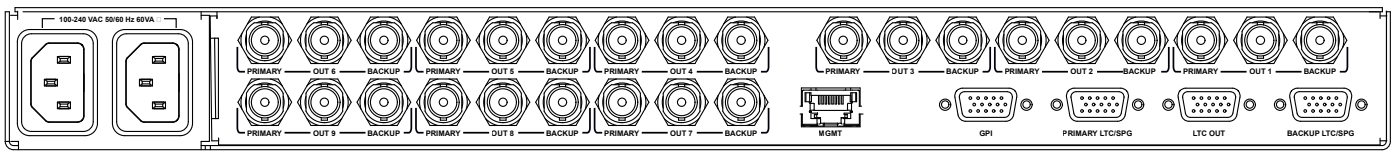
ECO8000

Automatic Changeover Unit for the SPG9000

The ECO8000 is a highly versatile automatic sync and signal changeover unit for modern master sync applications. This changeover unit offers exceptional reliability, stability and high availability. When configured with a primary plus backup pair of SPG9000 sync generators, the ECO8000 provides protection for all the mission-critical timing and synchronization signals required in modern broadcast, production, and post-production facilities.



Key Features

- Switches NTSC and PAL black burst, HD tri-level sync, AES/DARS, word clock, LTC, and SD/HD/3G-SDI signals
- Electronic Fast Switch function for near glitch-less sync source switching, minimizing disruption in operations
- Automatic or Manual changeover mode
- Front panel LED status/fault indicators for each individual channel and both power supplies
- Dual hot-swappable power supplies ensure continuous availability of reference signals
- Easy to manage with web-based interface for configuration and SNMP for status and alert information

ECO8000

Product Configuration

The ECO8000 has nine user-configurable BNC channels and four LTC channels. Each channel consists of primary and backup inputs and an output. The ECO8000 includes six 50 MHz Electronic Fast Switch channels and three 3 GHz Relay Switch channels. The Electronic Fast Switch channels support NTSC and PAL black burst, HD tri-level sync, AES/DARS, and word clock signals. The 3 GHz Relay Switch channels support SD/HD/3G-SDI signals as well as most analog reference signals.

Robust Fault-Resistant Architecture

The ECO8000 is designed with three loosely-coupled subsystems that together provide high reliability. The Channel Control System monitors the signal level on each input and switches to the other source if a fault occurs. It is implemented with a simple hardware state machine to maximize reliability. The Configuration and Monitoring System is software-based and includes the user interface. This system can be rebooted without any disturbance to the Channel Control System. The Redundant Power System monitors the two power supply modules, automatically switching to the backup supply if necessary.

Fault Detection of Sync and Reference Signals

Each channel has a signal level threshold for fault detection for the configured signal type. Non-critical signals may be disabled for fault detection or configured not to trigger a changeover, but are still switched when a fault is detected on an enabled channel.

Changeover Switching

In automatic mode (switch-on-fault), the ECO8000 will automatically select the backup channels should any of the primary inputs fail. However, in the unlikely event both sync sources are faulty, the ECO8000 will not alternate between the two sources.

Manual source selection can be used when normal maintenance is required for the SPG9000 sources, such as firmware upgrades. Manual mode also facilitates periodic testing of the changeover function. A notification can be sent if the backup channels have not been tested for six months.

50 MHz Electronic Fast Switch Channels

The Electronic Fast Switch function for channels 1–6 significantly improves the changeover switching speed and thus minimizes disturbance of the reference sync signals when switching between primary and backup inputs. The Electronic Fast Switch channels have latching relay backups that engage on loss of power to maintain the selected signal path.

3 GHz Relay Switch Channels

The 3 GHz Relay Switch channels 7–9 are optimized for SD/HD/3G-SDI signals but are also usable for most analog reference signals. These channels utilize high bandwidth latching relays to preserve the selected signal path upon a loss of power.

The Relay Switch channels are also equipped with a patented Relay Check function. When this function is enabled, the instrument automatically checks the signal level on each 3 GHz Relay Switch channel before and after every changeover switch to determine the condition of the relay contacts. If it is determined that the relay contacts may have nonconductive coating (such as oxide buildup), the instrument will attempt to self-clean the contacts by cycling the relay rapidly for 20 times to wear through the layer of nonconductive coating and restore the relay connections.

LTC Channels

The four LTC channels connect to the SPG9000 sync generators with standard 15-wire cables with DE-15 (HD-15) connectors. An optional breakout cable can be used for the ECO8000's LTC outputs, with XLR connectors for each of the four channels.

The SPG9000 can use its LTC 1 signal as a time input instead of a time code output, so the ECO8000 can similarly be configured to route the input signal on the LTC 1 channel to the inputs of both primary and backup SPG9000s.

SPG Trigger

The same cable used for LTC channels also includes one general purpose interface (GPI) signal from the primary and backup SPG9000s to the SPG Trigger input of the ECO8000. This GPI signal can be used to force a changeover switch for SPG9000 events other than signal faults, such as a reference loss of lock or a hardware fault.

The SPG Trigger is useful for hybrid SDI/IP facilities, to force the sync outputs from the ECO8000 to follow the SPG9000 that is serving as the active PTP grandmaster. This ensures that SDI equipment that is genlocked to a black burst or HD tri-level sync source is synchronized to ST 2110 equipment that is locked to the PTP grandmaster.

Front Panel and Web-Based User Interfaces

Dedicated buttons on the front panel can be used to select automatic or manual mode, and in manual mode, to select the primary or backup source. Channel and system parameters can also be configured from the front panel, using an LCD display for the menu system. LED fault indicators show the status of each individual channel and the status of the power supplies.

The ECO8000 can also be configured and controlled from a web-based user interface via the Ethernet management port, for remote access when the ECO8000 is installed in an equipment rack away from the operator.

Redundant Hot-Swappable Power Supplies

The ECO8000 has an innovative hot-swappable dual power supply system that virtually removes the risk of sync loss due to power supply unit failure, minimizing disruption in operations.

Unlike simpler devices, the ECO8000 has a designated active power supply and an idle backup supply. This ensures that they are not used at the same rate and will not potentially fail at about the same time. The ECO8000 will monitor the temperature-weighted hours of the active supply and alert the user when it approaches the rated limit. The backup supply undergoes a brief load test automatically each day and the user can be notified if this test fails, providing extra assurance that the backup power supply will be ready when needed. Each power supply module has both AC and DC indicator LEDs that continue to operate for 10 minutes after the loss of power. This allows quick troubleshooting in the event of supply failure or AC power failure.

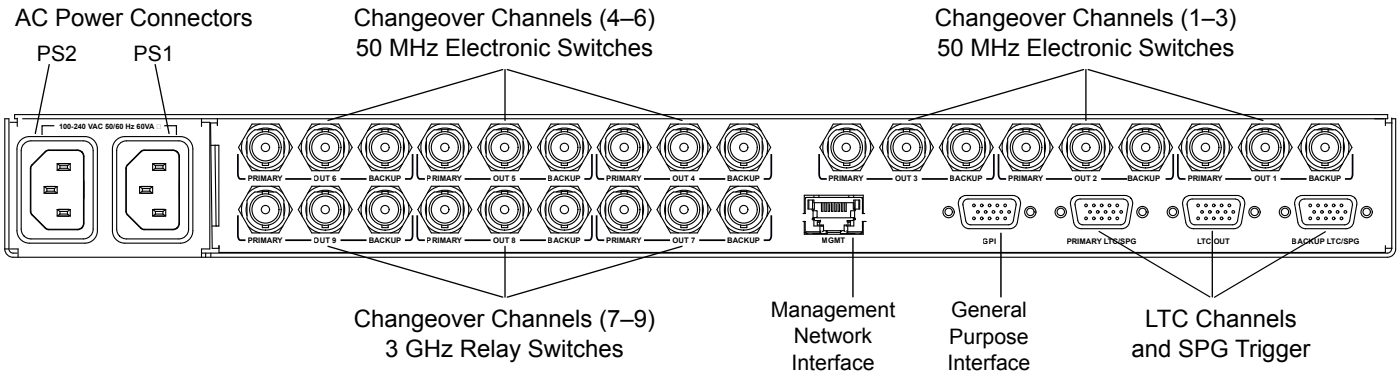
Alarm and Status Reporting

In addition to the front-panel and web interface status indicators, alarms can be reported through SNMP Trap messages, General Purpose Interface outputs, email notification to a local SMTP server, and/or an audible beeper.

An Event Log maintains the date and time of each reported event, and this log can be viewed via the front panel and web browser interfaces.

Technical Specifications

Rear-Panel Connectivity



Inputs/Outputs

Electronic Fast Switch Channels

Number of Channels	6
Signal Types	NTSC, PAL, HD Tri-Level, Word Clock (1 V and 5 V), AES/DARS, Custom
Bandwidth	50 MHz
Signal Fault Detection Threshold	–2 dB to –4 dB from the nominal level for the selected signal type
Switch Settling Time NTSC, PAL, HD Tri-Level DARS and 1 V Word Clock 5 V Word Clock	 Typically 5 ns glitch, then 125 ns to 90% of final value Typically 5 ns glitch, then 250 ns to 90% of final value Typically 25 ns glitch, then 500 ns to 90% of final value
Return Loss (typical)	35 dB, 300 kHz to 6 MHz 25 dB, 6 MHz to 30 MHz
Insertion Loss	< ±0.2 dB DC to 10 MHz Typical < –1 dB DC to 50 MHz
Maximum Switched Voltage	–3 V to +5 V
Crosstalk	Unselected input to output, or channel to channel < –60 dB, 300 kHz to 6 MHz < –40 dB, 6 MHz to 50 MHz

Technical Specifications

Relay Switch Channels

Number of Channels	3
Signal Types	SD-SDI, HD-SDI, 3G-SDI, NTSC, PAL, HD Tri-Level, Word Clock (1 V), AES/DARS, Custom
Bandwidth	3 GHz
Signal Fault Detection Threshold	−2 dB to −4 dB from the nominal level for the selected signal type
Relay Switch Interruption Time	Typically 0.5 ms to 2 ms
Return Loss (typical)	40 dB, 300 kHz to 6 MHz 30 dB, 6 MHz to 30 MHz 15 dB, 30 MHz to 1.5 GHz 10 dB, 1.5 GHz to 3 GHz
Insertion Loss	< −0.1 dB DC to 10 MHz Typical < −3 dB DC to 3 GHz Equivalent to approx. 5 m of Belden 1694 cable
Maximum Switched Voltage	±2.5 V peak, 1.5 V RMS
Crosstalk	Unselected input to output, or channel to channel < −48 dB, DC to 1.5 GHz < −40 dB, 1.5 GHz to 3 GHz

LTC Channels

Number of Channels	4 outputs or 3 outputs and 1 input
Signal Threshold	0.5 to 5 V_{p-p} in 0.5 V steps, differential or single-ended
Switching Interruption Time	Typically 1 ms
Load Range	600 Ω to open circuit
Crosstalk	< −60 dB

Technical Specifications

Dimensions	
Height	43.7 mm (1.72 in.)
Width	483 mm (19.0 in.)
Depth	557 mm (21.9 in.)
Weight	4.5 kg (10.0 lb.)

Power Source	
Voltage Range	100 to 240 VAC
Frequency	50/60 Hz
Power Consumption	50 VA maximum

Environmental	
Temperature	
Operating	0 °C to +50 °C (+32 °F to +122 °F)
Nonoperating	−20 °C to +60 °C (−4 °F to +140 °F)
Altitude	
Operating	To 3000 m (9842 ft.)

Ordering Information

Base Model

Product Code	Description
ECO8000	ECO8000 automatic changeover unit; includes 6 50 MHz electrical fast switch channels, 3 3 GHz relay switch channels, 4 LTC channels, general purpose interface, management LAN interface, and dual power supply modules

Accessory Options

Option Code	Description
ECO8000 RACK	Rackmount slides and rails kit for ECO8000 (1 RU height, standard full depth)
ECO8000 XLR	Adapter cable (6 feet long) from 15-pin D-sub LTC OUT connector on the ECO8000 to 4 XLR male connectors (for LTC outputs) and BNC male connectors (for General Purpose Interface outputs)
ECO8000 CBL	Set of connection cables (12 inch length) for primary & backup SPG9000s to the ECO8000. Includes 8 pairs of BNC to BNC cables for 6x Black, Word Clock and DARS outputs, 3 pairs of HD-BNC to BNC cables for SDI outputs, and one pair of D-sub 15 cables for LTC outputs.

Technical Specifications

Power Cords

Option Code	Description
ECO8000 A0	North America locking power cords (115 V, 60 Hz)
ECO8000 A1	Universal European locking power cords (220 V, 50 Hz)
ECO8000 A2	United Kingdom locking power cords (240 V, 50 Hz)
ECO8000 A3	Australia locking power cords (240 V, 50 Hz)
ECO8000 A5	Switzerland locking power cords (220 V, 50 Hz)
ECO8000 A6	Japan locking power cords (100 V, 110/120 V, 60 Hz)
ECO8000 A10	China locking power cords (220V, 50 Hz)
ECO8000 A11	India non-locking power cords (230 V, 50 Hz)
ECO8000 A12	Brazil non-locking power cords (127 V, 60 Hz)
ECO8000 A99	No power cords included

Service Options

The ECO8000 has a standard warranty period of one year, which can be extended to three or five years. Service options provide complete coverage, including all necessary repairs, software updates, parts, and labor. Coverage also includes all shipping costs, including freight and import/export fees. This guarantees faster repair times and cost-efficiency when compared to non-contract, “on-demand” repairs that are typically 5× the annual contract cost per incident, no matter how minor.

Option Code	Description
ECO8000 R3	ECO8000 Standard Warranty extended to 3 years
ECO8000 R5	ECO8000 Standard Warranty extended to 5 years

Post-Purchase Upgrades and Replacements

Option Code	Description
ECO800UP DPW	Replacement power supply module for the ECO8000. (Power cord option must also be specified)
ECO800UP RACK	Rackmount slides and rails kit for ECO8000 (1 RU height, standard full depth)
ECO800UP XLR	Adapter cable (6 feet long) from 15-pin D-sub LTC OUT connector on the ECO8000 to 4 XLR male connectors (for LTC outputs) and BNC male connectors (for General Purpose Interface outputs)
ECO800UP CBL	Set of connection cables (12 inch length) for primary & backup SPG9000s to the ECO8000. Includes 8 pairs of BNC to BNC cables for 6x Black, Word Clock and DARS outputs, 3 pairs of HD-BNC to BNC cables for SDI outputs, and one pair of D-sub 15 cables for LTC outputs.