone and DST from the input. (See page 132, *Time of Day submenu*.)

■ **DST Change ***. Daylight Saving Time (DST) changes twice a year in many time zones, but some locations do not observe daylight savings time. The SPG700 has a user programmable DST adjustment to the time zone offset that is made by adding or subtracting a specified amount from the current time setting. The scheduled date and time of the change must be programmed into the instrument. There are two methods for scheduling the DST offset:

- **Once**. In Once mode, the DST offset is applied only once on the date and time you specify. Set the DST offset to either add or subtract an hour from the time zone offset, depending on whether DST is starting or ending in your location.

- **Recurring**. In Recurring mode, the DST offset is applied when the DST START date and time that you specify occurs, and is removed when the DST END date and time that you specify occurs. The recurring DST offset can only be a positive number, such as one hour. The DST START/END dates are formatted as the DST rules are written (e.g., DST starts on the First Sunday in March at 02:00). For example, to change to daylight savings time, schedule the system to add one hour to the time zone offset at 02:00:00 (local time) on March 6, 2011. To return to standard time, schedule the system to remove the DST offset at 02:00:00 on November 6, 2011. At the scheduled time and date, the DST change is added to the time zone offset as seen from the instrument display. You can then program the next scheduled DST change.

An incoming VITC or LTC reference may have DST shift already applied. To avoid duplicating DST shifts, disable the DST SCHEDULER if the time of day reference has DST applied.

■ **Task Scheduler**. The task scheduler is responsible for triggering scheduled events at the appropriate time. This includes DST changes and triggered alarm outputs.

■ **TC Offset ***. Every timecode output has an independent offset (hours, minutes, seconds, frames) that can be added to the value of the selected timecode source.

■ **TC Engine**. The timecode engine runs at the rate specified through the user interface and generates the actual timecode bits needed for each output.

■ **LTC**. The instrument has four independent linear timecode outputs. Each output can be set independently with regard to timecode format, module timing, and timecode delay.

■ **Analog Black**. The instrument provides three analog sync outputs. Each output can be configured as NTSC or PAL Black burst (with optional VITC insertion) or HD trilevel sync.

■ **HD-SDI**. Option SDI provides two independent HD-SDI test signal generators, for which ancillary timecode (ATC) can be added.

■ **Program Time**. As an alternate to the local time of day, a program time counter can be used as a timecode source for any output. This counter can represent elapsed time, such as the timecode associated with program content during the editing process, for example.

■ **Reset Value**. The program time counter will start counting from the specified reset value. Program time can be reset to this value at any time using either the user interface or a general purpose interface (GPI) input.

■ **Alarm Time**. An alarm can be set to generate when the program time counter matches a predefined value. For example, you can specify the start timecode of your program content at 01:00:00:00. The program time can be initialized to 00:59:00:00 to start a one minute leader before the program. The alarm time could be set at 00:59:55:00 to signal a five second countdown before the program start, perhaps to signal a change from color bars to Black within the pre-program leader.

■ **GPI Out**. The instrument has two General Purpose Interface (GPI) outputs, either of which may be configured to begin when the program time matches a specified alarm time.

Web user interface

When the Web user interface is enabled in the System menu, you can use a Web browser to remotely control the instrument. Enter the IP address of the instrument in a supported Web browser to open the SPG700 Web Interface. (See Figure 5.) Click the various tabs to access the instrument settings and controls as you would using the front panel buttons.

NOTE. The Web user interface must be enabled from the System menu on the instrument front-panel before it can be accessed from a Web browser. (See page 109, System menu.)

Operational considerations

It is recommended that a maximum of four simultaneous users be connected to the instrument using the Web interface. If more users are connected, it may result in lower performance and inconsistent behavior.

Some front panel operations may interrupt or reduce the performance of the Web interface. For example, the Web server may experience temporary delays when a large file is being transferred using the USB port or when many buttons are being pressed on the front panel.

Levels of control   From the instrument front panel, use the Web User Interface setting in the System menu to control the level of instrument access from a Web browser. Use the left (◀) or right (▶) arrow button to select between the following options. Press the **ENTER** button to confirm the selection.

■ **Full-Control**. Allows a user to have full control of instrument settings when using the Web User Interface.

■ **Disable**. Disables the instrument from being accessed by the Web User Interface.

■ **Read-Only**. Allows a user to have read-only access to instrument settings when using the Web User Interface.

NOTE. Remote port 5000 is not required for the Web UI to function. If the SCPI remote is not required it should be disabled to increase security and prevent disruption by port scanners.

Supported Web browsers   For best results, use Google Chrome, Mozilla Firefox, Safari, or Internet Explorer 9.0 or later when you connect to the SPG700 Web Interface.

NOTE. The Web user interface requires Javascript to run.

Elements of the Web user interface

The following figure highlights elements of the Web user interface window. Some display elements are dependent on certain options being installed in the instrument.

NOTE. A red exclamation mark next to a menu item indicates that an alert exists. Click the item to view the alert details.
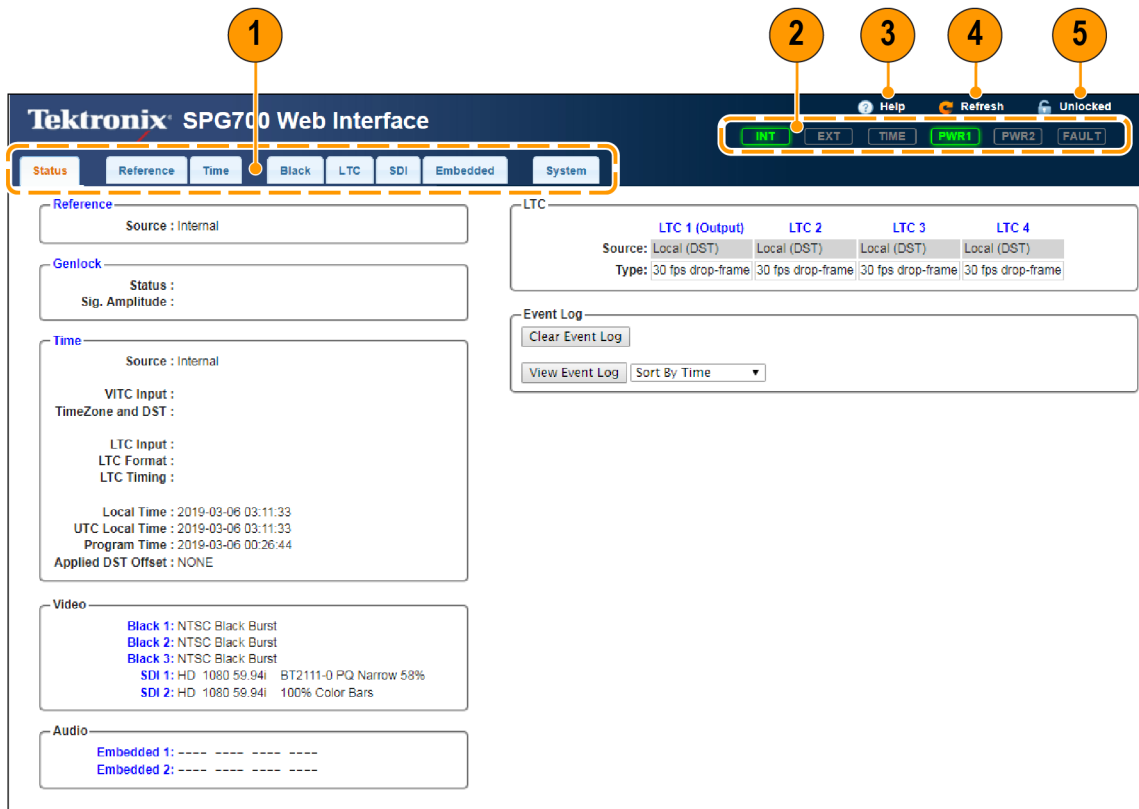
Figure 2: Example SPG700 Web User Interface window

Table 1: Elements of the Web user interface

Item number	Description
1	Menu tabs. Click a tab to access one of the following menus:

- **Status menu**. Use this menu to view the status of various instrument functions. You cannot make changes to instrument settings from the Status menu. For more information, see the *Status menu* section. (See page 107.)

- **Reference menu**. Use this menu to view or change the signal reference or genlock timing settings for the instrument. For more information, see the *Reference menu* section. (See page 55.)

- **Time menu**. Use this menu to view or change the time settings in the instrument. The settings are divided between the Time of Day, Daylight Savings Time, Program Time, and Jam Sync submenus. Click on the arrow next to the desired submenu to access that menu. For more information, see the *Time menu* section. (See page 131.)

- **Black menu**. Use this menu to view or change the settings for the Black outputs. You can configure the Black 1–3 tri-level sync signals. Click on the arrow next to the desired Black output to access the menu for that output. For more information, see the *Black menu* section. (See page 43.)

- **LTC menu**. Use this menu to view or change the settings for the LTC outputs. Click one of the selections for the desired LTC output to access the submenu for that output. For more information, see the *LTC menu* section. (See page 53.)

- **SDI menu (Option SDI only)**. Use this menu to view or change the settings for the SDI outputs. Click on the arrow next to the desired SDI output to access the menu for that output. For more information, see the *SDI button menu* section. (See page 59.)

- **AES menu**. At the release of this document, a Web interface for the AES menu was not available. For all instruments, use the AES button menu to view or change the settings for the Word Clock (48 kHz) output. For more information, see the *AES button menu* section. (See page 39.)

- **Embedded menu (Option SDI only)**. Use this menu to view or change the embedded audio settings for the SDI outputs. Click on the arrow next to the desired SDI output to access the menu for that output. For more information, see the *Embedded menu* section. (See page 49.)

- **System menu**. Use this menu to view or change general instrument settings and to view diagnostic results. The system settings includes Status, Presets, General Settings, SNMP Settings, GPI Settings, Options, and Diagnostics submenus. Click on the arrow next to the desired setting group to access the submenu for that group. For more information, see the *System menu* section. (See page 109.)

Table 1: Elements of the Web user interface (cont.)

Item number	Description
2	Indicators matching the indicators on the front panel of the instrument:
	■ **INT** and **EXT**. Indicates the status of the reference signal used to time signals. Click on INT or EXT to view the reference status on the Status menu tab.
	■ **TIME**. Indicates the status of the selected time input. Click on TIME to view the time status on the Status menu tab.
	■ **PWR1** and **PWR2**. Indicates the status of the Power Supply modules. Click on PWR1 or PWR2 to view the status of the Power Supply modules on the System menu tab.
	■ **FAULT**. Indicates the status of the instrument hardware. Click on FAULT to view the status of any faults on the System menu tab.
	For information about the possible states for each indicator, see the *SPG700 Installation and Safety Instructions*.
3	Click on Help to open a separate browser window that opens to the Tektronix SPG product Web page.
4	Click on Refresh to refresh the Web user interface.
5	Locked / Unlocked. Indicates whether the instrument front panel is locked or unlocked. Click to toggle the setting.

System settings available only by using the front panel

The System menu in the SPG700 Web Interface does not include all of the menu options that are available using the SYSTEM button on the instrument front panel. (See page 171, *SYSTEM button menu*.)

Information on the following menu items, which are available only from the front panel, is available as described below:

■ Backup and restore Presets to USB (See page 13, *How to backup/restore presets and user data*.)

■ Audio/video Epoch selection (See page 175, *Settings available only in the front-panel SYSTEM button menu*.)

■ Front panel time out period (See page 175, *Settings available only in the front-panel SYSTEM button menu*.)

■ Oven calibration (See the *SPG700 Installation and Safety Instructions* manual for instructions on how to calibrate the oven oscillator.)

■ Enable / Disable for SCPI remote

SNMP remote control

When the SPG700 is connected to an Ethernet network, you can configure the instrument to send SNMP traps to an NMS (Network Management Station) when certain errors are detected. If you intend to use SNMP commands to control the instrument, you must configure SNMP parameters.

SNMP configuration

The following table shows the SNMP parameters you can set using the System button SNMP submenu or the Web user interface.

Table 2: SNMP parameters

Setting	Description
Enable SNMP	Use this setting to turn on or off the remote access using SNMP.
Enable Traps	Use this setting to turn on or off the traps that are sent out through SNMP.
SNMP Traps	Use this setting to enable or disable the following traps. For more information about each trap, see the *SNMP TRAPS submenu* section. (See page 115.)
	■ Main fan fault
	■ Voltage error
	■ Temperature error
	■ Genlock input missing
	■ Loss of lock
	■ Near loss of lock
	■ VITC/LTC missing
	■ LTC out of SMPTE specifications
	■ Alarm time
	■ PS1 fault
	■ PS2 fault
	■ PS1 TWH (Temperature Weighted Hours)
	■ PS2 TWH (Temperature Weighted Hours)
Trap Destinations	Use this setting to set the IP addresses to which SNMP traps are sent through SNMP. Traps can be sent to up to four addresses when error conditions are detected.
	NOTE. A value of all zeroes for the address will disable that trap output.

Table 2: SNMP parameters (cont.)

Public Community	Use this setting to set the Public Community string. This string is effectively a password. Without this string, SNMP commands cannot read values from the instrument. ***NOTE.*** *The Public String is necessary for SNMP access to read values from the instrument.*
Private Community	Use this setting to set the Private Community string. This string is effectively a password. Without this string, SNMP commands cannot change values in the instrument. ***NOTE.*** *The Private String is necessary for SNMP access to write changes into the instrument.*

Download the MIB

You can download the SPG8000 MIB file from the SNMP Settings submenu under the System menu. (See page 114, *SNMP Settings submenu*.) The SPG8000, SPG8000A, and SPG700 share the same MIB file. Some of the commands in the file will apply to features and functions available only on the SPG8000 and SPG8000A.

How to backup/restore presets and user data

You can use the backup and restore functions to duplicate settings and signal files between different SPG700 generators.

You can view the USB drive status under the SYSTEM button menu (not available on the Web interface) and all user data using a USB drive that is connected to the instrument. The following information shows the status of the USB drive:

- **Not Connected** displayed when no USB drive is connected to the instrument.

- **Not Mounted** is displayed when a USB drive is connected to the instrument but is not mounted. Press the **ENTER** button to mount the drive. Normally, a USB drive will automatically mount when connected to the instrument.

- **Mounted** is displayed when a USB drive is connected to the instrument and is mounted. Press the **ENTER** button to safely unmount the drive. The message You May Now Safely Remove USB Drive appears when it is safe to remove the drive.

> ⚠ **CAUTION.** *To prevent the loss of data on the USB drive, be sure to unmount the USB drive before you remove the drive from the instrument.*

How the backup and restore operations work

During the backup operation, files are copied to a directory named "SpgBackup" in the root directory of the USB drive. The restore operation expects to copy files from this same directory.

All of the copy operations will create new directories/files on either the SPG700 or the USB drive as needed. If a file with the same name exists in the destination location, it will be overwritten. However, if a file exists in the destination location and not in the source location, the file will be left alone. Therefore, the restore and backup operations act as an overlay, and do not guarantee that there will not be additional files left in the destination location that did not exist in the source location.

Presets   When presets are copied, only the MSTATEX.YY files and enough directory structure to hold them in their correct locations (for example, SDI7/PRESET/MSTATE4.P00) will be copied or created.

NOTE. The preset file names use the format MSTATEX.PYY. In this example, X denotes the slot name, YY denotes the preset number (there are 13 possible presets). Separate presets are stored for each individual mainframe slot.

Only presets that have content are copied or written by the backup/restore processes. This is because only presets that have been saved have files associated with them and the backup/restore process copies only those files. Any preset that has never been saved will not have an associated file and therefore will not be copied.

All user data   When all of the user data is copied, every user file except for the FPGA configuration files will be copied. This function is useful in that all user-created files can be saved, restored, or copied to other SPG700 instruments.

User files are defined as any file that exists in the /app/F0 directory on the instrument. The files in this directory can include presets, signal files, frame picture files, logo files, sequence files, and for Option SDI, can also include text and font files. The user data files do not include the application software or any Linux files.

Memory requirements

It is recommended that you use the Flash Memory readout in the System button menu to determine how much memory is available on the instrument before you perform a restore operation. You can also go to the Status submenu of the System menu in the Web interface to see the amount of free and used space. Here is how much memory is required:

- If you are backing up or restoring only presets, you will need up to 1 MB of free space on the USB drive or in the flash memory of the instrument.

- If you are backing up or restoring all of the user data in the instrument, you will need up to 96 MB of free space on the USB drive or in the flash memory of the instrument.

If the backup or restore operation runs out of memory on the USB drive or the flash memory on the instrument before the operation is complete, the operation will copy as much data as it can and will then display an error message stating that the backup or restore operation was incomplete because the drive or device is full.

Backup/restore procedure

1. Connect a USB drive to the instrument.

2. Press the **System** button to select **System : PRESET**.

3. Verify the status of the USB drive:

   a. Press the up (▲) or down (▼) arrow button to select **System : USB <status>**.

   b. Verify that the USB status is **Mounted**.

   c. If the status is Not Mounted, press the **ENTER** button to mount the USB drive.

4. Press the up (▲) or down (▼) arrow button to select **System : BACKUP/RESTORE**.

5. Press the left (◄) or right (►) arrow button to select one of the following:

   - **Backup Presets to USB**

   - **Backup All User Data to USB**

   - **Restore Presets from USB**

   - **Restore All User Data from USB**

6. Press the **ENTER** button to start the selected backup or restore operation.

7. A warning message is displayed asking you to verify the operation. Press the **ENTER** button to proceed or press the **BACK** button to cancel the operation.

8. Monitor the progress of the file copy operation:

   a. During the first stage of the copy process, the display shows the names of the files as they are copied. Depending on the size of the files being copied, this may take a couple of minutes.

   b. When all of the files have been copied, the message "Finishing copy..." is displayed while the file system buffers are emptied. This message may appear for a couple of minutes.

   c. When the backup or restore operation is complete, the message "Backup completed successfully" or "Restore completed successfully" is displayed before the menu display returns to normal.

NOTE. If the USB drive or the flash memory on the instrument fills up before the backup or restore operation completes, an error message is displayed. Press the ENTER or BACK button to clear the error message. (See page 14, Memory requirements.)

---

9. After the backup or restore operation is complete, press the up (▲) or down (▼) arrow button to select **System : USB (Mounted)**.

10. Press the **ENTER** button to unmount the USB drive. After the message "You may now safely remove the USB drive" is displayed, the menu readout should change to **System : USB (Not mounted)**.

11. Remove the USB drive from the instrument.

How to transfer or install user files

You can use either an FTP client or a USB drive to transfer user files between instruments or to install user files directly on the instrument.

User files include test signals, logo overlays, and ID text overlay files. To install custom user files, the signal files must be installed in the proper directory on the instrument. (See page 21, *File structure required to install custom user files*.)

NOTE. *If you install new test signal files, you must reboot the instrument before you can output the new test signals. You do not need to reboot the instrument before you can use newly installed frame picture files, logo overlay files, or text string overlay files.*

To transfer or install user files using FTP

Perform the following steps to transfer or install user files using FTP:

1. Connect the instrument to your local Ethernet network or to a standalone Windows PC. See the *SPG700 Installation and Safety Instructions* for information about installing the instrument on a network.

2. On a computer connected to the same network as the instrument, open an FTP client such as Windows Explorer.

3. In the Windows Explorer command box, enter "ftp://IP address", where IP address is the network address assigned to the instrument.

NOTE. *Some FTP clients may ask for login credentials. In this case, login with a user name of "anonymous" and no password.*

4. The Windows Explorer window should immediately connect to the instrument and show the instrument file structure as shown below.
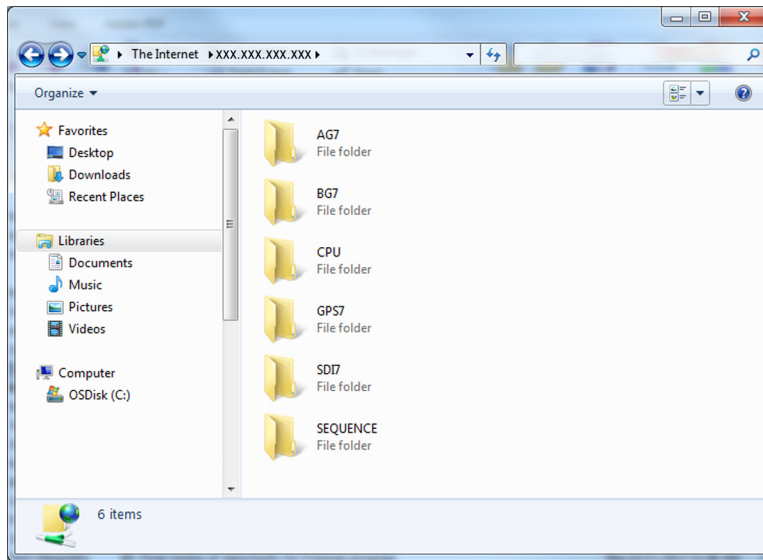
Figure 3: Example FTP view of the SPG700 file structure

5. Use Windows Explorer to drag and drop user files to or from the instrument.

⚠️ *CAUTION. If you are installing custom signal files on the instrument such as test signals or logo and ID text overlays, the signal files must be installed in the proper directory. Custom user files installed in the wrong directory location will be ignored by the instrument. (See page 21, File structure required to install custom user files.)*

*NOTE. If the flash memory on the instrument fills up before the copy operation completes, an error message similar to the one below is displayed. Click **OK** to clear the error message. You can use the SYSTEM : FLASH MEMORY menu selection to view the amount of free memory in the instrument.*
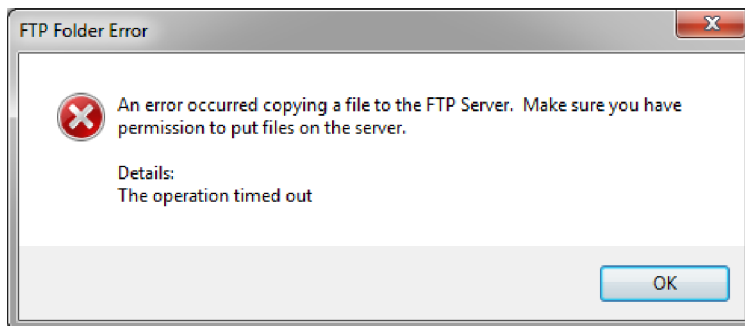
Figure 4: Example FTP error message when flash memory is full

6. After you are done transferring files, close the Windows Explorer window.

To transfer or install user files using a USB drive

You can use a USB drive connected to the USB port on the front of the instrument to transfer or install user files.

To transfer user files from an instrument to a USB drive

Perform the following steps to transfer user files from an SPG700 generator to a USB drive:

1. Insert a USB memory device into the USB port on the front of the instrument.

2. Verify that the USB device is properly installed:

   a. Press the **SYSTEM** button to access the SYSTEM menu.

   b. Use the up (▲) or down (▼) arrow button to select **SYSTEM : USB (Mounted)**.

   NOTE. The display will read "Mounted" if the USB device is properly installed. If the display reads "Unmounted" or "Not Connected", try to reinstall the USB device.

   If the instrument still does not recognize the USB device, attempt this procedure again using a different USB device from a well known brand that is 16 GB or less.

3. Use the up (▲) or down (▼) arrow button to select **SYSTEM : BACKUP/RESTORE**.

4. Use the left (◄) or right (►) arrow button to select one of the following options, and then press the ENTER button.

   - Select **Backup Presets to USB** if you want to transfer only the stored presets from the instrument.

   - Select **Backup All User Data to USB** if you want to transfer all user data including stored presets and user-created text, logo, picture, and test signal files.

5. In the overwrite confirmation display, press the **ENTER** button to perform the selected backup function.

6. During the backup process, progress messages are displayed. When the message Backup completed successfully is displayed, press any button to return to the SYSTEM menu display.

7. Use the up (▲) or down (▼) arrow button to select **SYSTEM : USB (Mounted)**.

8. Press the **ENTER** button to safely unmount the USB device. You can now use the USB device to transfer the saved files to another SPG700 generator or to restore user files after a firmware upgrade.

To install user files from a USB drive to an instrument

Perform the following steps to install user files from a USB drive to an instrument:

⚠ *CAUTION. In addition to transferring files from one instrument to another, you can use the Restore All User Data From USB function to directly install user-created text, logo, picture, and signal files on the instrument. In order to install user files, the files must be organized in specific directories on the USB drive. (See page 21, File structure required to install custom user files.)*

1. Insert a USB memory device containing the user files you want to install on the SPG700 generator into the USB port on the front of the instrument.

2. Verify that the USB device is properly installed:

   a. Press the **SYSTEM** button to access the SYSTEM menu.

   b. Use the up (▲) or down (▼) arrow button to select **SYSTEM : USB (Mounted)**.

   NOTE. The display will read "Mounted" if the USB device is properly installed. If the display reads "Unmounted" or "Not Connected", try to reinstall the USB device.

   If the instrument still does not recognize the USB device, attempt this procedure again using a different USB device from a well known brand that is 16 GB or less.

3. Use the up (▲) or down (▼) arrow button to select **SYSTEM : BACKUP/RESTORE**.

4. Use the left (◄) or right (►) arrow button to select one of the following options, and then press the ENTER button.

   - Select **Restore Presets From USB** if you want to install only the stored presets from another instrument.

   - Select **Restore All User Data From USB** if you want to transfer all user data including stored presets and user-created text, logo, picture, and signal files.

5. In the overwrite confirmation display, press the **ENTER** button to perform the selected restore function.

6. During the restore process, progress messages are displayed. When the message Restore completed successfully is displayed, press any button to return to the SYSTEM menu display.

7. Use the up (▲) or down (▼) arrow button to select **SYSTEM : USB (Mounted)**.

8. Press the **ENTER** button to safely unmount the USB device.

File structure required to install custom user files

In order to install custom user files from a USB drive, the files must be organized in the file structure described below. You can create the proper file structure by performing the Backup All User Data to USB function. You can then copy the directory structure from the USB drive to your computer. (See page 19, *To transfer user files from an instrument to a USB drive*.)

⚠ *CAUTION. If you are installing custom signal files on the instrument such as test signals or logo and ID text overlays, the signal files must be installed in the associated subdirectory for the file type in the SDI7 directory. Custom user files installed in the wrong directory location will be ignored by the instrument.*

The directory names listed below are case sensitive.

- A directory named **SpgBackup** is required at the top level of the USB drive.

- In the SpgBackup directory, a subdirectory named **SDI7** is required.

- In the SDI7 directory, subdirectories with the following names are required:

NOTE. All of the following subdirectories are not required to be in the SDI7 directory in order to be able to install user files. You only need the subdirectories related to the type of user files you are installing on the instrument. For example, if you are going to install only logo files, you need to have only the LOGO subdirectory exist in the SDI7 directory.

- ╺ LOGO – Use this directory to install only logo overlay files. The logo files must have a .bmp file name extension. (See page 71, *Logo overlay settings*.)

- ╺ PICTURE – Use this directory to install only frame picture files for use as test signals. The frame picture files must have a .bmp file name extension. (See page 95, *SDI picture file generation*.)

- ╺ SIGNAL – Use this directory to install only test signal files. The test signal files must have a .xml file name extension.

- ╺ TEXT – Use this directory to install only ID text overlay files. The ID text files must have a .txt file name extension. (See page 72, *ID Text overlay settings*.)

The following figure shows how the required directory structure for installing custom user files looks using Windows Explorer.
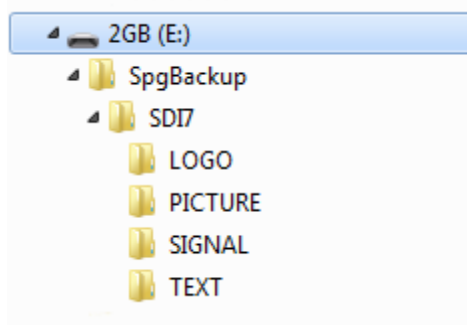
Figure 5: File structure for installing custom user files

How to upgrade the instrument firmware

Tektronix releases software and firmware updates for products to add new features and to fix product problems. You can find the latest firmware for your product at the Tektronix Web site (www.tek.com/downloads).

Determine if a firmware upgrade is needed

Before you begin the upgrade, perform the following steps to determine if the firmware on your instrument should be upgraded and to backup your user files.

> ⚠ **CAUTION.** *The firmware upgrade process replaces all installed user files with the factory default files. To prevent the loss of your user files, including custom test signals, logo and ID text overlays, and saved presets, be sure to backup all of your user data before you perform the upgrade. The following procedure includes instructions for backing up your user data.*

1. Verify the current firmware version installed on the instrument:

   a. Press the **SYSTEM** button to access the SYSTEM menu.

   b. Press the up (▲) or down (▼) arrow button to select **SYSTEM : VERSION INFO (F/W)**.

   c. In the second line of the display, note the firmware version number of the instrument.

Installed firmware version number	

2. Verify the latest version of software at the Tektronix Web site:

   a. On a computer, use a Web browser to navigate to the following Tektronix Web site: **www.tek.com/downloads**.

   b. On the Downloads Finder Web page, search by model number (such as SPG700) and filter by software and software type to locate the firmware-upgrade package for the instrument.

   c. Note the latest version number of the firmware-upgrade package(s).

Web site firmware version number	

3. If the latest firmware version at the Web site is the same as the version installed on your instrument, you do not need to upgrade the instrument firmware.

4. If the latest firmware version at the Web site is newer than the version on your instrument, download the latest firmware package to your computer.

5. After the firmware package ZIP file is downloaded, extract the following files into the directory of your choice: transfer.exe and firmware.pkg.

NOTE. *If a readme.txt file is included in the firmware package, be sure to read the file before you upgrade the firmware.*

6. If the firmware in your instrument needs to be upgraded, verify which options are currently installed before you install the software. After you install the upgrade, you will verify that any previously installed options are still enabled.

    a. Connect the instrument and computer to your local Ethernet network. See the *SPG700 Installation and Safety Instructions* for information about installing the instrument on a network.

    b. Press the **SYSTEM** button to access the SYSTEM menu.

    c. Press the up (▲) or down (▼) arrow button to select **SYSTEM : OPTIONS**. The second line of the display lists the options, if any, that are installed in the instrument. None is displayed if no options are installed, and SDI 3G is displayed if Option SDI is installed.

```
SYSTEM : OPTIONS
  SDI 3G
```

    d. Make a note of the installed options.

7. If the firmware in your instrument needs to be upgraded, to prevent the loss of your user files, be sure to backup your user files to a USB drive. (See page 19, *To transfer user files from an instrument to a USB drive*.) You will restore the user files at the end of the upgrade procedure.

CAUTION. *To prevent the loss of your user files, be sure to use the Backup All User Data to USB option in the backup procedure.*

Firmware upgrade overview

There are two methods for upgrading the instrument firmware:

■ Using a USB memory device (See page 25, *USB firmware upgrade*.)

■ Using an Ethernet network (requires a Windows PC) (See page 28, *Network firmware upgrade*.)

The time required to complete the firmware upgrade is approximately 10 minutes.

⚠ **CAUTION.** *The instrument automatically reboots at the end of the upgrade process. Do not perform the upgrade while the instrument is in use as a sync reference.*

Once the instrument has started to erase internal flash, do not remove power from the instrument. If you do so, the instrument flash may be corrupted and you will have to run the recovery procedure. (See page 30, Firmware upgrade troubleshooting.)

NOTE. If power to the instrument is lost before it begins erasing the internal flash, you can restart the firmware upgrade after the instrument reboots. If the instrument displays only a blank screen after power is reapplied, see the troubleshooting section for help. (See page 30, Firmware upgrade troubleshooting.)

If you have loaded the instrument memory with a large number of test signals or frame picture files, you may not be able to upgrade the instrument firmware because the memory is too full. If you receive a memory error while attempting to upgrade the firmware, you need to delete some of the test signal or frame picture files and then perform the upgrade.

USB firmware upgrade

Use the following steps to upgrade the instrument firmware using a USB memory device.

1. Insert a USB memory device into a USB port of the computer containing the latest instrument firmware.

2. On the computer, navigate to the USB device.

3. On the USB device, create a directory named **SpgUpgrd**.

⚠ **CAUTION.** *To prevent upgrade failure, be sure to correctly name the upgrade directory. The directory name is case sensitive, with the "S" and the "U" in SpgUpgrd being upper case.*

4. Open the SpgUpgrd directory and copy the firmware.pkg file from the downloaded ZIP file to the USB device. The USB device should have a directory path of **SpgUpgrd\firmware.pkg**.

5. Eject and safely remove the USB device from the computer.

6. If necessary, power on the instrument and wait for the instrument to fully boot up before inserting the USB device into the front-panel USB port on the instrument.

7. Press the **SYSTEM** button to access the SYSTEM menu.

8. Verify that the USB device is properly installed by pressing the up (▲) or down (▼) arrow button to select **SYSTEM : USB (Mounted)**.

NOTE. The display will read "Mounted" if the USB device is properly installed. If the display reads "Unmounted", try to reinstall the USB device.

If the instrument still does not recognize the USB device, attempt this procedure again using a different USB device from a well known brand that is 16 GB or less.

9. Press the up (▲) or down (▼) arrow button to select **SYSTEM : FIRMWARE UPGRADE**.

10. Press the left (◄) or right (►) arrow button to select **USB Upgrade**, and then press the **ENTER** button. A confirmation message is displayed as shown below.

*NOTE. If the instrument displays the message **ERROR: SpgUpgrd/firmware.pkg not found**, make sure you have the correct directory path on the USB device and then restart this procedure at step 6.*

```
*          Upgrade firmware 1.1 to X.X?          *
*          Yes : ENTER / No : BACK               *
```
3080-007

11. A second confirmation is displayed as shown below to remind you that the upgrade will delete all user-created files on the instrument.

⚠️ *CAUTION. If you did not backup your user files as part of the upgrade preparation process, it is recommended that you press the BACK button to cancel the upgrade and then backup your user files before performing the upgrade. (See page 19, To transfer user files from an instrument to a USB drive.) You will restore the user files at the end of the upgrade procedure.*

```
* !      User data will be lost. Continue?      ! *
*            Yes : ENTER / No : BACK            *
```
3080-065

12. Press the **ENTER** button to proceed with the upgrade or press the **BACK** button to cancel the upgrade.

13. When you press ENTER, the upgrade process begins. During the upgrade process, the instrument displays messages indicating the upgrade status.

⚠️ *CAUTION. Once the instrument has started to erase internal flash, do not remove power from the instrument. If you do so, the instrument flash may be corrupted and you will have to run the recovery procedure. (See page 30, Firmware upgrade troubleshooting.)*

14. If the instrument does not reboot at the completion of the firmware upgrade, remove and then reconnect the power cable(s).

15. Remove the USB device after the upgrade is complete:

⚠️ *CAUTION. To prevent a loss of data on the USB device, use the SYSTEM menu to unmount the USB device before removing it from the instrument.*

    a. Press the **SYSTEM** button.

    b. Press the up (▲) or down (▼) arrow button to select **SYSTEM : USB (Mounted)**, and then press the **ENTER** button.

    c. Remove the USB device from the instrument when the message **You may now safely remove the USB drive** appears.

16. Proceed to *Verify the firmware upgrade and reinstall user files*. (See page 30.)

Network firmware upgrade

Use the following steps to upgrade the instrument firmware using a network connection:

1. Connect the instrument and a Windows PC to your local Ethernet network or directly connect the instrument to a Windows PC. See the *SPG700 Installation and Safety Instructions* for information about installing the instrument on a network.

2. Prepare the instrument for the firmware upgrade:

   a. Press the **SYSTEM** front panel button.

   b. Press the up (▲) or down (▼) arrow button to select **SYSTEM : FIRMWARE UPGRADE**.

   c. Press the left (◄) or right (►) arrow button to select **Network Upgrade**, and then press the **ENTER** button. A confirmation message is displayed as shown below.

   ```
   *          Begin network firmware upgrade?         *
   *               Yes : ENTER  /  No : BACK          *
   ```
   3080-008

   d. A second confirmation is displayed as shown below to remind you that the upgrade will delete all user-created files on the instrument.

   ⚠ **CAUTION.** *If you did not backup your user files as part of the upgrade preparation process, it is recommended that you press the BACK button to cancel the upgrade and then backup your user files before performing the upgrade. The instructions for backing up user files is described in the section To transfer user files from an instrument to a USB drive. (See page 19.) You will restore the user files at the end of the upgrade procedure.*

   ```
   * !        User data will be lost. Continue?     ! *
   *               Yes : ENTER  /  No : BACK          *
   ```
   3080-065

   e. Press the **ENTER** button to proceed with the upgrade or press the **BACK** button to cancel the upgrade.

   f. When you press ENTER, a **Waiting for network connection** message is displayed along with the IP address of the instrument. This indicates the instrument is ready to be upgraded. An example display is shown below.

   ```
   Waiting for network connection . . .
   IP Address : XXX.XXX.XXX.XXX  (DHCP)
   ```
   3080-009

3. Perform the firmware upgrade:

   a. On the PC, double-click the **transfer.exe** file to launch the transfer program.

   b. Type the IP address or DNS name of the instrument you are upgrading, and then press **Enter**. This starts the firmware upgrade process. Messages indicating the progress of the upgrade appear in the transfer program window and on the instrument display.

⚠ *CAUTION. Once the instrument has started to erase internal flash, do not remove power from the instrument. If you do so, the instrument flash may be corrupted and you will have to run the recovery procedure. (See page 30, Firmware upgrade troubleshooting.)*

NOTE. The upgrade will not proceed until all of the firmware data is transferred to the instrument. Once the upgrade has started, the instrument will attempt to complete the upgrade even if it loses contact with transfer.exe. So that you can monitor the progress of the upgrade, it is suggested that you do not close the transfer.exe window until the transfer utility asks for another IP address.

Figure 6: Sample of transfer.exe window after the upgrade is complete

4. If the instrument does not reboot at the completion of the firmware upgrade, remove and then reconnect the power cable.

5. Proceed to *Verify the firmware upgrade and reinstall user files*. (See page 30.)

Verify the firmware upgrade and reinstall user files

1. After the instrument reboots at the end of the upgrade process, press the **SYSTEM** button to access the SYSTEM menu.

2. Press the up (▲) or down (▼) arrow button to select **SYSTEM : OPTIONS**. The second line of the display lists the options, if any, that are installed in the instrument. None is displayed if no options are installed, and SDI 3G is displayed if Option SDI is installed.

```
SYSTEM : OPTIONS
  SDI 3G
```

3. Verify that the options listed match those that you noted before the upgrade.

4. Press the up (▲) or down (▼) arrow button to select **SYSTEM : VERSION INFO (F/W)**. The second line of the display lists the installed firmware version.

5. Verify that the displayed firmware version is the same version as the firmware package you used to perform the upgrade.

6. If you backed up your user files before you upgraded the firmware, reinstall your user files as described in the section *To install user files from a USB drive to an instrument*. (See page 20.)

⚠ **CAUTION.** *To prevent the loss of your user files, be sure to use the **Restore All User Data from USB** option in the restore procedure.*

Firmware upgrade troubleshooting

If a power failure occurs during the upgrade and the instrument has a blank screen when you reapply power, perform the following procedure.

1. Connect an Ethernet cable between the instrument and your computer or local Ethernet network.

2. Remove the power cable to turn off the instrument.

3. Press and hold the STATUS button and then reconnect the power cable. Continue to hold the STATUS button until the message **Select upgrade network speed:** appears on the top line of the LCD display.

4. Press the left (◄) or right (►) arrow button to select a network speed (10BaseT, 100BaseT, or 1000BaseT), and then press the **ENTER** button. If you do not know your network speed, the 100BaseT selection is recommended.

5. When the message **Select upgrade network mode:** is displayed, press the left (◄) or right (►) arrow button to select from the following modes and then press the **ENTER** button.

 - **DHCP** – Use this selection if the instrument is connected to a network with DHCP support. An IP address will be assigned to the instrument from your network server.

 - **Local IP (192.168.1.1)** – Use this selection if the instrument is connected to a network without DHCP support or is connected to a standalone computer, and you want to use the factory default, static IP address of 192.168.1.1 for the upgrade.

NOTE. When you select either the Local IP or the Saved static IP upgrade mode, you cannot edit the displayed IP address. The IP address cannot be edited when the instrument is in recovery mode.

 - **Saved static IP (IP address)** – Use this selection if the instrument is connected to a network without DHCP support or is connected to a standalone computer, and you want to use the previously saved static IP address assigned to the instrument for the upgrade. The saved IP address is displayed.

 - **Quit and continue booting** – Use this selection to quit the upgrade process and leave the instrument in its current condition.

6. If you did not select Quit and continue booting in the previous step, the top line of the instrument display will show the message **Waiting for network connection** and the second line will list an IP address. Make a note of the displayed IP address.

7. Enter the IP address you noted in the previous step into the upgrade transfer application window on your PC to restart the upgrade process.

⚠️ *CAUTION. To prevent upgrade failure, leave the instrument power on during the upgrade process. The upgrade process may take up to 15 minutes to complete.*

8. When the upgrade is complete, the instrument should reboot. If it does not, cycle the power.

If you continue to experience an upgrade problem, contact Tektronix customer support or your local Tektronix representative for assistance.

How to operate an instrument with two power supplies (Option DPW only)

The standard instrument has one Power Supply module installed. With Option DPW, a second hot-swappable, redundant (backup) Power Supply module is provided. When two Power Supply modules are installed in the instrument, one is configured as the primary supply and the other is configured as the backup supply.

In the event that the primary supply fails, the backup supply automatically provides power to maintain instrument operation. You can remove and replace a failed supply without having to remove the instrument from operation. (See page 35, *To hot-swap a Power Supply module*.)

Power supply status

The status of the Power Supply modules can be viewed from the front or rear of the instrument. On the front panel, the PWR1 and PWR2 indicators illuminate using various colors to show the status of the Power Supply modules. The rear panel of each Power Supply module has a STATUS LED that matches the status shown on the PWR1 and PWR2 indicators. See the *SPG700 Installation and Safety Instructions* for information about the power supply status indicators.

You can use the SYSTEM menu to perform a load test on the backup supply and to view voltage levels in the instrument.

Temperature weighted hours (TWH)

The instrument keeps track of the age of a Power Supply module by calculating the temperature weighted hours (TWH). You can view the TWH of each installed supply using the SYSTEM : DIAGNOSTICS menu.

TWH calculation method. When the outside air temperature is at 25 °C or cooler, the Power Supply module is expected to last 15 years. As the outside air temperature rises to the maximum operating temperature of 50 °C, the expected life of the supply decreases to 5 years. Every hour, the instrument measures the outside temperature and increments the temperature weighted hours count in response to the measured temperature.

When the TWH value reaches a value of 131,400, then the associated PWR1 or PWR2 indicator will be set to orange to indicate that the supply should be replaced.

NOTE. When two Power Supply modules are installed, the active supply runs warmer than the backup supply. Therefore, the TWH of the active supply will increase faster than the backup supply.

To configure the preferred (active) supply

Perform the following steps to configure which Power Supply module is the preferred (active) supply:

NOTE. The preferred supply configuration only applies if two Power Supply modules are installed and both of the supplies are connected to a power source. If there are two Power Supply modules installed but one of the supplies has a failure, the good supply will be used to power the instrument regardless of the preferred supply configuration.

The recommended usage strategy is to configure one supply as preferred, and use the second supply only in case the first supply has a failure. This usage strategy allows the backup supply to have the maximum remaining life when it is needed.

The preferred supply configuration is not saved as part of the preset system. Therefore, the preferred supply configuration will not change when you activate any of the system presets, including the Factory Default preset. (See page 112, Presets submenu.)

The following procedure uses the front panel controls on the instrument to configure the preferred (active) supply. You can also use the System > General Settings submenu in SPG700 Web Interface to configure the preferred supply. (See page 113, General Settings submenu.)

1. Check the status of the front-panel PWR1 and PWR2 indicators:

   - Bright green indicates the preferred (active) supply.

   - Dim green indicates the inactive (backup) supply.

   NOTE. If the color of the PWR1 or PWR2 indicators is other than bright or dim green, service the faulty Power Supply module before proceeding.

2. Check the temperature weighted hours of the installed supplies:

   NOTE. It is recommended that you configure the supply with the most temperature weighted hours to be used as the primary preferred supply. This allows for the newer supply to be preserved so it can provide the best possible backup should the primary supply fail. (See page 32, Temperature weighted hours (TWH).)

   a. Press the **SYSTEM** button to access the SYSTEM menu.

   b. Press the up (▲) or down (▼) arrow button to select **SYSTEM : DIAGNOSTICS**, and then press the **ENTER** button to access the DIAGNOSTICS menu.

c. Press the up (▲) or down (▼) arrow button to select **SYSTEM : DIAGNOSTICS : POWER SUPPLY 1**. The second line of the display will list the number of hours the supply has been the active supply and the backup supply.

d. Press the right (►) arrow button to display the number of temperature weighted hours of the first supply as shown below. Note the number of hours of hours shown.

```
SYSTEM : DIAGNOSTICS : POWER SUPPLY 1
  Tmp Wtd: 0000677 (OK)(limit:131400)
```

3080-063

e. Press the up (▲) or down (▼) arrow button to select **SYSTEM : DIAGNOSTICS : POWER SUPPLY 2**.

f. Press the right (►) arrow button to display the number temperature weighted hours of the second supply. Note the number of hours of hours shown.

3. If the Power Supply module with the greatest number of temperature weighted hours is not the currently the preferred supply, then continue this procedure. Otherwise, you do not need to change the preferred supply configuration.

4. If you want to change the preferred supply configuration, press the **SYSTEM** button to access the SYSTEM menu.

5. Press the up (▲) or down (▼) arrow button to select **SYSTEM : POWER SUPPLY PREFERRED SELECT**.

6. Press the left (◄) or right (►) arrow button to display the supply you want to be the primary (active) supply: Power Supply 1 or Power Supply 2. The second line of the display shows the supply status: **Active, Preferred** or **Inactive**.

NOTE. When viewed from the front of the instrument, Power Supply 1 is the left Power Supply module and Power Supply 2 is the right Power Supply module. This matches the orientation of the PWR1 and PWR2 indicators on the front panel.

---

7. If status of the supply is Inactive, press the **ENTER** button to change the status to Active, Preferred. The front-panel indicator for the selected supply should change to bright green.

To hot-swap a Power Supply module

This procedure describes how to replace a Power Supply module while the instrument is in operation. Perform the following steps to hot-swap a Power Supply module:

⚠ **WARNING.** *Disconnect the power cord from the Power Supply module before you remove the module from the instrument. Also, do not connect a power cord to the Power Supply module while the module is not installed in the instrument. There are dangerous high voltages inside the module when the power cord is connected.*

⚠ **CAUTION.** *To prevent an unexpected shutdown of the instrument, be sure to unplug the correct power cord if you are replacing a faulty Power Supply module. (See Figure 7.)*

When viewed from the front of the instrument, Power Supply 1 is the left Power Supply module and Power Supply 2 is the right Power Supply module. This matches the orientation of the PWR1 and PWR2 indicators on the front panel. The STATUS LED on the rear panel of each Power Supply module will match the status shown by the front-panel PWR1 and PWR 2 indicators.

1. Remove the power cable from the Power Supply module that you are removing or replacing.

2. Pull out the handle located at the bottom of the supply. (See Figure 7.)

3. While pushing the retaining latch to the left, use the handle to pull the Power Supply module out of the instrument.

4. Insert the replacement supply into the instrument until it latches into place.

5. If necessary, push the handle of the supply into the storage position.

6. Connect the power cable to the Power Supply module you installed.

7. Check that the status of the Power Supply module you just installed is bright or dim green.

8. If desired, change the preferred supply configuration. (See page 33, *To configure the preferred (active) supply.*)

NOTE. *It is recommended that you configure the supply with the most temperature weighted hours to be used as the primary preferred supply. This allows for the newer supply to be preserved so it can provide the best possible backup should the primary supply fail.*
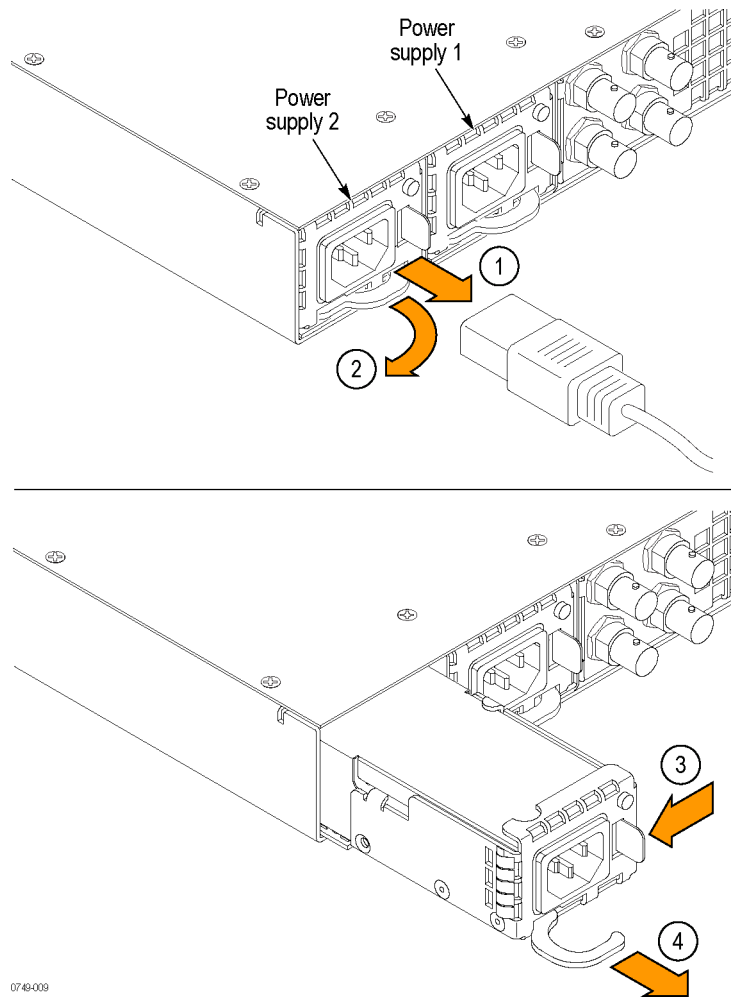
0749-009

Figure 7: Removing a Power Supply module

How to use Stay Genlock®

About Stay Genlock®

Stay GenLock® is a digital genlock technology developed by Tektronix to provide additional robustness and stability for genlocked Sync Pulse Generators (SPGs), as in a master/slave configuration.

If the external reference is removed from the genlock input, the instrument must use the internal oscillator as a frequency reference. Although the OXCO is a precision component, small frequency differences are inevitable. However, the Stay GenLock® technology maintains a history of the clock frequency, and therefore attempts to hold the last stable frequency before genlock was lost.

See the *Video Sync Pulse Generator and Electronic Changeover Unit System Integration Technical Reference* manual for more information about the Stay Genlock® function.

To enable Stay Genlock®

To enable the Stay GenLock® function on the instrument, perform the following steps:

NOTE. The following procedures use the front panel controls on the instrument to enable Stay GenLock®. You can also use the Reference menu in SPG700 Web Interface to enable Stay GenLock®. (See page 55, Reference menu.)

---

1. Press the front-panel **REFERENCE** button to access the REFERENCE menu.

2. Use the up (▲) or down (▼) arrow button to display **REFERENCE : LOCK LOSS ACTION**.

3. Use the left (◄) or right (►) arrow button to display **Stay at Current Frequency**, and then press the **ENTER** button to confirm the selection.

How to use Genlock Lock Action mode

In some cases, locking to a reference can cause a disruption or *shock* to the sync signals. To prevent this disruption, Genlock Lock Action mode can be set so you have to allow the system to lock or relock to the reference. This mode is supported when locking to NTSC, PAL, tri-level, and CW signals.

Use the following steps to access Genlock Lock Action mode:

1. Press the **REF** button.

2. Use the up (▲) or down (▼) arrow button to display the **REFERENCE : GL LOCK ACTION MODE** menu.

3. Use the left (◄) or right (►) arrow button to display either **Automatic** or **Wait for user approval**.

In Automatic mode, the system will lock as soon as the conditions allow. In the Wait for user approval mode, the system will not lock until you allow it. While waiting for you to approve a lock, the **EXT** indicator on the front panel will be red, and the lock status readout will indicate **Unlocked - waiting for user approval**.

To approve the system to lock, use the following steps:

1. Press the **REF** button.

2. Use the up (▲) or down (▼) arrow button to display the **REFERENCE: GL MANUAL LOCK APPROVAL** menu.

3. Follow the instructions, then press **ENTER** to approve the lock.

The approval will be active for two seconds to allow the lock to occur. If the system is not able to lock, it will revert to waiting for the lock approval state. The **Lock Action Mode** feature is supported by the Web UI.

AES menu

Use the AES button menu to view and configure the timing offset of the Word Clock (48 kHz) and DARS outputs and to set the signal level of the Word Clock output.

NOTE. *In the current software release, the SPG700 Web Interface does not support the AES menu. Use the AES button on the front panel to access the menu selections described below.*

Menu diagram   The following figure shows the main menu diagram for the AES button.
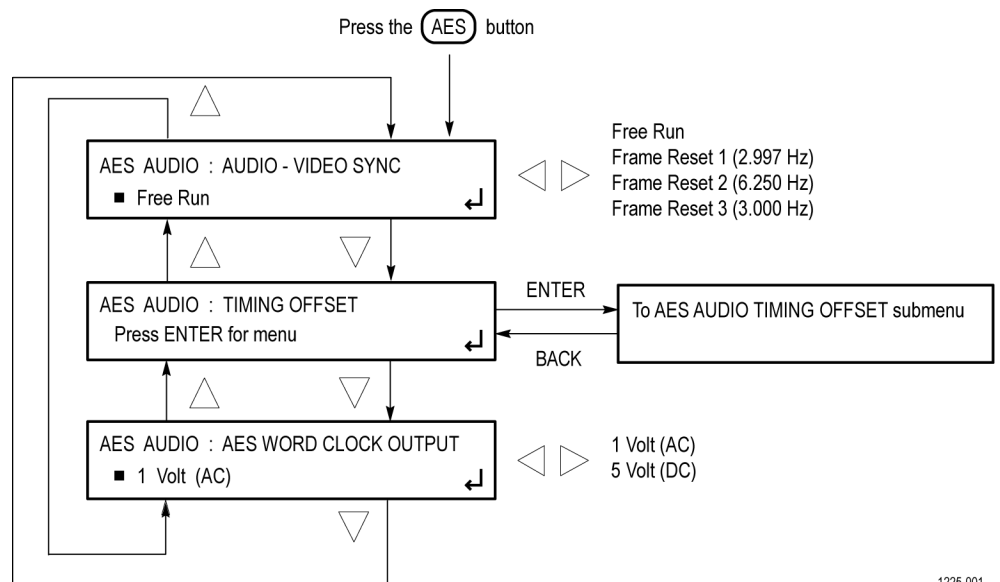
Figure 8: AES button menu diagram

AUDIO-VIDEO SYNC   This menu item selects the frame reset signal that is synchronized with the Word Clock and DARS signal outputs. Use the left (◄) or right (►) arrow button to make the selection.

The selection items are **Free Run**, **Frame Reset 1 (2.997 Hz)**, **Frame Reset 2 (6.250 Hz)**, and **Frame Reset 3 (3.000 Hz)**. For Free Run, the Word Clock and DARS signals are not synchronized with any of the frame reset signals. Press the **ENTER** button to enable the selection.

NOTE. If the frame reset signal used by the Word Clock and DARS signals is reset by a change of the video format, the Word Clock and DARS signal timing is also reset.

TIMING OFFSET   Press the **ENTER** button to access the **AES TIMING OFFSET** submenu. Use this submenu to set the timing offset of the Word Clock and DARS outputs relative to the genlock signal or the internal reference signal.(See page 40.)

AES WORD CLOCK OUTPUT   Sets the signal level of the Word Clock output. Use the left (◄) or right (►) arrow button to select **1 Volt (AC)** or **5 Volt (DC)**. Press the **ENTER** button to enable the selection.

AES TIMING OFFSET submenu

The following menu opens when you press ENTER in the AES button menu with TIMING OFFSET selected. (See Figure 8 on page 39.)
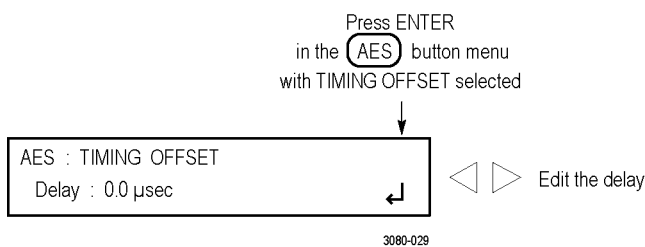
Figure 9: AES TIMING OFFSET submenu diagram

Use the left (◄) or right (►) arrow button to change the timing offset value in 1 μs steps. Set the value from –160 ms to +160 ms. A minus value is set as **Advance** and a plus value is set as **Delay**.

NOTE. You can reset the timing offset to zero by pressing the left (◄) and right (►) arrow buttons simultaneously.

You cannot adjust the timing offset when Free Run is selected as the AUDIO-VIDEO SYNC mode. (See page 39, AES menu.)

AES menu factory default settings

The following table shows the settings for the AES button menu that are reset when you use the PRESET submenu to recall the factory default settings. (See page 112, *Presets submenu*.)

Table 3: AES button menu factory default settings

Menu item name	Settings
AUDIO-VIDEO SYNC	Free Run
TIMING OFFSET (Delay or Advance)	0.0 μsec
AES WORD CLOCK OUTPUT	1 Volt (AC)

Black menu

Use the Black menu to view and configure the Black outputs. Click one of the bars for the three Black outputs (1, 2, or 3) to open the configuration submenu for that output. The bars for each Black output lists the current signal being output (i.e. NTSC Black Burst).

The following figure shows the Black menu with the Black 2 submenu expanded. Most of the entries in all three submenus are the same with the differences noted below.
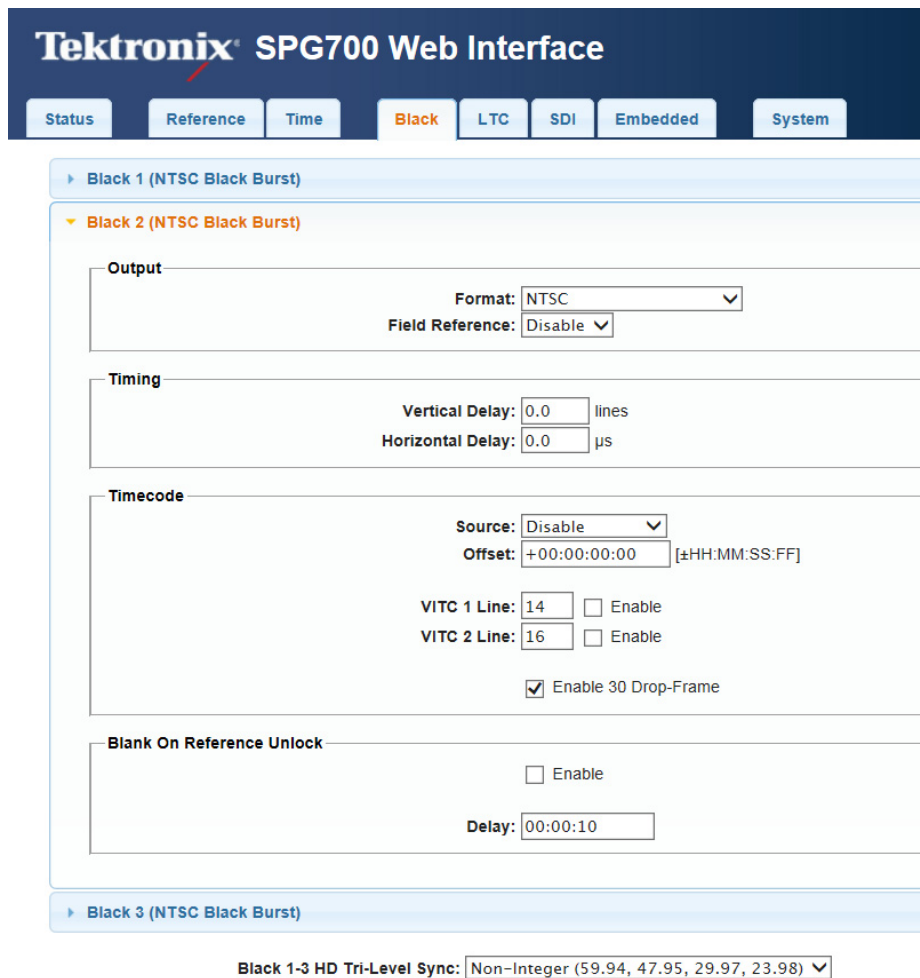
Figure 10: Black menu with the Black 2 submenu expanded

NOTE. *Black outputs 1–3 are a group that use the same HD tri-level sync rate.*

When the instrument is in Factory mode, a Calibration menu option is available. See the SPG700 Service Manual for more information.

Black Output settings

This submenu contains the Format and Field Reference selections.

Format Use drop-down list to select the signal format for the selected Black output.

Not all of the formats are available for the Black outputs; the available format choices depend on the following:

■ The CW 10 MHz format appears only for the Black 3 output. When CW 10 MHz is the selected output format, other Black menu items are unavailable for the Black 3 output.

■ The available HD output formats depend on whether the HD tri-level sync rate for the selected Black output is set to integer or non-integer. (See Table 4.)

Table 4: Black output formats

Non-integer formats	Integer formats
NTSC	NTSC
PAL	PAL
NTSC-J	NTSC-J
CW 10 MHz [1]	CW 10 MHz [1]
1080 59.94i	1080 60i
1080 23.98sF	1080 50i
1080 29.97p	1080 24sF
1080 23.98p	1080 30p
1080 59.94p	1080 25p
1080 47.95p	1080 24p
720 59.94p	1080 60p
1 PPS	1080 50p
	1080 48p
	720 60p
	720 50p
	1 PPS

[1] The CW 10 MHz format selection appears only for the Black 3 output.

Field Reference This menu item is available only for non-HD formats. Use the drop-down list to select **Enable** or **Disable** for the field reference on the selected Black output.

Black Timing settings

Use these settings to adjust the timing offset of the selected Black output relative to the internal reference signal. The range of the timing adjustment depends on the format of the selected Black output.

Vertical Delay

Enter the Vertical Delay in 1 line increments for the selected Black output.

Horizontal Delay

Enter the Horizontal Delay in increments based on the format of the selected Black output.

NOTE. If you are using the 50, 59.94 or 60 Hz progressive sync as a genlock source, as well as LTC as a time-code source, there are two possible alignments for the resulting system. Alignment can be checked by looking at the LTC timing status screen. If the timing is near zero, then it is aligned. If the timing is near a frame of offset, then it is not aligned.

You will need to unlock and re-lock the reference to achieve the desired alignment if this is important to the application you are using. Alternatively, you can use a lower frame rate video reference like NTSC, PAL, or 1080i tri-level.

The following table shows the Vertical Delay line settings and Horizontal Delay adjustment ranges.

Table 5: Black output timing adjustment ranges

Format name	Line settings	Coarse settings (µs)	Fine settings (ns)
NTSC	± 525	± 63.5556	± 10.00
PAL	± 1250	± 64.0000	± 10.00
1080 60i	± 562	± 29.6296	± 10.00
1080 59.94i	± 562	± 29.6593	± 10.00
1080 50i	± 562	± 35.5556	± 10.00
1080 24sF	± 562	± 37.0370	± 10.00
1080 23.98sF	± 562	± 37.0741	± 10.00
1080 30p	± 562	± 29.6296	± 10.00
1080 29.97p	± 562	± 29.6593	± 10.00
1080 25p	± 562	± 35.5556	± 10.00
1080 24p	± 562	± 37.0370	± 10.00
1080 23.98p	± 562	± 37.0741	± 10.00
720 60p	± 375	± 22.2222	± 10.00
720 59.94p	± 375	± 22.2444	± 10.00
720 50p	± 375	± 26.6667	± 10.00

Black Timecode settings

NOTE. The Black Timecode settings are available only when a non-HD format is set as the signal format of the selected Black output.

Source   Use the drop-down list to select the timecode source. The default value is Disable.

- **Disable**. Disables the timecode function for the selected Black output.

- **Local (DST)**. Uses the local time of day with Daylight Savings Time offset as the timecode.

- **Local (No DST)**. Uses the local time of day without Daylight Savings Time offset as the timecode.

- **UTC**. Uses Coordinated Universal Time as the timecode.

- **Program Time**. Uses the program time counter as the timecode.

NOTE. For the Black and LTC outputs, setting the timecode source to Local (DST), Local (No DST), or UTC will cause the ST309 output DST and time zone data to be set to match the selections.

In addition to enabling the timecode source, at least one line must be specified and enabled to carry a VITC signal.

Offset   Enter an offset for the selected Black output, relative to the selected timecode source in the format ±HH:MM:SS:FF. You can enter a time offset of up to ±23:59:59:29 (maximum frame value depends on the frame rate of the video signal).

NOTE. The Offset adjustment allows you to enter a time zone correction of up to ±23:59 hours. However, the ST309 standard only implements codes for time zones in the range of -12 to +13 hours. Therefore, when you are using ST309 data as the Time of Day source, it is recommended that the combined programmed offset from time zone and daylight savings time be restricted to the range of -12 to +13 hours.

Enable 30 Drop-Frame   Use the check box to enable or disable the 30 Drop Frame mode. Most applications will prefer drop-frame compensation VITC on NTSC, but if needed, it can be disabled by this menu item. This menu item appears only when NTSC or NTSC-J is set as the signal format for the selected Black output.

VITC 1 and 2 Line selections Use these menu items to insert the same VITC signal on 1 or 2 lines of the vertical interval.

Enter the video line number to insert the selected VITC signal. For NTSC, you can select lines from line 10 to 20 (lines 14 and 16 are recommended). For PAL, you can select lines between 6 and 22 (lines 19 and 21 are recommended).

Select the Enable check box for the selected line to enable or disable the output of a VITC signal.

Blank On Reference Unlock settings

These settings are available only for the Black 2 output. Use the Enable check box to enable or disable the blanking function when a loss of lock to the reference signal is detected. When enabled, the Black 2 output will be blanked for as long as the loss of lock condition occurs. The purpose of this function is to trigger a downstream change-over unit.

NOTE. When the Black 2 output is configured to blank on the loss of reference lock, the output should not be used for normal reference applications.

Delay When the Blank on Reference Unlock function is enabled, you can set the amount of time delay before the Black 2 output will be blanked when a loss of lock to the reference signal is detected. The purpose of the delay is to reduce false alarms by allowing a set amount of time for the loss of lock condition to clear before the Black 2 output is blanked. Enter the delay in HH:MM:SS.

Black 1-3 HD Tri-level Sync setting

Use this setting to set the HD tri-level sync rate for the three Black outputs. The HD tri-level sync rate setting limits which signal formats are available for the Black outputs. The Black outputs 1–3 are a group that must use the same HD tri-level sync rate (integer or non-integer).

Use the drop-down list to select either **Non-Integer (59.94, 47.95, 29.97, 23.98)** or**Integer (60, 50, 48, 30, 25, 24)**.

Black menu factory default settings

The following table shows the settings for the Black menu that are reset when you use the Preset submenu to recall the factory default settings. (See page 112, *Presets submenu*.)

Table 6: Black button menu factory default settings

Menu item name	Settings
Format	NTSC
Field Reference [1]	Disable
Timing	Vertical: 0 Line(s)
	Horizontal Coarse: 0.0 μsec
Timecode [1]	Source: Disable
	Offset: +00:00:00:00
	VITC 1 Line
	Line Number:
	NTSC/NTSC-J: 14
	PAL: 19
	Output: Disable
	VITC 2 Line
	Line Number:
	NTSC/NTSC-J: 16
	PAL: 21
	Output: Disable
	Enable 30 Drop Frame: Disabled [2]
Blank On Reference Unlock [3]	Disabled
Blank On Reference Unlock Delay [3]	00:00:10
Black 1–3: HD Tri-Level Sync	Non-integer

[1] These settings appear only for non-HD formats.

[2] This setting appears only when the format is set to NTSC.

[3] These settings appear only for the Black 2 output.

Embedded menu (Option SDI only)

When Option SDI is installed, use the Embedded menu to view and configure the embedded audio settings on the SDI video outputs. Use this menu to select the audio group for subsequent audio channel configuration, and to configure audio group parameters.

You can select audio group 1, 2, 3, or 4 for all SD, HD, and 3G Level A formats. For 3G Level B formats, you can select audio group 1, 2, 3, or 4 for both Link A and Link B.

In each audio group you can do the following:

■ Enable or disable the embedded audio

■ Select a specific channel

■ Set the sampling mode

■ Set the embedded audio frequency

■ Set the embedded audio amplitude

■ Set the click rate for the selected channel

Click **Embedded 1** to show the selections for the SDI 1 outputs; clicking **Embedded 2** shows the selections for the SDI 2 outputs.

The following figure shows a partial menu diagram for the Embedded 1 menu. You may have to scroll down the window to see the Secondary Output selection.

NOTE. The SPG700 Web Interface has an issue where the column headings in the Embedded menu do not align with their associated columns. The following figure shows the proper alignment of the column headings.

Figure 11: Partial Embedded menu diagram

Group enable   For most SDI signal formats, select the desired Link A audio group (1–4) by enabling the check box next to the Link A, Group selection. When the SDI signal format is set to 3G Level B, you can select between Link A and Link B for each audio group.

Sampling   For each audio group, use the drop-down list to set the sampling alignment status bits for the selected audio group's Audio Control Packet (ACP). Select **Frame**, **Frame w/o Frame #**, or **Asynchronous**. The sampling alignment status bits apply equally to each channel within the selected audio group.

Channel   Channels are listed in vertical columns within each audio group. Each channel has its own settings.

Mode   Use the drop-down list for each channel to select the mode: **Active**, **Inactive**, and **Mute**.

Frequency   For each channel, enter the frequency of the embedded audio signal from 10.0 Hz to 20 kHz, in steps of 0.5 Hz.

Amplitude   For each channel, enter the audio amplitude from –60 dBFS to 0 dBFS, in steps of 1 dBFS.

Audio Click   For each channel, use the drop-down list to set the audio click rate to one click every one, two, three, or four seconds, or turn the click off.

Origin   For each channel, click in the Origin box to enter a channel origin ID of up to four ASCII characters. The default origin values are based on the link, group and channel numbers. For example, an origin value of A1-1 represents Link A, group 1 and channel 1.

Secondary Output   Use the drop-down list at the bottom of the Embedded menu to select one of the following signals for the secondary (bottom) BNC connector of the selected SDI output: **Tones**, **No Audio**, or **Mute Audio**.

The SDI 1B audio output is the same format and sample structure as the SDI 1A audio output. The same is true for the SDI 2 connectors.

Embedded menu factory default settings

The following table shows the settings for the Embedded menu that are reset when you use the Preset submenu to recall the factory default settings. (See page 112, *Presets submenu*.)

Table 7: Embedded menu factory default settings

Menu item name	Settings
Embedded 1 or Embedded 2	
Group 1–4 (Link A)	Disable
Group 1–4 (Link B) [1]	Disable
Sampling	Frame
Channel 1–4	Mode: Active
	Frequency: 1000.0 Hz
	Amplitude: –20 dBFS
	Audio Click: None
	Channel Origin: A1-1 through A4-4
Secondary Output	Tones

[1]   The Link B, Group 1–4 settings are available only when the SDI output mode is set to 3G-Level B. (See page 59, *SDI menu (Option SDI only)*.)

LTC menu

Use the LTC menu to view and configure the LTC inputs and outputs on the GPI/LTC port. The following figure shows the LTC menu with the LTC 1 submenu expanded to show the menu selections.
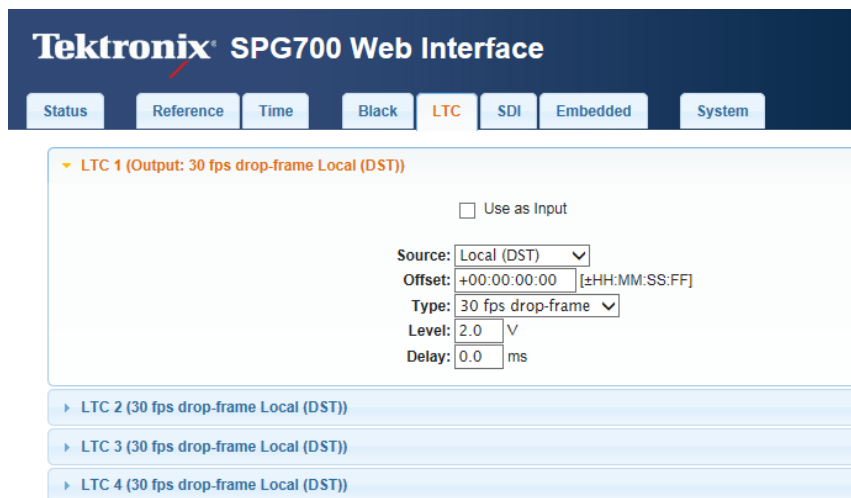
Figure 12: LTC menu with LTC 1 selected

Use as Input This menu item is available only with LTC 1. Select this check box to force LTC 1 to be an input.

Source Use drop-down list to select one of the following LTC signal sources. The default value is Local (DST).

- **Disable**. Disables the LTC outputs.

- **Local (DST)**. Uses the local time of day with Daylight Savings Time offset as the timecode.

- **Local (No DST)**. Uses the local time of day without Daylight Savings Time offset as the timecode.

- **UTC**. Uses Coordinated Universal Time as the timecode.

- **Program Time**. Uses the Program Time counter as the timecode.

NOTE. For the Black and LTC outputs, setting the timecode source to Local (DST), Local (No DST), or UTC will cause the ST309 output DST and time zone data to be set to match the selections.

Offset   Enter the LTC Offset in the form of ±HH:MM:SS:FF.

NOTE. The Offset adjustment allows you to enter a time zone correction of up to ±23:59 hours. However, the ST309 standard only implements codes for time zones in the range of -12 to +13 hours. Therefore, when you are using ST309 data as the Time of Day source, it is recommended that the combined programmed offset from time zone and the daylight saving time be restricted to the range of -12 to +13 hours.

Type   Use the drop-down list to select one of the following LTC output signal formats:

Table 8: LTC output signal formats

Format	Rate	Delay range
24fps	24 fps at 24 Hz	±20.83 ms
25fps	25 fps at 25 Hz	±20.00 ms
30fps	30 fps at 30 Hz	±16.67 ms
30fps drop-frame	30 fps drop frame at 29.97 Hz	±16.68 ms
24fps @ 23.98 Hz	24 fps at 23.98 Hz	±20.85 ms

Level   Enter the signal level of the selected LTC output between 0.5 V and 5.0 V in 0.5 V steps.

Delay   Enter the delay in milliseconds that will be used for all the signal formats.

LTC menu factory default settings

The following table shows the settings for the LTC menu that are reset when you use the Preset submenu to recall the factory default settings. (See page 112, *Presets submenu*.)

Table 9: LTC button menu factory default settings

Menu item name		Settings
LTC 1 to LTC 4		
	Use as Input (LTC 1 only)	Not selected
	Source	Local (DST)
	Offset	+ 00:00:00:00
	Type	30 fps drop frame
	Level	2.0 V
	Delay	0.00 msec

Reference menu

Use the Reference menu to view the current status of instrument settings such as the signal reference source, the signals being output, and information about system faults and alerts. The following figure shows the Reference menu including the Reference information and the Genlock Timing information.
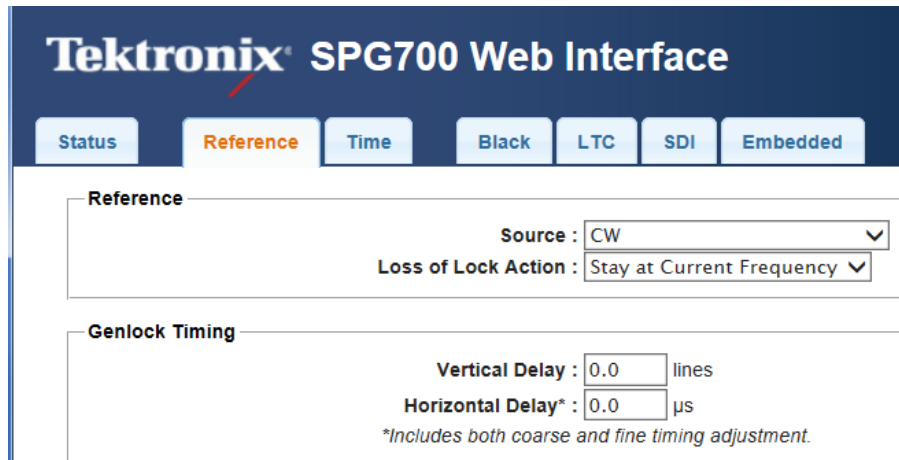
Figure 13: Reference tab menu

Reference settings

Source

Use the drop-down menu to select the reference source for the module timing. The following selections are available:

■ **Internal**. Uses the internal clock frequency setting as the timing reference.

■ **NTSC Burst**. Uses the NTSC Black burst signal applied to the REF input connector on the rear panel as the timing reference.

■ **NTSC Burst with 10 Field ID**. Uses the NTSC Black burst with 10 Field ID signal applied to the REF input connector as the timing reference.

■ **PAL Burst**. Uses the PAL Black burst signal applied to the REF input connector as the timing reference.

■ **HD Tri-Level Sync**. Uses the HDTV trilevel signal applied to the REF input connector as the timing reference.

■ **CW**. Uses the 1, 3.58, 4.43, 5, or 10 MHz continuous wave signal applied to the REF input connector as the timing reference.

Loss of Lock Action
This menu item is not active when the reference source is set to Internal. Use the drop-down list to select the action that the module will make when a loss of lock condition is detected. Select one of the following actions:

■ **Stay at Current Frequency**. Sets the module timing to keep operating at the current frequency until the reference signal is recovered.

■ **Use Internal Frequency**. Sets the module timing to switch to the internal frequency setting until the reference signal is recovered.

Genlock Timing settings

The Genlock Timing settings adjust the timing offset of the input signal relative to the internal reference signal. The selections are unavailable when the reference source is set to Internal.

The range of the timing adjustment depends on the selected signal format. (See Table 10.)

■ **Vertical Delay**. Enter the delay to adjust the Genlock vertical offset in 1 line increments.

■ **Horizontal Delay**. Enter the Genlock horizontal offset.

NOTE. If you are using the 50, 59.94 or 60 Hz progressive sync as a genlock source, as well as LTC as a time-code source, there are two possible alignments for the resulting system. Alignment can be checked by looking at the LTC timing status screen. If the timing is near zero, then it is aligned. If the timing is near a frame of offset, then it is not aligned.

You will need to unlock and re-lock the reference to achieve the desired alignment if this is important to the application you are using. Alternatively, you can use a lower frame rate video reference like NTSC, PAL, or 1080i tri-level.

Table 10: Timing adjustment ranges for reference input signals

Format name	Line settings	Coarse settings (µs)	Fine settings (ns)
NTSC	± 525	± 63.5556	± 10.00
PAL	± 1250	± 64.0000	± 10.00
1080 60i	± 562	± 29.6296	± 10.00
1080 59.94i	± 562	± 29.6593	± 10.00
1080 50i	± 562	± 35.5556	± 10.00
1080 24sF	± 562	± 37.0370	± 10.00
1080 23.98sF	± 562	± 37.0741	± 10.00
1080 30p	± 562	± 29.6296	± 10.00
1080 29.97p	± 562	± 29.6593	± 10.00

Table 10: Timing adjustment ranges for reference input signals (cont.)

Format name	Line settings	Coarse settings (μs)	Fine settings (ns)
1080 25p	± 562	± 35.5556	± 10.00
1080 24p	± 562	± 37.0370	± 10.00
1080 23.98p	± 562	± 37.0741	± 10.00
720 60p	± 375	± 22.2222	± 10.00
720 59.94p	± 375	± 22.2444	± 10.00
720 50p	± 375	± 26.6667	± 10.00
CW	± 1125	± 64 us	N/A

Reference menu factory default settings

The following table shows the settings for the Reference menu that are reset when you use the Preset submenu to recall the factory default settings. (See page 112, *Presets submenu*.)

Table 11: REF button menu factory default settings

Menu item name	Settings
Reference	
Source	Internal
Genlock Timing [1]	Vertical: 0.0 Line(s)
	Horizontal 0.0 μs
Loss of Lock Action [1]	Stay at current frequency
GL Lock Action Mode [2]	Automatic

[1] These menu items are not active when the reference source is set to Internal.

[2] This menu item appears only when REF Source is NTSC, PAL, Tri-Level, or CW.

SDI menu (Option SDI only)

Option SDI provides two independent HD-SDI test signal generators; use the SDI menu to view and configure the signals on the SDI video outputs. Select either SDI 1 or SDI 2 to expand the selections to show the menus for each generator. The menu selections are similar, but independent for each output. The following figure shows the SDI menu with the SDI 1 submenu expanded.
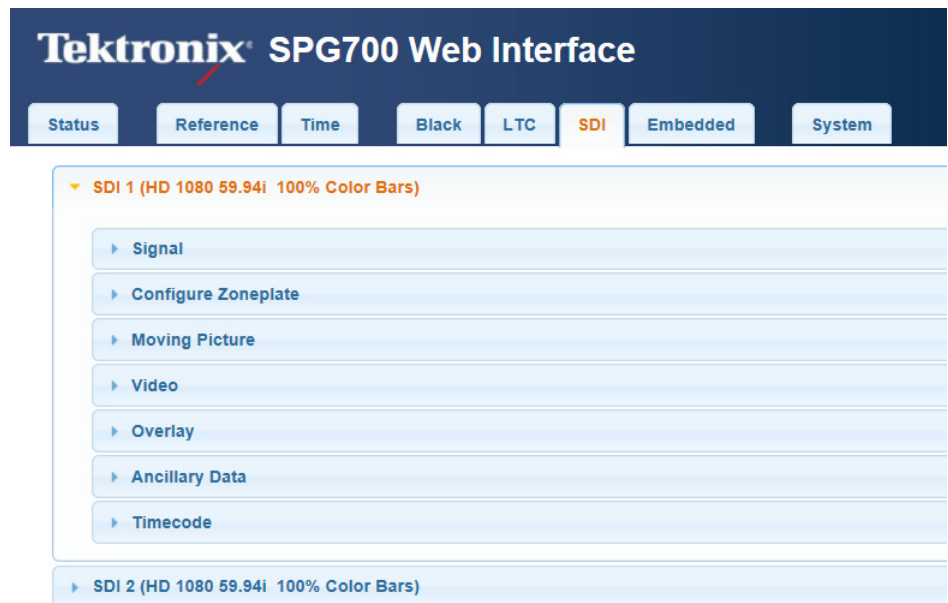
Figure 14: SDI menu with the SDI 1 submenu expanded

SDI Signal submenu

The Signal submenu contains the Standard, Signal Selection, Timing, and other information for defining the SDI signal. The following figure shows an example of the Signal submenu.

Figure 15: SDI Signal submenu

Signal Standard settings

These settings contains the selections for the Output mode, Format, and Sample Structure/Depth.

■ **Output Mode**. Use the drop-down list to select the Output Mode or to set the 3G-SDI serial link multiplexing method to Level A or Level B.

NOTE. You can read more about selecting and generating an SDI output signal. (See page 85, How to select an SDI output signal.)

= **SD**. Provides a SMPTE 259 compliant signal that runs at 270 Mbps.

= **HD (1920 × 1080)**. Provides a 1080-line, SMPTE 274M compliant signal.

= **HD (1280 × 720)**. Provides a 720-line, SMPTE 296M compliant signal.

- **3G-Level A**. This is one way of constructing the 3 Gb/s serial data stream, as described in SMPTE 425. For the mapping structure 1 signals such as 1080p50, 1080p59.94 and 1080p60, a Level A stream looks similar to HD video (as defined in SMPTE 292), except the data rate is twice as fast. In Level A, the lines are sent in order, consecutively. For other mapping structures, the video is at a lower frame rate, but has more bits and/or includes more channels. Refer to the SMPTE 425 standard for details on the Level A mapping method.

  The following 3G Level A signals are available:

  - **(1920 x 1080)**. The output is a 1080-line, SMPTE 425 compliant signal.

  - **(1280 x 720)**. The output is a 720-line, SMPTE 425 compliant signal.

  - **(2k x 1080)**. This output provides 2048 × 1080 resolution signals, primarily for digital cinema applications.

- **3G Level B**. This is an alternate way of constructing the 3 Gb/s serial data stream, as described in SMPTE 425. A Level B stream looks similar to dual link (as defined in SMPTE 372M). The serial data is constructed by interleaving the two links of the dual link video signal. As a result, some formats will have the serial data take two lines worth of time to propagate. This has implications for the effects of the pathological signals, and can confuse the definition of timing adjustments. Refer to the SMPTE 372M and SMPTE 425 standards for more information.

  The following 3G Level B signals are available:

  - **(1920 x 1080)**. The output is a 1080-line, SMPTE 425 compliant signal.

  - **(2k x 1080)**. This output provides 2048 × 1080 resolution signals, primarily for digital cinema applications.

  - **(2xHD 1080)**.This output provides two standard 1080-line SMPTE 292 HD streams in the same format. Select between Test Signal/Test Signal or Test Signal/Black for the two streams.

  - **(2xHD 720)**. This output provides two standard 720-line SMPTE 292 HD streams in the same format. Select between Test Signal/Test Signal or Test Signal/Black for the two streams.

- **Format**. Use the drop-down list to select the signal format for the selected SDI output. The available format choices depend on the selected Output Mode selection. (See page 86, *Available SDI output signals*.)

■ **Sample Structure/Depth**. When the output mode is set to a non-fast-progressive format, the Sample Structure/Depth menu is available. There are several sample structures to choose from. Use the drop-down list to select the desired sample structure.

3G Level A / Level B formats (720 line)

GBR 444 10b	YCbCr 444 10b
GBRA 4444 10b	YCbCrA 4444 10b

2K line formats

XYZ 444 12b	GBR 444 12b

NOTE. For SD, HD, and 3G fast-progressive formats, the color space / sample structure / depth is always YCbCr 422 10 bit.

Signal Selection setting

Use this setting to access test signal sets when the module is in generator mode. The instrument is shipped with a standard set of test signals already installed. (See Table 24 on page 88.) You can also download enhanced test signals. (See Table 25 on page 94.)

Signal Timing settings

Use these settings to adjust the timing offset of the serial digital video outputs relative to the internal reference signal (frame reset signal). This allows you to adjust the timing of this module relative to another module or to an external reference (such as Genlock).

■ **Vertical**. Enter the vertical timing offset; you can set the value from –½ to +½ frame in 1-line steps.

NOTE. A "line" of timing refers to the timing as if it were a raster scanning a CRT. This may not be the same as the time that a line of data is present on the serial link because of the way that Level B signals are interleaved.

■ **Horizontal**. Enter the horizontal timing offset ; you can set the value from –1 to +1 line in 1-clock steps.

■ **Relative To**. Sets the Zero Timing D-to-A compensation factor on or off for HD (1.485 Gb/s) and SD (270 Mb/s) formats only. Use the drop-down list to set the timing relative to Serial (0H) or Analog (DAC). In the serial mode (default), the output timing does not include compensation for the delay through a nominal D-to-A converter.

Other Signal submenu settings

The following settings appear near the bottom of the SDI Signal submenu:

- ■ **SMPTE 352 Payload ID Enable**. Select the check box to enable the SMPTE 352M Payload Identifier.

NOTE. The SMPTE 352M payload identifier is a required element for a compliant 3 Gb/s signal stream. The payload identifier is optional for SD and HD formats.

- ■ **Secondary Output**. Use the drop-down list to select a **Test Pattern** or a **Black** signal for the secondary BNC connector.

  When set to the Test Pattern selection for channel 1, the SDI 1A and SDI 1B connectors will output the same test signal. The same is true for the channel 2 connectors when Test Pattern is set as the Secondary Output selection for channel 2.

  When set to the Black selection for channel 1, the SDI 1B Black signal is the same format and sample structure as the SDI 1A output. The same is true for the channel 2 connectors when Black is set as the Secondary Output selection for channel 2.

- ■ **Alpha Channel Data**. This setting is active only when the sample structure is set to "+A" for 3G signal formats. Selects the data to be placed on the alpha channel when a sample structure that includes an alpha channel is selected. The channel can contain a duplicate of the Y or G channel data or a flat field signal. Use the drop-down list to Copy of Y/G Channel or select a 0% to 100% Flat Field in 10% increments.

- ■ **2xHD Stream Content**. This setting is active only when the signal format is set to 2×HD. It selects the content for the first and second HD signals on link A and link B. Use the drop-down list to select **Test Signal/Test Signal**, **Test Signal/Black**, or **Black/Test Signal**.

SDI Configure Zoneplate submenu

Use this submenu to configure the parameters of zone plate signals. These settings become active when you select a zone plate signal for output from the Signal Selection drop-down list. The information for each signal varies depending on the individual zone plate signal.

The Configure Zoneplate submenu consists of three major sections: Zoneplate Parameters, Video, and information that applies to all zone plate signals. For more information on using zone plate signals, refer to the information later in this document. (See page 96, *SDI Zone plate signals*.)

Zone plate parameters settings

The following figure shows an example of the zone plate parameters for a circle zone plate.
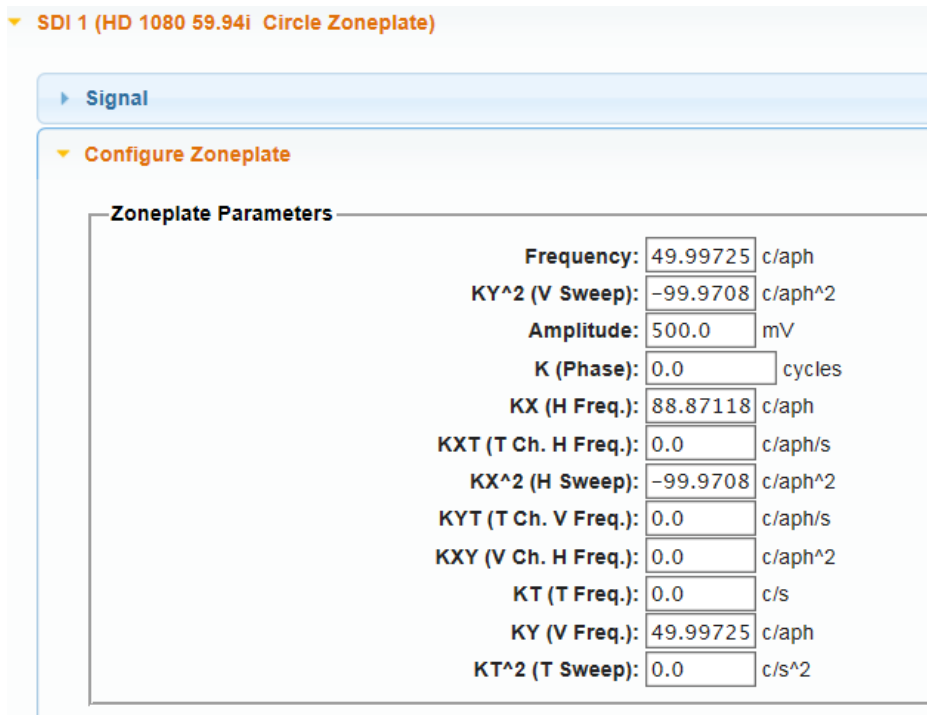
Figure 16: Circle zone plate configuration parameters

The information for the zone plate parameters varies with the zone plate signals. The parameters are discussed in more detail later in this document.

■ **Frequency**. This menu item is dependent on the zone plate signal. Detailed information for the different zone plate signals is provided in a separate table. (See Table 26 on page 100.)

■ The remaining parameters are zone plate dependent parameters. These are discussed in detail later in this document. (See page 101, *Zone plate dependent parameters*.)

Video settings   The following figure shows the Video menu selections for the Configure Zoneplate submenu.

Figure 17: Configure Zoneplate video menu selections

There are three video parameters that can be enabled or disabled by selecting the related check box.

- **Y/G/X Enable**. Select the check box to display one of the three signal components: the Y component for a YCbCr sample structure, the G component for a GBR sample structure, or the X component for an XYZ sample structure.

- **Cb/B/Y Enable**. Select the check box to display one of the three signal components: the Cb component for a YCbCr sample structure, the B component for a GBR sample structure, or the Y component for an XYZ sample structure.

- **Cr/R/Z Enable**. Select the check box to display one of the three signal components: the Cr component for a YCbCr sample structure, the R component for a GBR sample structure, or the Z component for an XYZ sample structure.

NOTE. When the sampling structure for the current format uses the YCbCr color space, the default settings enable only the Y channel. This results in the familiar Black to white zone plate patterns. When the RGB color space is used the default settings enable all three channels, also resulting in the Black to white zone plate patterns.

A colored zone plate pattern can be created by enabling or disabling individual channels. When the XYZ color space is used, the resultant patterns will show some chroma in all combinations of the X/Y/Z channel settings, due to the inherent encoding of this color space.

Other parameter settings
The following figure shows other menu selections for the Configure Zoneplate submenu These menu selections apply to all of the zone plate selections.

Figure 18: Configure Zoneplate parameters for all zone plate signals

■ **Enable T Reset**. Use the Enable T Reset parameter to reset the time coordinate (t in the zone plate equation) of the pattern to zero. When T Reset is first enabled, the time coordinate is reset to zero and there is no apparent motion in the zone plate, even if any of the time coefficients (K_{XT}, K_{YT}, K_T, or K_T2) are non-zero. Enabling the T Reset parameter does not set the other parameters to zero.

If you then change any of the K parameters, the temporal (t) coordinate will be allowed to change to match. Subsequent changes to K parameters will first reset the time coordinate (t), and then allow it to change with the K parameter.

When the Enable T Reset check box is cleared, the zone plate time coordinate will increment continuously. Resetting all of the time coefficients (K_{XT}, K_{YT}, K_T, and K_T2) to zero will stop the apparent zone plate motion but the temporal coordinate will remain where it is, even if it has moved to an off-screen position.

You must enable the T Reset parameter to reset the temporal coordinate to zero. To completely disable all motion and reset the pattern, set all of the time related K parameters to zero and enable the T Reset parameter by selecting the check box.

■ **Waveform**. Use this parameter to set the waveform shape. Use the drop-down list to set the waveform to a Sine, Triangle, or Square wave.

■ **Save As**. Use this parameter to save the setups in one of the custom files. Select the custom file from the drop-down list.

SDI Moving Picture submenu

Use this submenu to scroll the active picture area of the serial digital video signal up/down or left/right (or randomly), when in generator mode. The following figure shows the Moving Picture submenu.
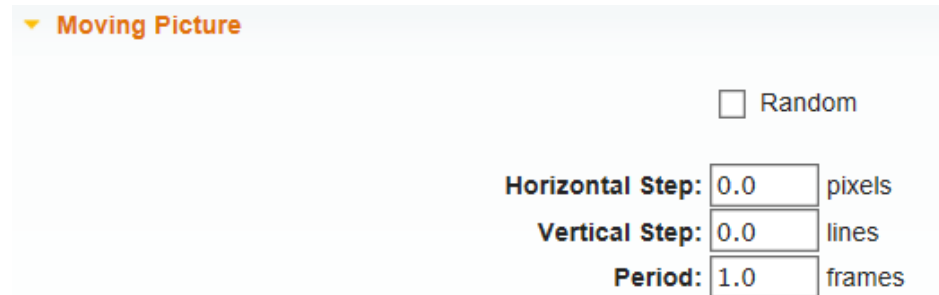
Figure 19: SDI Moving Picture submenu

NOTE. The Moving Picture function is not available with zone plate or multiburst signals. However, zone plate signals can be defined with motion in the zone plate parameters. (See page 98, To modify a zone plate signal.)

The Moving Picture function is enabled whenever the H Step or V Step parameter is set to a value other than 0.

When Moving Picture is enabled, the circle and text overlays remain static regardless of the signal type (standard test signal or "frame (.BMP) picture"). However, the logo overlay remains static for only standard test signals, but continues to move when used with a "frame (.BMP) picture."

Use the following menu items to specify the Moving Picture setups:

- **Random**. Select this check box to enable random scrolling. Clear the check box to disable random scrolling.

- **Horizontal Step**. Enter the number of pixels to be scrolled per frame set in the Period menu item below. Set the value from –252 to +252 in 4-sample steps.

- **Vertical Step**. Enter the number of lines to be scrolled per frame set in the Period menu item below. Set the value from –252 to +252 in 1-line steps.

- **Period**. Enter the time interval between occurrences of the scrolling. Set the value from 1 to 16 in 1-frame steps.

SDI Video submenu

Use this submenu to modify the video output signal. You can enable or disable individual video components, enable or disable edge filtering on each video line, enable or disable Error Detection and Handling (EDH) packet insertion (SD formats only), and enable or display the AV Timing mode.

The following figure shows the SDI Video submenu.

NOTE. The items in this menu modify the signal output to make it non-standard. To indicate that the signal is non-standard, an asterisk "" is inserted at the beginning of the signal name displayed in the STATUS menu.*

▾ Video

☑ Y Enable
☑ Cb Enable
☑ Cr Enable
☑ Edge Filter Enable
☐ AV Timing Mode
☑ EDH Enable
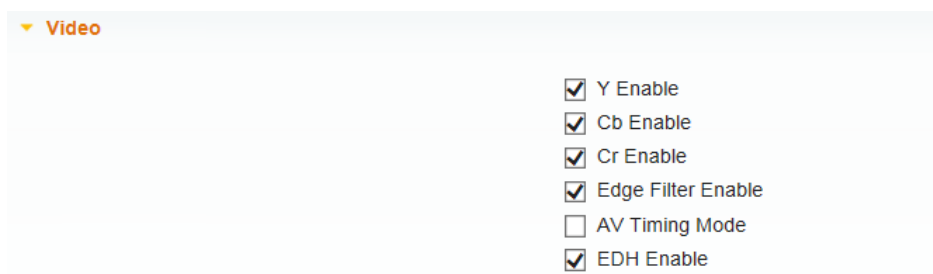
Figure 20: SDI Video submenu

Use the following menu items to change the video signal parameters:

- **Y Enable**. Select this check box to turn on the Y component (YCbCr format), G component (GBR format), or X component (XYZ format) of the serial digital video signal. Clear the check box to disable the Y component.

- **Cb Enable**. Select this check box to turn on the Cb component (YCbCr format), B component (GBR format), or Y component (XYZ format) of the serial digital video signal. Clear the check box to disable the Cb component.

- **Cr Enable**. Select this check box to turn on the Cr component (YCbCr format), R component (GBR format), or Z component (XYZ format) of the serial digital video signal. Clear the check box to disable the Cr component.

■ **Edge Filter Enable.** Select this check box to enable the Edge Filter on serial digital video signals that have a filter. This control has no effect on signals without a filter. Clear the check box to disable the Edge Filter.

When the Edge Filter is enabled, certain data transitions between two levels are run through a low-pass filter to set rise times, pulse widths, and to prevent ringing. If the filter is disabled, the edges will not be filtered. The filter should not be disabled in broadcast environments.

Edge filtering is not necessary in certain environments, such as digital cinema applications and several types of picture monitors and projectors. In these cases, disabling the edge filtering will result in instantaneous level changes for adjacent color bars.

■ **AV Timing Mode**. Select this check box to turn on the AV Timing Mode. Clear the check box to disable the AV Timing mode.

In the AV Timing mode, the video and audio are continuously cycled between being on as configured for 1 second then set to Black and muted for 4 seconds. Use this signal to measure the AV delay through a system with the AV Timing mode on an appropriate Tektronix waveform monitor or rasterizer.

■ **EDH Enable**. (SD output mode only.) Select this check box to turn on the insertion of EDH packets. Clear the check box to disable EDH packets.

SDI Overlay submenu

Use this submenu to select an item (logo, ID text, circle, or burnt-in timecode) to overlay on the output test signal, and to set the blinking mode for the overlay. The following figure shows the Overlay submenu.

NOTE. *You can store overlay functions, including text, in the instrument presets so that the overlay is restored on power up. (See page 112, Presets submenu.)*

Figure 21: SDI Overlay submenu

General overlay settings   The following menu items appear at the top of the Overlay submenu:

■   **Text/Circle Blink Enable**. Select this check box to enable the blinking function of the text and circle overlays. When enabled, use the drop-down list to select a fast or slow blinking mode.

Select the **Fast** blink mode to set the overlay to blink at approximately 0.5 second intervals. Select the **Slow** blink mode to set the overlay to blink at approximately 1.0 second intervals.

■   **Border Enable**. Select this check box to display a black border around the text and circle overlays.

NOTE. Turn on the border to provide cleaner transitions between the overlay and the test signal. This is especially useful for 4:2:2 format signals, which may have some ringing when the border is turned off.

Logo overlay settings   Use these settings to select a logo to overlay on the output test signal and to set the display position of the logo. The following figure shows the Overlay Logo settings.

Figure 22: SDI Overlay Logo settings

NOTE. To display a logo, you need to create a logo file (.bmp) and use FTP or a USB memory device to copy the file to the SDI7/Logo directory on the instrument. The file must be installed in the Logo folder. Files installed in the wrong location will be ignored by the instrument. (See page 17, How to transfer or install user files.)

Logo displays work best with the uncompressed BMP images (24 bits and 32 bits true color). Logo displays do not work with RLE8 or RLE4 BMP compression.

BMP files are not scaled for each raster size. For example, a 320×240 size bitmap will be rendered as 320×240 pixels regardless of the current raster area. The bitmap would occupy about 25% of the active video for the SD-525 format, but less than 4% of a 1920×1080 picture. Therefore, you might need to choose a bitmap size appropriate for the target display resolution when using the logo overlay.

The following settings are available for the Logo overlay:

■ **Logo Enable**. Select this check box to enable the Logo overlay and to enable the Logo overlay control settings.

■ **Source**. Use the drop-down list to select a logo file stored in the SDI7/Logo directory.

The default logo is the "first" file in the SDI7/Logo directory, as sorted by the date of the logo file (oldest first). If the factory-provided logo files are installed, the default logo is "Tektronix_logo_500x125.bmp."

If users remove the factory-provided logo files and added their own custom files, then the default logo will be the oldest file installed in the SDI7/Logo directory.

NOTE. The position of the logo overlay is referenced from the lower right of the active raster area.

■ **X Position**. Enter the horizontal position of the logo. The position is set as a percentage of active picture width. You can set the value from -100.0% to -1.0% in 0.1% steps.

■ **Y Position**. Enter the vertical position of the logo. The position is set as a percentage of active picture height. You can set the value from -100.0% to -1.0% in 0.1% steps.

ID Text overlay settings   Use these settings to create text or to select a text file that will be overlaid on the output test signal, and to set the display position of the text.

NOTE. You can store overlay functions, including text, in the instrument presets so that the overlay is restored on power up.

To display a text overlay, you need to either enter a text string or create a text file (.txt) and use FTP or a USB memory device to copy the file to the SDI7/TEXT directory on the instrument. The file must be installed in the TEXT folder. Files installed in the wrong directory location will be ignored by the instrument. (See page 17, *How to transfer or install user files*.)

When a text file is used, any Unicode character supported by the default font can be displayed. The text file can be encoded as plain 7-bit ASCII text, or UTF-8 encoding when extended Unicode characters are used. The text file can also include embedded newline characters to create text overlays spanning multiple lines.

When the string is entered from the front panel, it is limited to 30 characters in length, and can contain only standard ASCII characters.

The instrument uses a TrueType font to render text overlays; the default typeface is Deja Vu Sans. The font file is named "default.ttf" and is stored in the SDI7 directory of the instrument memory.

The instrument supports Latin, Cryillic, Greek, and symbol character sets for use with the text overlay. Using FTP, you can download an alternate TrueType font file. Make sure that the font file is renamed to "default.ttf" and that the instrument is rebooted for the new font to take effect.

The following figure shows the SDI Overlay ID Text settings.

Figure 23: SDI Overlay ID Text settings

The following settings are available for the ID Text overlay:

■ **Text Enable**. Select this check box to enable the ID Text overlay and to enable the ID Text overlay control settings.

■ **X Position**. Enter the horizontal position of the text. The position is set as a percentage of active picture width. You can set the value from 0.0% to 99.0% in 0.1% steps.

NOTE. The position of the text overlay is referenced from the top left of the active picture.

■ **Y Position**. Enter the vertical position of the text. The position is set as a percentage of active picture height. You can set the value from 0.0% to 99.0% in 0.1% steps.

■ **Height**. Enter the font size of the text. The size is set as a percentage of active picture height. You can set the value from 1.0% to 100.0% in 0.1% steps.

■ **Source Selection**. Use these menu items to display a user-entered text string or a selected text file.

　　‒ **File Selection**. Select this check box to enable the File drop-down list to select a text file stored in the SDI7/TEXT directory. If this check box is not selected, the instrument will use the text in the String field.

　　‒ **String**. Enter the for the logo text; you can use up to 30 characters.

　　‒ **File**. Select the text file containing the logo text from the drop-down list.

Circle overlay settings　Use these settings to overlay a circle on the output test signal and set the display position of the circle. The following figure shows the SDI Overlay Circle settings.

Figure 24: SDI Overlay Circle settings

NOTE. The position of the circle overlay is referenced from the center of the active picture.

The following settings are available for the Circle overlay:

■ **Circle Enable**. Select this check box to enable the Circle overlay and to enable the Circle overlay control settings.

■ **X Position**. Enter the horizontal position of the circle. The position is set as a percentage of active picture width. You can set the value from -50.0% to 50.0% in 0.1% steps.

■ **Y Position**. Enter the vertical position of the circle. The position is set as a percentage of active picture height. You can set the value from -50.0% to 50.0% in 0.1% steps.

■ **Diameter**. Enter the diameter of the circle. The diameter is set as a percentage of active picture height. You can set the value from 0.0% to 100.0% in 0.1% steps.

Burnt-In Timecode overlay settings

Use these settings to overlay a timecode readout (HH:MM:SS;frames) on the output test signal and set the size and position of the timecode readout. The following figure shows the SDI Overlay Burnt-In Timecode submenu.

Burnt-In Timecode

BITC Mode: Disable ∨

X Position: 5.0   % APW

Y Position: 5.0   % APH

☐ Second Line Enable

Figure 25: SDI Overlay Burnt-In Timecode settings

The following settings are available for the Burnt-In Timecode overlay:

- **BITC Mode**. Use the drop-down list to disable the burnt-In Timecode or select a Large or Small timecode.

- **X Position**. Enter the horizontal position of the timecode. The position is set as a percentage of active picture width. You can set the value from -50.0% to 50.0% in 0.1% steps.

- **Y Position**. Enter the vertical position of the timecode. The position is set as a percentage of active picture height. You can set the value from -50.0% to 50.0% in 0.1% steps.

- **Second Line Enable.** Select the check box to enable a second line of timecode readout (YY/MM/DD) on the output signal.

SDI Ancillary Data submenu

The ancillary data payload can carry non-video information, such as an Active Format Description (AFD), Closed Caption information, or other metadata.

NOTE. The ancillary inserter can place the data packet anywhere in the field and can overwrite any of the ancillary or video data with a few exceptions; the inserter will not overwrite embedded audio or CRC. Use care to not overwrite important information.

Use this submenu to set the ancillary data payload structure. The ancillary data payload can include information to supplement the video stream, including the Data Identifier (DID), Secondary Data Identifier (SDID), Data Count (DC), User Data Words (UDW), and a Checksum (CS).

The Data Identifier (DID) and Secondary Data Identifier (SDID) indicate the type of data contained in the packet.

The Data Count indicates the number of User Data Words to follow, and the User Data Words (UDW) comprise the actual payload carried in the ancillary data. The instrument addresses User Data Words 000 through 254.

Ancillary Data Payload settings

The following figure shows the SDI Ancillary Data Payload settings.
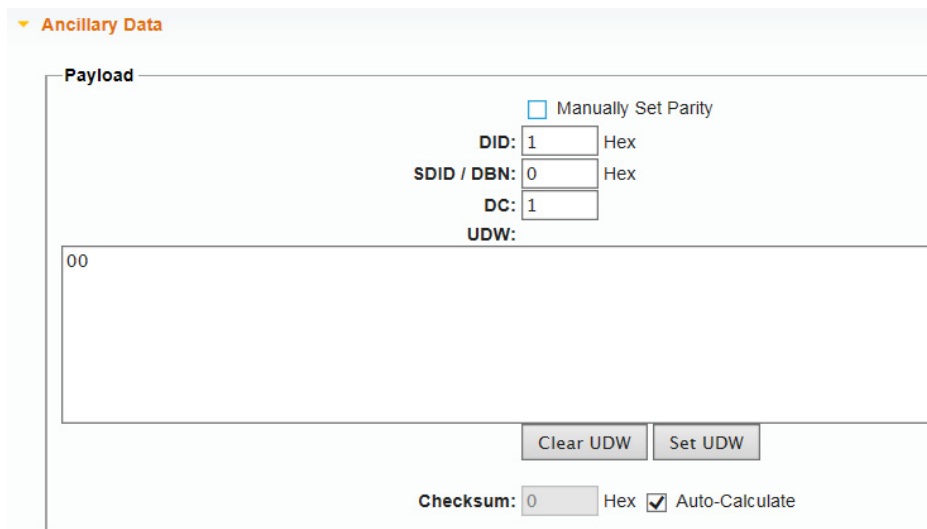
Figure 26: SDI Ancillary Data Payload settings

The following settings are available for the Ancillary Data Payload:

■ **Manually Set Parity**. Select the check box to manually set the parity. If the check box is not selected, the parity is set automatically. Automatic parity is an 8-bit mode, while Manual parity allows 10-bits. If a 10-bit word is entered while in manual parity and the module is later set to automatic parity, the correct 8 bits will be sent. The entire 10-bit word is in system memory, though, so if the module is then reset to manual parity the entire 10-bit word entered by the user will be transmitted.

■ **DID**. Use this field to edit the hex value of the Data ID word. You can set the Data ID from 0x00 to 0xFF (in 8-bit mode), or from 0x000 to 0x3FF (in 10-bit mode).

■ **SDID/DBN**. Use this field to edit hex value of the Secondary ID word. You can set the Secondary ID from 0x00 to 0xFF (in 8-bit mode), or from 0x000 to 0x3FF (in 10-bit mode).

■ **DC**. Use this field to edit the Data Count word to show the number of User Data Words to follow. You can set the Data Count from 0x00 to 0xFF (in 8-bit mode), or from 0x000 to 0x3FF (in 10-bit mode).

■ **UDW**. Use this area to enter a User Data Word from word 000 through word 254. You can set the User Data Word from 0x00 to 0xFF (in 8-bit mode), or from 0x000 to 0x3FF (in 10-bit mode). Click **Set UDW** to set the User Data Word. Click **Clear UDW** to clear the entire User Data Word.

NOTE. To make this process easier, you can use the PC-based TG Setup application. This application also allows you to import and export User Data Words as CSV files.

■ **Checksum**. Use this menu item to set the hex value of the Checksum. You can set the Checksum from 0x00 to 0xFF (in 8-bit mode), or from 0x000 to 0x3FF (in 10-bit mode). If the **Auto-Calculate** check box is selected, the checksum is calculated automatically.

Ancillary Data Output settings

The Ancillary Data Output settings define the ancillary data payload output. The menu selections differ depending on the output mode defined in the SDI Signal submenu. (See page 60, *Signal Standard settings*.) A Line selection is available in progressive formats where you can specify the line to carry the ancillary data.

NOTE. Different video modes and formats have different ranges of lines and pixels in their active and ANC spaces. Users should be careful to change the line, field and sample offset parameters of the ANC insertion feature after changing video modes or formats to be sure the ANC data is programmed as desired.

If the line number or sample offset are left at values outside the allowed range for a given format, the packet will not be inserted in the stream. Alternatively if these parameters are left at values near the end of active or ANC space, the packet may overwrite other elements of the stream such as EAV and SAV.

The following figure shows the SDI Ancillary Data Output settings.

Figure 27: SDI Ancillary Data Output settings

The following settings are available for the Ancillary Data Output:

- **Field**. Use the drop-down list to set the Field to carry the ancillary data payload. Select between **Field 1 Only**, **Field 2 Only**, and **Field 1 & 2**. This menu setting is available only in interlaced formats.

- **Field1 Line**. Enter a line number in Field 1 to carry the ancillary data payload. This menu setting is available only in interlaced formats.

- **Field2 Line**. Enter a line number in Field 2 to carry the ancillary data payload. This menu setting is available only in interlaced formats.

- **Sample Offset**. Enter the sample number where the ancillary data header will be. This is the first word of the ancillary data packet.

NOTE. Be sure to change the sample offset when you change the raster size. Otherwise, the ANC insertion may occur in an unexpected place or even be outside the raster structure. The sample offset is set relative to SAV in order to use standard sample numbering. However, this means that the most normal location at the start of HANC varies as a function of raster size.

- **Video Channel**. Use the drop-down list to set the video channel to **Luma** or **Chroma**.

- **Link Location**. Use the drop-down list to set the link location to **Link A** or **Link B**. This menu setting is available only in 3G Level B formats.

- **Stream Location**. Use the drop-down list to select **HD Stream1** or **HD Stream2**. This menu setting is available only in 2×HD formats.

- **Output Continuously**. Select this check box to continuously output an ancillary data payload into the SDI video signal. When the check box is cleared, the ancillary data payload output is disabled.

- **Insert Single Packet**. When the Output Continuously check box is cleared, click **Insert Single Packet** to insert one packet on one field into the SDI video signal.

SDI ancillary data payload example

As an example, one of the ancillary data payloads that can be easily generated by the instrument is the Active Format Description (AFD). AFD is a method of identifying the active area of the video picture to be displayed. Using AFD the aspect ratio of the picture can be automatically optimized for the display being used. AFD is defined in SMPTE 2016-1, and mapping AFD and bar data is defined in SMPTE 2016-3. The packet format appears as shown here:

NOTE. This is an example only. Inserting an AFD packet will not affect the SDI video produced.

DID: 0x41
SDID: 0x05
DC: 8

UDW[000]	0	AFD Code			AR	0	0
UDW[001]	0	0	0	0	0	0	0	0
UDW[002]	0	0	0	0	0	0	0	0
UDW[003]	T	B	L	R	0	0	0	0
UDW[004]	First bar data (b8 – b15)							
UDW[005]	First bar data (b0 – b7)							
UDW[006]	Second bar data (b8 – b15)							
UDW[007]	Second bar data (b0 – b7)							

CS: automatic calculation

Where AR = aspect ratio (1=16:9, 0=4:3), T = top bar data flag, B= bottom bar data flag, L = left bar data flag, and R = right bar data flag.

Note that these are all eight-bit values for the respective User Data Word. The instrument will automatically calculate the parity bits when Parity is set to Automatic, which is the default.

Most AFD codes do not require bar data information; only the first user data word needs to be defined. For example, one common AFD code for a 16:9 coded frame is "1001" (9), which indicates a 4:3 image, horizontally centered, with pillarboxes, as shown in the following figure:
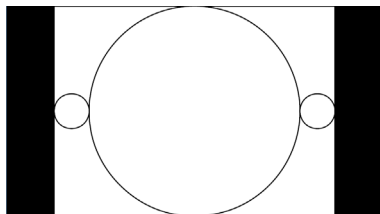
Figure 28: AFD code "1001" for a 16:9 coded frame

Therefore, for this AFD code set the data words as follows:

UDW [000]:   0x4C
UDW [001]:   0x00
UDW [002]:   0x00
UDW [003]:   0x00
UDW [004]:   0x00
UDW [005]:   0x00
UDW [006]:   0x00
UDW [007]:   0x00

The AFD ancillary data packet should be located in the active line portion of the vertical ancillary space (VANC), but no earlier than the second line after the RP 168 switch point. Line 9 with a sample offset of 0 (first word of active video, immediately after SAV) is a suitable location. The selected video channel should be **Luma** for most ancillary packets, including AFD. Finally, set the **ANC PAYLOAD Output** mode to **Continuous** to start AFD insertion of the active test signal. For this example, the SMPTE RP 219 color bars are an effective test pattern, because the center section of the 16:9 test signal contains the original 4:3 aspect ratio SMPTE pattern.

SDI Timecode submenu

Use this submenu to set ancillary timecode (ATC) parameters for the selected output. The following figure shows the SDI Timecode submenu.
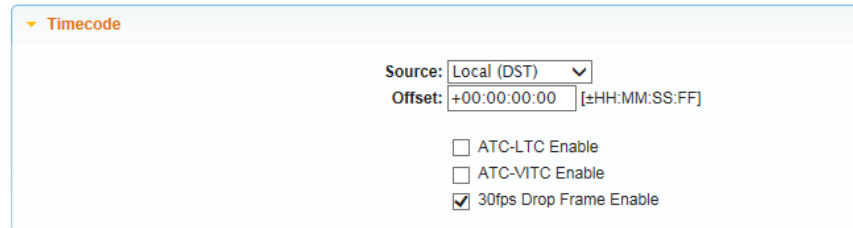
Figure 29: SDI Timecode submenu

The SDI Timecode submenu contains the following settings:

- ■ **Source**. Use the drop-down list to select either **Local (DST), Local (No DST), UTC** or **Program Time** as the timecode source. The default value is Local (DST).

  The Local (DST), Local (No DST) and UTC settings use the timing reference set in the Time of Day submenu of the Time menu as the timecode source. (See page 132, *Time of Day submenu*.) The Program Time setting uses the program time counter as the timecode source.

- ■ **Offset**. Use this menu item to set a Timecode Offset for the SDI outputs. This is an offset from the selected timecode source.

NOTE. The Offset adjustment allows you to enter a time zone correction of up to ±23:59 hours. However, the ST309 standard only implements codes for time zones in the range of -12 to +13 hours. Therefore, when you are using ST309 data as the Time of Day source, it is recommended that the combined programmed offset from time zone and DST be restricted to the range of -12 to +13 hours.

- ■ **ATC-LTC Enable**. Select this check box to enable or disable the Ancillary Linear time code type of ANC packets.

- ■ **ATC-VITC Enable**. Select this check box to enable or disable the Ancillary Vertical Interval time code type of ANC packets.

- ■ **30 DROP Frame Enable**. Select this check box to enable or disable the Drop Frame mode for the 30 frame per second timecode format. This menu item is available only when the frame or field rate for the current format is 29.97 or 59.94.

SDI menu factory default settings

The following table shows the settings for the SDI menu that are reset when you use the Preset submenu to recall the factory default settings. (See page 112, *Presets submenu*.)

The default settings are identical for the SDI 1 and SDI 2 outputs.

Table 12: SDI button menu factory default settings

Menu item name	Settings
Output Mode	HD (1920 × 1080)
Format	1080 59.94i
Sample Structure/Depth [1]	YCbCr 4:2:2 10b
Alpha Channel Data [2]	Use Y/G Channel
2xHD Stream Content [3]	Test Signal / Test Signal
Signal Selections	
Color Bar	100% Color Bars
Lnearity	Limit Ramp
Flat Field	100% Blue Field
Multiburst	Y Multiburst 15–30 MHz
Zoneplate	Circle Zoneplate
Monitor	Black-Dark Gray Step Scale
Pulse Bar	Color Pulses
Timing	Co-siting Pulse
SDI	SDI Matrix
Frame Picture [4]	No BMP files found in /SDI7/PICTURE/
Moving Picture	
Horizontal Step	0 Sample(s)
Vertical Step	0 Line(s)
Period	1 Frame(s)
Random	Disable

Table 12: SDI button menu factory default settings (cont.)

Menu item name	Settings
Overlay : Logo	
Status	Disable
Source	Tektronix_logo_500x125.bmp
	NOTE. The default logo is the "first" file in the SDI7/Logo directory, as sorted by the date of the logo file (oldest first). If the factory-provided logo files are installed, the default logo is "Tektronix_logo_500x125.bmp."
	However, if the user has removed the factory-provided logo files and added their own custom files, then the default logo will be the oldest file installed in the SDI7/Logo directory.
X Position	–5 % APW
Y Position	–5 % APH
Overlay : ID Text	
Status	Disable
Source	User-entered string
X Position	5.0 % APW
Y Position	5.0 % APH
Font Size	8.0 % APH
Overlay : Circle	
Status	Disable
X Position	0.0 % APW
Y Position	0.0 % APH
Diameter	90.0 % APH
Overlay : Burnt-In Timecode	
Mode	Disable
X Position	5.0 % APW
Y Position	5.0 % APH
Second Line	Disable
Overlay : Blink	
Text/Circle Blink	Off
Overlay : Border	
Text/Circle Border	Enable

Table 12: SDI button menu factory default settings (cont.)

Menu item name		Settings
Timing		
	Vertical	0 Line(s)
	Horizontal	0.0000 µs
	Relative To [5]	Serial (0H)
Timecode		
	Source	Local (DST)
	30 Drop [7]	Enable 30 Drop Frame
	ATC-LTC	Disable
	ATC-VITC	Disable
Video		
	Y	Enable
	Cb	Enable
	Cr	Enable
	Edge Filter	Enable
	AV Timing Mode	Disable
	EDH [8]	Enable
ANC Payload		
	Output	Disable
	Parity	Automatic
	DID	0x01
	SDID	0x00
	DC	0x01 (1)
	UDW	0x00
	CS	0x00 (Auto: 0x202)
	Auto-Calculate CS	Enable
	Field	1 Only
	Field 1 Line	9
	Field 2 Line	9
	Sample Offset	1928 (VANC)
	Video Channel	Luma
	Link Location [9]	Link A
	Stream Location [3]	HD Stream 1

Table 12: SDI button menu factory default settings (cont.)

Menu item name	Settings
SMPTE 352 Payload ID	Enable
Secondary Output	Test Pattern

1   This menu item is available only when a 3G-SDI 2K format is selected.

2   This menu item is available only when a 3G-SDI format is selected with YCbCrA or GBRA sample structure.

3   This menu item is available only when a 3G-SDI 2xHD format is selected

4   You must load frame picture files into the /SDI7/PICTURE/ directory in order to select a frame picture signal for output.

5   This menu item is available only for HD (1.485 Gb/s) formats.

6   The default timecode source depends on whether Option GPS is installed.

7   This menu item is available only for non-integer frame rates.

8   This menu item is available only when the output mode is set to SD.

9   This menu item is available only when a 3G-Level B format is selected.

How to select an SDI output signal

To select an output signal, perform the following procedure to generate either 3 Gb/s SDI, 1.5 Gb/s HD-SDI, or 270 Mb/s SD video test signals:

1. Select the output mode in the SDI Signal submenu. (See page 60, *Signal Standard settings*.)

2. Select the signal format in the SDI Signal submenu. (See page 60, *Signal Standard settings*.)

3. Select the sample structure and depth in the SDI Signal submenu. (See page 60, *Signal Standard settings*.)

4. Select the test signal that you want to generate in the SDI Signal submenu. (See page 62, *Signal Selection setting*.)

Available SDI output signals The following tables list the available SDI output signals and their associated structure.

Table 13: SDI – 3G Level A (1920 × 1080)

Structure			59.94i	50i	60i	23.98p	24p	25p	29.97p	30p	50p	59.94p	60p	23.98psf	24psf	25psf	29.97psf	30psf
YCbCr	4:4:4	12b	X	X	X	X	X	X	X	X				X	X	X	X	X
		10b	X	X	X	X	X	X	X	X				X	X	X	X	X
YCbCr+A		10b	X	X	X	X	X	X	X	X				X	X	X	X	X
YCbCr	4:2:2	12b	X	X	X	X	X	X	X	X				X	X	X	X	X
		10b									X	X	X					
GBR	4:4:4	12b	X	X	X	X	X	X	X	X								
		10b	X	X	X	X	X	X	X	X				X	X	X	X	X
GBR+A		10b	X	X	X	X	X	X	X	X				X	X	X	X	X

Table 14: SDI – 3G Level A (1280 × 720)

Structure			59.94i	50i	60i	23.98p	24p	25p	29.97p	30p	50p	59.94p	60p	23.98psf	24psf	25psf	29.97psf	30psf
YCbCr	4:4:4	10b				X	X	X	X	X	X	X	X					
YCbCr+A	4:4:4	10b				X	X	X	X	X	X	X	X					
GBR	4:4:4	10b				X	X	X	X	X	X	X	X					
GBR+A	4:4:4	10b				X	X	X	X	X	X	X	X					

Table 15: SDI – 3G Level A (2K × 1080)

Structure			59.94i	50i	60i	23.98p	24p	25p	29.97p	30p	50p	59.94p	60p	23.98psf	24psf	25psf	29.97psf	30psf
XYZ	4:4:4	12b				X	X	X	X	X				X	X	X	X	X
GBR						X	X	X	X	X				X	X	X	X	X

Table 16: SDI – 3G Level B (1920 × 1080)

Structure			59.94i	50i	60i	23.98p	24p	25p	29.97p	30p	50p	59.94p	60p	23.98psf	24psf	25psf	29.97psf	30psf
YCbCr	4:4:4	12b	X	X	X	X	X	X	X	X				X	X	X	X	X
		10b	X	X	X	X	X	X	X	X				X	X	X	X	X
YCbCr+A		10b	X	X	X	X	X	X	X	X				X	X	X	X	X
YCbCr	4:2:2	12b	X	X	X	X	X	X	X	X				X	X	X	X	X
		10b									X	X	X					
YCbCr+A		12b	X	X	X	X	X	X	X	X				X	X	X	X	X
GBR	4:4:4	12b	X	X	X	X	X	X	X	X				X	X	X	X	X
		10b	X	X	X	X	X	X	X	X				X	X	X	X	X
GBR+A		10b	X	X	X	X	X	X	X	X				X	X	X	X	X

Table 17: SDI – 3G Level B (2K × 1080)

Structure			59.94i	50i	60i	23.98p	24p	25p	29.97p	30p	50p	59.94p	60p	23.98psf	24psf	25psf	29.97psf	30psf
XYZ	4:4:4	12b				X	X	X	X	X				X	X	X	X	X
GBR						X	X	X	X	X				X	X	X	X	X

Table 18: SDI – 3G Level B (2×HD 1080)

Structure			59.94i	50i	60i	23.98p	24p	25p	29.97p	30p	50p	59.94p	60p	23.98psf	24psf	25psf	29.97psf	30psf
YCbCr	4:2:2	10b	X	X	X	X	X	X	X	X				X	X	X	X	X

Table 19: SDI – 3G Level B (2×HD 720)

Structure			59.94i	50i	60i	23.98p	24p	25p	29.97p	30p	50p	59.94p	60p	23.98psf	24psf	25psf	29.97psf	30psf
YCbCr	4:2:2	10b				X	X	X	X	X	X	X	X					

Table 20: SDI – HD-SDI (1920 × 1080)

Structure			59.94i	50i	60i	23.98p	24p	25p	29.97p	30p	50p	59.94p	60p	23.98psf	24psf	25psf	29.97psf	30psf
YCbCr	4:2:2	10b	X	X	X	X	X	X	X	X				X	X	X	X	X

Table 21: SDI – HD-SDI (1280 × 720)

Structure			59.94i	50i	60i	23.98p	24p	25p	29.97p	30p	50p	59.94p	60p	23.98psf	24psf	25psf	29.97psf	30psf
YCbCr	4:2:2	10b				X	X	X	X	X	X	X	X					

Table 22: SDI – SD-525 (720 × 486)

Structure			59.94i	50i	60i	23.98p	24p	25p	29.97p	30p	50p	59.94p	60p	23.98psf	24psf	25psf	29.97psf	30psf
YCbCr	4:2:2	10b	X															

Table 23: SDI – SD-625 (720 × 576)

Structure			59.94i	50i	60i	23.98p	24p	25p	29.97p	30p	50p	59.94p	60p	23.98psf	24psf	25psf	29.97psf	30psf
YCbCr	4:2:2	10b		X														

Test signal sets

The following tables list the signals assigned to each test signal set and the signals that can be selected in the signal set when the module is in generator mode. For example, when you select the COLOR BAR signal set, a signal in the Color Bars signal set is output.

NOTE. Picture displays operate best with uncompressed BMP images (24 bits and 32 bits true color). Picture displays do not work with RLE8 or RLE4 BMP compression.

Table 24: Standard SDI test signal sets

Signal set	Signals in the signal set	Description
Color Bar	100% Color Bars, 75% Color Bars (100% White), 75% Color Bars (75% White)	Eight full-height bars of white, yellow, cyan, green, magenta, red, blue, and Black. This pattern is available with three variations, at 100% value for all bars, at 75% value for colors and 100% for white, and at 75% value for all bars.
	100% Color Bars Over Red, 75% Color Bars Over Red	These variations on color bars are available only in the 625 50i format of the SD output mode. They consist of the 75% or 100% color bars signal on the top half of the raster, and a matching 75% or 100% red field on the lower half.
	SMPTE EG1 Color Bars	Color bars per SMPTE EG 1-1990. This pattern includes 75% color bars, reverse blue bars, −I and +Q sections, Black, white, and pluge sections. Note that this pattern is only available for YCbCr formats, since the −I and +Q sections contain color components outside of the legal RGB gamut. For the SD output mode, this pattern is available only for the 525-line 59.94i format.
	SMPTE RP219 Color Bars	Color bars per SMPTE RP 219-2002. This pattern is intended for 16×9 aspect ratio displays, with additional elements as compared to EG1 bars. The SDI implementation includes −I and +Q sections, but unlike the similar sections in EG1 bars, they have additional luminance to stay within RGB gamut. The −2% patch of the pluge section is clipped to 0% Black for XYZ formats. For SD, the color bars are the 4:3 aspect ratio version, as if converted from the 16:9 image with a center cut.
	SMPTE EG432-1 Color Accuracy	Split-screen color bars using values from SMPTE RP 431-2-2007. The upper half of the pattern is essentially the same as 100% color bars, corresponding to the "–1" set of colors defined in Table A.4 of the RP. The lower half is a set of desaturated color bars, corresponding to the "–2" color patch values.
	4K Q1/3 100% Color Bars 4K Q2/4 100% Color Bars 4K Q1/3 75% Color Bars (100% White) 4K Q2/4 75% Color Bars (100% White) 4K Q1/3 75% Color Bars (75% White) 4K Q2/4 75% Color Bars (75% White)	These color bars are for Quad-Link 4K. They provide the four independent 3Gb/s signals, which together, define a full 4K image.
	BT2111-0 HLG Narrow BT2111-0 PQ Narrow	These provide High-Dynamic-Range (HDR) signals that combine color bars and other signal types according to the BT2111-0 standard. The Color Bars sections include both a 2020 and 709 gamut section.

Table 24: Standard SDI test signal sets (cont.)

Signal set	Signals in the signal set	Description
Linearity	5 Step Staircase, 10 Step Staircase	Series of vertical bars of equal steps on all three channels. These patterns are color-independent so they will appear differently in YCbCr, RGB, or XYZ color spaces. Since the range of valid levels is not evenly divisible by 5 or 10 steps, the first and last bars slightly exceed the valid range, but are still well within legal limits. For example, the valid range for 10-bit YCbCr formats is from 64–940 for the Y channel (876 steps) and from 64–960 for the Cb/Cr channels (896 steps). Therefore, the level of the first bar is 62 and the level of the last bar is 942/962, which results in equal step sizes across the pattern.
	Valid Ramp, Y Valid Ramp, B-Y Valid Ramp, R-Y Valid Ramp	The Valid Ramp is a matrix of three different ramps, designed to test the video component channels for YCbCr, and for gamut range testing in all color spaces. These three ramps are also available as individual patterns that span the picture width. First, the Y Valid Ramp spans from Black to white, across the valid range of the luminance (Y) channel. Next, the B−Y Valid Ramp spans from yellow to cyan, across the valid range of the Cb color difference channel. Last, the R−Y Valid Ramp spans from cyan to red, across the valid range of the Cr color difference channel.
	3 Channel Ramp	Wide ramp from the lower valid value to the upper valid value for all three channels. This pattern is color-independent, so it will appear differently in YCbCr, RGB, or XYZ color spaces. On each side of the ramp there are small plateaus at the blanking level (Black) and at the valid level.
	Limit Ramp	Wide ramp that spans the legal limit range (4–1019 for 10-bit formats and 16–4079 for 12-bit formats) for all three channels. On each side of the ramp there are small plateaus at the blanking level, the valid level, and the limit level.
	Shallow Ramp Matrix	Vertical matrix of shallow ramps that together span the range between legal limits (4–1019 for 10-bit formats and 16–4079 for 12-bit formats). Each bit value is held for 16 pixels for 10-bit formats and for 4 pixels for 12-bit formats. There is overlap between the end of one ramp and the start of the next ramp.
	Color Ramp Matrix	Vertical matrix of ramps across the colors available in the valid RGB gamut. Each set of ramps transitions between adjacent hues: red–yellow–green–cyan–magenta–blue–red. From the top of the pattern, the first three rows of ramps are at 25%, 50%, and 75% saturation. The fourth row of ramps includes fully saturated colors at 100% value. The next three rows of ramps are at 75%, 50%, and 25% value. The bottom row of ramps is monochrome.

Table 24: Standard SDI test signal sets (cont.)

Signal set	Signals in the signal set	Description
Flat Field	0% Flat Field (Black), 50% Flat Field, 100% Flat Field (White)	Full-frame monochrome flat fields. The factory installed patterns include 0% (Black), 50%, and 100% (white). You can install extended signal sets, which include additional patterns for the remaining 10% increments. (See Table 25 on page 94.)
	100% Red Field, 100% Green Field, 100% Blue Field, 100% Cyan Field, 100% Magenta Field, 100% Yellow Field	Full-frame color flat fields. The factory installed patterns include each of six colors (red, green, blue, cyan, magenta, and yellow) at 100% value. You can install enhanced signal sets, which include additional patterns for these six colors at 75% value. (See Table 25 on page 94.)
	10% Flat Field, 20% Flat Field, 30% Flat Field, 40% Flat Field, 60% Flat Field, 70% Flat Field, 80% Flat Field, 90% Flat Field	Full-frame monochrome flat fields available in individual patterns from 10% to 90% in 10% increments. These signals are not part of the factory installed signal sets. You must install the enhanced signal sets to access these signals. (See Table 25 on page 94.)
	75% Red Field, 75% Green Field, 75% Blue Field, 75% Cyan Field, 75% Magenta Field, 75% Yellow Field	Full-frame color flat fields available in individual patterns of 75% value for each of six colors (red, green, blue, cyan, magenta, and yellow). These signals are not part of the factory installed signal sets. You must install the enhanced signal sets to access these signals. (See Table 25 on page 94.)
	Black to White-1, Black to White-2, Black to White-3, Black to White-4, Black to White-5, Black to White-6, Black to White-7, Black to White-8, Black to White-9, Black to White-10, Black to Gray-1, Black to Gray-2, Black to Gray-3, Black to Gray-4, Black to Gray-5, Black to Gray-6, Black to Gray-7, Black to Gray-8, Black to Gray-9, Black to Gray-10	Full-frame monochrome flat fields representing the individual steps in the SMPTE EG 432–1 step-scale patterns available under the MONITOR button. These signals are not part of the factory installed signal sets. You must install the enhanced signal sets to access these signals. (See Table 25 on page 94.)
	Red-1 Field, Red-2 Field, Green-1 Field, Green-2 Field, Blue-1 Field, Blue-2 Field, Cyan-1 Field, Cyan-2 Field, Magenta-1 Field, Magenta-2 Field, Yellow-1 Field, Yellow-2 Field	Full-frame color flat fields representing the individual colors in the SMPTE EG 432–1 color-accuracy patterns available under the COLOR BAR button. These signals are not part of the factory installed signal sets. You must install the enhanced signal sets to access these signals.

Table 24: Standard SDI test signal sets (cont.)

Signal set	Signals in the signal set	Description
Multiburst		Multiburst pattern consisting of five or six sine wave packets, each of fixed frequency. This pattern is typically used for frequency response testing for one or three video channels. The packets have a 60% amplitude range upon a 50% level, therefore range between 20% and 80% levels.
		For comparison to these peak limits, flat pedestals at 80% and 20% levels are present on the left side of the pattern. The set of packet frequencies used in each pattern is determined by the maximum bandwidth of the output format.
		For 4:2:2 YCbCr formats, one multiburst pattern consists only of a Y channel signal, up to the maximum frequency limit, and the second multiburst pattern is identical for all three channels, up to half of the Y channel frequency limit.
		For 4:4:4 formats, each multiburst pattern is identical for all three channels.
	Multiburst 0.5–2.75 MHz	(SD formats only) Three channel pattern with packet frequencies of 0.5, 1.0, 1.5, 2.0, and 2.75 MHz.
	Y Multiburst 0.5–5.75 MHz	(SD formats only) Y channel pattern with packet frequencies of 0.5, 1.0, 2.0, 3.0, 4.0 and 5.75 MHz.
	Multiburst 1–15 MHz	(HD and 3G formats only) Three channel pattern with packet frequencies of 1, 3, 6, 9, 12, and 15 MHz.
	Y Multiburst 15–30 MHz	(HD formats only) Y channel pattern with packet frequencies of 15, 18, 21, 24, 27, and 30 MHz.
	Multiburst 15–30 MHz	(4:4:4 and fast-progressive 3G formats only) Three channel pattern with packet frequencies of 15, 18, 21, 24, 27, and 30 MHz.
	Y Multiburst 35–60 MHz	(Fast-progressive 3G formats only) Y channel pattern with packet frequencies of 35, 40, 45, 50, 55, and 60 MHz.
Zone plate	Circle, Diagonal Sine, H Sine, H Sweep, V Sine, V Sweep, Custom-1, Custom-2	Zone plate test signal with real-time parametric controls. These test signals are listed in the Configure Zoneplate submenu. (See page 64, *SDI Configure Zoneplate submenu*.)
Monitor	ChromaDuMonde	Color reference chart, used with permission of DSC Laboratories. The pattern consists of a series of DSC standard color patches representing the six primary colors, 18 evenly spaced intermediate colors, and four skin tone reference patches. The 24 primary and intermediate colors will show as a hexagonal shape on a vectorscope display, providing a reference for comparison with a camera-generated image of a physical DSC ChromaDuMonde chart. The pattern also includes an 11-step crossed grayscale section and a center section with 0% Black and 100% white patches.

Table 24: Standard SDI test signal sets (cont.)

Signal set	Signals in the signal set	Description
	SMPTE 303M Color Reference	Color reference chart per SMPTE 303M, also known as the GretagMacbeth ColorChecker® chart. Note that cyan patch #18 cannot be reproduced properly in the RGB and XYZ color spaces because the red component lies at approximately −14%, which exceeds legal limits for RGB formats. This patch will appear as a cyan and Black checkerboard pattern, where the cyan patches are of a different hue than the full cyan patch as seen in YCbCr formats because the red component is clipped at 0%. The color values used from SMPTE 303M are those with respect to the D_{65} illuminant.
	Black-White Step Scale, Black-Dark Gray Step Scale	Gray scale patterns per §6.9 of SMPTE EG 432-1-2007. A series of ten different monochrome patches at increasing luminance values is centered on a gray background, to verify gray scale tracking. The ten steps of the Black to white scale are normalized gamma-corrected values of 1/10 to 1 and the ten steps of the Black to dark gray scale are 1/31 to 10/31.
	Pluge and Luma Reference	Includes two elements to assist in Black and white balance. The left side of the pattern contains a pluge pattern, with three vertical bars of −2%, 0%, and +2% Black. The right side of the pattern contains four gray boxes corresponding to luminance levels of 110 mV, 200 mV, 450 mV, and 700 mV (100% white) in the analog domain. The −2% patch of the pluge section is clipped to 0% Black for XYZ formats.
	Checkerboard	4×4 grid of alternating Black and white patches, used to measure intra-frame contrast per §6.8 of SMPTE SMPTE EG 432-1-2007.
	Window	White square centered on a Black background. This pattern can be used as an alternative to a full-field white pattern when it is desirable for the average picture level (APL) to approximate normal program content.
	Production Aperture	Includes single-pixel wide lines at the extreme edges of the active video area, marking the complete production aperture. Vertical lines are implemented as single-sample pulses with no edge filtering, so this pattern is not legal as a broadcast signal.
	Clean Aperture	Grid pattern per SMPTE RP 187-1995. The clean aperture is marked by the outer markers, with overscan markers at approximate 2.5% increments. The center 4:3 section of a 16:9 image has an additional set of aperture and overscan markers. Each line on the grid is implemented with two horizontal lines or a double-width pulse centered on two samples, because the actual aperture boundary and the center of the image each lie midway between lines and samples.
	Convergence	Grid pattern of equal size squares, with a dot at the center of each square. Each line and dot is implemented as a single horizontal line or single-sample pulse. This pattern is used to verify convergence of RGB channels, and no color fringing should be visible on the white lines and dots when the channels are aligned.

Table 24: Standard SDI test signal sets (cont.)

Signal set	Signals in the signal set	Description
Pulse Bar	2T Pulse and Bar	Two pulses of 2T half-amplitude width and full-scale amplitude. A positive pulse is added to a base level at the minimum valid value, and a negative pulse is added to a bar level at the maximum valid value. The 2T pulse is used for Short Time response testing and the bar is used for Line Time response testing.
		The type of 2T pulse depends on the signal format:
		■ For SD-525 format, this is a 2T4 pulse
		■ For SD-625 format, this is a 2T5 pulse
		■ For HD and slow-progressive 3G formats, this is a 2T30 pulse
		■ For 3G fast progressive formats, this is a 2T60 pulse
		■ For 4:2:2 formats, chroma pulses are at half the bandwidth
	Color Pulses	Eight color pulses of 2T half-amplitude width upon Black and white backgrounds. The upper half of the pattern has positive pulses on a Black background, testing each combination of the three color channels. The lower half of the pattern has a white background, so negative pulses are used to result in the same line colors. For example, the yellow pulse in the upper half is 100% red plus 100% green, resulting in yellow on a Black background. At the same horizontal location in the lower half, a pulse of −100% blue added to the white background also results in a yellow line.
Timing	Co-siting Pulse	One single-sample wide pulse in the center of the image, used to show the timing relationship and alignment between chroma and luma channels. Different amplitudes are used to distinguish the three channels.

Table 24: Standard SDI test signal sets (cont.)

Signal set	Signals in the signal set	Description
SDI	Equalizer Test	Full-field equalizer test pattern per SMPTE RP 198-1998. This pattern consists of alternate 10-bit words, 300h and 198h, regardless of the current sampling structure and format. For 10-bit 4:2:2 YCbCr HD-SDI formats, the Y samples carry the 198h words and the Cb/Cr samples carry the 300h words, resulting in a magenta-shaded field for this pattern. For other formats, these same 10-bit word values will result in different color representations. This pattern also includes the polarity control word, such that the first sample in the active picture in every other frame is 190h instead of 198h.
	PLL Test	Full-field phase-locked loop test pattern per SMPTE RP 198-1998. This pattern consists of alternate 10-bit words, 200h and 110h, regardless of the current sampling structure and format. It appears as a 24% gray field in 10-bit 4:2:2 YCbCr formats, but as different colors in other formats.
	SDI Matrix	Matrix pattern, with the equalizer test pattern (300h 198h) in the upper half of the field and the PLL test pattern (200h 110h) in the lower half of the field.
Frame Picture	Frame Picture	Picture rendered from user-supplied BMP files stored in the PICTURE directory of the mainframe memory. Use the left or right arrow button to select a test signal from the list. (See page 95, *SDI picture file generation*.)

Table 25: Enhanced SDI test signal sets

Enhanced signal set	Description
Monochrome fields	Includes all monochrome flat fields from 0% to 100% in 10% increments
Color fields	Includes color fields for six primary and secondary colors at both 100% and 75% values
SMPTE RP431-2 color patches	Includes full field patterns for each of the Black-White and Black-Dark Gray steps, plus the "–1" and "–2" color patches

SDI picture file generation

Frame pictures are .bmp files that are used to generate pictures. When generating signals from frame pictures, the instrument does not filter the video signal except at the left and right borders of the raster. The unfiltered signal allows users to control exactly what is generated and to create stressful patterns.

The instrument allows picture files to be used at resolutions larger and smaller than the native size of the picture file. If the picture image is larger than needed, it will be truncated and only the upper left corner of the image will be displayed. If the picture file resolution is smaller than the output raster, then the image will be displayed in the upper left corner of the output, and Black will be shown in the rest of the image.

The combination of not filtering and the use of nonnative image sizes has the potential to cause problems in several areas:

- If the video in the frame picture file has fast transitions that exceed the normal video limits, then the final output may ring excessively and therefore not be appropriate for transmission. In most cases, the picture file should be processed to limit the edge speed before it is downloaded to the instrument.

- If the video in the frame picture file is not shaped at the edges of the raster, then there may be ringing if the signal is put in motion. If this is a concern, then the picture file should be processed to have gradual transitions at the edges before it is downloaded.

- If the frame picture file is used at a raster that is smaller than the native size of the file, then it will be truncated at the output raster size which may create unshaped edges. These will be masked for normal operation, but will be exposed if the signal is set in motion. If this is a problem, then the user should create a second version of the picture file that has the desired native raster size and has shaped edges.

- If a frame picture file is used at a raster size greater than the native size of the file, then the two edges will inherently end up somewhere inside the output raster image. If the file has unshaped edges, then the output may have excessive ringing even when not in motion. If this is a concern, then the picture file should be processed to have gradual transitions at the edges before it is downloaded.

SDI Zone plate signals

Zone plate video test patterns, or simply "zone plates", are important tools for the evaluation of video processing systems and techniques.

They are called zone plates because the classical circular pattern looks like an optical zone plate (which uses the principles of Fresnel diffraction to focus and intensify light). Today, however, the name has been applied to a wide variety of stationary and "moving" test patterns.

The following figure shows two enlarged optical zone plates. The white areas are transparent and the black areas are opaque. The precise spacing of the rings focuses and intensifies light that passes through the plate.
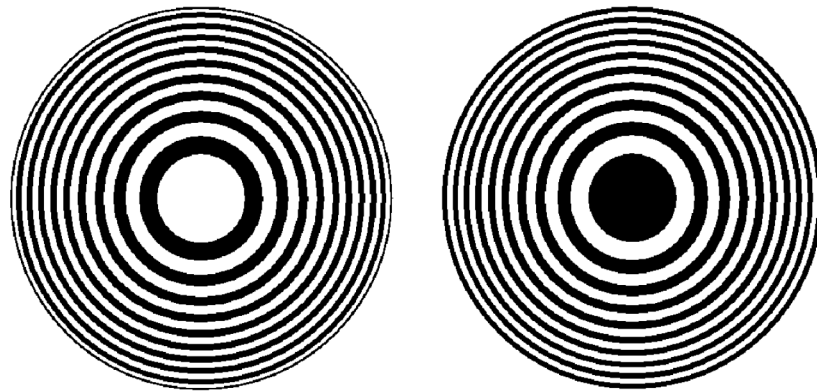

Figure 30: Optical zone plates (enlarged)

When Option SDI is installed, the instrument generates electronic zone plate signals, and can be configured to provide a near infinite number of test patterns. Six basic patterns are predefined (Circle, Diagonal, Horizontal Sine, Horizontal Sweep, Vertical Sine, and Vertical Sweep) for convenience. These patterns all have an overall, or pattern control, parameter.

Pattern control parameters are unique to the specific predefined signals, and are only found as the first item of the specific signal menu. User-created zone plate signals saved as Custom-1 or Custom-2 do not have pattern control parameters. The dependent parameters are common to all of the zone plate signals, and are found below the pattern control parameter in the menu for each zone plate signal.

Altering the pattern control parameter will make changes to the test signal while maintaining the basic pattern. For example, the pattern control parameter for the Circle zone plate signal is the Circle Frequency parameter. The Circle Frequency parameter controls the maximum frequency of the circle. You may alter the Circle Frequency at will, and the system will adjust four other dependent parameters to maintain the pattern as a circle. However, if you alter the underlying dependent parameters individually the pattern may change to be something other than a circle.

After changes have been made you can save the new signal as a custom zone plate signal.

To use a zone plate signal   Zone plate signals can be accessed from the Signal Selection setting in the SDI Signal submenu. (See page 60, *SDI Signal submenu*.) Here is an example of how you can use zone plate signals to simplify a common task.

One common task is measuring the horizontal frequency response of a system. With a typical swept-frequency generator you would apply a signal such as a 1 MHz to 30 MHz sweep with markers every 5 MHz. Then you try to estimate the frequency of the 3 dB roll-off point by interpolating the position of the 3 dB point between the markers.

The instrument's adjustable zone plate signal provides a better way:

- The H Sweep Zoneplate pattern control parameter is the H Sweep Frequency, which controls the upper frequency limit of the sweep (the swept-to frequency).

  - Simply adjust the H Sweep Frequency until the system roll-off is at –3 dB.

  - Read the frequency directly from the instrument display.

- The H Sine Zoneplate, which provides a constant frequency horizontal sine signal instead of a swept signal, can be used to reduce error in measuring attenuation at a given frequency.

  - Set the Horz. Frequency parameter to a low value and measure the amplitude of the entire line.

  - Next, calculate the –3 dB point (0.707 × the low frequency amplitude).

  - Finally, increase the Horz. Frequency parameter until the system response for the whole line is at the calculated –3 dB level, and read the –3 dB frequency directly from the instrument display.

- Since the ZP Amplitude parameter is adjustable for each of these signals, you can measure the response at 100%, 60%, or any other level as needed.

These same techniques can be used to measure vertical or diagonal response, by selecting the appropriate zoneplate signal.

To modify a zone plate signal

There are times when a specific test case requires a modified zone plate signal. By making and saving changes to the zone plate parameters you can create a new signal that is based on the selected signal, and then save that new signal. Changes you make affect only the new signal; the standard zone plate signal used as a basis for the new signal is not changed.

Before making changes, make sure you are familiar with both the zone plate pattern control parameters and zone plate pattern dependent parameters. (See page 99, *Zone plate pattern control parameters*.) (See page 101, *Zone plate dependent parameters*.)

Perform the following steps to change a zone plate signal's parameters:

1. In the SDI menu, open the Signal submenu to access the Signal Selection drop-down list.

2. Use the drop-down list to view the Zoneplate Signals subgroup and select a zone plate signal from the provided six standard zone plate signals (Circle, Diagonal, H Sine, H Sweep, V Sine, and V Sweep), or two user-defined signals (Custom-1 Zoneplate or Custom-2 Zoneplate). Each of the standard zone plate signals have a pattern control parameter that is unique to that signal as shown in the following table:

Zone plate signal	Pattern control parameter
Circle	Circle frequency: [x] c/aph [1]
Diagonal	Diag. Frequency: [x] c/aph [1]
H Sine	Horiz. Frequency: [x] MHz
H Sweep	H Sweep Frequency: [x] MHz
V Sine	Vert. Frequency: [x] c/aph [1]
V Sweep	V Sweep Frequency: [x] c/aph [1]

[1] c/aph = cycles per active picture height

3. When the desired zone plate signal is displayed, such as **Circle Zoneplate**, click Configure Zoneplate to open the Circle Zoneplate submenu.

4. While the pattern control parameter is displayed, you can edit the menu parameters to modify the signal while maintaining the basic pattern.

5. When you are done changing parameters, go to the **Save As:** menu item at the bottom of the menu and select either **Custom 1** or **Custom 2** to save the signal modifications.

Zone plate pattern control parameters

NOTE. Zone plate variations can be sinusoidal, square, or triangular. These discussions of zone plated parameters will refer to sinusoidal variations for convenience.

Zone plate patterns are made up of sinusoidal variations in luminance, with the "peaks" of the sine waves resulting in white areas on the video screen and the wave "troughs" shown as gray or black. The cycles can occur in all three of the video dimensions: horizontally, or along each line of the picture; vertically, or "down" the video frame; and temporally (with time). The three dimensions are often referred to by the shorthand designations of X, Y, and T.

The luminance of any point in the picture, physically on the screen and in time, is determined by the value of sine at that particular point; the value of sine follows from the phase of the cycle at that point; and (by the definition of a zone plate) the phase of any point is determined by the equation:

$$\phi_{xyt} = k_\phi + k_X\,(x) + k_Y\,(y) + k_T\,(t) + k_{XT}\,(xt) + k_{YT}\,(yt) + k_{XY}\,(xy)$$
$$+\frac{1}{2}k_{X^2}\,(x^2) + \frac{1}{2}k_{Y^2}\,(y^2) + \frac{1}{2}k_{T^2}\,(t^2)$$

where x, y, and t are the coordinates of the point in question and k_Φ, k_X, k_Y, k_T, k_{XT}, k_{YT}, k_{XY}, $k_X{}^2$, $k_Y{}^2$, and $k_T{}^2$ are constants.

All instrument zone plate patterns are defined with coefficients of ten parameters that correspond to the constants in the above equation. Note that while the possibilities are virtually endless, most common zone plates are defined with only one or two parameters, while the coefficients of the remaining parameters are kept at zero.

The instrument generates six standard zone plate signals: circle frequency, diagonal frequency, horizontal sine frequency, horizontal sweep frequency, vertical sine frequency, and vertical sweep frequency. Each standard zone plate signal has a pattern control parameter. (See Table 26.) This pattern control parameter is unique to the zone plate signal it is associated with.

When you first enter the zone plate parameters menu for a signal, the pattern control parameter for that signal is displayed. The pattern control parameter controls the basic pattern frequency by adjusting the dependent parameters. For example, if you change the Circle Frequency, the generator adjusts four of the dependent parameters to keep the circle round.

Table 26: Zone plate pattern control parameters

Zone plate signal	Pattern control parameter	Parameter definition
Circle	Circle Frequency (maximum c/aph)	The circle frequency is actually the equivalent of the maximum vertical sinusoid frequency at the very top and bottom of the screen (see the discussion of the $K_Y\,2$ parameter). Adjusting the circle frequency has the simple effect of increasing or decreasing the maximum frequency at the outer edges of the pattern. However, this adjustment actually changes the coefficients of four of the zone plate parameters to keep the pattern round and centered on the screen.
Diagonal	Diagonal Frequency (equivalent c/aph)	The diagonal frequency is $\sqrt{2}$ times the vertical and horizontal frequencies (c/aph). Adjusting the diagonal sine frequency changes both the KX and KY coefficients.
H Sine	Horizontal Frequency (MHz)	The horizontal frequency reported on the display is the real time frequency of the sine wave that causes the vertical bar pattern. The maximum frequency is half of the clock frequency used by the generator for the active video standard (for example, 74.25 MHz/2 = 37.125 MHz).
H Sweep	H Sweep Frequency (maximum MHz, or multiple)	For horizontal sweep frequencies up to half of the video standard's sampling frequency, f_s, the displayed value is the maximum (or swept to) frequency of the sine wave. For numbers greater than $f_s/2$, dividing the displayed value by the sampling frequency will give the number of complete DC–($f_s/2$)–DC cycles per line. For example, in a standard with sampling frequency of 74.25 MHz, a horizontal sweep frequency of 148.5 MHz will result in approximately two complete frequency sweeps across the picture.
V Sine	Vertical Frequency (c/aph)	The vertical frequency is actually the K_Y coefficient. The maximum frequency (c/aph) corresponds to the number of active video lines in a field of the active video standard. For example, when an 1125-line system is output (which has 1080 active lines), K_Y can be any value between –540 and 540.
V Sweep	V Sweep Frequency (maximum c/aph, or multiple)	The vertical sweep frequency is actually the $K_Y\,2$ coefficient. For numbers greater than maximum, dividing the displayed value by that maximum will give twice the number of complete DC-max-DC sweeps per field (sweeps = $(K_Y 2/K_Y)/2$). For example, in a standard with 1080 lines per field, a vertical sweep frequency of 2160 c/aph^2 would result in one complete frequency sweep down the picture.

Zone plate dependent parameters

The zone plate dependent parameters are listed below the Frequency pattern control parameter in each of the zone plate patterns; they are the same for all zone plate patterns.

Frequency (pattern control) parameter

Display name: Frequency

Units: c/aph per active picture height (c/aph²)

The instrument generates six standard zone plate signals: circle frequency, diagonal frequency, horizontal sine frequency, horizontal sweep frequency, vertical sine frequency, and vertical sweep frequency. Each standard zone plate signal has a pattern control parameter. (See Table 26 on page 100.)

K_Y^2 parameter

Display name: KY^2 (V Sweep)

Units: c/aph per active picture height (c/aph²)

The K_Y^2 (V Sweep) parameter sets the increase (or decrease) in vertical frequency down the frame. (K_Y^2 compares to K_X^2 as K_Y compares to K_X.) Again, a good way to see the effect of K_Y^2 is to view the field on a waveform monitor. With KY set to 0.0, a K_Y^2 coefficient of 10 will result in the apparent vertical sine wave changing from DC to 10 c/aph from the top of the picture to the bottom.

To center the "DC point" at mid-screen, set K_Y^2 to –2 times K_Y.

The Vertical Sweep zone plate is a "K_Y^2-only" zone plate. (See Figure 34.)

Figure 31: A "K_Y^2-only" zone plate

Amplitude parameter

Display name: Amplitude

Units: mV

Use this parameter to adjust the zone plate signal amplitude from 0.0 mV to 798.0 mV, in 0.5 mV increments. The default value is 700 mV.

K parameter

Display name: K (Phase)

Units: cycles

The $K_\varnothing$ parameter is the initial phase of the pattern; it cannot create a pattern by itself. To see the effects of this adjustment, first set the K_X coefficient to approximately 0.75 and set a waveform monitor to view the line waveform. Then adjust $K_\varnothing$. The sine wave will begin on each line at the selected point in the cycle. Note that 0.25 cycle corresponds to a phase of 90 degrees (or $\pi/2$ radians); recall that the sine of 90° is 1.0 and the sine of –90° is –1.0. When $K_\varnothing = 0.25$, the pattern will begin in the upper left corner of the screen as white; when $K_\varnothing = -0.25$, the beginning will be Black.

K_X parameter

Display name: KX (H Freq.)

Units: cycles/active picture height (c/aph)

K_X denotes the initial constant horizontal frequency of the pattern. To see the effects of changing this coefficient, set a waveform monitor to view the video lines. Note that the units are cycles per active picture height. The number of cycles in a line will depend on the width-to-height aspect ratio of the active format. For example, $K_X = 9.0$ will result in approximately 12 cycles per line in a format with a 4:3 aspect ratio; the same setting will yield about 16 cycles per line when the ratio is 16:9.

To estimate the equivalent absolute frequency of the sine wave (i.e., to convert from c/aph to c/s, or Hz), use the formula

$$f_{eq} \approx K_X \times R_{l:av} \times R_{aspect} \times N_{lines} \times f_{frame}$$

where

R_{aspect} = the aspect ratio (width ÷ height)
N_{lines} = the number of lines per frame
f_{frame} = the frame rate
$R_{l:av}$ = the ratio of line length to the length of the active video

The maximum frequency is (±) half of the active format's sampling frequency. In formats that use a 74.25 MHz clock, for example, the maximum value of KX will correspond to a sine frequency of 37.1 MHz.

The Horizontal Sine zone plate, for example, is a "K_X-only" zone plate. (See Figure 34.)
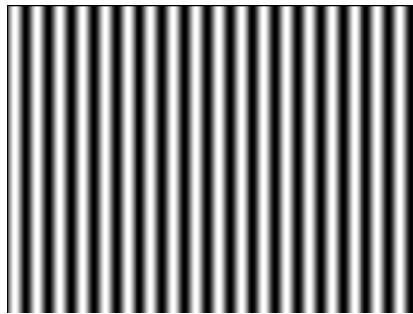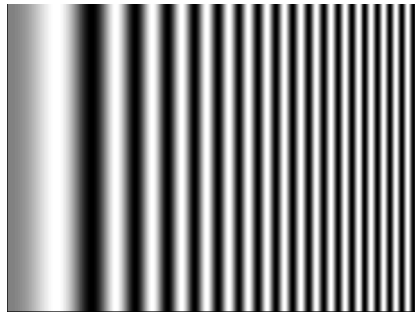

Figure 32: A "K_X-only" zone plate

K_{XT} parameter   Display name: KXT (T Ch. H Freq.)

Units: c/aph per second (c/aph/s)

The K_{XT} (T Ch. H Freq.) parameter controls the change in horizontal sine frequency over time. Setting K_{XT} to 1.0, for example, causes the horizontal frequency to increase by one c/aph each second. If K_X is 0.0, then the frequency will be 10 c/aph after ten seconds, 20 c/aph after twenty seconds, and so forth. The frequency will increase until it reaches the maximum for the active format, then the phase of the signal will "flip" by 180° (the sine wave will become "negative") and the frequency will continue to "increase" through DC, when the cycle will begin again.

K$_X$² parameter

Display name: KX^2 (H Sweep.)

Units: c/aph per active picture height (c/aph²)

The K$_X$² (H Sweep) parameter sets the increase (or decrease) in the horizontal frequency as a function of position along the video line. When K$_X$² alone is applied, the result resembles a common sweep test signal. Again, use a waveform monitor to look at (all) the video lines to see the effects of K$_X$². When K$_X$ is 0.0, setting K$_X$² to 9 will result in the line waveform changing from DC to 9 c/aph in the width equal to one "active picture height." As with K$_X$, the ending frequency will depend on the aspect ratio of the active video format. For example, in a 16:9 format with a K$_X$ of –9.0, a K$_X$² coefficient of 9.0 will cause the waveform to increase to DC in one "aph." The frequency will continue to increase to approximately 7.0 c/aph by the end of the line.

Use this formula to calculate K$_X$ and K$_X$² terms for a sweep with the DC point at mid-screen:

$$K_X = \left(-\tfrac{1}{2} R_{aspect}\right) \times K_{X^2}$$

where R$_{aspect}$ is the aspect ratio (width ÷ height) of the active format.

The Horizontal Sweep zone plate (H Sweep) is a "K$_X$²-only" zone plate. (See Figure 34.)

Figure 33: A "K$_X$²-only" zone plate

K$_{YT}$ parameter

Display name: KYT (V Ch. V Freq.)

Units: c/aph per second (c/aph/s)

The K$_{YT}$ (V Ch. V Freq.) parameter controls the change in vertical sine frequency over time. Setting K$_{YT}$ to 1.0, for example, causes the vertical frequency to increase by one c/aph each second. If KY is initially 0.0, then the frequency will be 10 c/aph after ten seconds, 20 c/aph after twenty seconds, and so forth. The frequency will increase until it reaches the maximum for the active format, then the phase of the signal will "flip" by 180° (the frequency will become "negative") and the frequency will continue to increase through DC in a repetitive cycle.

K$_{XY}$ parameter

Display name: KXY (V Ch. H Freq.)

Units: c/aph per active picture height (c/aph^2)

The K$_{XY}$ (V Ch. H Freq.) parameter sets the change in horizontal frequency as a function of the vertical position in the video frame. To see the effects of this parameter, set the waveform monitor to view one selected line only. Then, with K$_{XY}$ set to approximately 25 (all other coefficients left at 0.0), look at line waveforms from top to bottom of the frame. The horizontal frequency increases slightly on each succeeding line, reaching 25 c/aph on the last line of active video. The result can be thought of as a vertically arranged "sweep" signal.

K$_T$ parameter

Display name: KT (T Freq.)

Units: cycles per second (c/s)

The K$_T$ (T Freq.) parameter, if used alone, does not create a "pattern." Rather, the entire screen will cycle (sinusoidally) between white and Black. The effect will be similar on either line or field display of a waveform monitor.

Typically, a small K$_T$ coefficient is set to add apparent motion to a standard circle, sine wave, or sweep pattern. To see the picture effects of this parameter, select any of the standard zone plates and vary K$_T$. Note that the K$_T$ coefficient may be positive or negative; the sign will determine the direction of the pattern's motion.

K$_Y$ parameter

Display name: KY (V Freq.)

Units: cycles per active picture height (c/aph)

The K$_Y$ (V Freq.) parameter sets the initial *vertical* frequency of the pattern (it is analogous to K$_X$ rotated 90° clockwise). To see the effects of this parameter, set it to a low number and adjust a waveform monitor to view one or two fields of the instrument SDI output. The variation in the (dc) voltage level from line to line will give the field waveform the appearance of a sampled sine wave, especially at a K$_Y$ of around 5 to 10 c/aph (the sinusoid can become difficult to discern at higher frequencies). Note that in the Y (vertical) parameters, the c/aph units translate directly into visible cycles down the frame.

The Vertical Sine zone plate is a "K$_Y$-only" zone plate. (See Figure 34.)

Figure 34: A "K$_Y$-only" zone plate

K$_T$2 parameter

Display name: KT^2 (T Sweep)

Units: cycles per second per second (c/s^2)

The K$_T$2 (T Sweep) parameter sets the change in temporal frequency over time. If K$_T$ is initially 0.0, setting K$_T$ 2 to 1.0 will result in an apparent K$_T$ of 10.0 after ten seconds, 20.0 after twenty seconds, and so forth. The temporal frequency will increase to maximum, return to 0.0, and repeat the cycle as long as the value of K$_T$ 2 remains greater than zero.

Status menu

Click the Status tab to view the current status of instrument settings such as the signal reference source, the signals being output, and information about system faults and alerts. This menu is for viewing status only and no changes to the instrument settings can be made from this menu. The following figure shows the menu diagram on the left side of the Status menu.
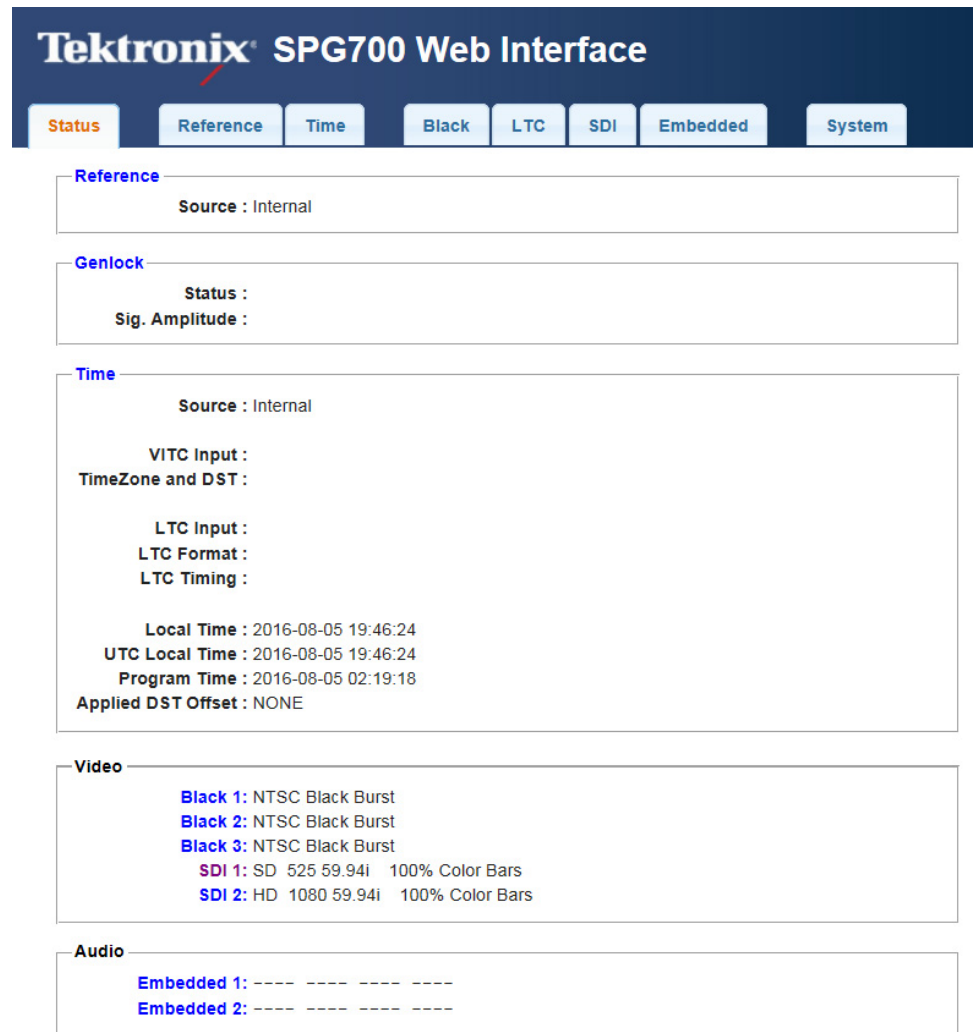

Figure 35: Status display – left side

In addition to the LTC status display on the top right of the display, there are indicators to provide a quick view of the instrument status. More information on these indicators is available under the System tab. (See page 109, *System menu*.)

How to make configuration changes from the Status menu

Each of the status items listed in the Status menu have links highlighted in blue that allow you to quickly move to the configuration menu for that parameter. For example, click Black 1 to go to the configuration menu for the Black 1 output.

Reference

This section of the Status display lists the currently selected reference source. Click the Reference tab to change the reference source.

Genlock

This section of the Status display shows the status and signal amplitude of the timing offset. If the Reference Source is set to Internal, these menu items will not contain any data. If a fault occurs, the Status field lists possible reasons for the fault. Click the System tab for more information on a fault or a reason for an alert.

Time

This section of the Status display shows the currently selected timing source on the top line and displays additional timing status messages. The information depends on the selected time source (such as, LTC, VITC, Internal). The submenu also provides an overview of the LTC input, format, and timing information for LTC outputs. and information on the current time settings.

Video

This section of the Status display shows the current format for each of the Black outputs (1–3). The submenu item appears only when Option SDI is installed; it shows the format and test signal on the selected SDI output (1 or 2).

Audio

This section of the Status display appears only when Option SDI is installed; it shows the status of the audio on each of the embedded audio groups and channels for the selected SDI output.

LTC

This section appears on the right side of the Status display. This section of the Status display shows the current source for each of the LTC outputs (1–4) and the Type fields show the format of each signal. If LTC 1 is configured to be an input, the display shows "Input" as the status for that signal. Click on the heading of each column to quickly go to the related item under the LTC tab.

LTC	LTC 1 (Output)	LTC 2	LTC 3	LTC 4
Source:	Time of Day	Time of Day	Time of Day	Time of Day
Type:	30 fps drop-frame	30 fps drop-frame	30 fps drop-frame	30 fps drop-frame

Figure 36: LTC status display

System menu

Use the System menu to view and configure instrument settings such as network parameters, SNMP traps, GPI alarms, installed options, display brightness, beeper control, and hardware/firmware versions.

You can also use this menu to perform firmware upgrades, save and recall presets, and view diagnostic results.

The following figure shows the top-level System menu.

Figure 37: System menu

Status indicators
The INT, EXT, TIME, PWR1, PWR2, and FAULT indicators on the top right side of the SPG700 Web Interface display provide a quick overview of the system status. If there are any problems, the color of the indicators change (such as red). You can click on an indicator to quickly go to the related menu to get more information. More information on the front panel indicators is provided in the *SPG700 Installation and Safety Instructions*.

Status submenus
Click the individual selections to open submenus for the System menu.

■ **Status**. This submenu provides a quick overview of the current system status. (See page 110, *Status submenu*.)

■ **Presets**. Use this submenu to save or recall instrument settings saved as a preset. (See page 112, *Presets submenu*.)

■ **General Settings**. Use this submenu to provide information on the general instrument settings and to upgrade the firmware through the Network. (See page 113, *General Settings submenu*.)

■ **SNMP Settings**. Use this submenu to enable or disable SNMP (Simple Network Management Protocol), and to configure up to four IP addresses to receive SNMP traps. (See page 114, *SNMP Settings submenu*.)

■ **GPI Settings**. Use this submenu to configure the General Purpose Interface (GPI) inputs and outputs. (See page 116, *GPI Settings submenu*.)

■ **Options**. Use this submenu to view which options are installed in the instrument. (See page 119, *Options submenu*.)

■ **Diagnostics**. Use this submenu to view the results of diagnostic tests for various components of the instrument. (See page 120, *Diagnostics submenu*.)

Status submenu

Use this submenu to provide an overview of the status of the instrument. The menu items are read-only and cannot be modified directly. The following figure shows an example of the Status submenu; in this example no faults or alerts were detected by the instrument.
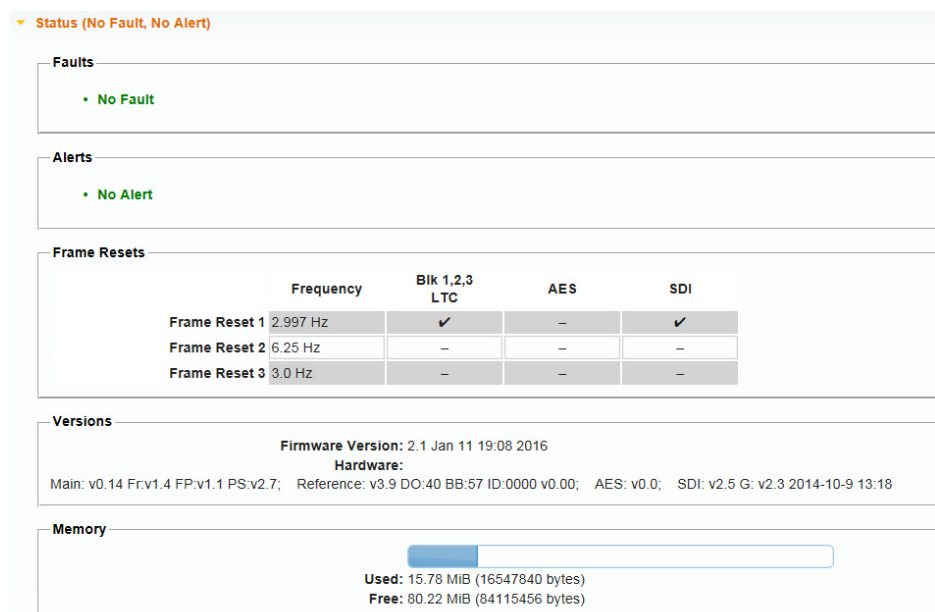
Figure 38: System Status submenu

The Status submenu contains the following sections:

■ **Faults**. If there are any instrument faults, this section contains a brief description of the fault. If no faults are detected, **No Fault** is displayed. Refer to the *SPG700 Installation and Safety Instructions* for more information on the alert and fault error messages.

■ **Alerts**. If there are any instrument alerts, this section contains a brief description of the alert. If no alerts are detected, **No Alert** is displayed. Refer to the *SPG700 Installation and Safety Instructions* for more information on the alert and fault error messages.

■ **Frame Resets**. This section displays the three frame reset signals in the instrument and shows, if any, which instrument outputs are currently using each frame reset signal. Refer to *Frame reset signals* for detailed information about how the frame reset signals are used. (See page 1.)

The following figure shows the Frame Reset 1 signal being applied to the Black 1, 2, and 3 and SDI outputs. In this example, no outputs are using the Frame Reset 2 and 3 signals.

Frame Resets	Frequency	Blk 1,2,3 LTC	AES	SDI
Frame Reset 1	2.997 Hz	✔	–	✔
Frame Reset 2	6.25 Hz	–	–	–
Frame Reset 3	3.0 Hz	–	–	–

Figure 39: Frame Resets example

■ **Versions**. This section displays the versions of the various software and hardware components in the instrument. The firmware version includes the date and time of the firmware build; the date and time are in the format <month, date, time, year>.

The hardware versions include the following:

  – Main. Lists the versions for the CPU, main FPGA (Fr), Front Panel board (FP), and Power Supply Combiner board (PS).

  – Reference. Lists the versions for the Black board PLD, both of the Black board FPGA versions (DO and BB), and an ID value. The ID value will always be "0000 v0.0".

  – AES. The AES version will always be v0.0.

  – SDI. When Option SDI is installed, lists the versions for the SDI PLD, the SDI FPGA version (G), and the build date (year, month, day, time).

■ **Memory**. This section displays the total amount of flash memory that is installed in the instrument and displays the amount of memory that is being used and the amount that remains free (available). The graphical bar provides a quick view of the amount of memory being used.

The flash memory is used by the custom test signal, frame picture, logo, font, and text overlay files that you install in the instrument. When the amount of available memory is low, you might need to delete some of these custom files from memory before you can install new files.

Presets submenu

Use this submenu to recall instrument settings saved as a preset or save the current instrument settings to a preset. You can also delete or rename presets. The following figure shows the Presets submenu.
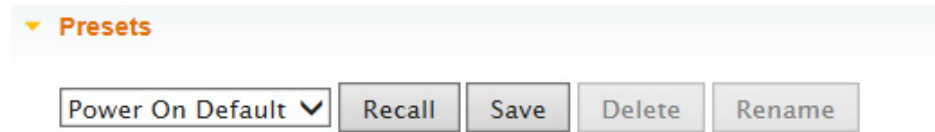

Figure 40: System Presets submenu

Use the drop down list to select the desired preset. There are 13 user-selectable presets. The first seven numbered presets can be recalled using the mainframe GPI (General Purpose Interface).

The following three presets are named at the factory and have special functions:

■ **Power On Default**. Use this preset to save instrument settings that you want automatically loaded when the instrument powers on. You cannot assign this preset name to another preset.

■ **User Default**. Use this preset to save user-specified default settings. If you save new instrument settings in this preset, a confirmation message appears to prevent overwriting.

■ **Factory Default**. Use this preset to reset the mainframe and all of the installed modules to the factory default settings. Some System button menu settings are not affected when the factory default settings are recalled. (See page 129, *System menu factory default settings*.)

Use the following buttons to recall, save, delete, or rename existing presets:

■ **Recall**. Click the button to recall the instrument settings saved in the selected preset.

■ **Save**. Click the button to save the current instrument settings to one of the 13 available presets, shown in the drop-down list.

■ **Delete**. Click the button to delete the contents of the specified preset in the drop-down list. You cannot delete the following presets: Power on Default, User Default, and Factory Default.

■ **Rename**. Click the button to rename the selected preset from the drop-down list. When you click the Rename button, another dialog box appears where you can enter the new name. You can enter a text string of up to 32 characters. Click **OK** after entering the new name.

General Settings submenu

Use this submenu to enable or disable the alarm beeper, adjust the front panel LCD contrast, select the active power supply, and to update the firmware through the Network.

- **Enable Alarm Beeper**. Select the check box to enable the beeper function in the instrument. When enabled, the beeper alerts the user when a fan fault condition has been detected. Clear the check box to disable the alarm beeper.

- **Front Panel LCD Contrast**. Enter a number between 0 and 40 to adjust the contrast of the LCD display. The default value is 8.

- **Active Power Supply**. When two power supply modules are installed in the instrument (Option DPW) and both are connected to power, use this menu item to select which of the two supplies is the primary (active) supply.

NOTE. It is recommended that you configure the supply with the most temperature weighted hours to be used as the primary supply. This allows for the newer supply to be preserved so it can provide the best possible backup should the primary supply fail. For more information about how to operate an instrument with two power supplies, see the SPG700 Installation and Safety Instructions.

- **Upgrade Firmware (via Network)**. Click this button to upgrade the instrument firmware via the Network. If you want to upgrade the firmware using a USB drive, you must use the instrument front panel to perform the upgrade. (See page 23, *How to upgrade the instrument firmware*.)

When you click the Upgrade Firmware button, a dialog box displays a warning that the firmware upgrade procedure will disrupt instrument operation and will overwrite all user data. Click OK to proceed or Cancel to cancel the procedure.

When you click OK, the instrument will connect to the Network to download the latest firmware. Follow the on-screen instructions to download the firmware.

SNMP Settings submenu

Use this submenu to enable or disable SNMP (Simple Network Management Protocol) remote control of the instrument and to configure up to four IP addresses to receive SNMP traps. The following figure shows the SNMP Settings submenu.
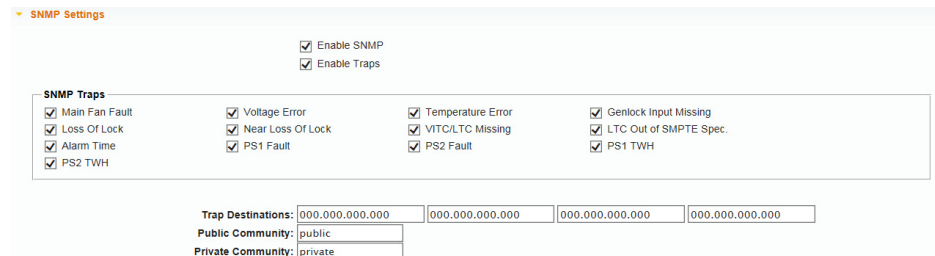

Figure 41: SNMP Settings submenu

This submenu has the following menu items:

■ **Enable SNMP**. Select this check box to enable SNMP communication with the instrument; clear the check box to disable the communication.

■ **Enable Traps**. Select this check box to enable the instrument to send SNMP traps; clear the check box to disable the instrument from sending SNMP traps.

■ **SNMP Traps**. This section of the submenu lists the individual SNMP traps. Select individual traps for which instrument conditions will trigger an SNMP trap to be sent. For more information on each trap refer to the discussion of the SNMP Traps. (See page 115, *SNMP Traps*.)

■ **Trap Destinations**. Use these entry boxes to set the destination IP addresses of the SNMP traps. You can configure up to four IP addresses to which SNMP traps will be sent when error conditions are detected.

NOTE. The default value for the SNMP trap addresses is all zeroes, which disables the trap outputs.

■ **Public Community**. Use this area to set the Public Community string, which is effectively a password and is required before SNMP commands can read values from the instrument. The default string value is **public**. You can enter a string of up to 16 characters.

■ **Private Community**. Use this area to set the Private Community string, which is effectively a password and is required before SNMP commands can read or write changes into the instrument. The default string value is **private**. You can enter a string of up to 16 characters.

■ **Download SPG8000 MIB File**. Click this link to download and open the SPG8000 MIB file. The SPG8000, SPG8000A, and SPG700 share the same MIB file. Some of the commands in the file will apply to features and functions available only on the SPG8000 and SPG8000A.

SNMP Traps   Select the individual traps to be sent by the instrument to trigger an SNMP trap. Select the check boxes to enable the traps; clear the check boxes to disable them.

■ **Main Fan Fault**. When enabled, the instrument sends an SNMP trap when a fault with the main fan is detected.

■ **Voltage Error**. When enabled, the instrument sends an SNMP trap when a voltage error is detected. You can use the Diagnostics submenu to view the current instrument voltages. (See page 120, *Diagnostics submenu*.)

■ **Temperature Error**. When enabled, the instrument sends an SNMP trap when a temperature error is detected. You can use the Diagnostics submenu to view the current instrument temperatures. (See page 120, *Diagnostics submenu*.)

■ **Genlock Input Missing**. When enabled, the instrument sends an SNMP trap when a loss of the genlock reference input signal is detected.

■ **Loss of Lock**. When enabled, the instrument sends an SNMP trap when a loss of lock to the genlock reference input signal is detected.

■ **Near Loss of Lock**. When enabled, the instrument sends an SNMP trap when a near loss of lock to the genlock reference input signal is detected. The threshold for near loss of lock is approximately $2 \times 10\text{-}6$ from the ends of the tune range.

■ **VITC/LTC Missing**. When enabled, the instrument sends an SNMP trap when a loss of the VITC or LTC output signal is detected.

■ **LTC Out of SMPTE Spec**. When enabled, the instrument sends an SNMP trap when the LTC input signal is detected to be noncompliant with the SMPTE standard.

■ **Alarm Time**. When enabled, the instrument sends an SNMP trap when the program time counter matches the Alarm Time value configured in the Time menu.

■ **PS1 Fault**. When enabled, the instrument sends an SNMP trap when a fault with Power Supply 1 is detected.

■ **PS2 Fault**. When enabled, the instrument sends an SNMP trap when a fault with Power Supply 2 is detected.

■ **PS1 TWH**. When enabled, the instrument sends an SNMP trap when Power Supply 1 is detected to have exceeded the temperature weighted hours limit.

■ **PS2 TWH**. When enabled, the instrument sends an SNMP trap when Power Supply 2 is detected to have exceeded the temperature weighted hours limit.

GPI Settings submenu

The GPI Settings submenu configures the General Purpose Interface (GPI) inputs and outputs. See the *SPG700 Installation and Safety Instructions* for information about the GPI interface.

The following figure shows the GPI submenu.

Figure 42: GPI Settings submenu

This submenu contains the following menu items:

■ **Input Trigger Select**. Use the drop-down list to configure pin 4 of the GPI port connector to trigger the instrument to perform one of the functions listed below.

   ▬ **None**. This selection disables the GPI Input Trigger function.

   ▬ **Reset Program Time**. This selection resets the program time of the instrument.

   ▬ **Jam Sync**. This selection immediately synchronizes the instrument timecode to the selected time source for each output.

NOTE. A daily Jam Sync should be performed on systems running at non-integer frame rates. This can be scheduled using the Jam Sync submenu in the Time menu. (See page 139, Jam Sync submenu.)

■ **GPI Output Alarms**. Use these menu items to configure which instrument faults will trigger an output signal on the selected GPI output. Each Output Alarm Section has a series of faults that can be selected to trigger an output signal. These faults are described in more detail under GPI Output Alarm Selections. (See page 118, *GPI Output Alarm Selections*.)

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Each GPI output corresponds to specific pins on the GPI and GPI/LTC port connector on the rear panel of the instrument.

- **Output 1 Alarm Select**. This output corresponds to pin 2 on the GPI port connector and pin 1 on the GPI/LTC port connector.

- **Output 2 Alarm Select**. This output corresponds to pin 3 on the GPI port connector and pin 2 on the GPI/LTC port connector.

- **Output 3 Alarm Select**. This output corresponds to pin 6 on the GPI port connector. The GPI output 3 signal does not appear on the GPI/LTC port connector.

■ **Alarm Delays**. Use these menu items to configure the delay for each of the GPO Lock and GPO Time error and warning conditions. The purpose of the delay settings is to reduce the number of false alarms by allowing time for the fault condition to clear before an alarm signal is sent. The delays for each of the error and warning conditions are in the HH:MM:SS format. The default delay is 10 seconds for each of the error and warning conditions. The delay is applied to all three GPI output signals.

- **GPO Lock Error**. Sets the delay time before a GPI alarm signal is sent when a loss of lock to the genlock reference input signal is detected.

- **GPO Lock Warning**. Sets the delay time before a GPI alarm signal is sent when a near loss of lock to the genlock reference input signal is detected. The threshold for near loss of lock is approximately $2 \times 10e\text{-}6$ from the ends of the tune range.

- **GPO Time Error**. Sets the delay time before a GPI alarm signal is sent when the instrument detects that the selected time input is invalid. For example, if LTC is the selected time input and the signal is missing or discontinuous.

- **GPO Time Warning**. Sets the delay time before a GPI alarm signal is sent when the instrument detects that the selected time input is present and valid, but not meeting all expectations. For example, if LTC is the selected time input but the timing between LTC and the genlock input does not meet the SMPTE 12M specification.

GPI Output Alarm Selections

The GPI Output Alarm Selections configure which instrument faults will trigger an output signal on the selected GPI output (1, 2 or 3). Each GPI output is separately configured.

- **Hardware Fault**. When enabled, sends an alarm signal to the selected GPI output when a hardware fault in the instrument is detected. Use the Diagnostics submenu in the System menu to view information for all conditions that can trigger this fault. (See page 120, *Diagnostics submenu*.)

- **PS Fault**. When enabled, sends an alarm signal to the selected GPI output when a fault with either Power Supply module is detected.

- **Lock Error**. When enabled, sends an alarm signal to the selected GPI output when a loss of lock to the genlock reference input signal is detected.

- **Lock Warning**. When enabled, sends an alarm signal to the selected GPI output when a near loss of lock to the genlock reference input signal is detected. The threshold for near loss of lock is approximately $2 \times 10e\text{-}6$ from the ends of the tune range.

- **Time Error**. When enabled, sends an alarm signal to the selected GPI output when the selected time input is invalid. For example, if LTC is the selected time input and the signal is missing or discontinuous.

- **Time Warning**. When enabled, sends an alarm signal to the selected GPI output when the selected time input is present and valid, but not meeting all expectations. For example, if LTC is the selected time input but the timing between LTC and the genlock input does not meet the SMPTE 12M specification.

- **Alarm Time**. When enabled, sends an alarm signal to the selected GPI output for the one second when the program time counter matches the Alarm Time value configured in the Time menu. (See page 138, *Alarm Time*.)

Options submenu

The Options submenu displays which options are installed in the instrument and allows you to enter the option key for Option SDI.

The following figure shows the Options submenu.

Figure 43: Options submenu

This submenu contains the following menu items:

- **Unique ID**. This is the unique ID number assigned to the instrument. You will need to provide this ID number when you order Option SDI.

- **Option Key**. This area displays the option key assigned to the instrument. If you order an upgrade to the instrument, you may be supplied a new option key that you must enter using this menu item in order to enable the option. Enter the option key and then click **Apply** to enable the option.

- **Options Enabled**. This is a list of hardware and software options installed in the instrument. If your instrument has Option SDI installed, **SDI 3G** will be listed. If no options are installed, **None** is displayed.

- **Option**. This area displays a list and description of the installed options.

Diagnostics submenu

The Diagnostics submenu displays the results of diagnostic tests for various components of the instrument. It contains information on the following components of the SPG700:

■ Mainframe, including power supply information

■ Reference module

■ SDI module.

NOTE. The Diagnostics submenu provides information on all of the conditions that drive the FAULT light on the front panel, and the Hardware fault selection on the GPI.

When the instrument is in Factory mode, you can view additional diagnostic results and initiate specific diagnostic tests for servicing the instrument. See the SPG700 Service Manual for more information about the Factory mode diagnostics.

Mainframe diagnostic readouts

The following figure shows the diagnostic readouts for the Mainframe. The readouts are grouped into sections for general diagnostics, power supply diagnostics, and Main board voltages.

Mainframe

Tune:	+0.00e-6 (2099634 --> 2099634)
Calibration:	+0.01e-6 (2099634)
PLLs:	12.288:**Lk** 54:**Lk** 74.25:**Lk** 74.176:**Lk**
Temperature:	Main: 43.0C (**OK**) , CPU: 55.0C (**OK**)
Fan Speed:	6658 RPM (**OK**),
RTC Battery:	RTC Battery is > 40% (**OK**)
POST Results:	0,0,0,0

Power Supplies

	Power Supply 1(Active)	Power Supply 2
Voltage:	+12.0V = 11.97V (**OK**)	PS2 12V: not installed
Hours:	Active: 000366 Standby: 000000	PS2 not installed
TWH:	Tmp Wtd: 0000408 (**OK**) (limit:131400)	PS2 not installed
Mfg. Date:	PS1 Mfg Date: 17:27:21 07/16/2015	PS2 not installed
Part No.:	119790900	0
Load Test History:	PS1 Load History: last test n/a Num pass 0 Num fail 0 Last pass: ---- Last fail: ----	PS2 not installed

Backup Test: Pass: Backup supply PS2 loadtest   [Run]

Main Board Voltages

Main +5.0V: 4.95V (**OK**)		**Main +3.3V:** 3.34V (**OK**)	
Main +2.5V: 2.48V (**OK**)		**Main +1.8V:** 1.80V (**OK**)	
Main +1.5V: 1.50V (**OK**)		**Main +1.2V:** 1.19V (**OK**)	
Main −5.0V: −5.08V (**OK**)		**Main +3.3AV:** 3.30V (**OK**)	
Slot 1 +5.0V: 4.98V (**OK**)		**Slot 2 +5.0V:** 4.98V (**OK**)	
Slot 3 +5.0V: 4.98V (**OK**)		**Slot 4 +5.0V:** 4.95V (**OK**)	
Slot 1 +3.3V: 3.37V (**OK**)		**Slot 2 +3.3V:** 3.38V (**OK**)	
Slot 3 +3.3V: 3.38V (**OK**)		**Slot 4 +3.3V:** 3.37V (**OK**)	
Sl. 1/2 +8.0AV: 8.00V (**OK**)		**Sl. 3/4 +8.0AV:** 7.92V (**OK**)	
Sl. 1/2 +5.0AV: 4.98V (**OK**)		**Sl. 3/4 +5.0AV:** 5.03V (**OK**)	
Fan +5.0V: 5.01V (**OK**)			

Figure 44: Mainframe diagnostic readouts

General mainframe diagnostic readouts. The following general diagnostic readout information is provided for the Mainframe:

■ **Tune**. This readout displays how far the instrument is deviating from the calibrated internal frequency of the internal oscillator in order to lock to an external reference input. One value of this readout is to determine if the instrument oscillator needs to be calibrated. If the instrument is locked to a traceable reference, then any tune value indicates error in the instrument calibration.

The first part of the readout indicates the fractional amount of deviation from the calibrated frequency. For example, if you use a reference signal to lock to a video source that is 5 parts per million high, then the readout will say "+5.00e-6". This allows you to measure the frequency of the reference input and to see if the input is near the end of the available tuning range. If the instrument is in internal reference mode, the tune value should be 0.00 e-6 and the integer values will equal the Calibration value readout.

NOTE. The display will show non-zero deviation values only when the signal reference source is not configured as Internal in the Reference menu. (See page 55.)

The integer values indicate the actual tuning control word. The allowed range of the tuning control word is 0 to 4,194,304. The first number is the current value of the word and the second number is the target value for the tuning control loop. In most cases, these two values are the same. However, in the case where the instrument needs to make a large frequency change to achieve signal lock, then depending on the instrument mode, the value may slew slowly to the target value to stay inside the allowed slew rate for reference systems. In this case, the first number will slew over seconds or minutes until it equals the value of the second number. If the instrument is taking a long time to lock to an external reference signal, the Tune readout may provide valuable information about what is happening.

- **Calibration**. This readout displays the tuning control word for the calibrated frequency of the mainframe oscillator and how far the instrument is deviating from the calibrated frequency to achieve a lock to the internal reference.

  The first part of the readout indicates the fractional amount of deviation from the calibrated frequency. For example, a readout of "0.59e-6" indicates a fractional correction of 0.59 parts per million. When a calibration of the instrument oscillator is performed, the readout values will typically change.

  Over the life of the oscillator oven, the expected frequency drift is ±2.5 e-6, so this number should always be in this range. If the fractional number is not within this range, then the instrument may have been miscalibrated, or the oscillator oven may have drifted out of specification since the last calibration. In this case, you should consider calibrating the internal frequency of the instrument using the Oven oscillator calibration procedure as described in the *SPG700 Installation and Safety Instructions*.

  After calibration, if the value is still greater than ±2.5 e-6, then you may need to get the oven oscillator serviced.

- **PLLs**. These readouts display the frequency for each of the internal clocks used to drive the video outputs. All of the clocks should show a status of locked (**Lk**) during normal instrument operation.

- **Temperature**. These readouts display the temperature of the Main and CPU hardware components in degrees C followed by the status. The status shows **OK** when a temperature is within the operating range or **WARN** when a temperature is out-of-range.

- **Fan Speed**. This readout displays the current speed of the main fan in RPM followed by the status. **OK** displays when the fan operation is within range; **WARN** displays when the fan operation is out of range.

- **RTC Battery**. This readout displays the status of the RTC (Real Time Controller) battery power level. The following status messages can appear:

  - **> 40% (OK)**. This indicates the battery power is good.

  - **20% to 40% (WARN)**. This indicates the battery power is getting low and should be replaced soon.

  - **< 20% (LOW)**. This indicates that the battery should be replaced immediately.

- **POST Results**. This readout displays error codes for four internal modules. The error code numbers should all be "0" (zero). Non-zero numbers indicate a hardware problem with the instrument and that the instrument should be returned to Tektronix for service. This readout is not available from the instrument front panel.

Power Supplies diagnostic readouts. The following figure shows the diagnostic information for the power supplies, a subset of the Mainframe diagnostic information.

```
┌─Power Supplies───────────────────────────────────────────────────────────┐
│                        Power Supply 1(Active)        Power Supply 2        │
│            Voltage:  +12.0V = 12.03V (OK)          +12.0V = 12.10V (OK)     │
│              Hours:  Active: 000776 Standby: 000000  Active: 001598 Standby: 000585 │
│                TWH:  Tmp Wtd: 0000855 (OK)(limit:131400)  Tmp Wtd: 0002447 (OK)(limit:131400) │
│          Mfg. Date:  PS1 Mfg Date: 17:27:21 07/16/2015  PS2 Mfg Date: 14:47:56 08/25/2015 │
│           Part No.:  119790900                       119790900             │
│                      PS1 Load History: last test n/a  PS2 Load History: last test PASS │
│                      Num pass 0                       Num pass 23           │
│  Load Test History:  Num fail 0                       Num fail 0            │
│                      Last pass: ----                  Last pass: 18:00:04 09/14/2016 │
│                      Last fail: ----                  Last fail: ----       │
│                                                                            │
│        Backup Test:                                                        │
│  Pass: Backup supply PS2 loadtest, cooling period active: 2 min 24 sec remaining  [ Run ] │
└────────────────────────────────────────────────────────────────────────────┘
```

Figure 45: Power Supplies diagnostic readouts (load test in progress)

The following diagnostic information is shown for each installed Power Supply module:

- **Voltage**. These readouts display the status of the +12 V supply on each installed power supply module. If the voltage is within the operating range **OK** is displayed; if the voltage is out-of-range, **WARN** is displayed. If a power supply module is not installed, **PS<1 or 2> 12V: not installed** is displayed.

- **Hours**. These readouts display the number of hours that each installed power supply module has been in the preferred (Active) and backup (Standby) states. If a power supply module is not installed, **PS<1 or 2> not installed** is displayed for that module.

- **TWH**. These readouts display the number of temperature weighted hours that each installed power supply module has been in operation versus a limit of 131,400 hours. **OK** displays if the number of hours is within the operating limit; **WARN** displays when the number of hours exceeds the limit. For critical applications, you may want to replace the power supply periodically to prevent down time.

  The instrument uses a log to track the number of hours that a power supply module has been powering the instrument. The expected life of a power supply module varies with the temperature and load. For a fully-loaded instrument in a 25 °C room, the power supply is specified to last at least 15 years (131,400 hours). For a lightly loaded instrument with only one or two modules running a 25 °C, the power supply should last 20 years (175,000 hours).

  At the maximum room temperature, the expected life of the power supply is significantly less. For example, for a fully loaded instrument operating at 50 °C room temperature, the expected life of the power supply is 5 years (43,800 hours). The temperature-weighted hours (TWH) accounts for variations in the operating environment and displays a number normalized to 25 °C operation. Therefore, if the TWH is near the 131,400 recommended limit, then you should consider replacing the supply.

  If a power supply module is not installed, **PS<1 or 2> not installed** is displayed for that power supply.

- **Mfg. Date**. These readouts display the manufacturing date of each installed power supply module. The readouts include the time (HH:MM:SS) and the date (day, month, year). If a power supply module is not installed, **PS<1 or 2> not installed** is displayed for that module.

- **Part No**. These readouts display the Tektronix part number of each installed power supply module. If a power supply module is not installed, this readout displays **0** for that power supply. This readout is not available from the instrument front panel.

- **Load Test History**. These readouts display a brief history of the load test for each installed power supply module. The readouts include the status of the previous load test for each installed power supply module (when the module was configured to be the backup (standby) supply), the number of times the module has passed or failed the test, and the date (year, month, day) and time (HH:MM:SS) of the last test. If a power supply module is not installed, **PS<1 or 2> not installed** is displayed for that power supply.

■ **Backup Test.** The instrument must have two power supply modules installed (Option DPW) and connected to power in order to run this load test. The load test checks that the power supply module that is configured as the backup supply is operational and ready to be configured as the primary (preferred) supply.

You can manually perform the backup test by clicking the **Run** button. While the instrument is in operation, this test is automatically performed once every 24 hours. The example diagnostic display above shows the readout with a load test in progress.

NOTE. If you have only one power supply installed that is connected to power, an error message will appear if you attempt to run this test.

If you attempt to run the load test immediately after changing the preferred supply configuration or if you rerun the test immediately after running the test a first time, an error message may appear stating that the load needs to cool down before the test can be run. The error message includes an estimate of the time needed for the load to cool down before you can run the test. An example message in this situation is "Error: cooldown, 1 min 40 sec left."

Main Board Voltages diagnostic readouts. These readouts display the status of the Main board voltages. **OK** displays when the voltages are within the operating range; **WARN** displays when a voltage is out-of-range.

Reference Module diagnostic readouts

The following figure shows the diagnostic information for the Reference Module.
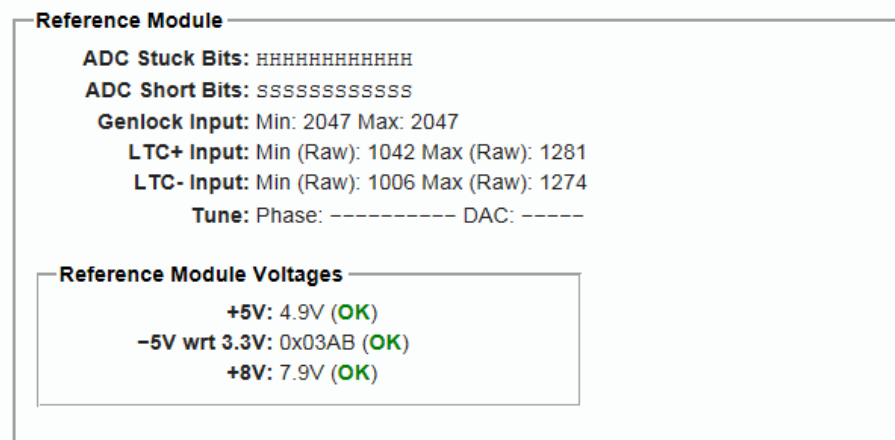
Figure 46: Reference Module diagnostic readouts

The following diagnostic readouts are shown for the Reference Module.

NOTE. If no input is applied to the Genlock circuit, then the ADC bits will be moving and so may appear stuck. This is not an indication of a problem.

- **ADC Stuck Bits**. This readout is a 12-bit display showing the bits stuck high (H), low (L), or OK (-).

- **ADC Short Bits**. This readout is a 12-bit display showing any shorted adjacent lines (SS) (-).

- **Genlock Input**. This readout displays the minimum and maximum value from the genlock ADC for the present input signal.

- **LTC+ input**. This readout displays the minimum and maximum raw ADC values of the positive LTC input.

- **LTC- input**. This readout displays the minimum and maximum raw ADC values of the negative LTC input.

- **Tune**. This readout should be ignored.

- **Reference Module voltages**. These readouts display the voltages of the Reference module. The status for each voltage displays **OK** when the voltages are within the operating range; the status displays **WARN** when a voltage is out-of-range.

SDI Module diagnostic readouts

The following figure shows the diagnostic information for the SDI Module.

```
┌─ SDI Module ──────────────────────────────────────────────────┐
│                                                                │
│      Temperatures: SDI Board: 50.0C FPGA: 49.0C                │
│        PLL Status: Flex0: Lock Flex1: Lock                     │
│        DDS Status: DDS0 Phase: Lock DDS1 Phase: Lock           │
│                                                                │
│   ┌─ SDI Module Voltages ──────────────────────────────────┐  │
│   │   +1.2V: 1.19V (OK)              +1.2VA: 1.20V (OK)     │  │
│   │   +3.3V: 3.28V (OK)              +3.3VA: 3.27V (OK)     │  │
│   │   +1.5V: 1.51V (OK)               +3.0V: 3.02V (OK)     │  │
│   │   +1.8V: 1.83V (OK)                Dref: 0.922V (OK)    │  │
│   └────────────────────────────────────────────────────────┘  │
│                                                                │
└────────────────────────────────────────────────────────────────┘
```
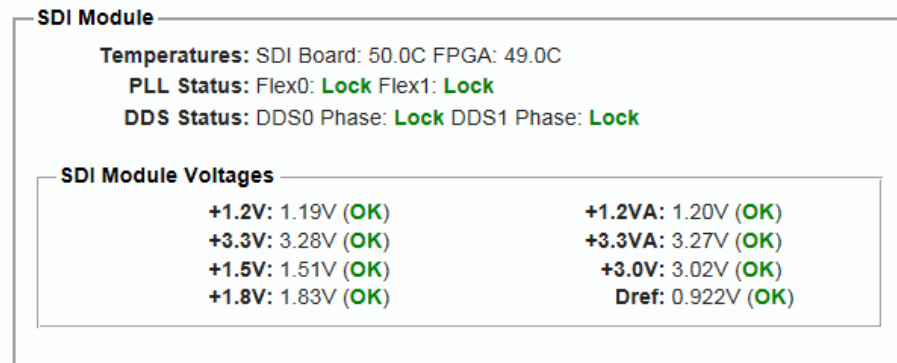
Figure 47: SDI Module diagnostic readouts

The following diagnostic readouts are shown for the SDI module:

■ **Temperatures**. This readout displays the temperatures of the SDI board and the FPGA in degrees C.

■ **PLL Status**. This area displays information about the clocks used to generate SDI signals (Option SDI only):

– **Flex0**. This readout indicates the state of the flexible clock generator for output channel 1 (SDI 1A and SDI 1B connectors). This readout should show **Lock** (locked). An **Unlk** (unlocked) reading might indicate a problem with the Option SDI board or with the instrument.

– **Flex1**. This readout indicates the state of the flexible clock generator for output channel 2 (SDI 2A and SDI 2B connectors). This readout should show Lock (locked). An **Unlk** (unlocked) reading might indicate a problem with the Option SDI board or with the instrument.

■ **DDS Status**. This readout displays information about the clocks used to generate SDI signals (Option SDI only):

– **DDS0 Phase**. This readout indicates that the flex clock circuit is correctly aligned with the internal frame pulse for output channel 1 (SDI 1A and SDI 1B connectors). This readout should show **Lock** (locked). An **Unlk** (unlocked) reading might indicate a problem with the Option SDI board or with the instrument.

– **DDS1 Phase**. This readout indicates that the flex clock circuit is correctly aligned with the internal frame pulse for output channel 1 (SDI 2A and SDI 2B connectors). This readout should show **Lock** (locked). An **Unlk** (unlocked) reading might indicate a problem with the Option SDI board or with the instrument.

■ **SDI Module voltages**. These readouts display the voltages on the SDI module. The status for each voltage displays **OK** when the voltages are within the operating range; the status displays **WARN** when a voltage is out-of-range.

System menu factory default settings

The following table shows the settings for the System menu that are reset when you use the Preset submenu to recall the factory default settings. (See page 112, *Presets submenu*.)

The following System button menu settings are not restored when you recall the factory default settings:

■ Front panel time-out period

■ Network parameters

■ SNMP parameters

■ Web user interface control setting

■ Beeper control setting

■ Power supply preference selection (Option DPW only)

Table 27: System button menu factory default settings

Menu item name	Settings
GPI	
Input Trigger	None
Output <1–3>	
Hardware Fault	Disable
Power Supply Fault	Disable
Lock Error	Disable
Lock Warning	Disable
Time Error	Disable
Time Warning	Disable
Alarm Time	Disable
Alarm Delays	
GPO Lock Error	00:00:10
GPO Lock Warning	00:00:10
GPO Time Error	00:00:10
GPO Time Warning	00:00:10

Time menu

Use the Time menu to set instrument time parameters in submenus, such as the time of day source, the time zone offset, the daylight savings time schedule, the program time, and the jam sync settings.

The following figure shows the Time menu.
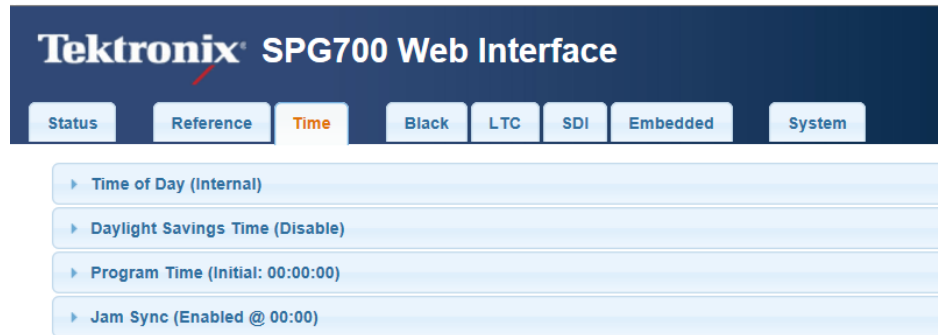
Figure 48: Time menu

The following submenus are available in the Time menu:

- **Time of Day.** Sets the time of day reference that will be used by the instrument. (See page 132, *Time of Day submenu*.)

  The possible reference choices change depending on the selected reference source. (See page 55, *Reference menu*.)

- **Daylight Savings Time.** Configures how the instrument handles Daylight Saving Time. Select this menu item and press the **ENTER** button to access the Daylight Savings Time submenu. (See page 136, *Daylight Savings Time submenu*.)

- **Program Time.** Configures the program time parameters for the instrument. The Program Time is used to create a time code that is not locked to time of day. This is useful if the time code is intended to start at a uniform time for multiple takes of a production. (See page 138, *Program Time submenu*.)

- **Jam Sync.** Configures the parameters for the Jam Sync function. Use the function to immediately synchronize the instrument timecode with the selected time source for each output or to regularly schedule a synchronization. (See page 139, *Jam Sync submenu*.)

Time of Day submenu

This submenu sets the time of day reference that will be used by the instrument when the reference source is set to Internal in the Reference menu. The following figure shows the Time of Day submenu with the Source set to Internal.

Figure 49: Time of Day submenu

Source   Use this setting to select a Time of Day source from the drop-down list:

- **Internal**. In Internal Time of Day mode, the user can manually input the time. On versions 2.5.1 and earlier, setting the time manually did not affect the Real Time Clock (RTC). On later versions of the software, setting the time manually also sets the RTC.

- **LTC Input**. Selects the LTC time code input as the timecode reference. The function of the LTC connector must be set to Input to use LTC as a time code input.

- **VITC Input**. Selects the vertical interval time code as the timecode reference. The VITC input is only available when the Reference Source is set to a video Genlock signal.

NOTE. When the VITC or LTC inputs are used as time-of-day sources, the hh:mm:ss:ff settings will be synchronized to the VITC or LTC source (if present). When the SMPTE309 Data mode is set to Use as Input or to Use as Input/Output, the date is set using the VITC or LTC source. When the SMPTE309 Data mode is set to Ignore, the date is set from the internal RTC. (See page 133, SMPTE309 Data.)

Mode　　When LTC Input or VITC Input is selected as the Time of Day source, use the Mode drop-down list to select one of the following synchronization modes:

- **Follow**. The time of day follows the VITC or LTC on the input signal if the signal is stable for at least 100 consecutive frames.

- **Synchronize Once**. The VITC or LTC on the input signal is continuously monitored until a stable signal is received (at least 100 consecutive frames). At that time, the time of day synchronizes (once) to this reference.

- **Synchronize Now**. The time of day attempts to synchronize with the VITC or LTC on the input signal when you click the **Synchronize Now** button. A total of ten attempts to synchronize are made. After ten attempts, no further attempts are made to synchronize regardless if synchronization occurred or failed. A stable signal of at least 100 consecutive frames is needed.

SMPTE309 Data　　When LTC Input or VITC Input is selected as the Time of Day source, use the SMPTE309 Data drop-down list to select how the instrument will respond to ST309 data in the timing source:

NOTE. The Time Zone Offset adjustment allows you to enter a time zone correction of up to ±23:59 hours. However, the ST309 standard only implements codes for time zones in the range of -12 to +13 hours. Therefore, when you are using ST309 data as the Time of Day source, it is recommended that the combined programmed offset from time zone and Daylight Savings Time be restricted to the range of -12 to +13 hours.

- **Ignore**. If available, the HH:MM:DD;FF data on the incoming LTC/VITC signal is used, but any YYYY-MM-DD, TZ-Offset and Daylight Savings Time enabled/disabled data is completely ignored in the Time of Day system. In this mode, the Time Zone and Daylight Savings Time settings in the instrument menu are used to set the time of day from the input time code and the date is set from the internal RTC. This is the mode that should be used if there is no ST309 date data on the input time code. In this case, the STATUS button display will still show the YYYY-MM-DD, TZ-Offset and DST settings from the instrument menu.

- **Use as Input**. The ST309 data in the timing source is used and applied to the master Time system in the instrument. For example, if the data indicates that the time zone offset is +8:00 hours, then the master Time is set to the YYYY-MM-DD HH:MM:SS;FF from the LTC/VITC input, minus the 8 hour offset. This makes the master Time set to UTC. However, the timecode data on all outputs is then recalculated based on the time zone offset and DST offset settings on the instrument. This mode is useful if the incoming time code data is from a different time zone than the outputs you intend to create.

- **Use as Input/Output**. The ST309 data in the timing source is used and applied to the master Time as when "Use as Input" is selected. But in this case, the time zone offset and Daylight Savings Time enabled/disabled data from the LTC/VITC timing source is used to drive the output timecode including the ST309 data. This means that any time zone offset and Daylight Savings Time adjustment settings in the instrument are ignored and that whatever timecode data is coming in from the LTC/VITC timing source will match the data on the timecode for the signal outputs.

Notes about SMPTE309 data usage.

- If ST309 data is not present on the selected time reference, then the default SMPTE309 Data mode setting of "Ignore" is the correct selection. For most applications in which the input time reference does have the ST309 data, then the setting of "Input" is usually the best choice. While in "Input" mode, the time zone and DST programming on the input and output are independent, with the input set by the ST309 data on the input and the outputs being set by the menu in the instrument. This is the best mode of operation even if all units are set to the same time zone and DST values.

- When the SMPTE309 Data mode is set to "Ignore," you cannot use the Time Zone Offset or DST offset controls on the slave unit to adjust the time code outputs. The reason for this is that the slave unit assumes that the VITC/LTC inputs are local time and already have such corrections applied. However, you can offset the time code on individual outputs using the offset controls for each output. The local time zone and DST settings do affect the master time-of-day since the offsets are subtracted from the input and added to the output, but the net effect is that the outputs match the inputs unless individually offset.

- SMPTE309 time zone offset data on individual outputs is not affected by adjusting time code offsets on individual outputs. The time code offset controls on the individual outputs does not affect the time zone offset fields in the output time code data. For example, if the slave unit is configured with a time zone offset of –08:00 and then you also adjust the time code offset on the SDI Channel 1 output by another +03:00 hours, the SMPTE309 data on that output will still read –08:00 in the time zone offset field even though the actual output is UTC –05:00 hours.

- The applied DST offset display is incorrect when the SMPTE309 Data mode is set to "Use as Input/Output." When "Use as Input/Output" is selected, the Applied DST Offset indicator on the slave unit does not report the actual DST offset being applied by the system. Instead, the indicator reports the DST offset that would be applied if the slave unit was using its own DST offset configuration (as it would in VITC/LTC "Ignore" or "Use as Input" modes).

Internal Date/Time   Use this setting to manually enter the date and time in the form YYYY-MM-DD HH:MM:SS to activate the time-of-day change.

⚠ *CAUTION. When you apply the start time and date offset, this typically causes a disruption to the syncs, so care should be taken to verify the date and time are correct before activating the time-of-day setting for Internal mode.*

NOTE. The manual time of day setting is not automatically reapplied when the instrument power is cycled. If the instrument powers on in Internal mode, the time of day will be acquired from the real time clock in the instrument.

The time zone offset must be set to maintain the correct relationship between UTC and local time.

Time Zone Offset   Use this setting to set the time zone offset for your location in reference to UTC in the form ±HH:MM.

This setting allows you to enter a time zone correction of up to ±23:59 hours. However, the ST309 standard only implements codes for time zones in the range of -12 to +13 hours. Therefore, when you are using ST309 data as the Time of Day source, it is recommended that the combined programmed offset from time zone and Daylight Savings Time be restricted to the range of -12 to +13 hours.

NOTE. When the Daylight Savings Time schedule is set to Once and the daylight savings event occurs, the scheduled offset will be added to the time zone offset and the Daylight Savings Time schedule will be cleared. This allows for a new schedule to be set up for any time in the future. (See page 191, Daylight Savings Time submenu.)

Daylight Savings Time submenu

This submenu configures how the instrument handles Daylight Saving Time. The following figure shows the Daylight Savings Time submenu.

Figure 50: Daylight Savings Time submenu

Selection Mode   Use this drop-down list to set the DST schedule function to one of the following:

- **Disable**. Use this setting to disable the Daylight Savings Time schedule function.

- **Once**. Use this setting to schedule a specific calendar date and time to apply or remove the daylight savings time offset. For example, "2016-03-06 02:00:00."

- **Recurring**. Use this setting to set up relative dates and times to apply and remove the daylight savings time offset. For example, "1st Sun of Oct 02:00:00."

⚠️ *CAUTION.* *When you change the selection mode, any daylight savings time offset that is currently being applied will be removed and any new daylight savings time offset that is configured for the new mode will be applied immediately.*

Offset   Use this setting to set the daylight savings time offset that will be applied when either the Once Date/Time event or the Recurring Start event occurs at the user-scheduled time.

The date and time digits take the following form: HH:MM. When the Recurring Start function is set, this offset can only be a positive number.

NOTE. *The Offset adjustment allows you to enter a time zone correction of up to ±23:59 hours. However, the ST309 standard only implements codes for time zones in the range of -12 to +13 hours. Therefore, when you are using ST309 data as the Time of Day source, it is recommended that the combined programmed offset from time zone and DST be restricted to the range of -12 to +13 hours.*

Once Date/Time Use this setting to enter the date and time in the form YYYY-MM-DD HH:MM:SS for when you want to apply daylight savings time a single time. The Selection Mode must be set to Once for this setting to be active.

NOTE. In Once Date/Time mode, the pending offset can be positive or negative, which allows you to add or subtract from the currently applied daylight savings time offset.

⚠ *CAUTION. An incoming VITC or LTC reference may have a daylight savings time shift already applied. To avoid duplicating shifts, disable the daylight savings time if the time of day reference has daylight savings time applied.*

In Once Date/Time mode, daylight savings time offsets can be compounded. This means that if an offset is currently being applied, and the scheduled time is then changed to a future date, the newly configured offset will be added to the already applied offset. For example, if an offset of +1 hour is applied on March 9 and the scheduled date is then changed to March 16, the resulting offset after March 16 will be +2 hours.

Recurring Start The Recurring Start time is the time when the daylight savings time offset will be added to the time zone offset. Use the drop-down lists to enter the information and then the time in the following format: HH:MM:SS. For example, if you enter Second Sunday in March 02:00:00 for the Recurring Start time, the daylight savings time offset would be added to the time zone offset on the second Sunday in March at 2 AM.

NOTE. If you enable the Recurring function at a time between the Start and End settings, the daylight savings time offset is immediately applied.

Recurring End The Recurring End time is the time when the daylight savings time offset will be removed. Enter the information similar to the Recurring Start time described above.

Program Time submenu

This submenu configures the program time parameters for the instrument. Program time is used to create time code that is not locked to time of day. This is useful if the time code is intended to start at a uniform time for multiple takes of a production.

The following figure shows the Program Time submenu.

Figure 51: Program Time submenu

NOTE. You can use the Input Trigger setting in the System GPI submenu to configure pin 4 of the GPI port connector to trigger the instrument to reset the program time. (See page 116, GPI Settings submenu.)

Initial Time   Use this setting to enter the initial program time. The digits take the following form: HH:MM:SS. Click the **Apply Initial Time Now** button to apply the initial time.

Alarm Time   Select the Enable Alarm box to enable the alarm time function.

Enter the Alarm Time schedule setting in the form HH:MM:SS. Using the GPI connector, the Alarm Time function can be used to drive a light or similar indicator of alarm occurrences at a specific time in a program.

NOTE. You can use the System GPI Output submenu to configure the GPI port connector to output a signal when the Alarm Time setting is reached. (See page 118, GPI Output Alarm Selections.)

Jam Sync submenu

This submenu configures the parameters for the Jam Sync function. Use the function to immediately synchronize the instrument timecode with the selected time source for each output or to regularly schedule a synchronization.

NOTE. A daily Jam Sync should be performed on systems running at non-integer frame rates.

The following figure shows the Jam Sync submenu diagram.
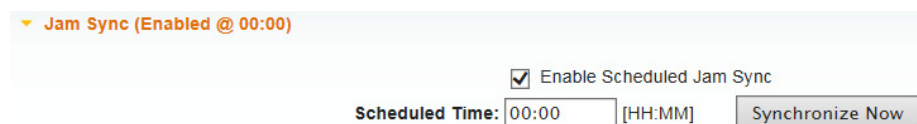
Figure 52: Jam Sync submenu

Scheduled/Disable   Select the check box to enable the Jam Sync function. When enabled, the Jam Sync function will be applied at the time configured using the Scheduled Time selection below.

Scheduled Time   Enter the scheduled time for the daily Jam Sync function. The digits take the following form: HH:MM. Click the **Synchronize Now** button to immediately perform a jam sync to remove the residual error in the drop-frame time code counting.

NOTE. You can use the Input Trigger setting in the System GPI submenu to configure pin 4 of the GPI port connector to trigger the instrument to force a Jam Sync. (See page 116, GPI Settings submenu.)

TIME button menu factory default settings

The following table shows the settings for the Time menu that are reset when you use the Preset submenu to recall the factory default settings.

Table 28: TIME button menu factory default settings

Menu item name	Settings
Time of Day	
Source	When the Reference source is not Internal: VITC Input
Mode	Follow
SMPTE309 Data	Ignore
Internal Time of Day	2008–01–01 00:00:00
Time Zone Offset	+00:00
Daylight Savings Time	
Mode	Disable
Offset	+01:00
ONCE Scheduled Time	2008–01–01 00:00:00
RECUR Start	Second Sunday in March 02:00:00
RECUR End	First Sunday in November 02:00:00
Program Time	
Initial Time	00:00:00
Alarm	Disabled
Alarm Time	00:00:00
Jam Sync	
Mode	Scheduled
Scheduled Time	00:00:00

Front panel menu operation

This section provides information about operating the instrument using the front-panel buttons and display. These menus and selections are similar to those on the Web interface.

The descriptions for the menu selections shared between the SPG700 Web Interface and the front-panel menus are located the associated AES, Black, Embedded, LTC, Reference, SDI, Status, and System menu sections of this manual.

Submenu and menu selection names

The names of submenus and menu selections on the front panel do not always directly correlate with the names that appear on the SPG700 Web Interface. The SPG700 Web interface display reduces the need for some submenus and there is more room for selection names.

Menu access buttons

Use the following buttons to access the desired menu display:

- **AES**. Use this button menu to view and configure the timing offset and voltage of the Word Clock (48 kHz) output.

- **BLACK**. Use this button menu to view and configure the Black outputs. Press the BLACK button repeatedly to selected the desired Black output (1, 2, or 3) to configure.

- **EMBED**. (Option SDI only) Use this button menu to view and configure the embedded audio settings on the SDI video outputs. Use this menu to select the audio group for subsequent audio channel configuration, and to configure audio group parameters.

- **LTC**. Use this button menu to view and configure the LTC inputs and outputs on the GPI/LTC port.

- **REF**. Use this button menu to view and configure instrument settings such as the signal reference source, the signals being output, and information about system faults and alerts.

- **SDI**. (Option SDI only) Use this button menu to view and configure the signals on the SDI video outputs. Press the SDI button repeatedly to select the desired SDI output (SDI 1 or SDI 2) to configure. The menu selections for the SDI 1 and SDI 2 outputs are similar, but are independent for each output.

- **STATUS**. Use this button menu to view the current status of instrument settings such as the signal reference source, the signals being output, and information about system faults and alerts. This menu is for viewing status only and no changes to the instrument settings can be made from this menu.

■ **SYSTEM**. Use this button menu to view and configure instrument settings such as network parameters, SNMP traps, GPI alarms, installed options, display brightness, beeper control, and hardware/firmware versions. You can also use this menu to perform firmware upgrades, save and recall presets, and view diagnostic results.

■ **TIME**. Use this button menu to set instrument time parameters in submenus, such as the time of day source, the time zone offset, the daylight savings time schedule, the program time, and the jam sync settings.

Menu control buttons

Use the following buttons to control the menu display:

■ **Arrow buttons** (▲, ▼, ◄, and ►). Use these arrow buttons to navigate through the available menu items.

■ **ENTER button**. Use the ENTER button to enable the selected menu item or to enter a submenu.

■ **BACK button**. Use the BACK button to return to the previous menu item.

LCD display readouts

The LCD display is a two-line, 40-character-per-line display. Almost all menus have two lines of text, where the first line shows the current position in the current menu, and the second line shows the current selection (if there is not a submenu). If nothing is on the second line, press the ENTER button to access the corresponding submenu.

The readouts on the LCD display vary depending on the instrument setting and which menu is being accessed. The following figure shows some example display readouts.

Example 1

```
SYSTEM : NET SETUP : DHCP
   ■ Enable                                        ↵
```

Example 2

```
SDI 1 : TIMING
   Press ENTER for menu                            ↵
```

Example 3

```
STATUS : ALERT
   Loss of lock on REF input                      1/3
```

3080-040
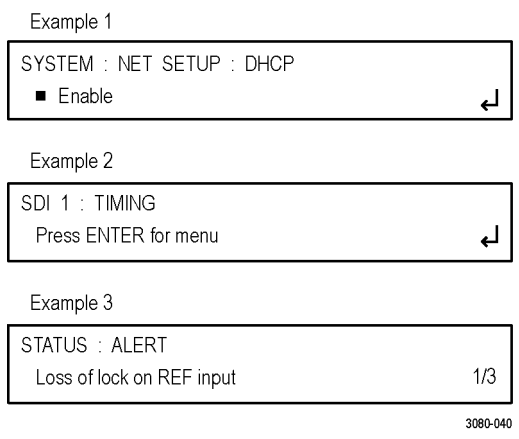
Figure 53: Example display readouts

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The format of the readouts usually follow these guidelines:

- The top line of the display lists the current menu selection. The first word is usually the name of the selected button menu, followed by the name of a parameter or category.

- The second line of the display shows the setting of the selected menu setting. As shown in example 1 above, a bullet in front of a setting indicates that setting is the currently selected setting.

- As shown in examples 1 and 2 above, if a carriage return character is displayed at the far right of the second line, this indicates one of both of the following two situations:

  - There are additional settings that can be accessed by pressing the left (◄) or right (►) arrow button. When the desired setting is displayed, press the ENTER button to select that setting.

  - There is a submenu available for the menu selection that can be accessed by pressing the ENTER button. When you enter a submenu, press the BACK button to return to the top menu.

- As shown in example 2 above, if the second line of the display reads "Press ENTER for menu," this indicates that you need to press the ENTER button to access the submenu for that menu selection.

- As shown in example 3 above, if there are multiple alerts or faults reported in the STATUS menu, the far right of the second line will display the currently viewed alert or fault number followed by the total number of alerts or faults. In example 3, the display shows "1/3," indicating that the currently displayed alert is number one of three reported alerts. In this situation, press the left (◄) or right (►) arrow button to view the other alerts or faults.

AES button menu diagrams

Use the AES button menu to view and configure the timing offset and voltage of the Word Clock (48 kHz) output. The following figure shows the top level diagram for the AES button menu.

NOTE. As of the latest firmware release, there is no Web interface for the AES menu. You will need to use the instrument front panel to make changes in this menu. (See page 39, AES menu.)
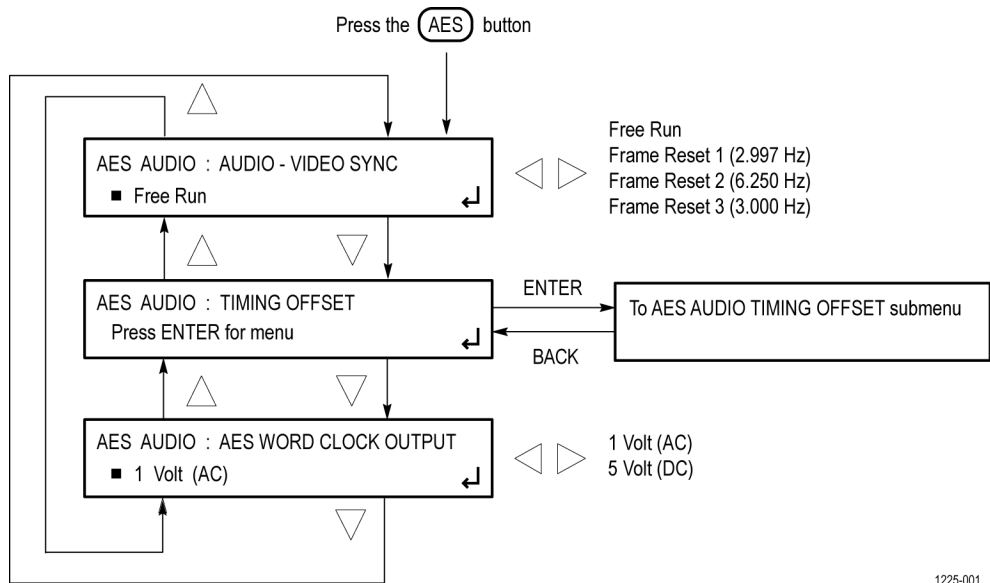
Figure 54: AES button menu diagram

AES AUDIO TIMING OFFSET submenu diagram

The following figure shows the diagram for the AES AUDIO TIMING OFFSET submenu.
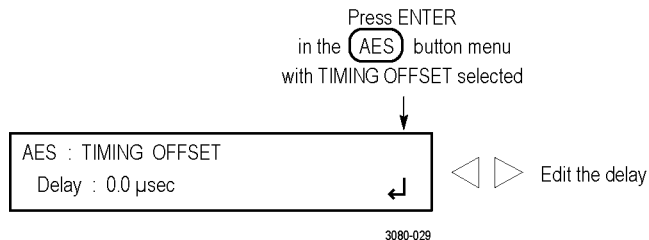
Figure 55: AES button – AES TIMING OFFSET submenu diagram

BLACK button menu diagrams

Use the BLACK button menu to view and configure the Black outputs. Press the BLACK button repeatedly to selected the desired Black output (1, 2, or 3) to configure. The following figures shows the top level diagrams for the BLACK button menu.

Figure 56: BLACK button menu diagram – part 1

Continued from previous page

Press the (BLACK) button *1

BLACK 1-3 : HD TRI-LEVEL SYNC RATE
■ Non-Integer (59.94, 47.9529.97, 23.98) ↵

◁ ▷   Non-Integer (59.94, 47.95, 29.97, 23.98)
       Integer (60, 50, 48, 30, 25, 24)
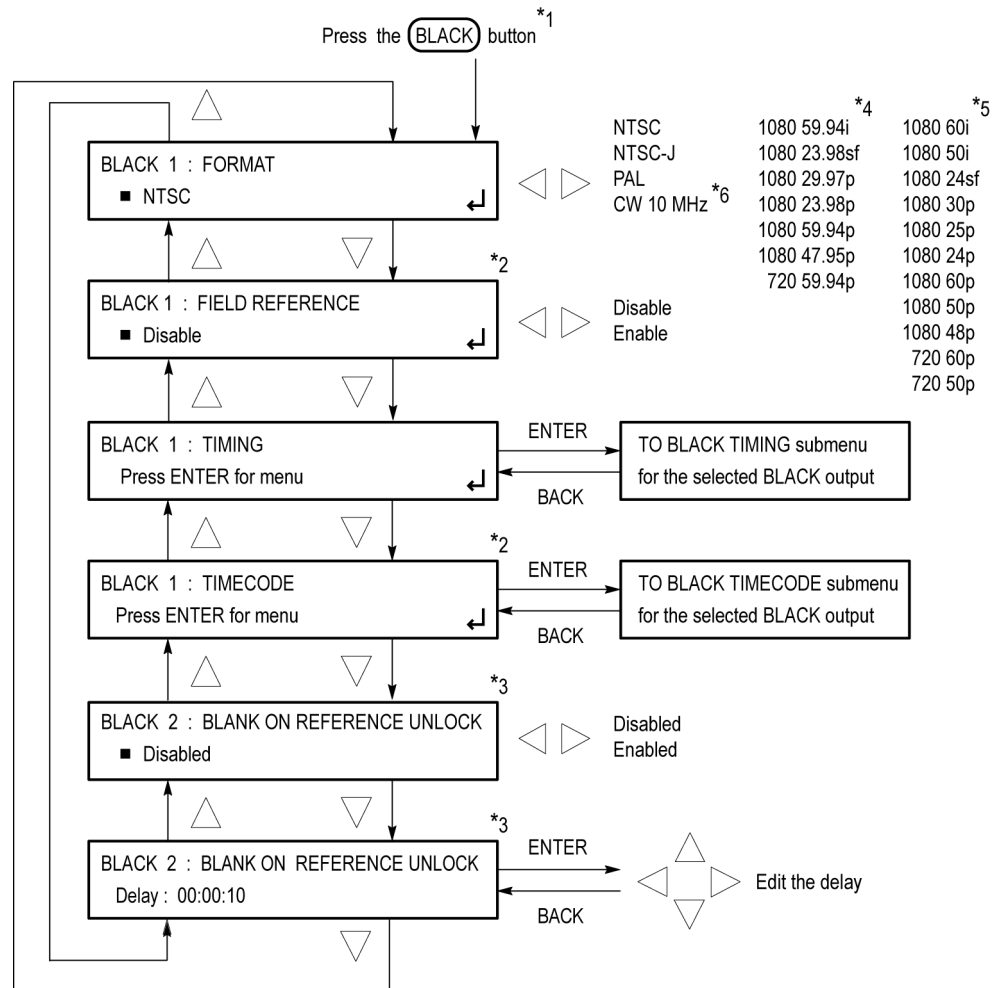
*1 Press the (BLACK) button repeatedly to select the desired BLACK output (1-3) or to select the desired group of Black outputs. When you select a group of BLACK outputs, you can set whether a non-integer or an integer clock will be used for the HD tri-level sync rate for those outputs.

1225-011b

Figure 57: BLACK button menu diagram – part 2

BLACK TIMING submenu diagram

The following figure shows the diagram for the BLACK TIMING submenu.

Press ENTER
in the (BLACK) button menu
with TIMING selected

△

*1

BLACK 1 : TIMING : NTSC
Vertical : 0 Line(s) ↵

◁ ▷   Edit the number of lines

△   ▽

BLACK 1 : TIMING : NTSC
Horizontal Coarse : 0.0000 μsec ↵

◁ ▷   Edit the number of microseconds

△   ▽

BLACK 1 : TIMING : NTSC
Horizontal Fine : 0.00 nsec ↵

◁ ▷   Edit the number of nanoseconds

▽
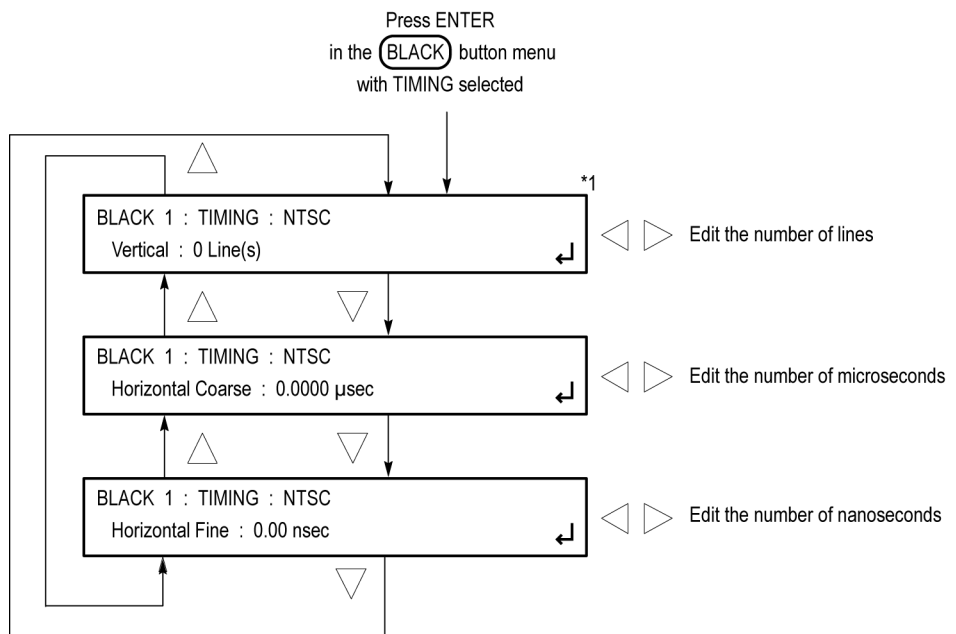
*1 The displayed timing format depends on which format is selected in the BLACK button main menu.

1225-012

Figure 58: BLACK button – BLACK TIMING submenu diagram

BLACK TIMECODE submenu diagram

The following figure shows the diagram for the BLACK TIMECODE submenu.
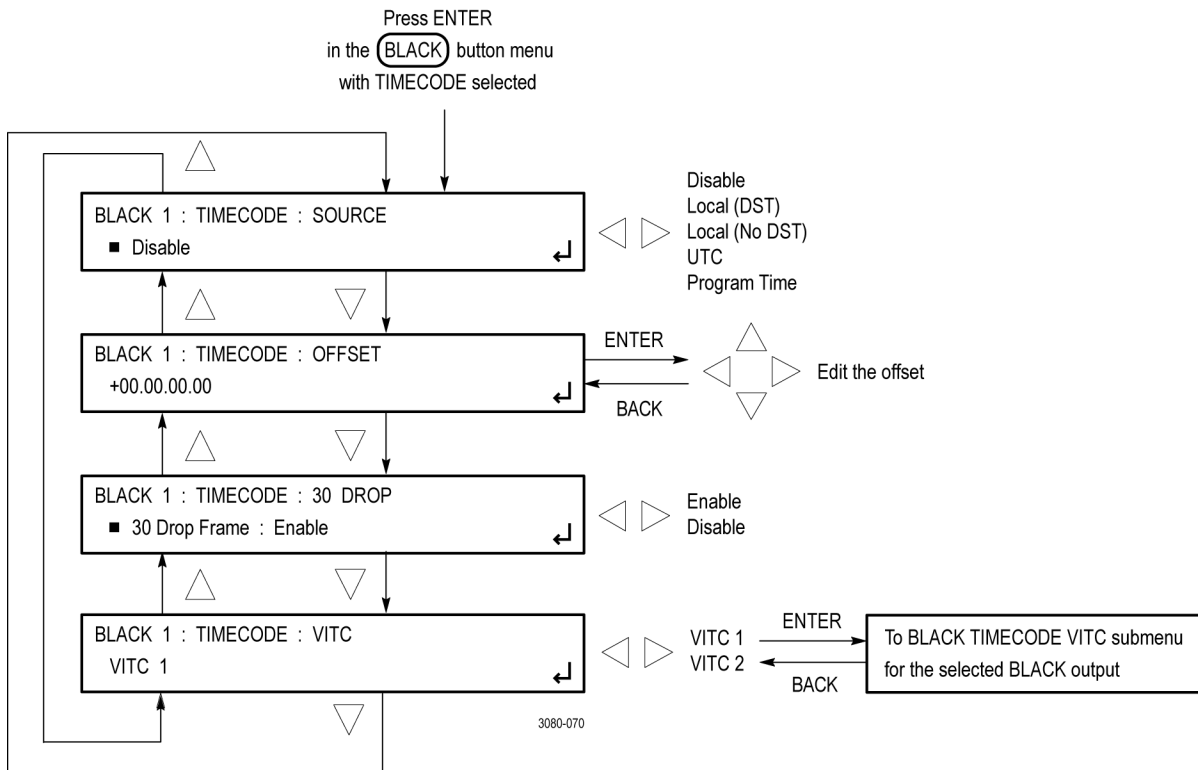
Figure 59: BLACK button – BLACK TIMECODE submenu diagram

**BLACK TIMECODE VITC
submenu diagram**

The following figure shows the diagram for the BLACK TIMECODE VITC submenu.
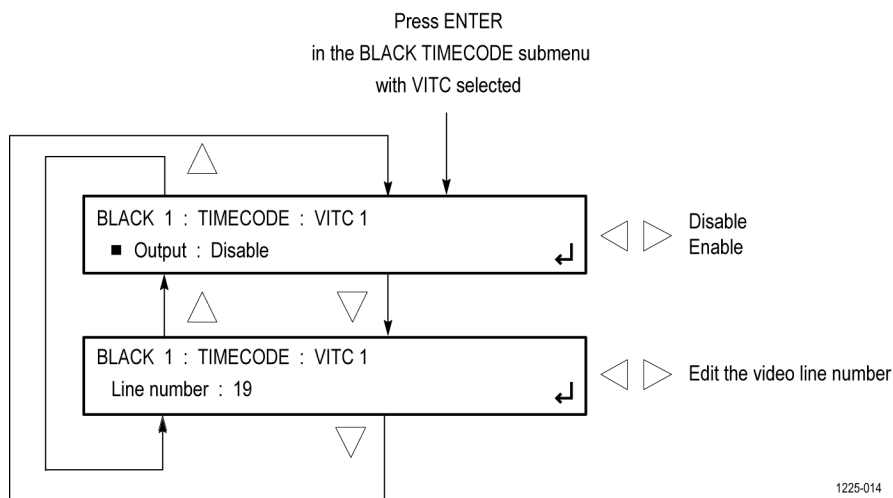
Figure 60: BLACK button – BLACK TIMECODE VITC submenu diagram

EMBED button menus (Option SDI only)

When Option SDI is installed, use the EMBED button menu to view and configure the embedded audio settings on the SDI video outputs. Use this menu to select the audio group for subsequent audio channel configuration, and to configure audio group parameters.

The following figure shows the top level diagram for the EMBED button menu.
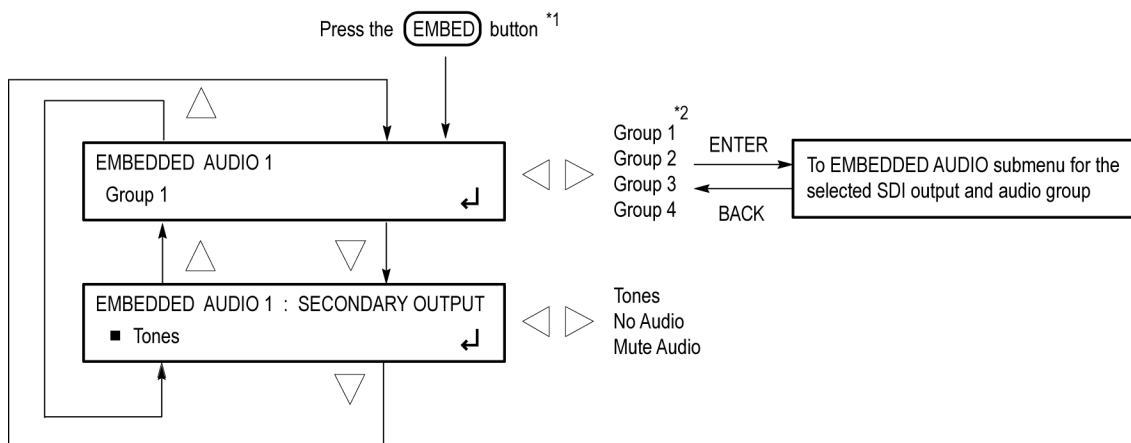
*1 Press the EMBED button repeatedly to select the embedded audio for the desired SDI output (1 or 2).

*2 When the SDI signal format is set to 3G Level B, you can select groups 1-4 for link A or select groups 1-4 for link B.

1225-017

Figure 61: EMBED button menu diagram

EMBEDDED AUDIO submenu diagram   The following figure shows the diagram for the EMBEDDED AUDIO submenu.
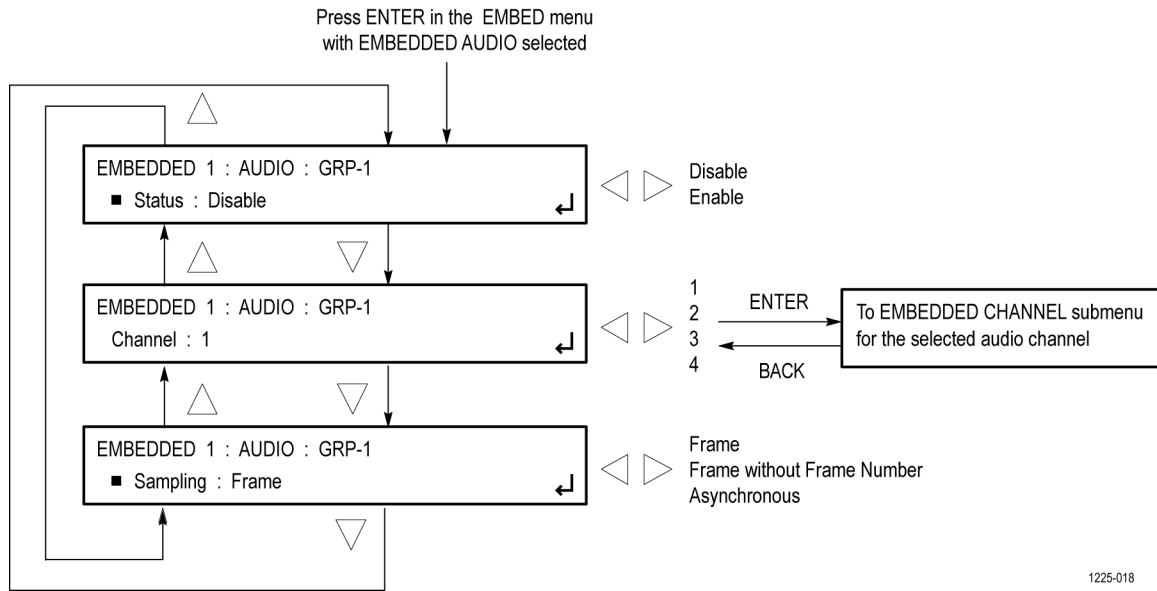
Figure 62: EMBED button – Embedded Audio Group submenu diagram

EMBEDDED CHANNEL submenu diagram

The following figure shows the diagram for the EMBEDDED CHANNEL submenu.
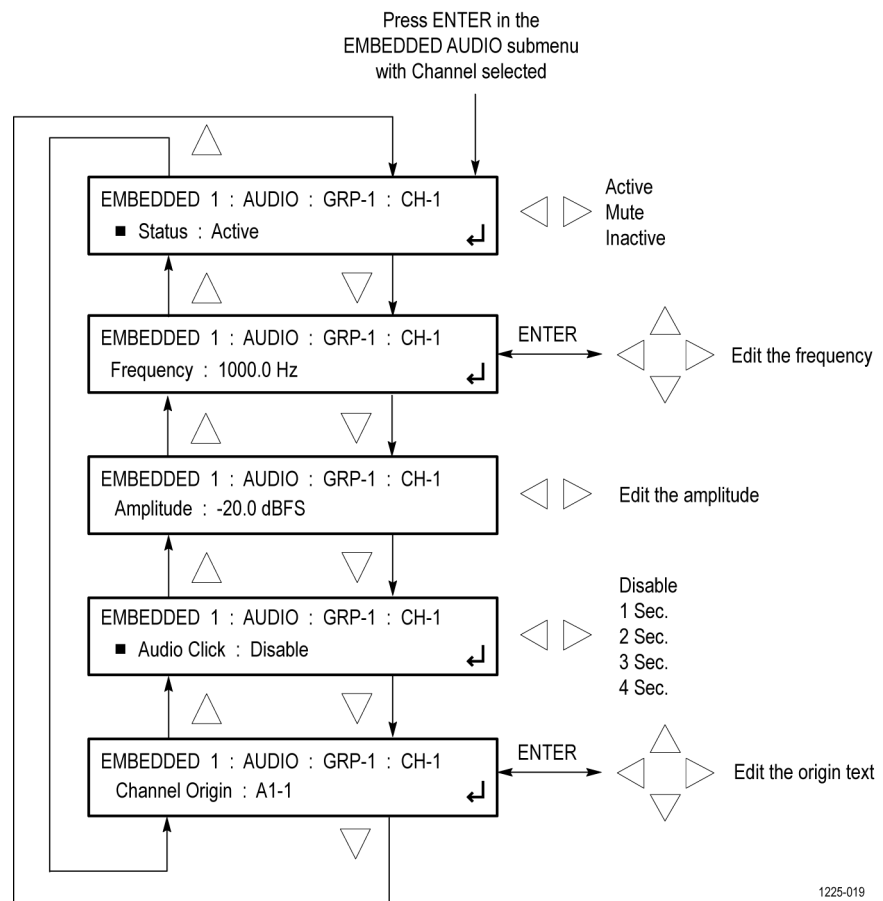
Figure 63: EMBED button – EMBEDDED CHANNEL submenu diagram

LTC button menus

Use this button menu to view and configure the LTC inputs and outputs on the GPI/LTC port. The following figure shows the top level diagram for the LTC button menu.
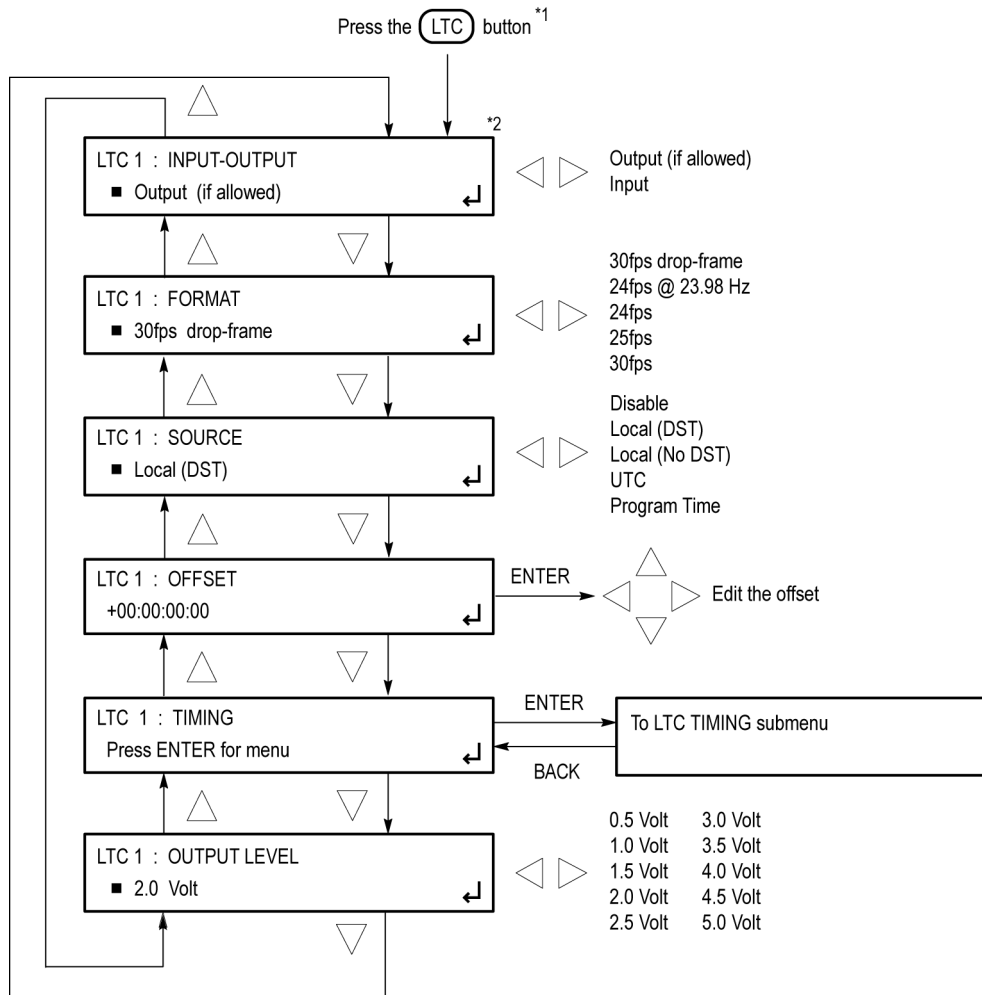
Figure 64: LTC button menu diagram

LTC TIMING submenu diagram

The following figure shows the diagram for the LTC TIMING submenu.

Press ENTER in the LTC menu
with TIMING selected

LTC [x] : TIMING : 30fps drop
　Delay : 0.00 msec

◁ ▷　Edit delay time

1225-008
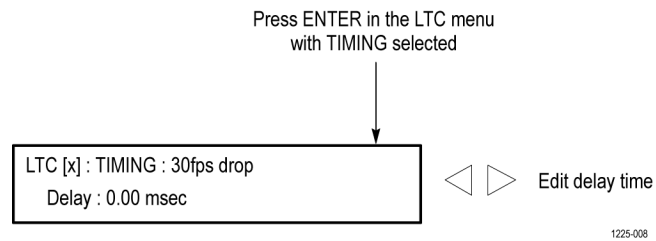
Figure 65: LTC button – LTC TIMING submenu diagram

REF button menus

Use this button menu to view and configure instrument settings such as the signal reference source, the signals being output, and information about system faults and alerts. The following figure shows the top level diagram for the REF button menu.
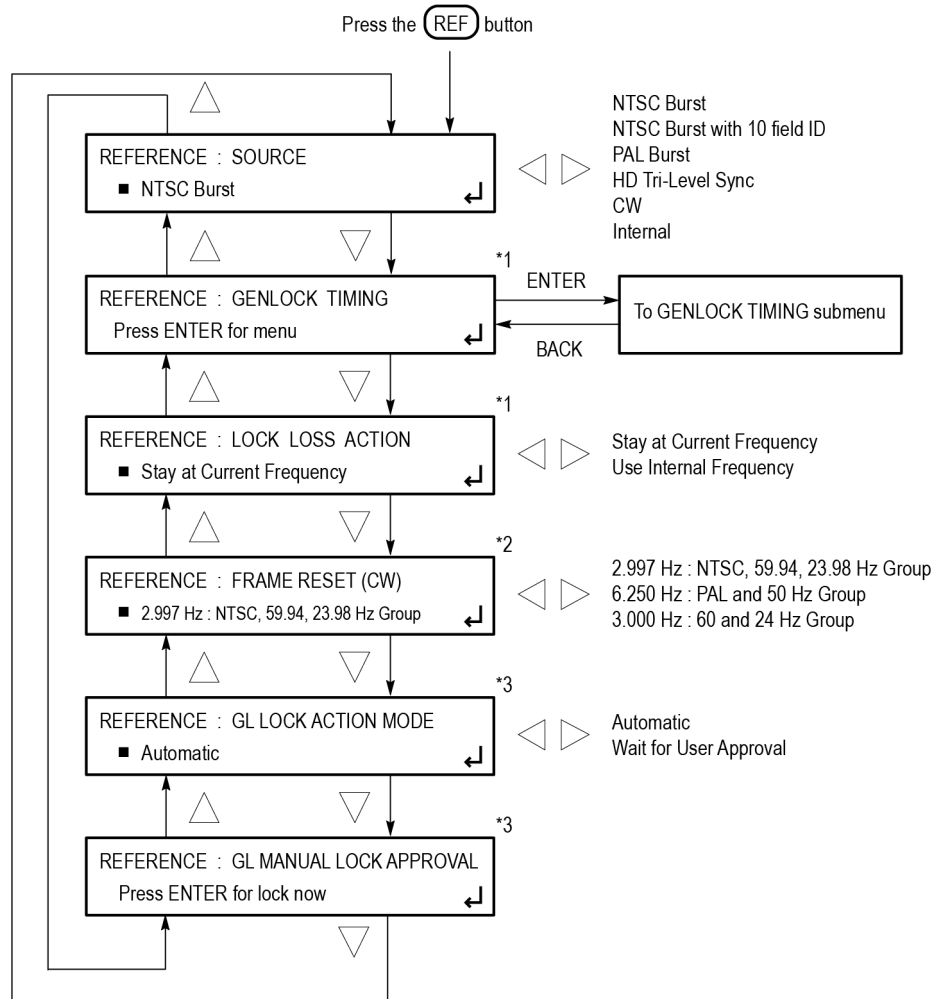
*1 This menu item does not appear when the reference source is set to internal.

*2 These menu items appear only when the reference source is set to CW mode.

*3 These menu items appear only when the reference is set to NTSC, PAL, Tri-Level and CW.

1225-048

Figure 66: REF button menu diagram

GENLOCK TIMING submenu diagram

The following figure shows the diagram for the GENLOCK TIMING submenu.
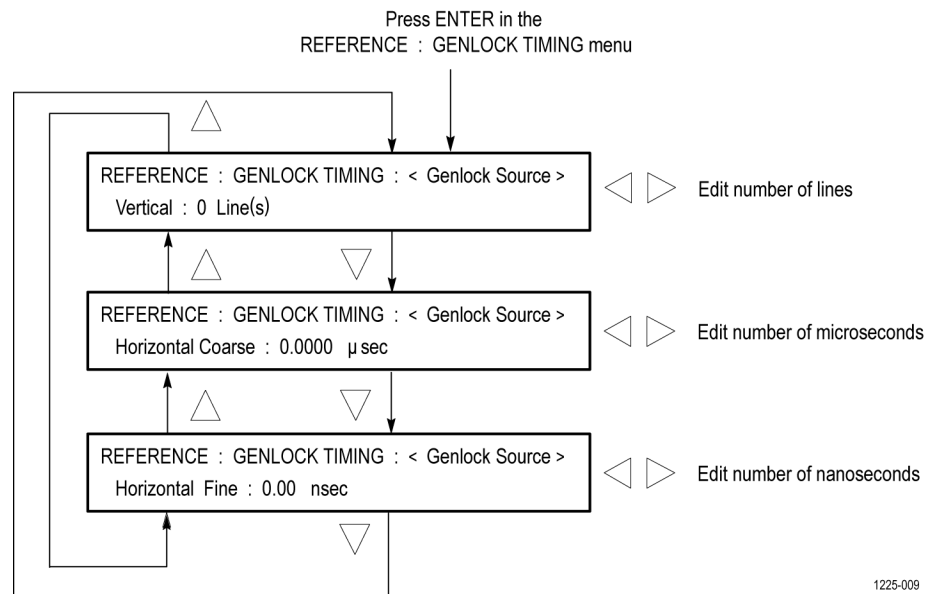
Figure 67: REF button – GENLOCK TIMING submenu diagram

SDI button menus (Option SDI only)

Use this button menu to view and configure the signals on the SDI video outputs. Press the SDI button repeatedly to select the desired SDI output (SDI 1 or SDI 2) to configure. The menu selections for the SDI 1 and SDI 2 outputs are similar, but are independent for each output.

The following figures show the top level diagrams for the SDI button menu.
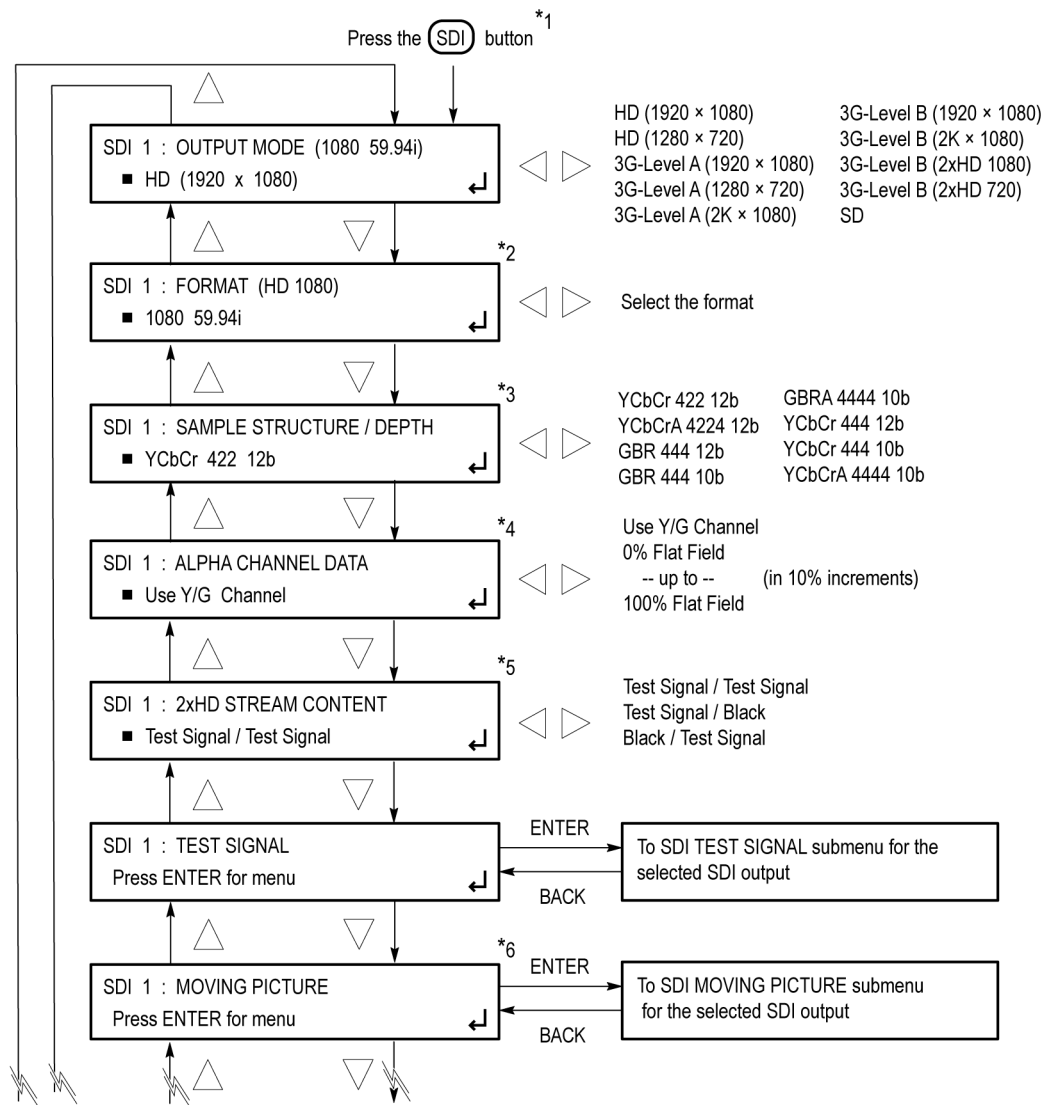
Figure 68: SDI button menu diagram - part 1

Continued from previous page

Figure 69: SDI button menu diagram - part 2

SDI TEST SIGNAL submenu diagram   The following figure shows the diagram for the SDI TEST SIGNAL submenu.

Press ENTER in the (SDI) button menu
with TEST SIGNAL selected

SDI 1 : TEST SIGNAL : COLOR BAR
100% Color Bars
◁ ▷ Select a Color Bars signal

SDI 1 : TEST SIGNAL : LINEARITY
Limit Ramp
◁ ▷ Select a Linearity signal

SDI 1 : TEST SIGNAL : FLAT FIELD
100% Blue Field
◁ ▷ Select a Flat Field signal

SDI 1 : TEST SIGNAL : MULTIBURST
Y Multiburst 15-30 MHz
◁ ▷ Select a Multiburst signal

SDI 1 : TEST SIGNAL : ZONE PLATE
Circle Zoneplate
◁ ▷ Select a Zone Plate signal

ENTER
BACK
To the SDI ZONE PLATE submenu for
the selected SDI zone plate signal

*1

SDI 1 : TEST SIGNAL : MONITOR
Black-Dark Gray Step Scale
◁ ▷ Select a Monitor signal

SDI 1 : TEST SIGNAL : PULSE BAR
Color Pulses
◁ ▷ Select a Pulse Bar signal

SDI 1 : TEST SIGNAL : TIMING
Co-siting Pulse
◁ ▷ Select a Timing signal

SDI 1 : TEST SIGNAL : SDI
SDI Matrix
◁ ▷ Select an SDI signal

*1

SDI 1 : TEST SIGNAL : FRAME PICTURE
No BMP files found in /SDI7/PICTURE/
◁ ▷ Select a Frame Picture file

*1 You must Load Frame Picture files in the /SDI7/PICTURE/
directory in order to select a Frame Picture signal output.

1225-021

Figure 70: SDI button – SDI TEST SIGNAL submenu diagram

SDI MOVING PICTURE submenu diagram

The following figure shows the diagram for the SDI MOVING PICTURE submenu.
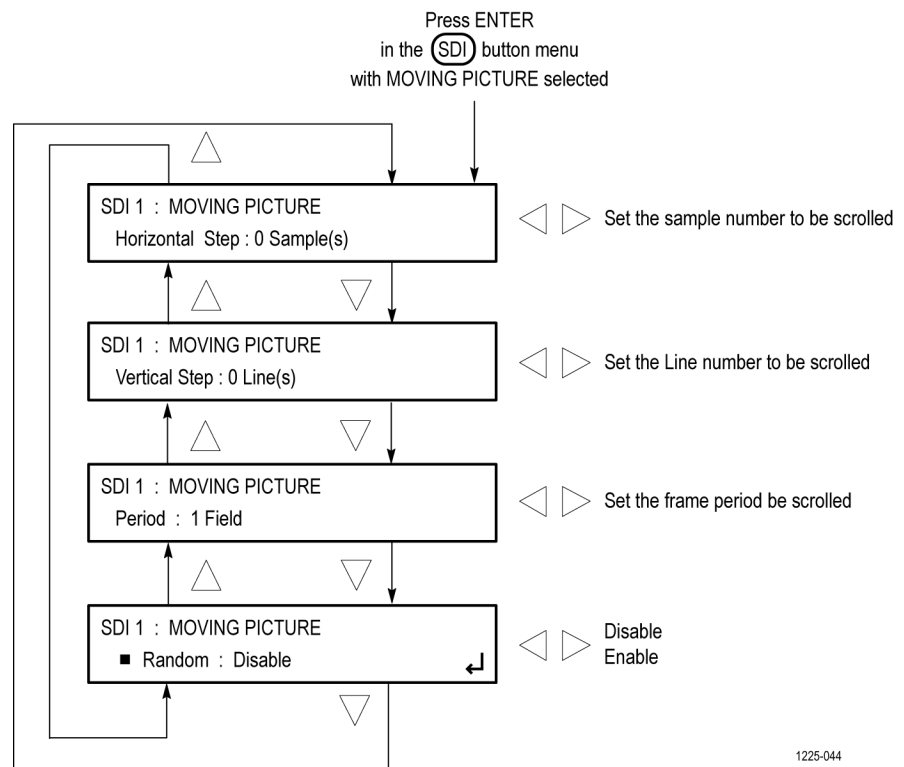
Figure 71: SDI button – SDI MOVING PICTURE submenu diagram

SDI OVERLAY submenu diagram   The following figure shows the diagram for the SDI OVERLAY submenu.
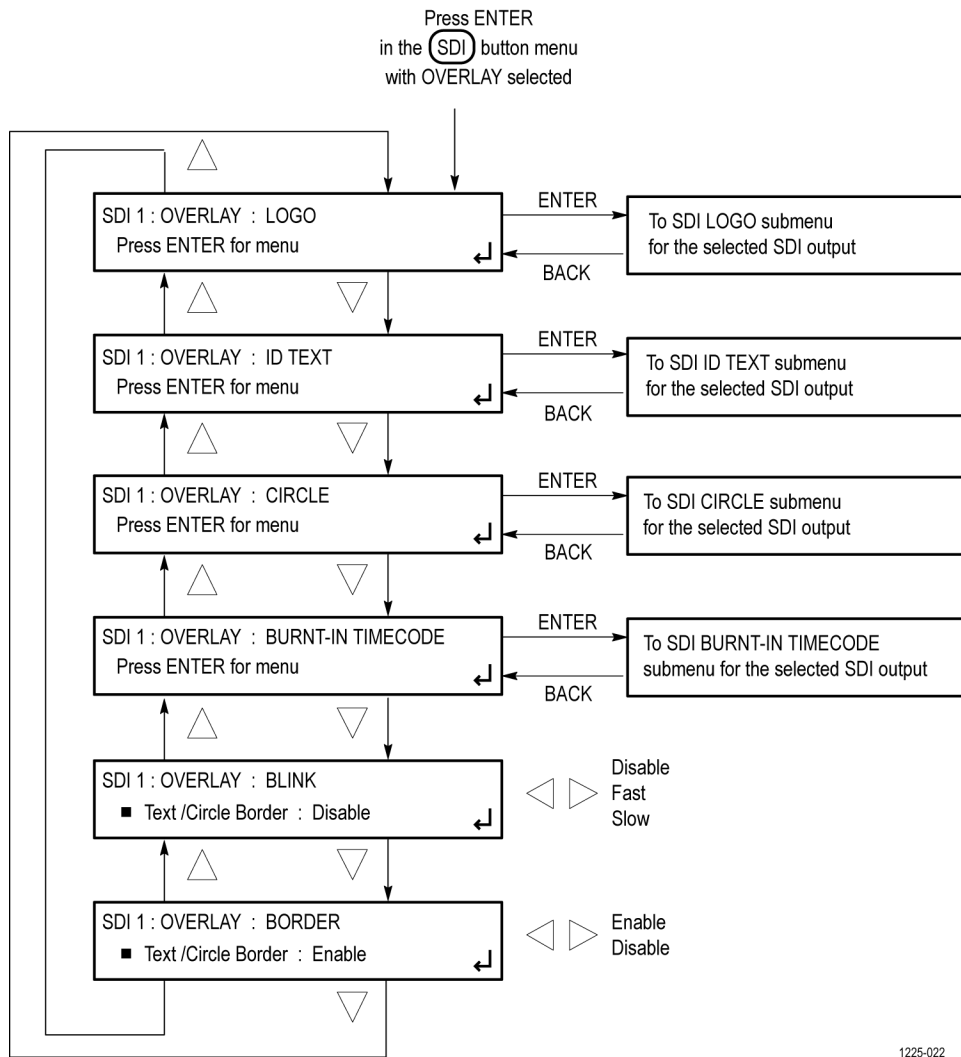
Figure 72: SDI button – SDI OVERLAY submenu diagram

SDI OVERLAY LOGO submenu diagram   The following figure shows the diagram for the SDI OVERLAY LOGO submenu.
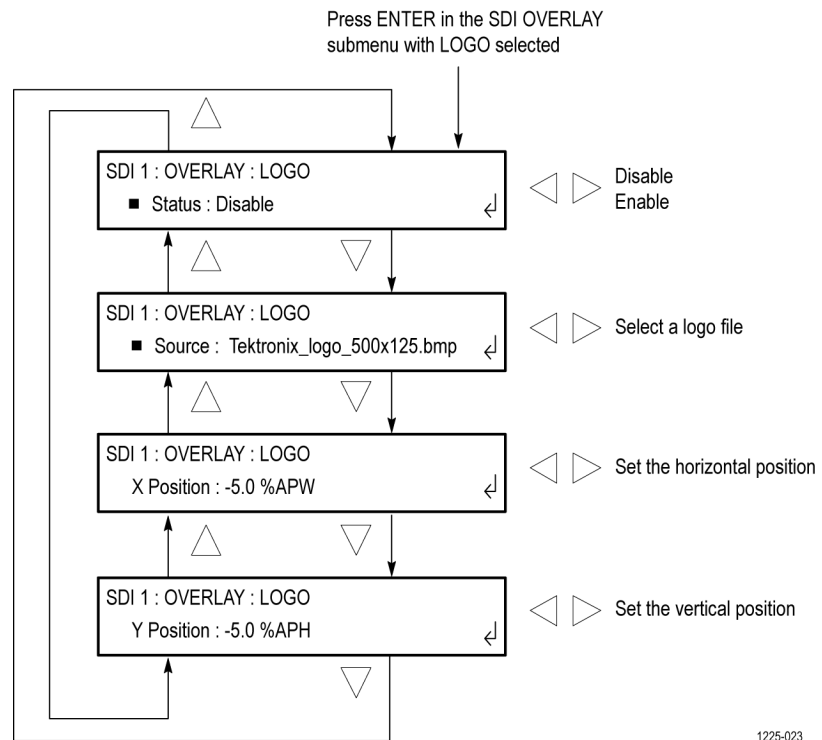
Figure 73: SDI button – SDI OVERLAY LOGO submenu diagram

SDI OVERLAY ID TEXT submenu diagram

The following figure shows the diagram for the SDI OVERLAY ID TEXT submenu.
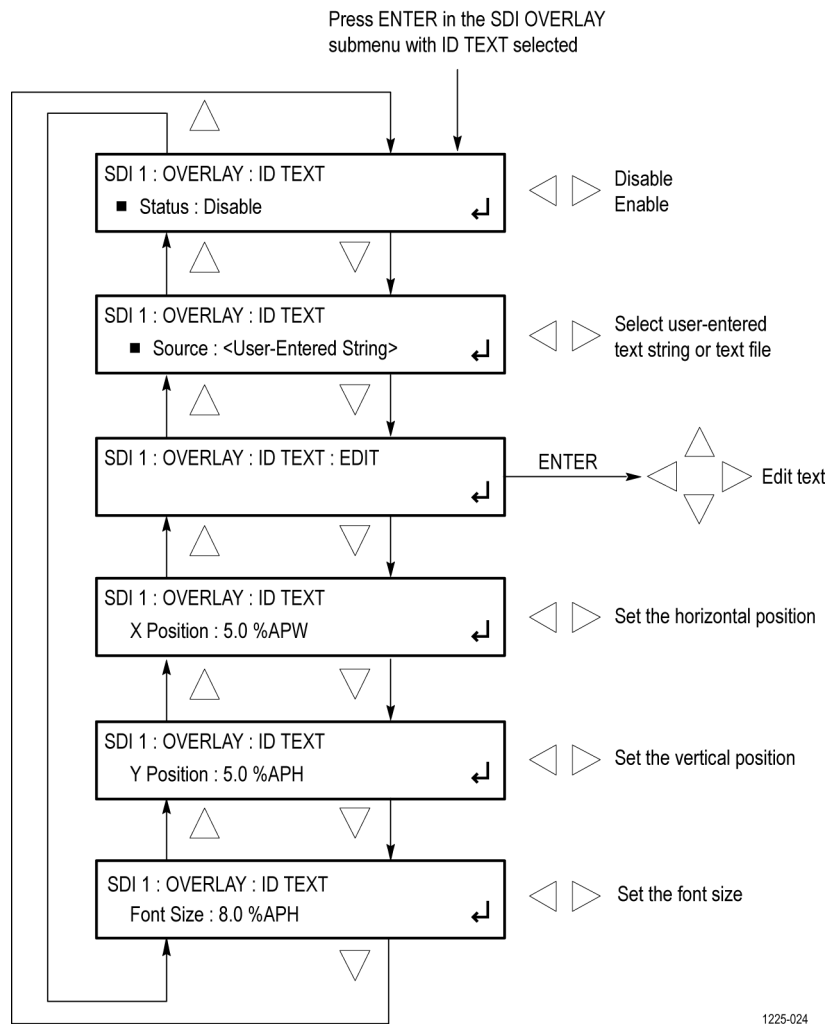
Figure 74: SDI button – SDI OVERLAY ID TEXT submenu diagram

SDI OVERLAY CIRCLE submenu diagram

The following figure shows the diagram for the SDI OVERLAY CIRCLE submenu.
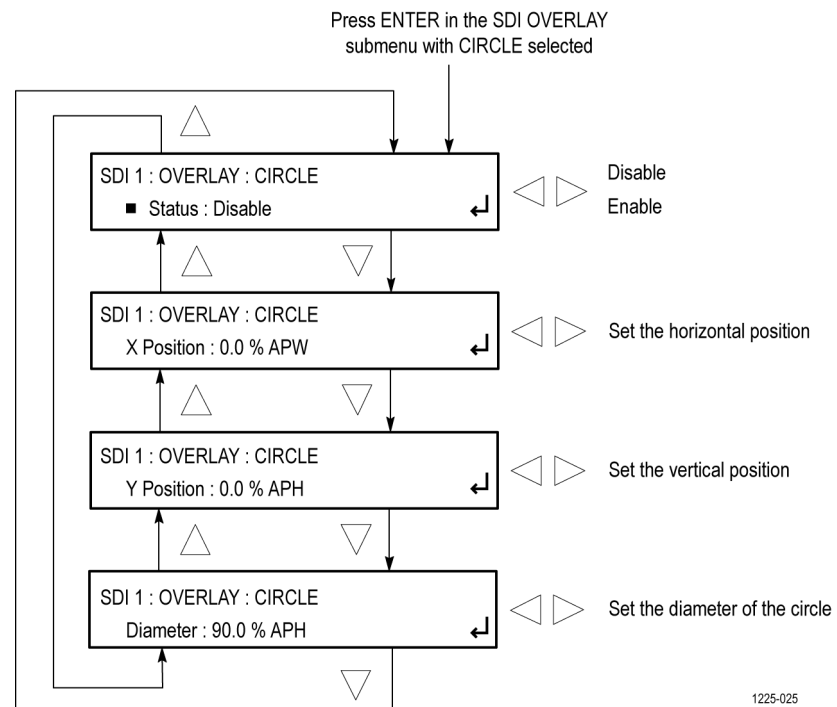
Figure 75: SDI button – SDI OVERLAY CIRCLE submenu diagram

SDI OVERLAY BURNT-IN TIMECODE submenu diagram

The following figure shows the diagram for the SDI OVERLAY BURNT-IN TIMECODE submenu.
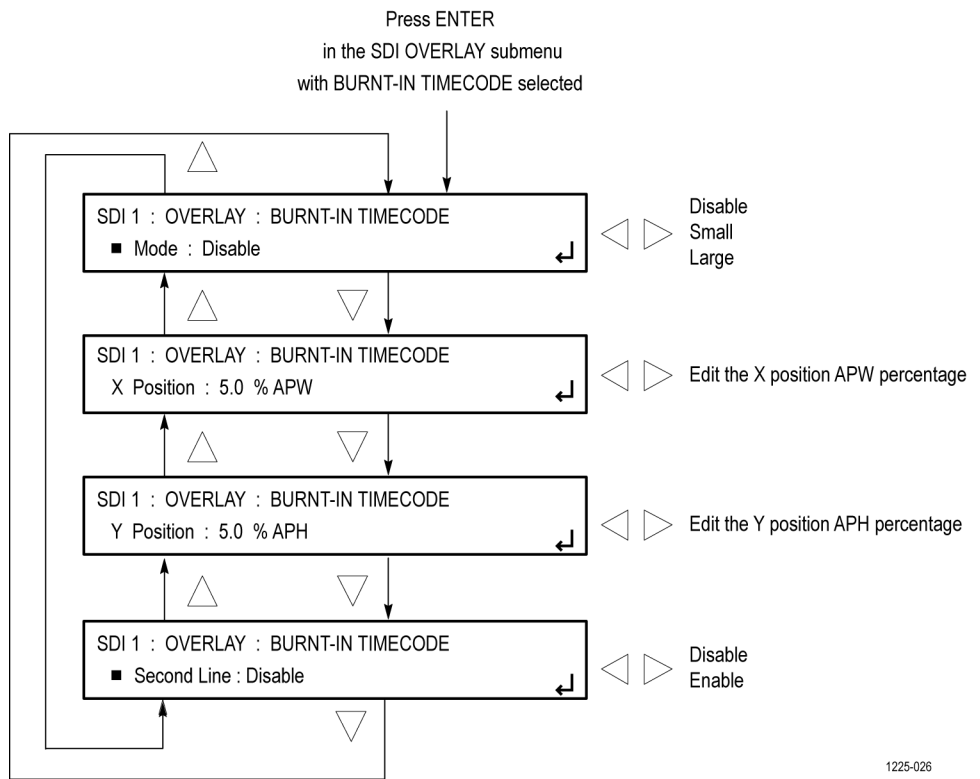
Figure 76: SDI button – SDI Overlay BURNT-IN TIMECODE submenu diagram

SDI TIMING submenu diagram

The following figure shows the diagram for the SDI TIMING submenu.
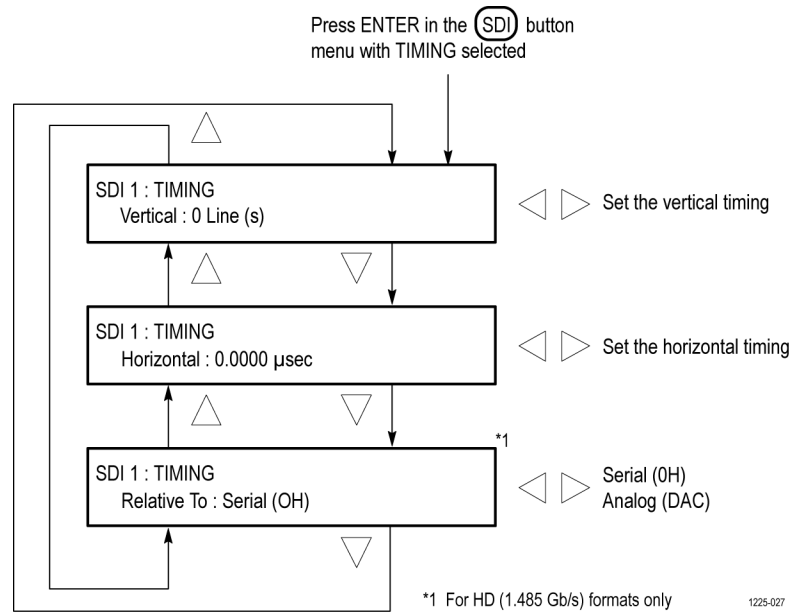
Figure 77: SDI button – SDI TIMING submenu diagram

SDI TIMECODE submenu diagram

The following figure shows the diagram for the SDI TIMECODE submenu.
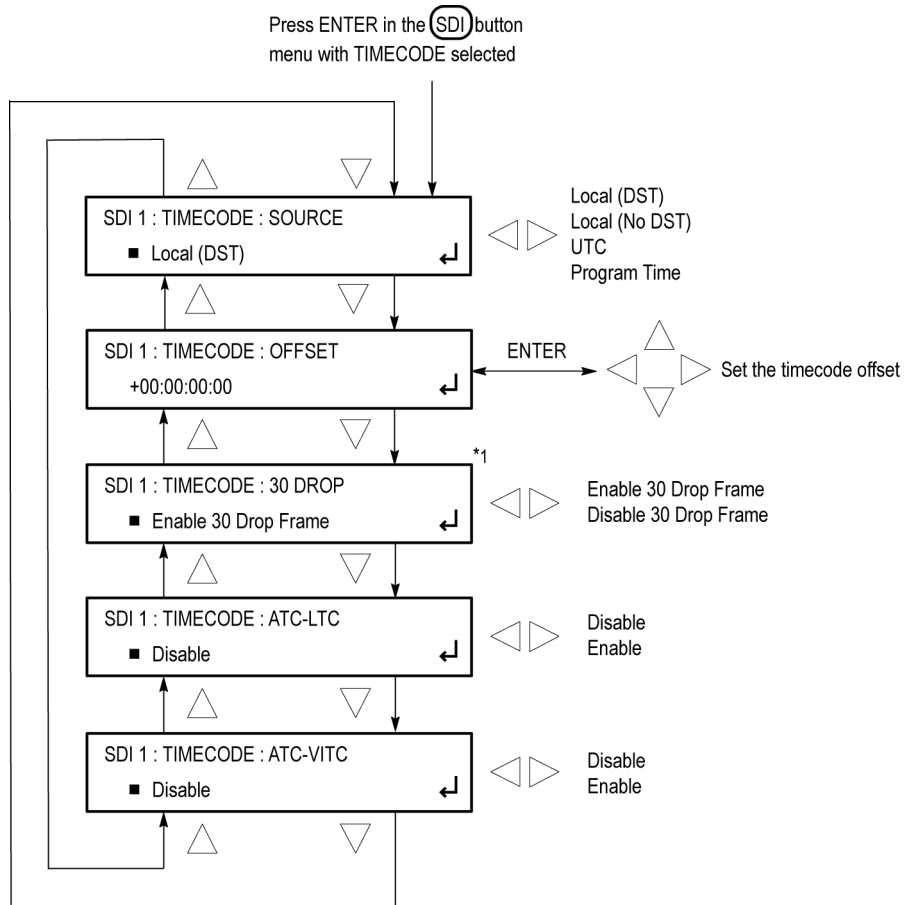
Figure 78: SDI button – SDI TIMECODE submenu diagram

SDI VIDEO submenu diagram   The following figure shows the diagram for the SDI VIDEO submenu.
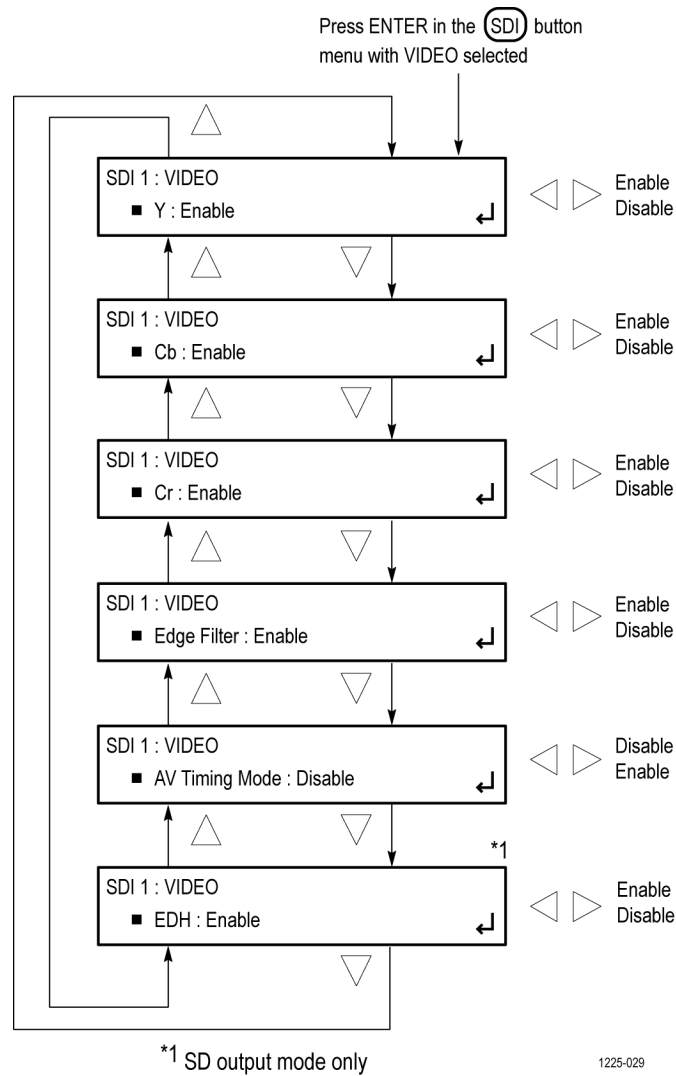
Figure 79: SDI button – SDI VIDEO submenu diagram

SDI ANC PAYLOAD submenu diagram

The following figures show the diagrams for the SDI ANC PAYLOAD submenu.
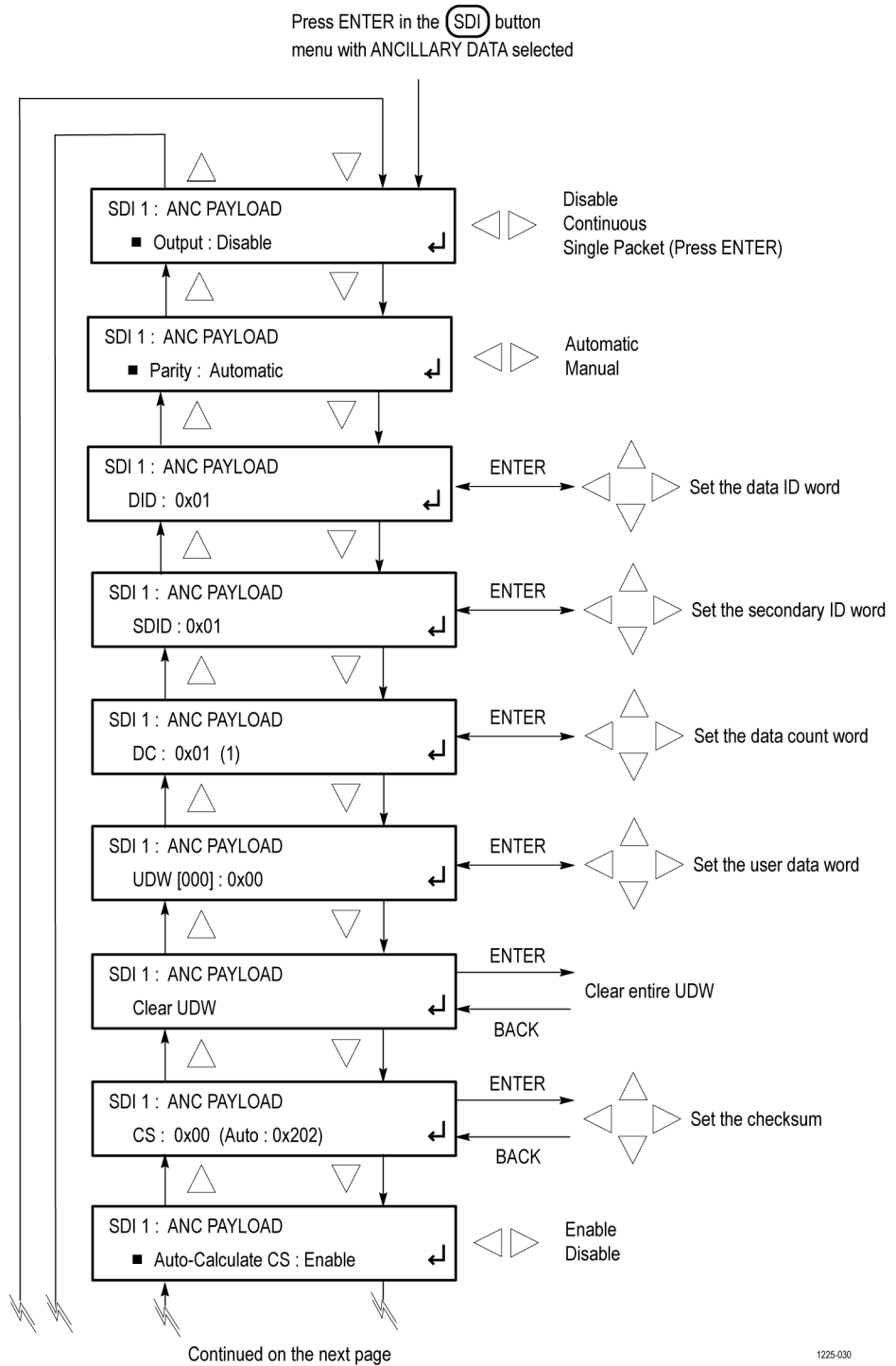
Figure 80: SDI button – SDI ANC PAYLOAD submenu diagram - part 1
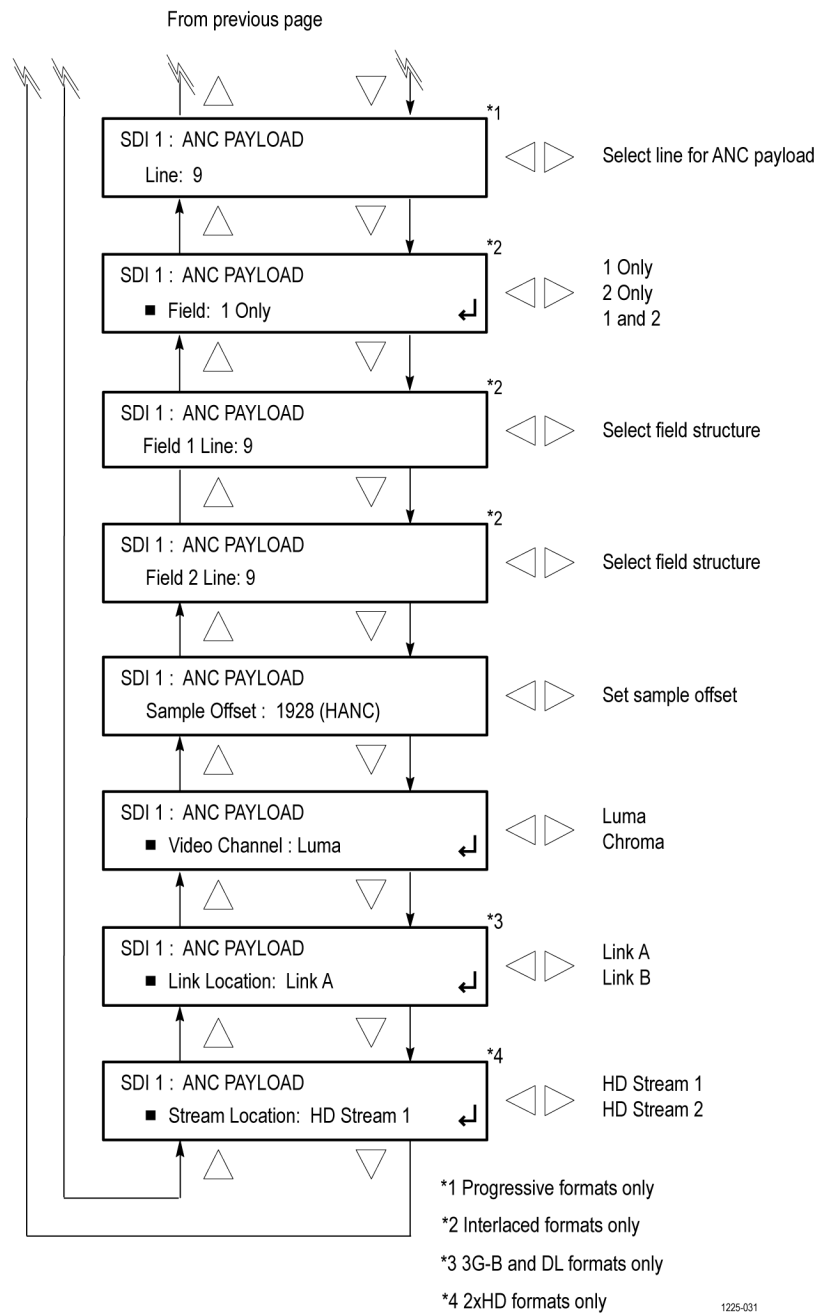
Figure 81: SDI button – SDI ANC PAYLOAD submenu diagram - part 2

STATUS button menus

Use this button menu to view the current status of instrument settings such as the signal reference source, the signals being output, and information about system faults and alerts. This menu is for viewing status only and no changes to the instrument settings can be made from this menu.

The following figures show the top level diagrams for the STATUS button menu.


```
Power on the SPG700 or press
  the  STATUS  button
```

STATUS : FAULT
  PS2 fault error   1/2   ◁ ▷   View more faults

STATUS : ALERT
  Loss of lock on reference input   1/3   ◁ ▷   View more alerts

STATUS : REFERENCE : NTSC Burst
  Loss of lock   ◁ ▷   View more reference status

STATUS : TIME : INTERNAL
  Internal : 2016-10-23 20:10:24:30 (Local)   ◁ ▷   View more time status

STATUS : BLACK 1-3
  B1: NTSC B2: 720p59 B3: 1080i59
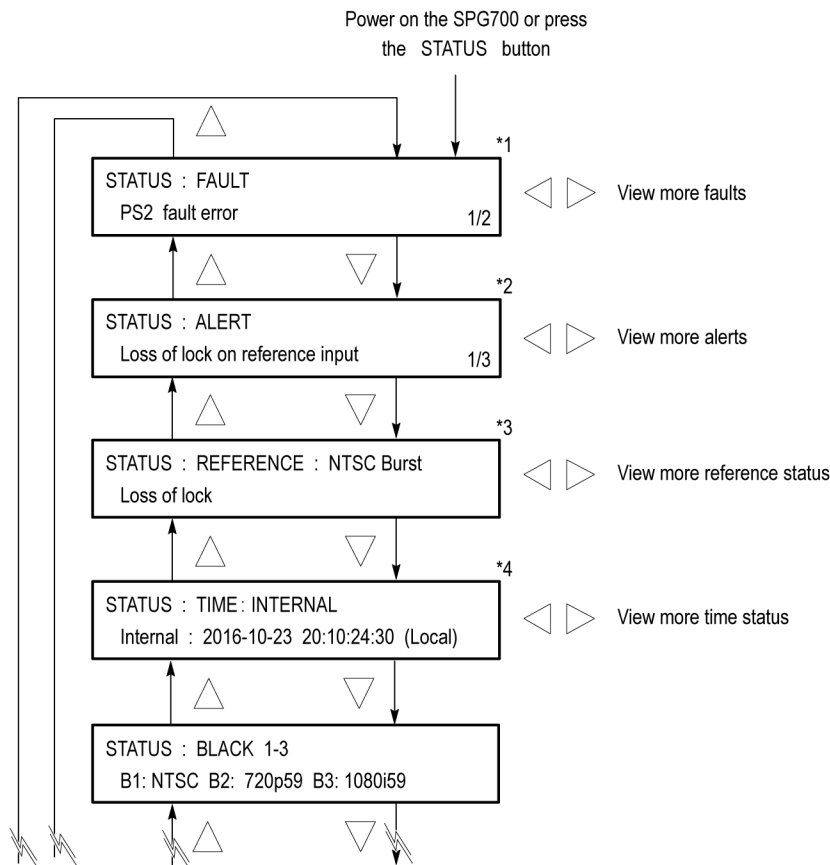
*1 This menu item appears only when an instrument hardware issue has caused a status indicator to turn Orange or Red on the front panel status or web interface.
*2 This menu item appears only when a problem with the reference or time inputs that has caused a status indicator to turn Orange or Red on the front panel status or web interface.
*3 The readout for this menu item depends on the selected reference source (i.e. Internal, NTSC Burst, etc.).
*4 The readout for this menu item depends on the selected time source (i.e. LTC, VITC, Internal, etc.).

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Figure 82: STATUS button menu diagram - part 1

Continued from previous page

STATUS : LTC
L1: 30DF   L2: 24   L3: 30   L4: 30DF

*5

STATUS : SDI 1 : 100% Color Bars
HD 1080 59.94i

View the status for the SDI 2

*5

STATUS : EMBEDDED AUDIO 1
PPPP PPPP - - - - - - - -

View the embedded audio status for the SDI 2 output
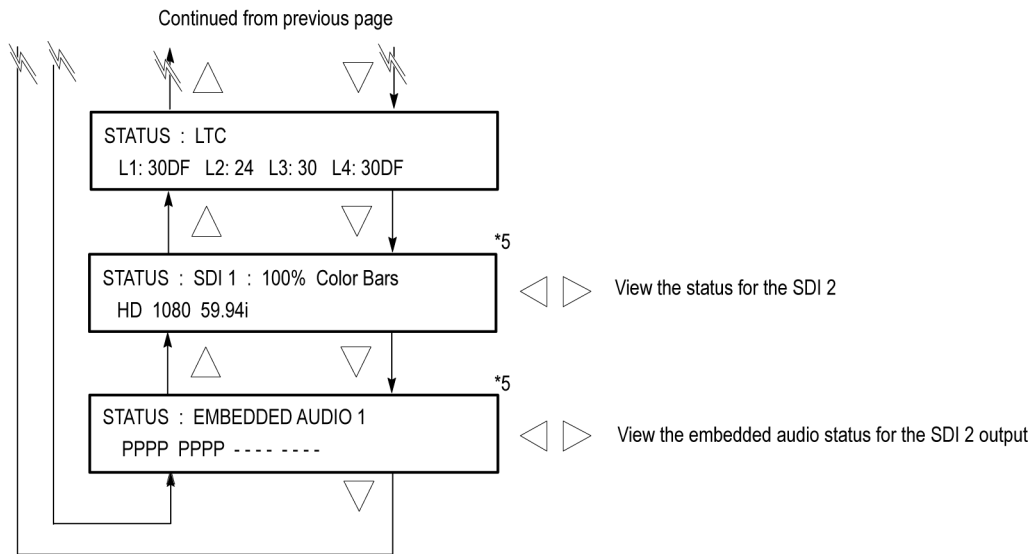
*5 These menu items appear only when Option SDI is installed.

1225-016

Figure 83: STATUS button menu diagram - part 2

SYSTEM button menu

Use this button menu to view and configure instrument settings such as network parameters, SNMP traps, GPI alarms, installed options, display brightness, beeper control, and hardware/firmware versions. You can also use this menu to perform firmware upgrades, save and recall presets, and view diagnostic results.

The following figures show the top level diagrams for the SYSTEM button menu.

Press the (SYSTEM) button

SYSTEM : PRESET
Press ENTER for menu

ENTER → To PRESET submenu
← BACK

SYSTEM : NETWORK
Press ENTER for menu

ENTER → To NETWORK SETUP submenu
← BACK

SYSTEM : SPG A/V OUTPUT EPOCH SELECTION
■ 1970   Jan 1st 00:00:00 GMT

◁ ▷   1970 Jan 1st 00:00:00 GMT
1958 Jan 1st 00:00:00 GMT

SYSTEM : SNMP
Press ENTER for menu

ENTER → To SNMP submenu
← BACK

SYSTEM : SCPI - PORT 5000
■ Enable

◁ ▷   Enable
Disable

SYSTEM : WEB USER INTERFACE
■ Full-Control

◁ ▷   Full-Control
Disable
Read-Only

*1

SYSTEM : USB (Not Connected)
No USB Drive Detected

SYSTEM : BACKUP / RESTORE
Backup Presets to USB

◁ ▷   Backup Presets to USB
Backup All User Data to USB
Restore Presets from USB
Restore All User Data from USB

SYSTEM : GPI
Press ENTER for menu

ENTER → To GPI submenu
← BACK

SYSTEM : LCD CONTRAST
LOW << 8 >> HIGH

◁ ▷   Adjust the LCD display contrast

*1 The USB selection shows the USB status (mounted or unmounted) and allows for manual mounting or unmounting.

1225-032a

Figure 84: SYSTEM button menu diagram - part 1

Continued from ⬭SYSTEM⬭ button page 1

SYSTEM : BEEPER CONTROL
■ Enable ↵

◁ ▷   Enable
       Disable

SYSTEM : FRONT PANEL DISABLE
■ Time Out : 1 Hour ↵

◁ ▷   1 Hour   1 Minute
       Off   10 Minutes
       Immediately 30 Minutes

SYSTEM : POWER SUPPLY PREFERRED SELECT
■ Power Supply 1 (Active, Preferred) ↵

◁ ▷   View status of   ENTER   Set the currently selected supply
       Power Supply 2   ——→   as the active, preferred supply

SYSTEM : FLASH MEMORY
Total : 100663296 (Free : 92934144) ↵

SYSTEM : OPTIONS
SDI 3G

ENTER
——→   To OPTIONS submenu
←——
BACK

SYSTEM : VERSION INFO (H/W)
V1.00 Fr: 1.4 FP: 1.1 PS: 2.7 ↵

◁ ▷   View more hardware version information

SYSTEM : VERSION INFO (F/W)
Version 2.1 Jan 11 19:08 2016 ↵

SYSTEM : FIRMWARE UPGRADE
USB Upgrade

◁ ▷   USB Upgrade   ENTER   To USB upgrade or to
       Network Upgrade ——→   Network upgrade
                        ←——
                        BACK

Continued on next page

1225-032b

Figure 85: SYSTEM button menu diagram - part 2

Continued from (SYSTEM) button page 2

SYSTEM : CALIBRATE OVEN Internal Frequency Calibration ↵	ENTER → ← BACK	To CALIBRATE OVEN submenu
SYSTEM : FRAME RESET STATUS Press ENTER for menu ↵	ENTER → ← BACK	To FRAME RESET STATUS submenu
SYSTEM : EVENT LOG Press ENTER for menu ↵	ENTER → ← BACK	To EVENT LOG submenu
SYSTEM : DIAGNOSTICS Press ENTER for menu ↵	ENTER → ← BACK	To DIAGNOSTICS submenu
SYSTEM : POWER SUPPLY LOAD TEST Press ENTER for menu ↵	ENTER → ← BACK	To POWER SUPPLY LOAD TEST submenu

1225-032c

Figure 86: SYSTEM button menu diagram - part 3

Settings available only in the front-panel SYSTEM button menu

The following SYSTEM button menu settings are available only using the front panel and are not available on the SPG700 Web Interface:

- **SPG A/V OUTPUT EPOCH SELECTION**. Sets which SMPTE Epoch reference will be used for system timing. Use the left (◄) or right (►) arrow button to select from the following choices: 1970 Jan 1st 00:00:00 GMT or 1958 Jan 1st 00:00:00 GMT. Press the **ENTER** button to enable the selection.

- **FRONT PANEL DISABLE**. Sets the time-out period until the front-panel buttons are disabled. Use the left (◄) or right (►) arrow button to select from the following choices: Disable, Immediately, 1 Minute, 10 Minutes, 30 Minutes, and 1 Hour. Press the **ENTER** button to enable the selection.

  When you select any of these time-out periods (except Disable), the front-panel buttons are disabled and the display dims when that time passes without a button push. To enable front-panel operation, press and hold the FRONT PANEL ENABLE button for a few seconds to restart the time-out counter and enable the front-panel buttons.

- **SCPI – PORT 5000.** Enables or disables the access to the SCPI remote control port. This is independent from the Web interface access.

NOTE. If the remote port is not needed this setting should be disabled to provide better security and resistance to port scanning.

PRESET submenu diagram   The following figure shows the diagram for the PRESET submenu.
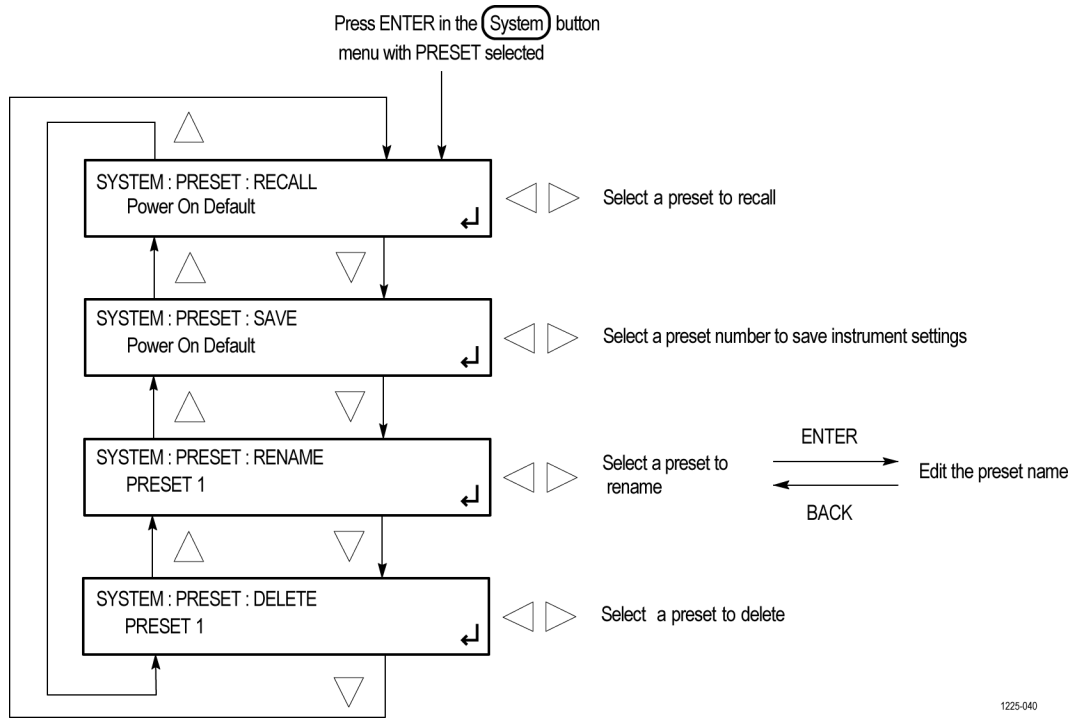
Figure 87: SYSTEM button – PRESET submenu diagram

NETWORK SETUP submenu diagram

The following figure shows the diagram for the NETWORK SETUP submenu.

Press ENTER in the (SYSTEM) button menu with NETWORK selected

SYSTEM : NET SETUP : DHCP
  Enable ↵

Enable
Disable

*1 ENTER

SYSTEM : UTIL : NET SETUP : IP ADDRESS
  000.000.000.000

BACK

Set the IP address

*1 ENTER

SYSTEM : UTIL : NET SETUP : SUBNET MASK
  000.000.000.000

BACK

Set the subnet address

*1 ENTER

SYSTEM : UTIL : NET SETUP : GATEWAY
  000.000.000.000

BACK

Set the gateway address

1225-041
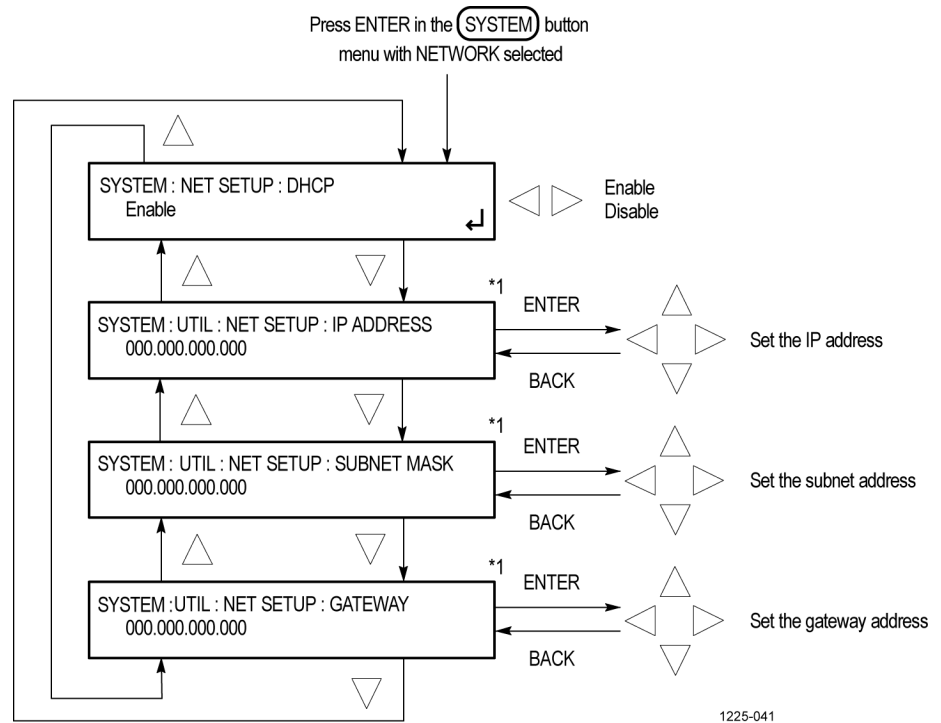
*1 You can edit the address only when DHCP is disabled.

Figure 88: SYSTEM button – NETWORK SETUP submenu diagram

SNMP submenu diagram   The following figure shows the diagram for the SNMP submenu.
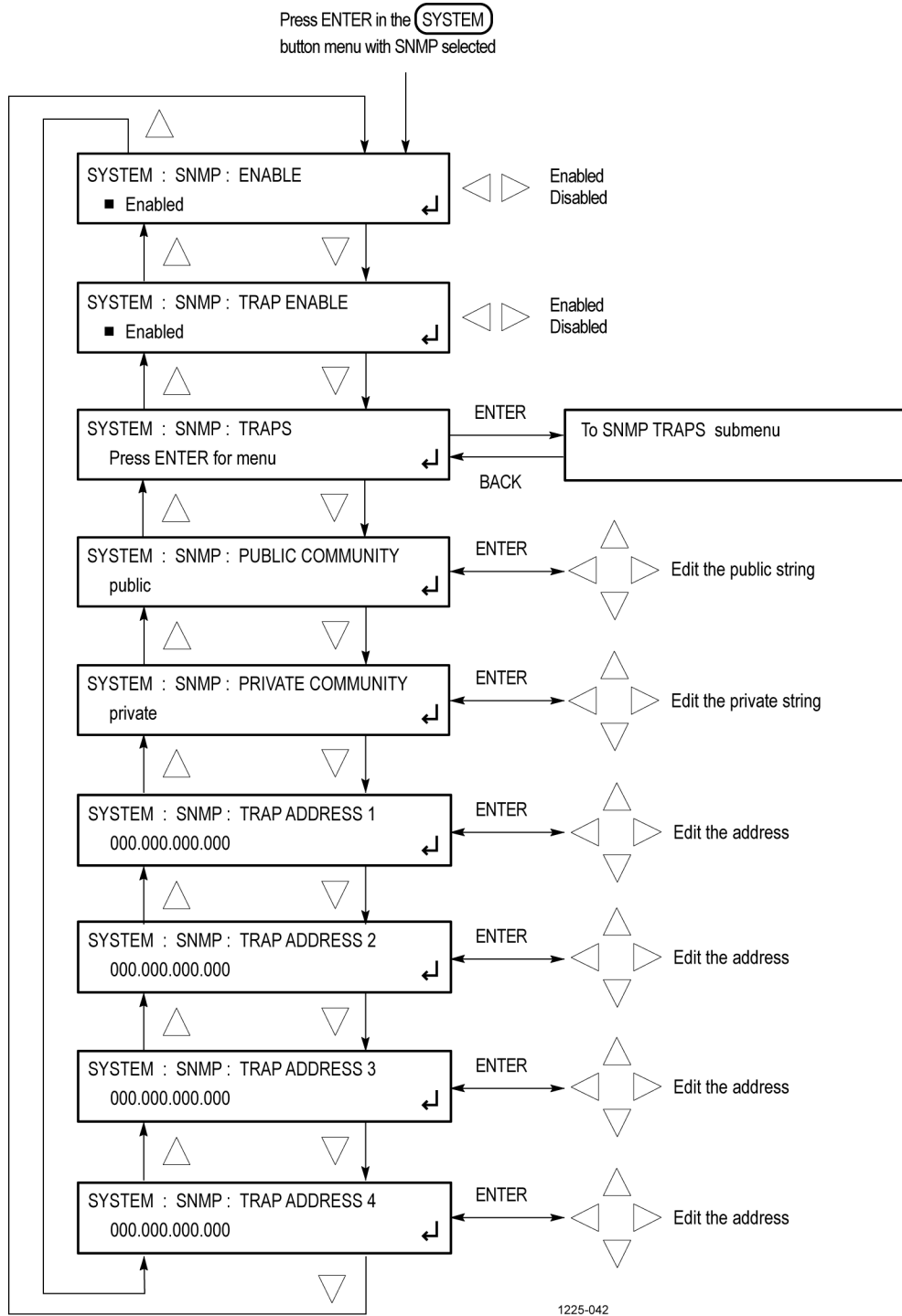
Figure 89: SYSTEM button – SNMP submenu diagram

SNMP TRAPS submenu diagram   The following figures show the diagrams for the SNMP TRAPS submenu.
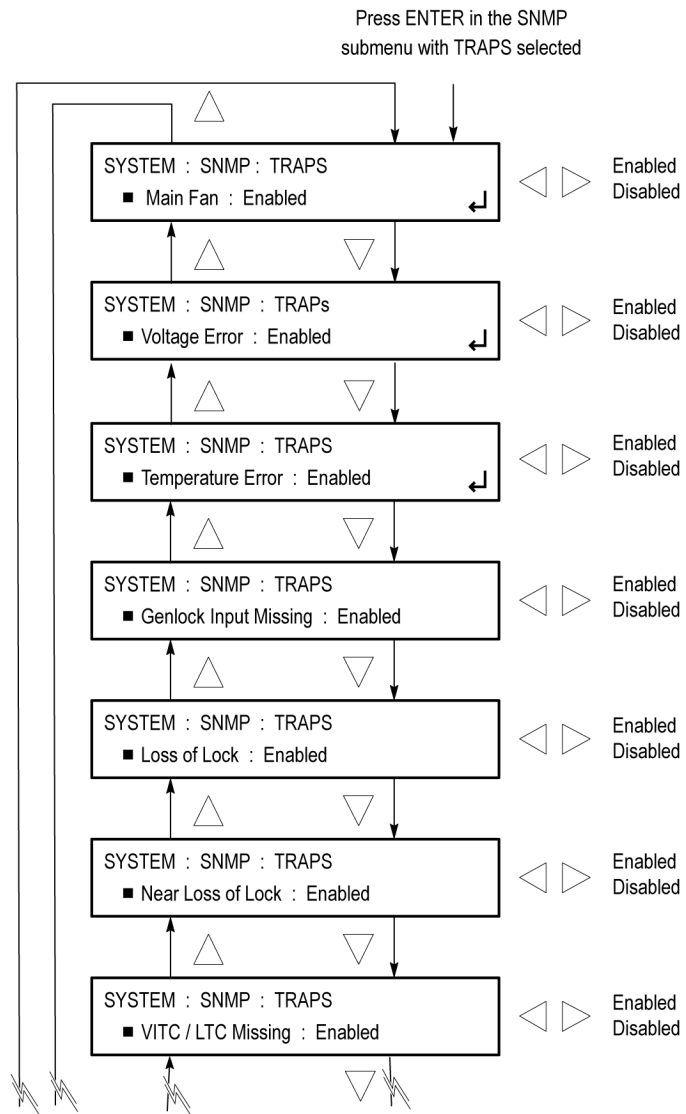
Figure 90: **SYSTEM button – SNMP TRAPS submenu diagram - part 1**

Continued from previous page
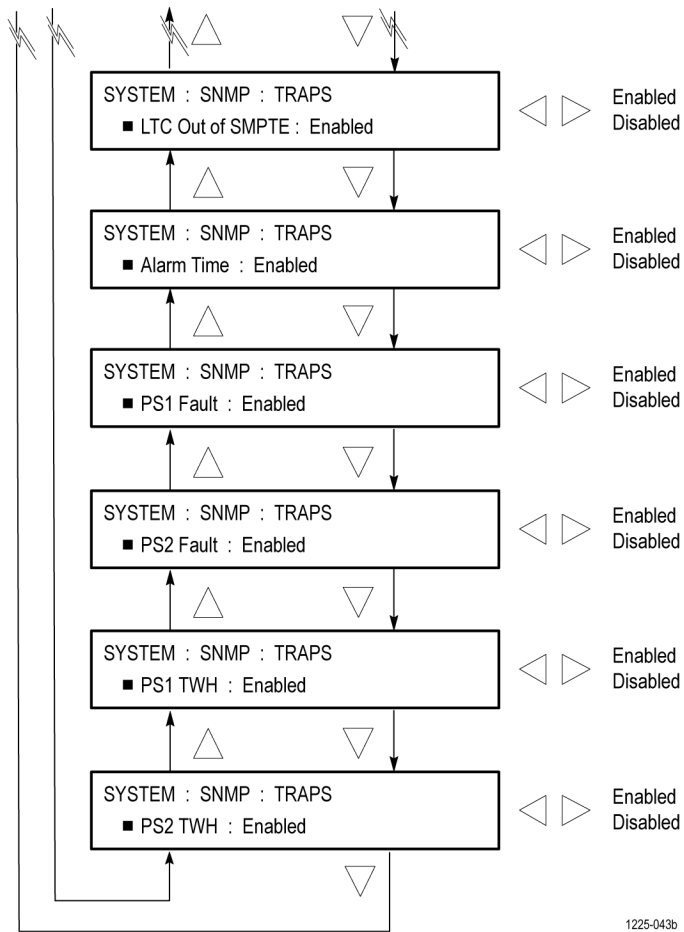
Figure 91: SYSTEM button – SNMP TRAPS submenu diagram - part 2

GPI submenu diagram   The following figure shows the diagram for the GPI submenu.
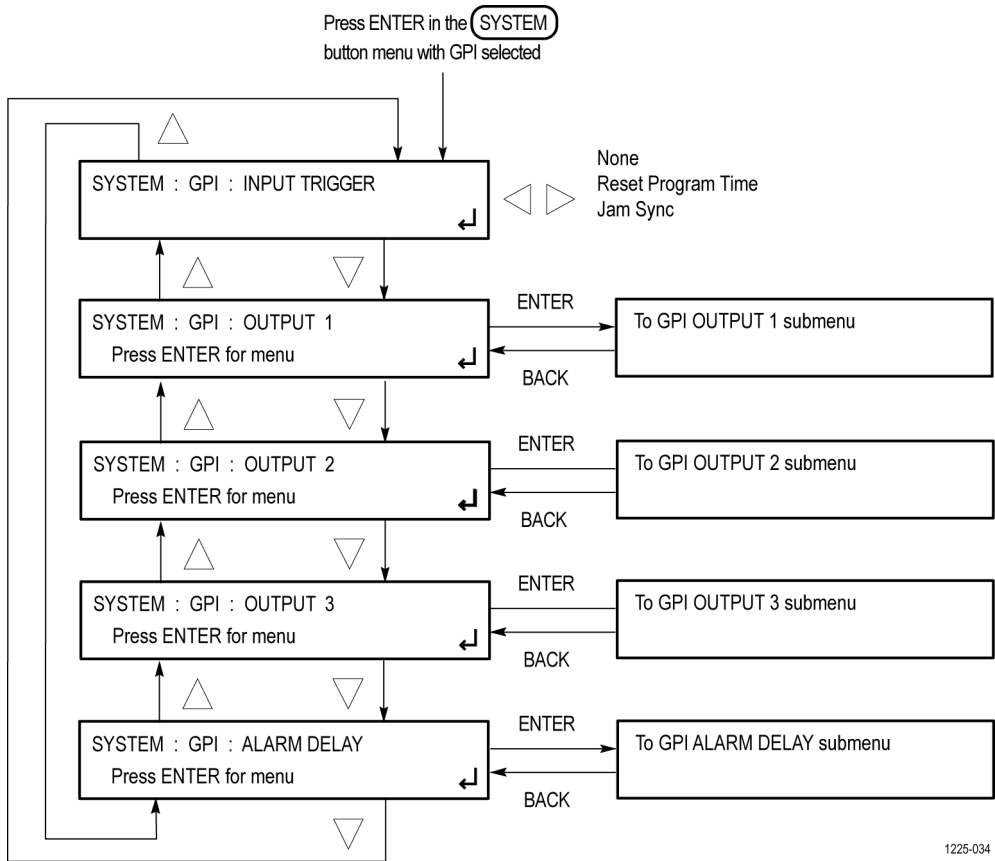
Figure 92: SYSTEM button – GPI submenu diagram

GPI OUTPUT <1, 2, or 3> submenu diagram

The following figure shows the diagram for the selected GPI OUTPUT submenu (1, 2, or 3).
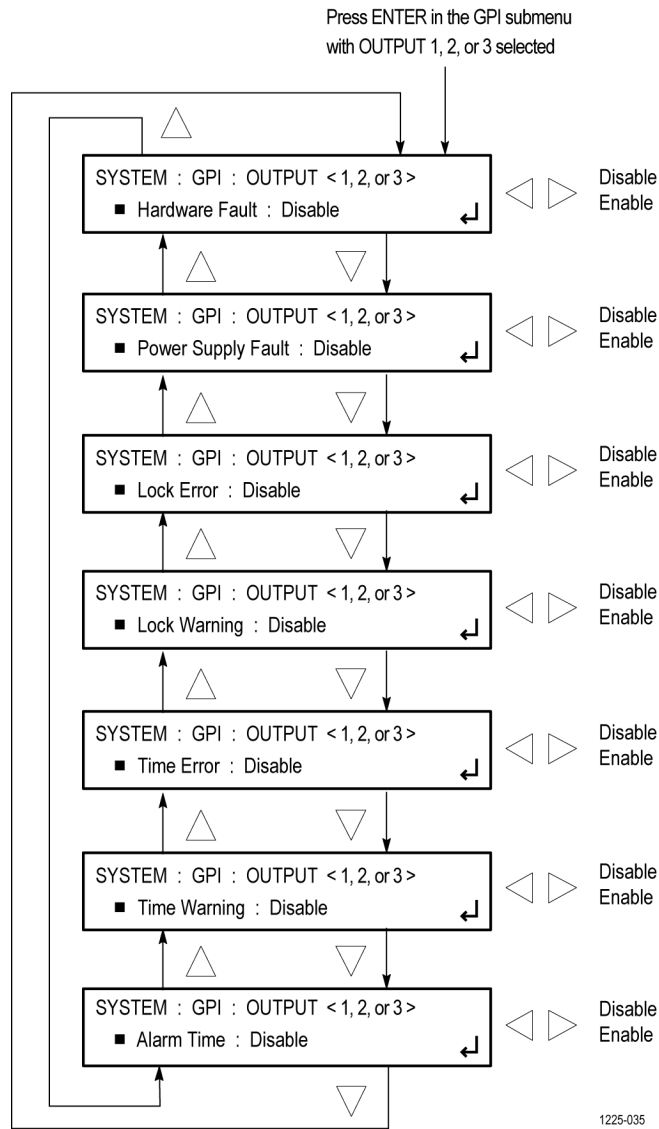
Figure 93: SYSTEM button – GPI OUTPUT <1, 2, or 3> submenu diagram

GPI ALARM DELAY submenu diagram

The following figure shows the diagram for the GPI ALARM DELAY submenu.

Press ENTER in the GPI submenu
with ALARM DELAY selected

SYSTEM : GPI : ALARM DELAY
GPO Lock Error : 00:00:10   ↵   ENTER   Edit the delay

SYSTEM : GPI : ALARM DELAY
GPO Lock Warning : 00:00:10   ↵   ENTER   Edit the delay

SYSTEM : GPI : ALARM DELAY
GPO Time Error : 00:00:10   ↵   ENTER   Edit the delay

SYSTEM : GPI : ALARM DELAY
GPO Time Warning : 00:00:10   ↵   ENTER   Edit the delay

1225-036
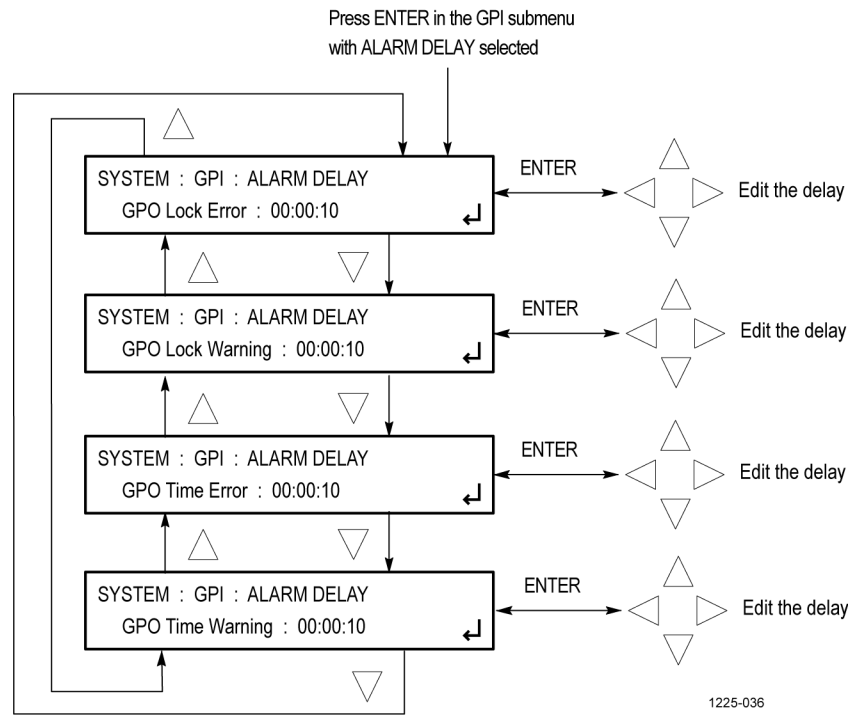
Figure 94: SYSTEM button – GPI ALARM DELAY submenu diagram

OPTIONS submenu diagram

The following figure shows the diagram for the OPTIONS submenu.
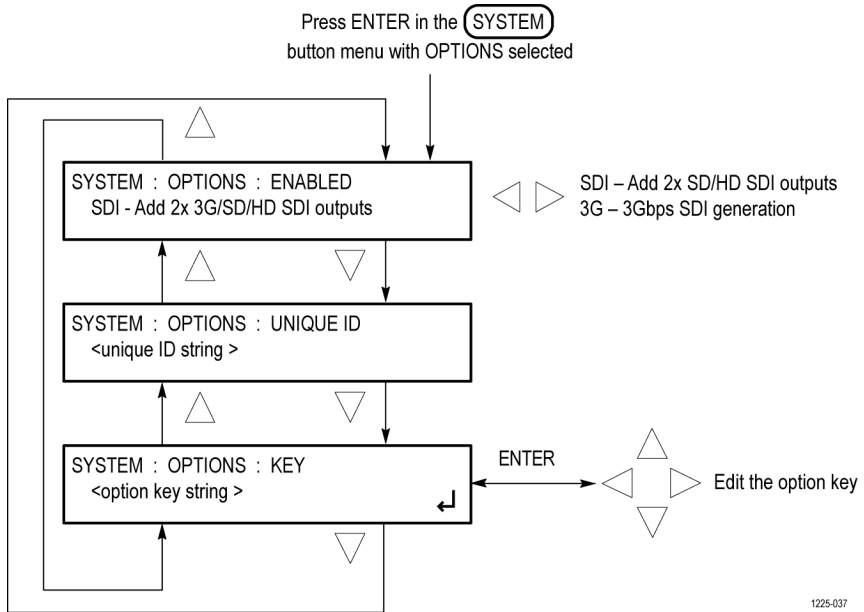
Figure 95: SYSTEM button – OPTIONS submenu diagram

FRAME RESET STATUS submenu diagram

The following figure shows the diagram for the FRAME RESET STATUS submenu.
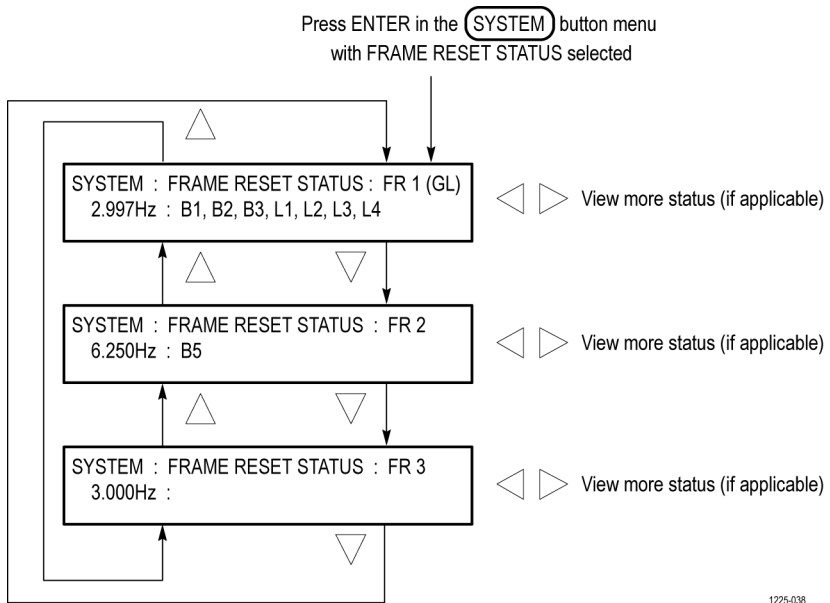
Figure 96: SYSTEM button – FRAME RESET STATUS submenu diagram

EVENT LOG submenu   The following figure shows the diagram for the EVENT LOG submenu.

Press ENTER in the (SYSTEM) button
menu with EVENT LOG Setup selected

△

*1 ENTER

SYSTEM : EVENT LOG : EVENT LOG BY TYPE
Press ENTER for menu ↵

BACK

△ ▽

View all events by type

*1 ENTER

SYSTEM : EVENT LOG : EVENT LOG BY TIME
Press ENTER for menu ↵

BACK

View log entries in the
order by time

*1 ENTER

SYSTEM : EVENT LOG : LAST EVENT BY TYPE
Press ENTER for menu ↵

BACK

△

▽

View the last entry of
each type of event

*2 ENTER

SYSTEM : EVENT LOG : CLEAR EVENT LOG
Press ENTER ↵

Clear the event log

*3 ENTER

SYSTEM : EVENT LOG : SAVE LOG TO USB
Press ENTER ↵

Export the event log to a USB device

▽

*1 Each event that is logged is described below this figure.
*2 This is a true clear and there is no recovery.
*3 Log entries will be saved by event type.

1216-074

Figure 97: SYSTEM button – EVENT LOG submenu diagram

With Event Log selected there are three ways to view the log entries:

- **EVENT LOG BY TYPE.** Allows you to see all the log entries by the type of event. In each type, the log entries are listed by time. Use the up (▲) and down (▼) arrow buttons to view the different types of events. If the event has additional information, use the left (◄) and right (►) arrow buttons to view the later entries.

- **EVENT LOG BY TIME.** Lists all the log entries in the order they occurred. The list starts with the oldest entry. Push the right arrow to get to later entries. Use the left (◄) arrow button to see the recent entries and the right (►) arrow button to view the later entries.

- **LAST EVENT BY TYPE.** Displays the last entry of each type of event. Use the up (▲) and down (▼) arrow buttons to view the different types of events.

NOTE. If the log is filled with one type of entry, this submenu will keep the last entry of each type and prevent one type from filling the entire log.

*If an option has not been installed or is not supported, the corresponding log event type will never have entries. For example, the SPG700 does not support GPS, so the **GPS missing** log event type will not have entries.*

The different types of logged events are listed below in the order in which they appear in the log:

- **Reference near loss of lock.** Indicates if the lock system was near the pull range limit (typically about ±8 ppm).

- **Reference loss of lock.** Indicates that the instrument was unable to lock to the selected reference.

- **GPS missing.** Indicates that GPS was enabled and no GPS satellites were detected.

- **Fan fault.** Shows if any of the fans stalled or were running slow.

- **Temperature fault.** Indicates that the temperature sensors were detecting a temperature that was above or below the allowed limits.

- **Diagnostic error.** Shows if any of the diagnostics failed. This includes monitors on the power supplies, fans, temperature, and various phase locked loops. This log entry corresponds to the fault light on the front panel.

- **LTC/VITC missing.** Indicates that the selected time input of LTC or VITC was not present.

- **LTC not SMPTE.** Indicates that LTC was not timed to the reference within the limits defined by SMPTE ST 12.

- **Genlock input missing.** Indicates if Analog sync reference loop through input was selected and not present.

- **GPS/PTP FOM.** Indicates that the Figure of Merit dropped below the user configured threshold.

- **Alarm time.** Logs the time that the user configured alarm clock was triggered.

- **Power supply 1 fault.** Indicates that power supply 1 was not working or did not have AC power applied.

- **Power Supply 2 fault.** Indicates that power supply 2 was not working or did not have AC power applied.

- **Power supply 1 TWH.** Shows if the supply has logged more than 131,000 temperature-weighted hours of use. This indicates the supply is near the end of its design life and should be replaced.

- **Power supply 2 TWH.** Shows if the supply has logged more than 131,000 temperature-weighted hours of use. This indicates the supply is near the end of its design life and should be replaced.

- **PS switch.** Indicates if the instrument switched from one power supply to another.

- **Instrument reboot.** Records the time of each start up.

- **MTOD change.** Logs the time of any change to the master time of the instrument.

- **DST change.** Logs the time of any Daylight Saving Time change.

- **Frame 1,2,3 change.** Indicates that the internal frame pulse phase was adjusted. These adjustments may cause disruptions in the output signals. Adjustments are normal when initially locking to a reference or aligning outputs to an epoch. The additional value on the log entry indicates the number of clock cycles by which the frame pulse was adjusted.

- **Leap second change.** Indicates that a leap second has been detected and applied. The value indicates the leap second offset received from the GPS or PTP input.

- **Reference source change.** Indicates the new selected reference any time the reference source is changed. the values are: **0** is Internal, **1** is GPS, **2** is NTSC Burst, **3** is NTSC Burst with 10 Field ID, **4** is PAL Burst, **5** is Tri-Level Sync, **6** is CW, and **7** is PTP.

- **Reference locked.** Indicates the time at which the reference is locked. This is useful when used with the **Reference loss of lock** events to determine how long a system was unlocked.

- **Wait for user approval.** Indicates the time at which the system started waiting for a user to allow the system to lock.

DIAGNOSTICS submenu diagram

The following figure shows the diagram for the DIAGNOSTICS submenu.
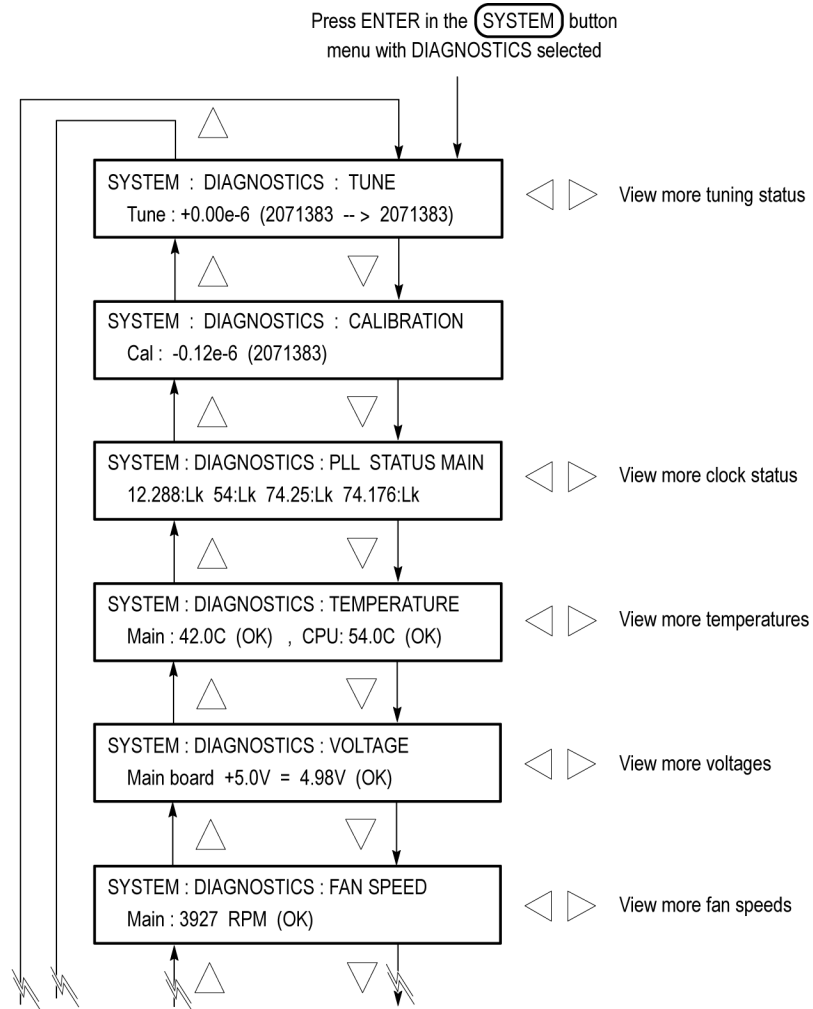
Figure 98: SYSTEM button – DIAGNOSTICS submenu diagram - part 1

Continued from previous page
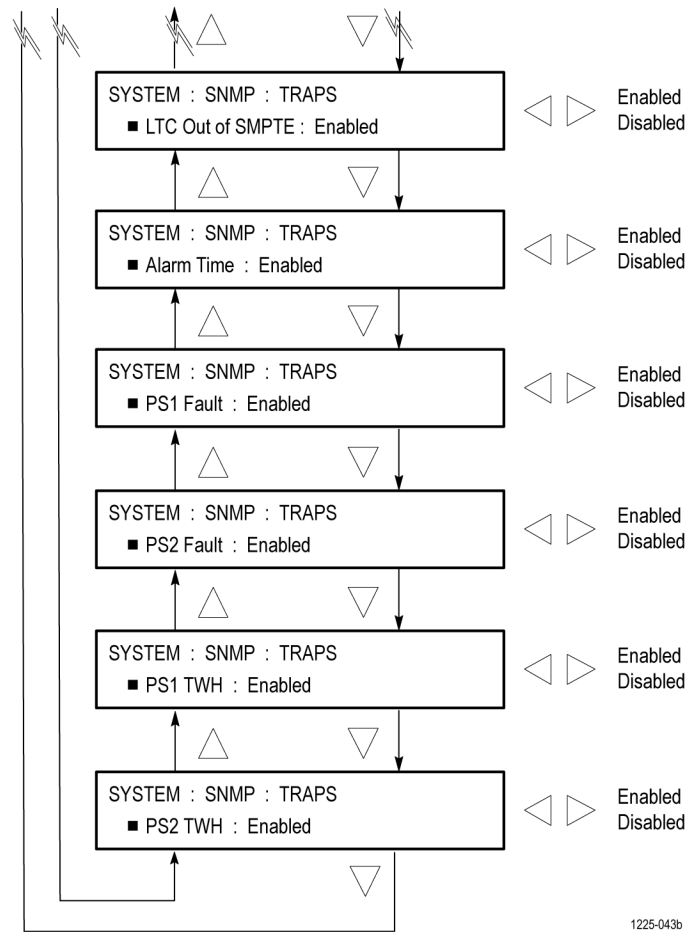
Figure 99: SYSTEM button – DIAGNOSTICS submenu diagram - part 2

POWER SUPPLY LOAD TEST submenu diagram

The following figure shows the diagram for the POWER SUPPLY LOAD TEST submenu.
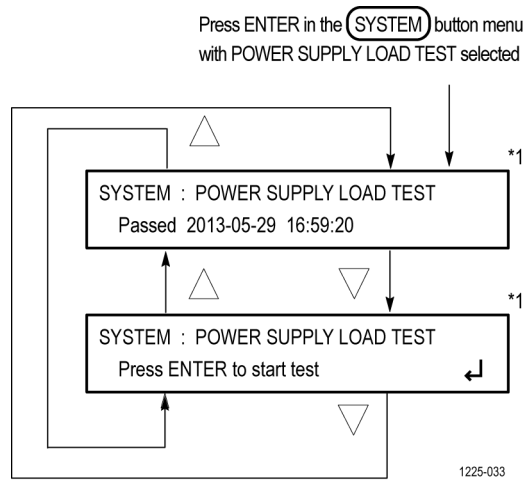
*1 The Power Supply Load Test is available only when two power supply modules are installed (Option DPW).

Figure 100: SYSTEM button – POWER SUPPLY LOAD TEST submenu diagram

TIME button menus

Use this button menu to set instrument time parameters in submenus, such as the time of day source, the time zone offset, the daylight savings time schedule, the program time, and the jam sync settings. The following figure shows the top level diagram for the TIME button menu.
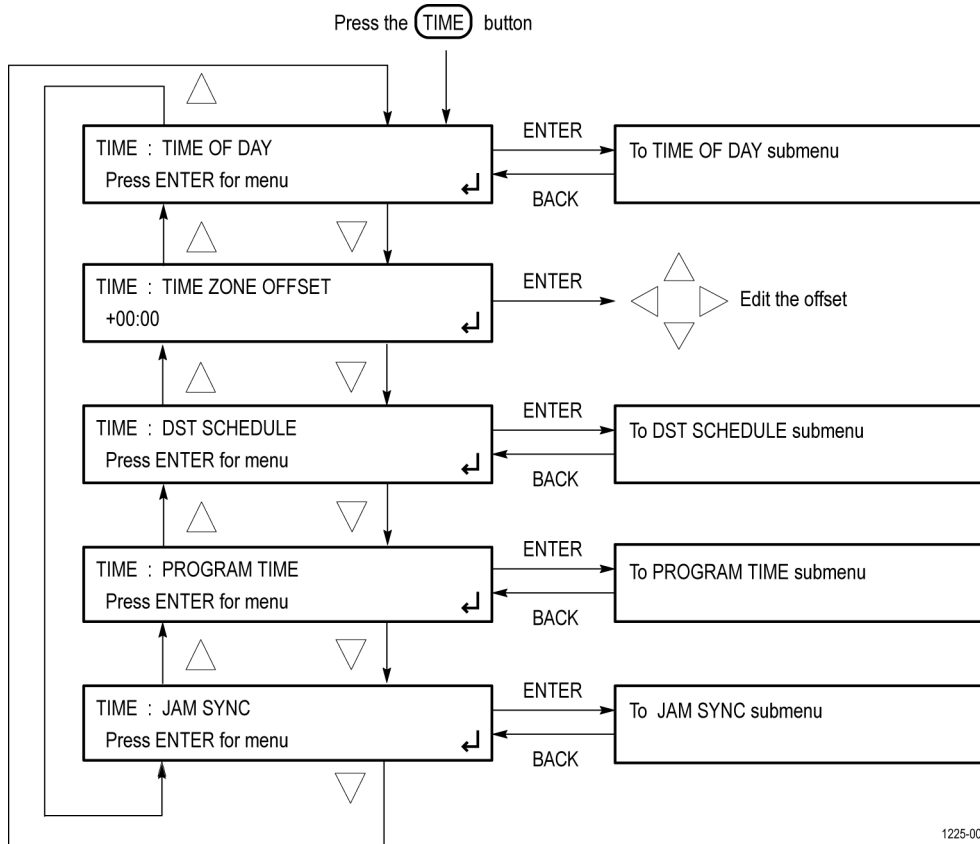
Figure 101: TIME button menu diagram

TIME OF DAY submenu diagram

The following figure shows the diagram for the TIME OF DAY submenu.
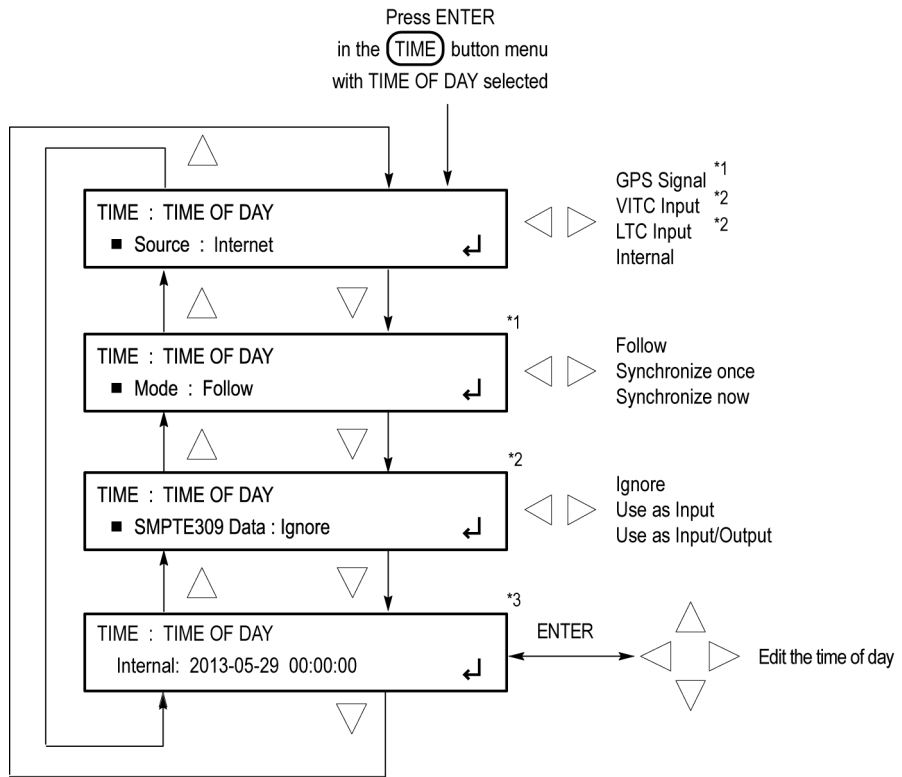
*1 These selections appear only when GPS is not set as the reference source.

*2 This selection appears only when LTC or VITC is set as theTime of Day source.

*3 This selection appears only when the TIME OF DAY source is set to Internal.

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Figure 102: TIME button – TIME OF DAY submenu diagram

DST SCHEDULE submenu diagram   The following figure shows the diagram for the DST SCHEDULE submenu.
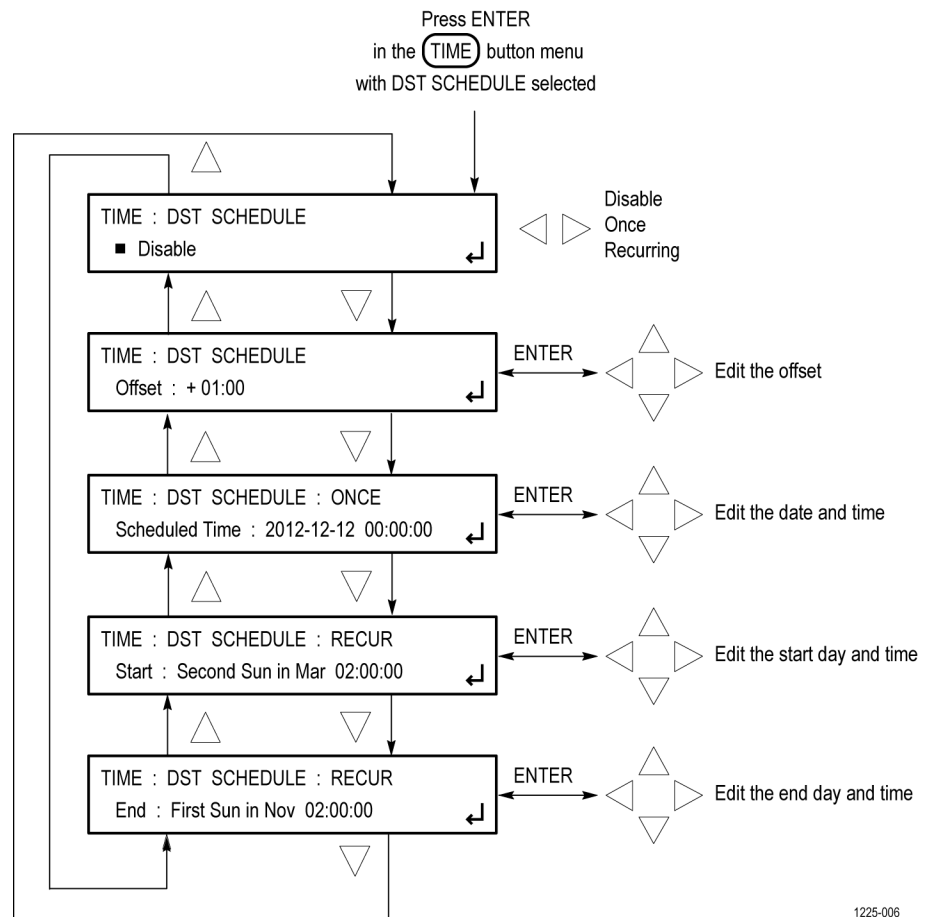
Figure 103: TIME button – DST SCHEDULE submenu diagram

PROGRAM TIME submenu diagram

The following figure shows the diagram for the PROGRAM TIME submenu.
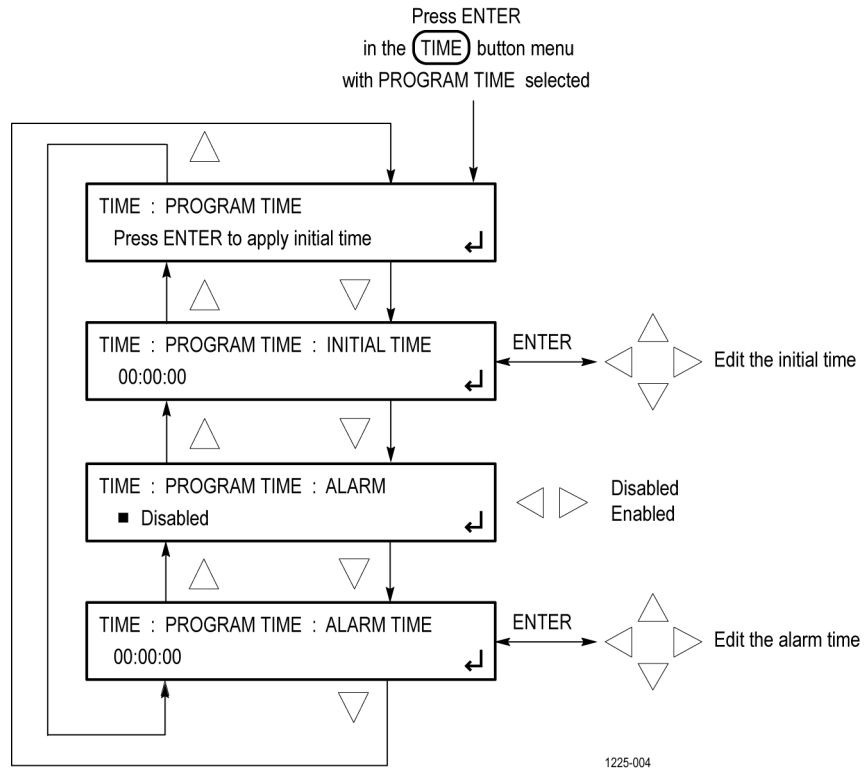
Figure 104: TIME button – PROGRAM TIME submenu diagram

JAM SYNC submenu diagram

The following figure shows the diagram for the JAM SYNC submenu.
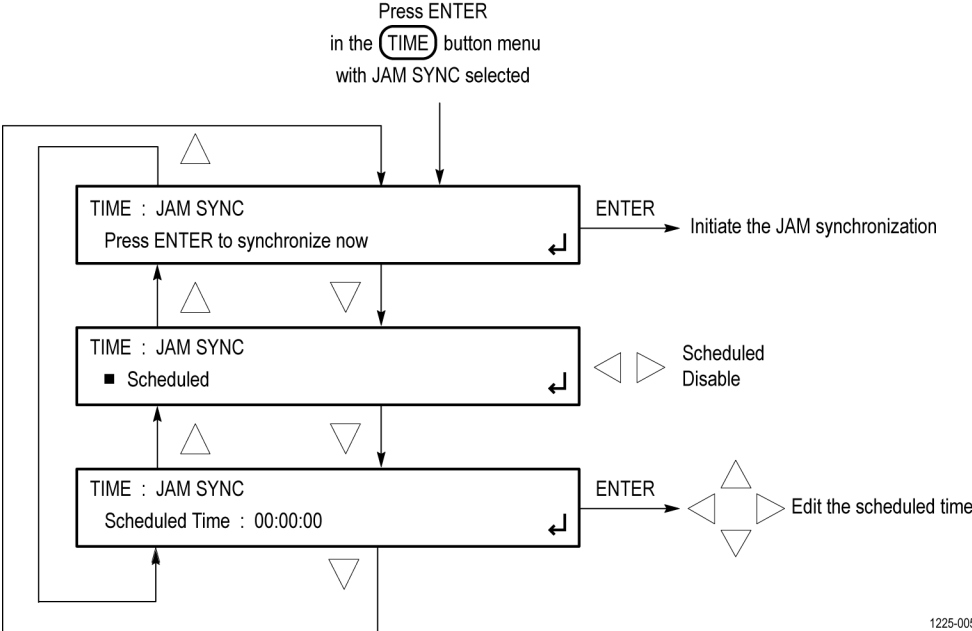
Figure 105: TIME button – JAM SYNC submenu diagram

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