



SPG9000

Timing and Reference System

Release Notes

This document supports firmware version 5.1

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Release Notes

This document describes new features, fixes, and improvements of firmware version 5.1 for the SPG9000 Timing and Reference System.

Product Updates

Upgrades All SPG9000 units are eligible for upgrading to version 5.1 using the standard upgrade process. If the SPG9000 is currently using version 4.1 or later, the remote upgrade process added in that release may be used to upgrade to version 5.1.

All customers (using any older version) are very strongly recommended to upgrade to version 5.1 as soon as possible to take advantage of important bug fixes and stability improvements. Specifically, there is an issue with the operating system kernel present in all releases prior to version 5.1, in which the main CPU will hang after 287 days of operation. This has been fixed in version 5.1.

The upgrade process from either version 4.1 or version 4.2 to version 5.1 will require two steps when using the File Manager of the web interface:

1. Upgrade to an intermediate version 4.9. This firmware is included in the same .zip package that is downloaded from the Telestream website.
2. Upgrade from version 4.9 to 5.1.

The upgrade process from version 5.0 to 5.1 can be performed in one step when using the File Manager of the web interface.

The upgrade process using the front-panel USB port can be performed in one step, directly to version 5.1 from any older version.

Downgrades There are currently no downgrades possible from version 5.1 to any earlier version.

New Features

The version 5.1 release adds several new features and enhancements plus several fixes and improvements, including one critical fix. See the user manual for details about the following functions and their operation:

- PTP follower instances now have configuration options for internal servo operation and summary statistics for key timing and clock metrics. These features can be used to improve PTP performance over networks with large packet delay variation (PDV), such as networks not using PTP-aware switches.
- The Secondary Reference feature can now be configured with PTP Follower as the primary source and GNSS as the secondary source.
- A new Audio/Video Synchronization test pattern is available for measuring the offset that audio is delayed or advanced relative to video.
- The Indian Regional Navigation Satellite System (also known as NavIC) is now supported the GNSS reference source.

- The Narrow Linear sender model is supported for ST 2110-20 video IP streams, in addition to the Narrow (gapped) model for streams shared with SDI outputs.
- SNMP now supports version 2 with community strings (SNMPv2c), for use with legacy management systems that do not support the more secure SNMPv3.
- Time code outputs (LTC, VITC, and ATC for SDI and ST 2110-40 streams) can now use TAI as the time source. TAI is similar to UTC but is unaffected by leap second changes.
- A “legacy” format for date encoding has been added as an option for LTC outputs. This format preceded the ST 309 standard from 1999 and is compatible with some older time code clocks.

Resolved Issues and Improvements

This firmware release has resolved the following issues and makes the following improvements to the previous 5.0 release.

System The SPG9000 will no longer be unresponsive after about 287 days, requiring a power cycle when that occurs. The root cause was a design flaw for a counter in the main CPU. The Linux kernel used this counter in its high-resolution timer implementation, and when the counter overflowed the CPU would hang. The fix is an updated kernel that does not use this counter for Linux timers.

The syslog message format has been updated for both remote servers and for the local files saved to volatile memory. The timestamp now uses RFC 5424 format. The same hostname is now used for messages from both the main and secondary processors of the SPG9000, so messages will include “(main)” or “(hps)” to identify the respective CPU. Many messages have been updated to provide additional information compared to previous firmware versions.

The initial syslog messages generated immediately after the system is powered up will have a timestamp closer to the actual time (within 1 hour of when the system was powered down) instead of a timestamp far in the past. During the boot sequence, the hardware real-time clock (RTC) is used to update the system time so syslog timestamps after that point will be accurate.

New API methods have been added to identify the most recently recalled preset (GET /configuration/preset-file) and to recall a named preset file previously saved via the web or front-panel interfaces (POST /configuration/preset-file/recall).

Resolved Issues and Improvements

The JSON schema for some API methods have been updated:

1. For the `/gnss/1/configuration` object, the `"constellation-type"` item has been changed to a `"constellations"` array.
2. The `"signal-warning-threshold"` item in the `/gnss/1/configuration` object has been moved to the `"warning-threshold"` item in the `/reference` object.
3. Some `"status"` values for the `"ptp-follower"` sub-object for the `/reference/status` object have been renamed to `"locked-strong"`, `"locked-nominal"`, `"locked-min"` and `"locked-warning"` to match the values used for `"gnss"` reference.

New diagnostics have been added to show the status of several clock circuits on the TSG board. These diagnostics may be used to identify hardware issues that cause PTP leaders to have large timing jitter.

Several security issues related to the SPG9000's internal web server have been resolved.

Fixed an issue where an API query to `/system/diagnostics` and `/system/diagnostics/sequencer` endpoints might cause the main application to crash and restart.

Fixed a rare issue where the system might crash and restart. In these cases, the trace files in the service report would show `"ZmqAdapter"` errors.

A syslog message that says the `"leap-seconds.list"` is about to expire or has expired will no longer be reported.

GNSS Fixed the issue where an invalid leap second offset (difference between the GPS epoch and current UTC time) might be applied, causing the system time to jump and affecting all time outputs. The GNSS receiver might report an incorrect offset value if the GNSS signal is subject to multipath interference, so additional software checks have been added to verify the leap second offset and reject invalid values before they are applied.

Fixed an issue where the GNSS Figure of Merit (FOM) briefly drops to an unlocked state (FOM 0 or FOM 2) causing the SPG9000 to go into holdover mode. In these cases, the GNSS receiver would temporarily report a loss of position fix from each satellite. In version 5.1, these false alarms from the GNSS receiver are ignored and the logic for determining the FOM value has been changed.

GNSS constellation configuration has been updated to allow independent selection of each available system, rather than selecting from a pre-defined list of system combinations.

The per-satellite health data of the GNSS signal (as seen on the web interface) now shows a numeric status code if the value is not `"ok"`. Consult the User Manual for a description of several codes.

Resolved Issues and Improvements

If the reference source is GNSS and the system powers up with no signal, then the reference source is changed to Genlock Input, then changed back to GNSS (still with no signal), the Tune value shown in the Reference diagnostics will no longer adjust the system clock at a very high rate (about 10 ppm).

Reference The system will correctly set the clock frequency and phase on power-up if the primary reference source (GNSS or PTP) is missing but the secondary source (PTP or GNSS) is available. Thereafter, if the primary reference source is restored, the system will slowly adjust the clock according to the Holdover Recovery settings. If the offset is greater than 1 second, the time and phase will be jammed.

Note that if the primary source is GNSS and the secondary source is CW (10 MHz), and the system powers on without a GNSS signal, the system time will be incorrect because there is no time source with a CW signal. The initial jam when the GNSS signal is still necessary.

With a PTP reference source using two PTP instances (Dual Follower modes), the Maximum Offset Before Jam setting will always be observed when the active PTP instance switches from one port to the other and a phase offset is present.

The Unlimited option of the Max Offset Before Jam setting has been changed to “Maximum”. When the reference is GNSS, there is a 1 second maximum offset before a jam is necessary. For PTP reference, the limit is 15 seconds.

The reference source can be changed from GNSS, PTP, or Internal to any of these other source types without any synchronization shock if the time and phase of each source are within 1 second.

The Signal Warning Threshold menu for GNSS has been moved to a Warning Threshold menu that is also used for the PTP Follower reference.

If the time-of-day source is set to LTC or VITC and the input signal is lost, the system time will stay continuous instead of jamming to the time saved in the real-time clock (RTC).

The “Jam Phase” holdover recovery mode now behaves correctly when PTP is the secondary reference.

Genlock The vertical (line) and horizontal coarse adjustments for genlock timing will now work when the input format is a 10 MHz CW signal. A new menu for Primary Output Frame Adjust determines the clock steps, for NTSC, PAL, and other formats.

Fixed an issue where the phase would (on rare occasions) jump by several microseconds when the CW (10 MHz) signal becomes the active reference source (i.e. when the primary GNSS signal is lost).

The Genlock Timing menus are now available when the secondary reference source is CW (10 MHz), not just when the primary reference source is Genlock Input.

Resolved Issues and Improvements

PTP When the system is configured with a PTP Follower reference on one or more ports and PTP Leaders on other ports, the clock class of the upstream grandmaster is now used for the downstream leader(s), regardless of the domain number(s) used on either network.

When a leader instance is in the Passive state, the Time Source is now updated if the reference source of the system is changed. Previously, the Time Source would only update for leaders in the Active state.

Additional states are shown for PTP followers as they are acquiring a lock to the leader. “Adjusting” is displayed when the Offset From Master is greater than the Tracking Threshold. “Stabilizing” is displayed when the servo loop is adjusting the gain to reduce clock variance. “Tracking” is displayed when the PTP follower is fully locked.

The measurements for instantaneous and average message rates are now more accurate. Also, rates are now shown only for the domain of the specific PTP instance, rather than for all PTP messages received on the network interface.

The 15-minute measurement intervals used for summary statistics in the `GET /ptp/{instance}/performance-monitoring-ds` API method will no longer have missing data.

Performance monitoring data is now correctly collected for PTP follower instances that are disabled and re-enabled multiple times in any measurement period.

Black Timing adjustments made from the front-panel interface for horizontal fine delay (0-10 ns) now correctly set the correct value.

Test Signals The near-white and near-black levels used for ID text overlay and burnt-in time code overlay are now based on the Transfer Characteristics and Range settings of the current video format instead of always using 90% for near-white and 10% for near-black. This ensures that the text is not excessively bright for HDR formats.

Y (luma) and C (chroma) samples for test signal transitions (such as from one color bar to the next) are now correctly aligned for 4:2:2 YCbCr formats for UHD/4K image sizes.

The font selection for ID text overlay has been moved from the File Manager section on the System tab of the web interface to a Global Options section on the Video tab.

IP RS-FEC settings for the IP 1 and IP 2 ports operating at 25 Gbps line speed are now preserved in non-volatile memory when the system powers down and back up again.

IP audio streams will now always start transmitting when the system powers up if the stream is enabled in the Power-On Default preset.

The RTP timestamps for ST 2110-40 data streams are now correctly set for interlaced video formats.

Resolved Issues and Improvements

The “sampling” parameter on the “a=fmtp” line in the SDP object for an ST 2110-20 video stream is now correct for RGB formats.

NMOS The “chassis_id” for the two IP ports in the “interfaces” sub-object of the IS-04 /self object now uses the MAC address of the management port of the SPG9000 rather than the MAC address of the respective IP port. This has also been fixed for the chassisid value in LLDP messages broadcast from each of the four media ports.

A new vendor-specific endpoint (/x-spg9000/status) has been added for a client to check the registration status of the SPG9000 node.

BCP-003-01 support has been added. If the web server for the user interface and API has been configured to use HTTPS (after an SSL certificate has been installed), the NMOS API can be configured to use either HTTPS or HTTP as desired.

General Limitations

This firmware release has the following general limitations.

Genlock When the reference source is changed to Genlock Input, it may take several seconds for the internal frame resets to fully adjust.

Reference When the primary reference source is GNSS and the secondary reference source is CW (10 MHz), and the system is powered up when there is no GNSS signal, there will be two phase jams when the GNSS signal is restored.

GNSS GNSS does not lock while the system is in mobile mode and moving.

GNSS status messages for possible spoofing or multipath detection are disabled for receiver firmware versions 1.03 or earlier.

PTP If the time-of-day reference is VITC from a PAL signal on the genlock input and the genlock timing offset of the source signal is adjusted, the system time of the SPG9000 does not adjust correctly.

When using Dual Follower modes for a PTP reference source, the system will switch to the better PTP instance when it reaches the Stabilizing state instead of waiting until the Tracking state. It will also use a follower in the Stabilizing state if neither instance is Tracking, when it should be in holdover mode in this situation.

Test Signals If TIFF image files (especially UHD or 4K size) are set for the test pattern output on one or more video sources in the Power-On Default preset, the system boot time will be noticeably longer. A standard test pattern is recommended for the Power-On Default preset and then load the image file after the system is running.

General Limitations

- SDI** SDI Timing Adjustment is scaled wrong for some formats, so the amount requested is not equal to the actual offset of the signal.
- NMOS** The SPG9000 may briefly stop sending IS-04 “health” messages to the registry after several weeks of continuous operation. If this happens, the NMOS process will restart and the SPG9000 will re-register its node, device and sender resources.
- System** USB memory devices may erroneously report being damaged after removal from the SPG9000 and mounting on another computer.

Front panel display updates may briefly show an intermediate setting before displaying the correct setting.

The system may not function properly immediately after a firmware upgrade when a new PLD is loaded. Always cycle power to the system after performing a firmware upgrade.

If the system time is incorrect (perhaps because the Internal time source is intentionally set to another time), files uploaded with the File Manager will show that incorrect date and time instead of the creation time of the source file.

If the internal system time is intentionally set to a date far in the past or future, the web interface may be unavailable.