



SPG700
Multiformat Reference Sync Generator
Release Notes

This document supports Firmware Version 3.2.

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Contacting Tektronix

Tektronix, Inc.
14150 SW Karl Braun Drive
P.O. Box 500
Beaverton, OR 97077
USA

For product information, sales, service, and technical support:

- In North America, call 1-800-833-9200.
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Release notes

This document describes new features, improvements, and limitations of Firmware Version 3.2 for the SPG700 Multiformat Reference Sync Generator.

New features

Event Log update

The Event Log was added in Version 3.0 and has been expanded in Version 3.2 to include Web UI support. For simplicity, the expanded log is shown here in its entirety. The event log captures 1000 events to help troubleshoot issues in a plant. Each log event shows the UTC time at which the event happened. Some event types display additional information about the event. There are three ways to view the log entries when using the Event Log:

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. 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 earlier 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. The last entry of each type will be kept even if other types of events have filled the log.

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 10 Field ID, 4 is PAL BURST, 5 is TRI LEVEL, 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.

NOTE. *The SPG700 does not support PTP or GPS. Any event log entries related to PTP or GPS will show in the menu, but will not be used.*

Option to require user approval for Locking Reference

In some cases, locking to a reference can cause a disruption or “shock” to the sync signals. To prevent this disruption, a new mode has been added whereby the system will wait for a user to allow the system to lock or re-lock to the reference. This mode is supported when locking to NTSC, PAL, Tri-level and CW signals.

To access this function, press the **REF** button, then press the down arrow multiple times to reach the **REFERENCE : GL LOCK ACTION MODE** menu. Press the left or right arrow to select either **Automatic** or **Wait for user approval**. In **Automatic** mode, the system will lock as soon as the conditions allow. This is equivalent to the operation in previous versions of code. In the **Wait for user approval** mode, the system will not lock until the user allows it. While waiting for the user 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, press the **REF** button, then press the down arrow multiple times to reach the **REFERENCE: GL MANUAL LOCK APPROVAL** menu. 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 **Manual Lock** feature is supported by the Web UI.

CW Frame Reset select menu

When the reference mode is set to **CW**, the genlock timing will only affect one of the frames. Use this menu to select which frame rate will be adjusted by the genlock timing controls. Each output signal frame rate is related to one of the three internal frame rates as indicated in the following menu selections:

- 2.997Hz : NTSC, 59.94. 23.98 Hz group
- 6.25Hz : PAL and 50Hz group
- 3.000Hz : 60 and 24 Hz group

To access this menu while referenced to CW, press **REF** button, then press the down arrow multiple times to reach the **REFERENCE : FRAME MENU (CW)** menu. Use the left and right arrow to select the desired frame rate.

- New HDR signals** Two new color bar type signals have been added to the SDI signal list. These are called BT2111-0 HLG Narrow and BT2111-0 PQ Narrow. These provide levels to test and design HDR systems and devices.
- Other HDR signals may be available. Please contact Tektronix Customer Service for details.

Fixed firmware limitations

The following limitations are fixed in this firmware version:

- Network Mask limitation** In previous versions, the Control port had some limitations on the netmask values for addresses in the 192.168.x.x range. Version 3.2 removes the special limits for netmasks when using those addresses.
- Web UI Read Only mode allowing changes** In previous versions, some parameters could be changed from the Web UI while it was in read-only mode. This has been fixed. Read only mode will not allow any changes.
- Web UI - Unable to set Time Source to Program Time for Black 1, 2, 3** Previously, this action did not work from the Web UI. This has been fixed.

General limitations

This firmware release has general limitations, which are outlined below. Please check the Tektronix Web site (www.tek.com/downloads) for any firmware updates to the SPG700 generator.

- Firmware upgrades**
- When the SPG700 Firmware is upgraded (using a USB drive or a network connection), all files created or installed by the user are deleted. The deleted files include presets, signal files, frame picture files, logo files, sequence files, and for Option SDI, can also include text and font files. The standard set of factory installed signal files, logo files, and Option SDI font files are restored when the firmware is upgraded.
- To prevent the loss of your user created files, use the **Backup all User Data to USB** function from the **SYSTEM** menu to save your user files before you upgrade the firmware. After the upgrade, use the **Restore all User Data From USB** function from the **SYSTEM** menu to restore your user created files.

- If you have loaded the SPG700 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.

Clear the cache on the browser after an update to the Instrument code. This is necessary to get the new features on the Web UI.

Network configuration using Manual mode

A network connectivity problem may occur when using Manual mode to configure the instrument IP address or subnet mask settings and the instrument is communicating across network boundaries. The problem does not occur when using DHCP mode to configure the network settings.

If your instrument is configured for Manual mode, use the following steps to work around this problem:

1. Configure the instrument IP address or subnet mask settings using Manual mode.
2. After configuring the IP address or subnet mask, perform one of the following:
 - Change the network gateway address to a valid value.
 - If the network gateway address is already correct, toggle the gateway address. For example, change the gateway address to some other (incorrect) address, apply the change, and then change the gateway address back to the correct value.

Alert messages

If there is an active alert condition (e.g. reference input missing) while the **STATUS : ALERT** menu is displayed, the alert message(s) will not automatically change if the alert condition is cleared. To view any changes to the alert messages, you must change to another menu and then return to the **STATUS : ALERT** menu.

Resetting an output signal

A signal output interruption or synchronization shock may occur when the instrument rereads or resets signal data, such as format changing, preset recall, or signal-button assignment.

Incorrect CW reference signal

If an NTSC or PAL signal is connected to the **REF** input when the reference source is set to **CW**, the video timing of all SPG700 outputs will rattle every 1–2 seconds. To resolve this problem, use the **REFERENCE : SOURCE** menu to select the signal type that matches the reference input signal.

- Web UI / Remote control** Some performance issues have been observed when the SPG700 Web Interface is used with Internet Explorer 8. The use of newer browsers is recommended.
- Clear the cache on the browser after an update to the Instrument code. This is necessary to get the new features on the Web UI.
- In some instances, the Web UI will not recover well from a power cycle on the instrument. If this occurs, close the Web UI windows, cycle the power on the SPG, then clear the cache before re-starting the Web UI.
- Time of day changes for timecode outputs** When the time of day changes, such as when scheduled daylight savings adjustments are made or when the internal time is set from the front panel, there can be a delay before that change is reflected on timecode outputs.
- This delay may be a small number of frames (fraction of a second) when all timecode output formats are based on the same clock rate (for example, NTSC black burst and 1080i 59.94 HD tri-level on black outputs in addition to 30 fps drop-frame on LTC outputs), or up to several seconds when timecode formats based on different clock rates are used (for example, 29.97 fps and 24 fps on different outputs).
- Daylight Savings Time (DST) scheduler system** The DST scheduler system applies the DST offset even if the Time of Day (TOD) source is set to **VITC Input** or **LTC Input** and the SMPTE309 mode is set to **Ignore** or **Use as Input**. In these cases, the offset is applied whether or not a valid **VITC** or **LTC Input** signal is available. For proper DST scheduling, you need to ensure that the instrument has valid time information and manually enter the correct time of day if the system is not synchronized to an accurate time of day source.
- The manual Time of Day setting is not automatically reapplied when the instrument power is cycled. If the instrument powers up in with the Time of Day source set to **Internal** mode, the time of day will be acquired from the internal real-time clock in the instrument. Check the system time of day and adjust as needed to ensure that it is correct before the next transition of the DST scheduler when the Time of Day source is set to **Internal** mode.
- Option SDI** **SDI equalizer test signal.** Per SMPTE RP198 for HD-SDI, a polarity change word is used to ensure equal probabilities of the DC bias for the equalizer test pattern. However, some SDI formats still exhibit an unequal bias. Enabling a dynamic bit stream in the output signal, such as embedded audio or timecode data, will result in both DC levels appearing in the output signal.
- Test signal files.** The Option SDI signals use file-based test signal definitions. If you modify a signal file from the factory version, unpredictable results may occur. To recover from this situation, reload the factory version of the signal file from the Tektronix Web site (www.tek.com/downloads).

Multi-language support. Languages that require combined glyphs in order to be represented may not be correctly rendered in the Text ID display on SDI signals.

Multiburst signal motion. Do not set a Multiburst signal in motion on SDI signals. Otherwise, a corrupted signal will be generated.

Overlay and zone plate circles not round. For SD 525 and 625 signal formats, the overlay and zone plate circles are not perfectly round.

Bitmap files for logo overlays. When you create bitmap files for logo overlays, filter the sharp edges within the logo image before you download the bitmap file to the instrument. The SPG700 applies a filter to the left and right edges of the bitmap image to reduce high-frequency ringing on the signal waveform. However, this filter is not applied within the span of the image.



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Contacting Tektronix

Tektronix, Inc.
14150 SW Karl Braun Drive
P.O. Box 500
Beaverton, OR 97077
USA

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Release notes

This document describes new features, improvements, and limitations of Firmware Version 3.2 for the SPG8000 Master Sync / Clock Reference Generator.

New features

Event Log update

The Event Log was added in Version 3.0 and has been expanded in Version 3.2 to include Web UI support. For simplicity, the expanded log is shown here in its entirety. The event log captures 1000 events to help troubleshoot issues in a plant. Each log event shows the UTC time at which the event happened. Some event types display additional information about the event. There are three ways to view the log entries when using the Event Log:

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. 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 earlier 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. The last entry of each type will be kept even if other types of events have filled the log.

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. For PTP and GPS references, the log will display the value of the FOM that was present at the time of the event.
- **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 10 Field ID, 4 is PAL BURST, 5 is TRI LEVEL, 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.

NOTE. *The SPG8000 does not support PTP. Any event log entries related to PTP will show in the menu, but will not be used.*

Option to require user approval for Locking Reference

In some cases, locking to a reference can cause a disruption or “shock” to the sync signals. To prevent this disruption, a new mode has been added whereby the system will wait for a user to allow the system to lock or re-lock to the reference. This mode is supported when locking to NTSC, PAL, Tri-level and CW signals.

To access this function, press the **REF** button, then press the down arrow multiple times to reach the **REFERENCE : GL LOCK ACTION MODE** menu. Press the left or right arrow to select either **Automatic** or **Wait for User Approval**. In **Automatic** mode, the system will lock as soon as the conditions allow. This is equivalent to the operation in previous versions of code. In the **Wait for user approval** mode, the system will not lock until the user allows it. While waiting for the user 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, press the **REF** button, then press the down arrow multiple times to reach the **REFERENCE: GL MANUAL LOCK APPROVAL** menu. 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 **Manual Lock** feature is supported by the Web UI.

CW Frame Reset select menu

When the reference mode is set to **CW**, the genlock timing will only affect one of the frames. Use this menu to select which frame rate will be adjusted by the genlock timing controls. Each output signal frame rate is related to one of the three internal frame rates as indicated in the following menu selections:

- 2.997Hz : NTSC, 59.94. 23.98 Hz group
- 6.25Hz : PAL and 50Hz group
- 3.000Hz : 60 and 24 Hz group
- Keep GPS/PTP Timing

Keep GPS/PTP Timing allows for locking to GPS or PTP to set the time, then switching to CW lock with minimal shift. This operation is explained in the *Hybrid GPS/CW operation* section of these release notes.

To access this menu while referenced to CW, press **REF** button, then press the down arrow multiple times to reach the **REFERENCE : FRAME MENU (CW)** menu. Use the left and right arrow to select the desired frame rate.

Hybrid GPS/CW operation

In some locations, the GPS may not be reliable. Other installations may have a large plant based on a rubidium standard and will want to maintain compatibility with that, but may want to add operations based on absolute time. Hybrid operation is a good mechanism for these applications, and a new CW frame menu allows this to work well.

This mode works by locking to GPS to get the correct time and leap second offsets, then switching to 10MHz CW lock to maintain a stable frequency and reject any interference on the GPS. Periodically, the system should be re-locked to the GPS to correct any drift in the system. Depending on the needs of the system, the interval between re-locking may be days or months.

To use this function, access the CW frame menu and set the CW frame to **Use GPS/PTP Timing**. The CW frame menu operation is explained in the *CW Frame Reset select menu* section of these release notes.

Set the reference to GPS and allow the system to lock. Connect the CW input and then switch to CW reference. There may be a small shift as this locks, so this should be done at a noncritical time. To re-lock to the GPS, change the reference back to that source. Depending on how long the system has been drifting, this will cause more of a disruption, so it should be done at a noncritical time.

The SPG8000 should be configured to power up in the GPS mode so that it recovers the time and phase correctly.

A second SPG8000 can be locked to the GPS, and outputs from the main and extra SPG can be compared in a monitor to help determine how much the system has drifted and when it is a good time to re-lock to the GPS.

New HDR signals

Two new color bar type signals have been added to the SDI signal list. These are called BT2111-0 HLG Narrow and BT2111-0 PQ Narrow. These provide levels to test and design HDR systems and devices.

Other HDR signals may be available. Please contact Tektronix Customer Service for details.

Fixed firmware limitations

The following limitations are fixed in this firmware version:

Network Mask limitation In previous versions, the Control port had some limitations on the netmask values for addresses in the 192.168.x.x range. This version removes the special limits for netmasks when using those addresses.

Web UI Read Only mode allowing changes In previous versions, some parameters could be changed from the Web UI while it was in read only mode. This has been fixed. Read only mode will not allow any changes.

Web UI - Unable to set Time Source to Program Time for Black 1, 2, 3 Previously, this action did not work from the Web UI. This has been fixed.

Black 4 and 5 HD sync artifacts In previous versions, some HD Tri-level sync signals occasionally had artifacts on the rising and falling edges. This has been fixed.

General limitations

This firmware release has general limitations, which are outlined below. Please check the Tektronix Web site (www.tek.com/downloads) for any firmware updates to the SPG8000 generator.

Firmware upgrades

- When the SPG8000 firmware is upgraded (using a USB drive or a network connection), all files created or installed by the user are deleted. The deleted files include presets, signal files, frame picture files, logo files, sequence files, and for Option SDI, can also include text and font files. The standard set of factory installed signal files, logo files, and Option SDI font files are restored when the firmware is upgraded.

To prevent the loss of your user created files, use the **Backup All User Data to USB** function from the **SYSTEM** menu to save your user files before you upgrade the firmware. After the upgrade, use the **Restore All User Data From USB** function from the **SYSTEM** menu to restore your user created files.

- If you have loaded the SPG8000 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.
- Clear the cache on the browser after an update to the Instrument code. This is necessary to get the new features on the Web UI.

Network configuration using Manual mode

A network connectivity problem may occur when using Manual mode to configure the instrument IP address or subnet mask settings and the instrument is communicating across network boundaries. The problem does not occur when using DHCP mode to configure the network settings.

If your instrument is configured for Manual mode, use the following steps to work around this problem:

1. Configure the instrument IP address or subnet mask settings using Manual mode.
2. After configuring the IP address or subnet mask, perform one of the following:
 - Change the network gateway address to a valid value.
 - If the network gateway address is already correct, toggle the gateway address. For example, change the gateway address to some other (incorrect) address, apply the change, and then change the gateway address back to the correct value.

Alert messages	If there is an active alert condition (e.g., reference input missing) while the STATUS : ALERT menu is displayed, the alert message(s) will not automatically change if the alert condition is cleared. To view any changes to the alert messages, you must change to another menu and then return to the STATUS : ALERT menu.
Resetting an output signal	A signal output interruption or synchronization shock may occur when the instrument rereads or resets signal data, such as format changing, preset recall, or signal-button assignment.
Incorrect CW reference signal	If an NTSC or PAL signal is connected to the REF input when the reference source is set to CW , the video timing of all SPG8000 outputs will rattle every 1–2 seconds. To resolve this problem, use the REFERENCE : SOURCE menu to select the signal type that matches the reference input signal.
Web UI / remote control	<p>Some performance issues have been observed when the SPG8000 Web Interface is used with Internet Explorer 8. The use of newer browsers is recommended.</p> <p>Clear the cache on the browser after an update to the Instrument code. This is necessary to get the new features on the Web UI.</p> <p>In some instances, the Web UI will not recover well from a power cycle on the instrument. If this happens, close the Web UI windows, cycle the power on the SPG, then clear the cache before restarting the Web UI.</p>
Time of day changes for timecode outputs	<p>When the time of day changes, such as when scheduled Daylight Savings adjustments are made or when the internal time is set from the front panel, there can be a delay before that change is reflected on timecode outputs.</p> <p>This delay may be a small number of frames (fraction of a second) when all timecode output formats are based on the same clock rate (for example, NTSC black burst and 1080i 59.94 HD tri-level on black outputs in addition to 30 fps drop-frame on LTC outputs), or up to several seconds when timecode formats based on different clock rates are used (for example, 29.97 fps and 24 fps on different outputs).</p>
Daylight Savings Time (DST) scheduler system	The DST scheduler system applies the DST offset even if the Time of Day (TOD) source is set to VITC Input or LTC Input and the SMPTE309 mode is set to Ignore or Use as Input . In these cases, the offset is applied whether or not a valid VITC or LTC Input signal is available. For proper DST scheduling, you need to ensure that the instrument has valid time information and manually enter the correct time of day if the system is not synchronized to an accurate time of day source.

When the TOD source is set to **GPS** signal and the GPS is not locked to the input signal, the DST scheduler system will apply the DST offset when the internal real-time clock (which is subject to slight drift) reaches the time scheduled for the DST offset to be applied or removed. Ensure that the GPS is locked and that the system time of day is correct before turning on the DST scheduler system.

The manual time-of-day setting is not automatically reapplied when the instrument power is cycled. If the instrument powers up in with the Time of Day source set to **Internal** mode, the time of day will be acquired from the internal real-time clock in the instrument. Check the system time of day and adjust as needed to ensure that it is correct before the next transition of the DST scheduler when the Time of Day source is set to **Internal** mode.

Option GPS

Missing GPS or GLONASS signal. When the reference source is set to GPS signal but the external GPS or GLONASS signal is missing, the SPG8000 automatically uses the internal reference signal as the reference source. However, the front-panel **INT** indicator does not turn green to show that the internal reference is being used. The **EXT** indicator does correctly turn red to indicate that the external (GPS or GLONASS) reference is missing.

GPS receiver Version 3015 with Firmware Version 1.06. GPS receiver modules with Firmware Version 1.06 installed have a problem with the leap second information they receive from the satellite system. Occasionally, the receiver erroneously reports that the current number of applied leap seconds is 255 instead of the correct number (currently 18). This error causes a 3 minute 59 second offset in the system time of day, which will last until the correct report is received (usually in the next broadcast 12 minutes later). SPG8000 Firmware Versions 2.1 and above contain a fix for this problem.

Receiver Version 3015 with Software 1.06 may occasionally see a smaller leap second change that lasts for 12.5 minutes. To prevent this from affecting the operation, configure the instrument to defer applying the leap second until a local time such as 1 or 2 AM. Ensure the local time is not the same as UTC midnight, so that the change is deferred at least an hour.

NOTE. *SPG8000 Firmware Version 2.2 or above must be installed to view the GPS receiver firmware version.*

GPS receiver modules with Firmware Version 1.06 installed also have a problem when they are configured to operate in the GPS & GLONASS dual constellation mode. It is recommended to configure the GPS receiver to operate in either the GPS or GLONASS single constellation mode.

GPS receiver Version 3015 with Firmware Version 1.08. GPS receiver modules with Firmware Version 1.08 installed corrected the issue with the occasional erroneous reporting of the currently applied leap second data. However, Firmware

Version 1.08 introduced a new problem where the GPS receiver will prematurely apply pending leap second changes when the “pending leap second” flag in the GPS signal is asserted instead of waiting until the leap second is actually applied (June 30 or December 31).

Receiver Version 3015 with SW 1.06 may occasionally see a smaller leap second change that lasts for 12.5 minutes. To prevent this from affecting the operation, configure the instrument to defer applying the leap second until a local time such as 1 or 2 AM. Ensure the local time is not the same as UTC midnight so the change is deferred at least an hour.



CAUTION. *To prevent the premature application of a pending leap second, customers with GPS receiver Version 3015 which has Firmware Version 1.08 installed should contact your local Tektronix representative. An upgrade kit is available to replace this version of GPS receiver.*

GPS receiver Version 3015 with Firmware Version 1.09. GPS receiver modules with Firmware Version 1.09 installed corrected the issue with premature leap second changes. However, Firmware Version 1.09 had an issue with not automatically reacquiring the position after the instrument was moved to a new location. SPG8000 Firmware Versions 2.2 and above contain a fix for this problem. It is strongly recommended that SPG8000 Firmware Version 2.2 or above be installed on any instrument with GPS receiver Version 3015 with Firmware Version 1.09.

GPS receiver Version 3023. It is strongly recommended that instruments with GPS receiver Version 3023 have Firmware Version 2.5 or above installed. Previous SPG8000 firmware versions have issues that will cause operational problems with the 3023 Version GPS receiver.

GPS receiver Version 3023 with Software Version 1.03. If receivers of this combination are inside the footprint of the QZSS constellation, they may not maintain lock correctly. Instrument Software Versions 3.0.1 and later will update most instruments to 1.04 or later module code. Contact a local Tektronix representative to receive an upgrade kit if a system is not able to update to 1.04.

GLONASS only operation. The GLONASS signal incorporates leap seconds in a different way than the GPS system, so the GPS signal is required for correct operation. If GLONASS only mode is selected, then that will be converted internally to GLONASS plus GPS. If an antenna is used which only provides the GLONASS signal, then the leap seconds will not be correctly maintained.

Option SDI SDI equalizer test signal. Per SMPTE RP198 for HD-SDI, a polarity change word is used to ensure equal probabilities of the DC bias for the equalizer test pattern. However, some SDI formats still exhibit an unequal bias. Enabling a dynamic bit stream in the output signal, such as embedded audio or timecode data, will result in both DC levels appearing in the output signal.

Test signal files. The Option SDI signals use file-based test signal definitions. If you modify a signal file from the factory version, unpredictable results may occur. To recover from this situation, reload the factory version of the signal file from the Tektronix Web site (www.tek.com/downloads).

Multi-language support. Languages that require combined glyphs in order to be represented may not be correctly rendered in the Text ID display on SDI signals.

Multiburst signal motion. Do not set a Multiburst signal in motion on SDI signals. Otherwise, a corrupted signal will be generated.

Overlay and zone plate circles not round. For SD 525 and 625 signal formats, the overlay and zone plate circles are not perfectly round.

Bitmap files for logo overlays. When you create bitmap files for logo overlays, filter the sharp edges within the logo image before you download the bitmap file to the instrument. The SPG8000 applies a filter to the left and right edges of the bitmap image to reduce high-frequency ringing on the signal waveform. However, this filter is not applied within the span of the image.



SPG8000A
Master Sync / Clock Reference Generator
Release Notes

This document supports Firmware Version 3.2.

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Contacting Tektronix

Tektronix, Inc.
14150 SW Karl Braun Drive
P.O. Box 500
Beaverton, OR 97077
USA

For product information, sales, service, and technical support:

- In North America, call 1-800-833-9200.
- Worldwide, visit www.tek.com to find contacts in your area.

Release notes

This document describes new features, improvements, and limitations of Firmware Version 3.2 for the SPG8000A Master Sync / Clock Reference Generator.

New features

Event Log update

The Event Log was added in Version 3.0 and has been expanded in Version 3.2 to include Web UI support. For simplicity, the expanded log is shown here in its entirety. The event log captures 1000 events to help troubleshoot issues in a plant. Each log event shows the UTC time at which the event happened. Some event types display additional information about the event. There are three ways to view the log entries when using the Event Log:

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. 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 earlier 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. The last entry of each type will be kept even if other types of events have filled the log.

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. For PTP and GPS references, the log will display the value of the FOM that was present at the time of the event.
- **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. The value displayed in the event is the FOM value that caused the event to be logged.
- **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 10 Field ID, 4 is PAL BURST, 5 is TRI LEVEL, 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.

Option to require user approval for Locking Reference

In some cases, locking to a reference can cause a disruption or “shock” to the sync signals. To prevent this disruption, a new mode has been added whereby the system will wait for a user to allow the system to lock or re-lock to the reference. This mode is supported when locking to NTSC, PAL, tri-level and CW signals.

To access this function, press the **REF** button, then press the down arrow multiple times to reach the **REFERENCE : GL LOCK ACTION MODE** menu. Press the left or right arrow to select either **Automatic** or **Wait for user approval**. In **Automatic** mode, the system will lock as soon as the conditions allow. This is equivalent to the operation in previous versions of code. In the **Wait for user approval** mode, the system will not lock until the user allows it. While waiting for the user 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, press the **REF** button, then press the down arrow multiple times to reach the **REFERENCE: GL MANUAL LOCK APPROVAL** menu. 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 **Manual Lock** feature is supported by the Web UI.

CW Frame Reset select menu

When the reference mode is set to **CW**, the genlock timing will only affect one of the frames. Use this menu to select which frame rate will be adjusted by the genlock timing controls. Each output signal frame rate is related to one of the three internal frame rates as indicated in the following menu selections:

- 2.997Hz : NTSC, 59.94. 23.98 Hz group
- 6.25Hz : PAL and 50Hz group
- 3.000Hz : 60 and 24 Hz group
- Keep GPS/PTP Timing

Keep GPS/PTP Timing allows for locking to GPS or PTP to set the time, then switching to CW lock with minimal shift. This operation is explained in the *Hybrid GPS/CW or PTP/CW Operation* section of these release notes.

To access this menu while referenced to **CW**, press **REF** button, then press the down arrow multiple times to reach the **REFERENCE : FRAME MENU (CW)** menu. Use the left and right arrow to select the desired frame rate.

Hybrid GPS/CW or PTP/CW operation

In some locations, the GPS or PTP available may not be reliable. Other installations may have a large plant based on a rubidium standard and will want to maintain compatibility with that, but may want to add PTP or other operation based on absolute time. Hybrid operation is a good mechanism for these applications, and a new CW frame menu allows this to work well.

This mode works by locking to GPS or PTP to get the correct time and leap second offsets, then switching to 10MHz CW lock to maintain a stable frequency and reject any interference on the GPS or PTP. Periodically, the system should be re-locked to the GPS or PTP to correct any drift in the system. Depending on the needs of the system, the interval between the re-locking may be days or months.

To use this function, access the CW frame menu and set the CW frame to **Use GPS/PTP Timing**. The CW frame menu operation is explained in the *CW Frame Reset select menu* section of these release notes.

Set the reference to GPS or PTP and allow the system to lock. Connect the CW input and then switch to CW reference. There may be a small shift as this locks, so it should be done at a noncritical time. To re-lock to the GPS or PTP, change the reference back to that source. Depending on how long the system has been drifting, this will cause more of a disruption, so it should be done at a noncritical time.

The SPG8000A should be configured to power up in the GPS or PTP mode so that it recovers the time and phase correctly.

A second SPG8000A can be locked to the GPS or PTP, and outputs from the main and extra SPG can be compared in a monitor to help determine how much the system has drifted, and when it is a good time to re-lock to the GPS or PTP.

New HDR signals

Two new color bar type signals have been added to the SDI signal list. These are called BT2111-0 HLG Narrow and BT2111-0 PQ Narrow. These provide levels to test and design HDR systems and devices.

Other HDR signals may be available. Please contact Tektronix Customer Service for details.

Fixed firmware limitations

The following limitations are fixed in this firmware version:

Network Mask limitation In previous versions, the Control and PTP ports had some limitations on the netmask values for addresses in the 192.168.x.x range. Version 3.2 removes the special limits for netmasks when using those addresses.

Web UI Read Only mode allowing changes In previous versions, some parameters could be changed from the Web UI while it was in Read Only mode. This has been fixed. Read Only mode will no longer allow changes.

Web UI — Unable to set Time Source to Program Time for Black 1, 2, 3 Previously, this action did not work from the Web UI. This has been fixed.

Black 4 and 5 HD sync artifacts In previous versions, some HD tri-level sync signals would occasionally have artifacts on the rising and falling edges. This has been fixed.

PTP operation **Priority of secondary master reset if primary master was changed to a slave.** Previously, the Priority 1 and Priority 2 of the secondary master would be reset to 128 if the primary master was changed to a slave, then changed back to a master. The secondary master priority is now unaffected by changes to the primary master.

Secondary PTP Master was not able to set some parameters in the SMPTE Profile Metadata TLV. Previously, the settings for Default Frame rate, CFID, and Drop Frame were erroneously copied from the primary master settings. Version 3.2 allows them to be independently set.

PTP Master Clock Class while genlocked. Previously, when operating in the SMPTE profile, the master used some of the profile-specific clock classes such as 150. This has been changed so the master will now report a class of 13 while genlocked to an analog reference, and 14 if in holdover after being genlocked.

PTP AVB profile IP encapsulation vs. ethernet frames. Previously, the AVB profile used IP encapsulated frames like all the other profiles. In the latest version, the AVB profile uses Ethernet mode frames instead of IP mode frames. The AVB profile should be treated as a beta level function, as it has not been tested for interoperability.

General limitations

This firmware release has general limitations, which are outlined below. Please check the Tektronix Web site (www.tek.com/downloads) for any firmware updates to the SPG8000A generator.

Firmware upgrades

- When the SPG8000A firmware is upgraded (using a USB drive or a network connection), all files created or installed by the user are deleted. The deleted files include presets, signal files, frame picture files, logo files, sequence files, and for Option SDI, can also include text and font files. The standard set of factory installed signal files, logo files, and Option SDI font files are restored when the firmware is upgraded.

To prevent the loss of your user-created files, use the **Backup all User Data to USB** function from the **SYSTEM** menu to save your user files before you upgrade the firmware. After the upgrade, use the **Restore all User Data From USB** function from the **SYSTEM** menu to restore your user-created files.

- If you have loaded the SPG8000A 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.
- Clear the cache on the browser after an update to the Instrument code. This is necessary to get the new features on the Web UI.

Network configuration using Manual mode

A network connectivity problem may occur when using Manual mode to configure the instrument IP address or subnet mask settings and the instrument is communicating across network boundaries. The problem does not occur when using DHCP mode to configure the network settings.

If your instrument is configured for Manual mode, use the following steps to work around this problem:

1. Configure the instrument IP address or subnet mask settings using Manual mode.
2. After configuring the IP address or subnet mask, perform one of the following:
 - Change the network gateway address to a valid value.
 - If the network gateway address is already correct, toggle the gateway address. For example, change the gateway address to some other (incorrect) address, apply the change, and then change the gateway address back to the correct value.

Alert messages	If there is an active alert condition (e.g., reference input missing) while the STATUS : ALERT menu is displayed, the alert message(s) will not automatically change if the alert condition is cleared. To view any changes to the alert messages, you must change to another menu, then return to the STATUS : ALERT menu.
Resetting an output signal	A signal output interruption or synchronization shock may occur when the instrument rereads or resets signal data, such as format changing, preset recall, or signal-button assignment.
Incorrect CW reference signal	If an NTSC or PAL signal is connected to the REF input when the reference source is set to CW , the video timing of all SPG8000A outputs will rattle every 1–2 seconds. To resolve this problem, use the REFERENCE : SOURCE menu to select the signal type that matches the reference input signal.
Web UI / remote control	<p>Some performance issues have been observed when the SPG8000A Web Interface is used with Internet Explorer 8. The use of newer browsers is recommended.</p> <p>Clear the cache on the browser after an update to the Instrument code. This is necessary to get the new features on the Web UI.</p> <p>In some instances, the Web UI will not recover well from a power cycle on the instrument. If this occurs, close the Web UI windows, cycle the power on the SPG, then clear the cache before restarting the Web UI.</p>
Time of day changes for timecode outputs	<p>When the time of day changes, such as when scheduled Daylight Savings adjustments are made or when the internal time is set from the front panel, there can be a delay before that change is reflected on timecode outputs.</p> <p>This delay may be a small number of frames (fraction of a second) when all timecode output formats are based on the same clock rate (for example, NTSC black burst and 1080i 59.94 HD tri-level on black outputs in addition to 30 fps drop-frame on LTC outputs), or up to several seconds when timecode formats based on different clock rates are used (for example, 29.97 fps and 24 fps on different outputs).</p>
Daylight Savings Time (DST) scheduler system	The DST scheduler system applies the DST offset even if the Time of Day (TOD) source is set to VITC Input or LTC Input and the SMPTE309 mode is set to Ignore or Use as Input . In these cases, the offset is applied whether or not a valid VITC or LTC Input signal is available. For proper DST scheduling, you need to ensure that the instrument has valid time information and manually enter the correct time of day if the system is not synchronized to an accurate time of day source.

When the TOD source is set to **GPS** signal and the GPS is not locked to the input signal, the DST scheduler system will apply the DST offset when the internal real-time clock (which is subject to slight drift) reaches the time scheduled for the DST offset to be applied or removed. Ensure that the GPS is locked and that the system time of day is correct before turning on the DST scheduler system.

The manual time of day setting is not automatically reapplied when the instrument power is cycled. If the instrument powers up in with the Time of Day source set to **Internal** mode, the time of day will be acquired from the internal, real-time clock in the instrument. Check the system time of day and adjust as needed to ensure that it is correct before the next transition of the DST scheduler when the Time of Day source is set to **Internal** mode.

Option GPS

Missing GPS or GLONASS signal. When the reference source is set to GPS Signal but the external GPS or GLONASS signal is missing, the SPG8000A automatically uses the internal reference signal as the reference source. However, the front-panel **INT** indicator does not turn green to show that the internal reference is being used. The **EXT** indicator does correctly turn red to indicate that the external (GPS or GLONASS) reference is missing.

GPS receiver Version 3015 with Firmware Version 1.06. GPS receiver modules with Firmware Version 1.06 installed have a problem with the leap second information they receive from the satellite system. Occasionally, the receiver erroneously reports that the current number of applied leap seconds is 255 instead of the correct number (currently 18). This error causes a 3 minute 59 second offset in the system time of day, which will last until the correct report is received (usually in the next broadcast 12 minutes later). SPG8000A Firmware Versions 2.1 and later contain a fix for this problem.

Receiver Version 3015 with Software 1.06 may occasionally see a small leap second change that lasts for 12.5 minutes. To prevent this from affecting the operation, configure the instrument to defer applying the leap second until a local time such as 1 or 2 AM. Ensure the local time is not the same as UTC midnight, so that the change is deferred at least an hour.

NOTE. *SPG8000A Firmware Version 2.2 or later must be installed to view the GPS receiver firmware version.*

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GPS receiver Version 3023. It is strongly recommended that instruments with GPS receiver Version 3023 have Firmware Version 2.5 or later installed. Previous SPG8000A Firmware versions have issues that will cause operational problems with the 3023 Version GPS receiver.

GPS receiver Version 3023 with Software Version 1.03. If receivers of this combination are inside the footprint of the QZSS constellation, they may not maintain lock correctly. Instrument Software Versions 3.0.1 and later will update most instruments to 1.04 or later module code. Contact a local Tektronix representative to receive an upgrade kit if a system is not able to update to 1.04.

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Option PTP

Composite reference for PTP master. Genlock to PAL Burst mode with VITC or 25 Hz LTC is fully functional. Genlock to NTSC Burst with VITC or 30 Hz Drop Frame LTC basically works, but is not fully accounting for the drop frame compensation. Therefore, there may be a few frames of error in the time which is decoded by the slave device and the time code on the outputs may not be exactly aligned until the instrument has executed a scheduled jam sync.

Additionally, the daily jam sync of an NTSC reference may cause a slight shift in the time sent by the PTP master. Therefore, for composite operation it is recommend to use a PAL reference signal.

ST2059-2 leap seconds. The ST2059-2 Synchronization Metadata message leap seconds fields are not fully implemented. The other fields in these messages are working correctly.

ST2059-2 metadata. The PTP message with the SMPTE ST2059-2 meta data will not contain the advance notice for a leap second change.

Slave lock time. The slave takes about 2.5 minutes to lock.

Announce message interruption on reference change. During a reference source change the master may stop sending announce messages for a brief time. This can cause the slaves to search for another master and restart the lock process. This will happen more frequently at high announce rates where a short time will exceed the selected announce timeout count.

This effect can be reduced by using a lower announce message rate or by increasing the announce timeout count on all the devices on the domain.

Factory preset or firmware upgrade. After recalling the Factory preset or performing a firmware upgrade and then changing to PTP slave mode operating in Mixed mode without negotiation, the slave device will actually be requesting negotiation. Setting the Master IP address into the AMT of the slave unit will correct this problem. When operating the instrument from a preset that includes the AMT setting, the operation will be correct.