

# Automatic Changeover Unit

## ECO8000 Datasheet

The ECO8000 is a highly versatile automatic sync and signal changeover unit with configurations and capabilities required to address modern master sync application and other advanced sync timing application. This changeover unit offers exceptional reliability, stability and high availability and is designed with optional high bandwidth input changeover capabilities for HD/SD and/or 3G-SDI signal environments.

### Features & Benefits

- Switches analog black burst, HD tri-level sync, AES/DARS, word clock, LTC, as well as SD/HD/3G-SDI signals - all the timing and synchronization signals required in modern broadcast, production, and post production facilities
- Scalable product architecture to fit various application needs
- Electronic Fast Switch function for near glitch-less sync source switching, minimizing disruption in operations
- Automatic or Manual changeover mode
- Front panel LED fault indicators for each individual channel as well as the status of the 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

### Applications

- Sync generator and time reference generator system for broadcast, studio, mobile, and post-production facilities
- Master or slave (genlock) operation for distributed system architectures

This changeover unit can be used with the following signal generators to form the complete sync generator system, which offers extra redundancy for the critical timing and synchronization system in the facilities.

- A pair of Tektronix Master Sync / Master Clock Reference Generators (SPG8000) for most broadcast facility timing applications
- A pair of Tektronix Test Signal Generators (TG8000) for more advanced post production facility timing applications

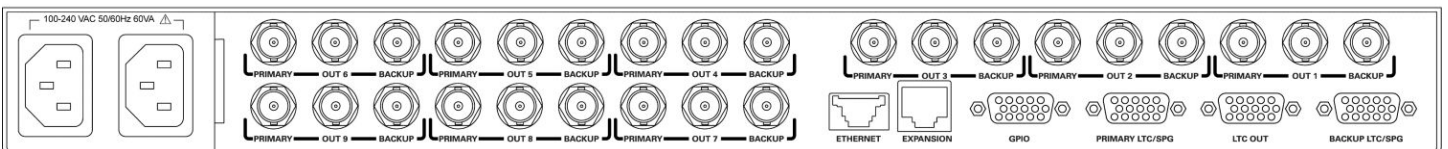
### Instrument configuration

The ECO8000 provides up to nine user-configurable BNC channels and four LTC channels. Each channel consists of primary and backup inputs, and an output.

The base configuration has three 50 MHz Electronic Fast Switch channels with options for six more 50 MHz Electronic Fast Switch or 3 GHz Relay Switch channels in groups of three channels each, plus four optional LTC channels.

The 50 MHz Electronic Fast Switch channels support 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.

For applications that require more than nine BNC channels, two ECO8000 instruments can be configured to work as a single system which practically doubles the number of channels available (up to 18 BNC channels and eight LTC channels).



ECO8000 Automatic Changeover Unit front panel and back panel

## Channel configuration

Channel configuration can be set either via the front panel or the ECO8000 Web User Interface. Signal amplitude fault detection level follows the setting of the channel configuration. Detection on individual channel may be disabled, giving the option of disabling switching to the backup unit on failure of signals not critical to the facility operation.

## Changeover switching

When operated in the switch-on-fault mode, the ECO8000 will automatically select the backup sync source 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. If necessary, this function may be overridden with the manual sync source selection. Manual source selection also facilitates periodic testing of the changeover function.

## 50 MHz Electronic Fast Switch channels

The Electronic Fast Switch function, which comes standard with all 50 MHz Electronic Fast Switch channels, 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.

## Optional 3 GHz Relay Switch channels

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

In addition, these channels are equipped with the Tektronix patent-pending "Relay Check" function <sup>1</sup>. 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 of these channels. If it is determined that the relay contacts may have nonconductive coating (such as oxide) buildup, the instrument will cycle the relay rapidly for 20 times to wear through the layer of nonconductive coating in an attempt to restore the relay connections (relay self-cleaning attempt).

## Optional LTC channels

The optional LTC channel connections are pin-compatible with the Tektronix SPG8000 and TG8000 <sup>2</sup> generators, so these signals can be connected with standard 15 pin D-SUB cables. The same cable can be used to carry GPI connections, which allow the SPG8000 to trigger a changeover on certain error conditions such as loss of genlock.

## Front panel controls

In association with the LCD display, front-panel controls are provided for source selection, operating mode, resetting the fault indicators, and for disabling the front-panel controls. LED fault indicators are also provided for each individual channels as well as the status of the power supplies. When the unit is connected to an Ethernet network, these functions are also available from the ECO8000 Web User Interface using a Web browser on a computer connected to the same network.

## Optional backup power supply

The optional hot-swappable, redundant (backup) dual power supply system (Option DPW) virtually removes the risk of sync loss due to power supply unit failure, minimizing disruption in operations. Unique to the ECO8000 and ECO8020, the unit periodically tests the backup power supply to verify its performance. If the test fails, a fault will be indicated on the LED fault indicator as well as an error message for backup power supply replacement - providing extra assurance that the backup power supply will be ready when needed.

Each power supply module has both AC and DC indicator LEDs. These LEDs continue to operate for 10 minutes after the loss of power. This allows quick troubleshooting in the event of supply or AC power failure.

## Alarm and status reporting

Alarm and status information can be reported through SNMP, GPI, email notification, and/or the ECO8000 Web User Interface.

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<sup>1</sup> The Relay Check function on the 3 GHz Relay Switch channels operates only on channels that are connected (terminated).

<sup>2</sup> The TG8000 generator must have a GPS7 module installed in order to support LTC generation.

# Specifications

## Inputs and outputs

### Typical return loss

<b>Base and Option REF 50 MHz Electronic Fast Switch channels</b>	35 dB, 300 kHz to 6 MHz 25 dB, 6 MHz to 30 MHz
<b>Option HREF 3 GHz Relay Switch channels</b>	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

<b>Base and Option REF 50 MHz Electronic Fast Switch channels</b>	< $\pm 0.2$ dB DC to 10 MHz Typical < -1 dB DC to 50 MHz
<b>Option HREF 3 GHz Relay Switch channels</b>	< -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

<b>Base and Option REF 50 MHz Electronic Fast Switch channels</b>	-3 V to +5 V
<b>Option HREF 3 GHz Relay Switch channels</b>	$\pm 2.5$ V peak, 1.5 V RMS
<b>Option LTC channels</b>	$\pm 5$ V

**Maximum switched current (Option HREF only)** 100 mA

### Crosstalk

Unselected input to output or channel to channel

<b>Base and Option REF 50 MHz Electronic Fast Switch channels</b>	< -60 dB, 300 kHz to 6 MHz < -40 dB, 6 MHz to 50 MHz
<b>Option HREF 3 GHz Relay Switch channels</b>	< -48 dB, DC to 1.5 GHz < -40 dB, 1.5 GHz to 3 GHz

**Relay switch interruption time (Option HREF only)** Time that it takes for the relays to switch and settle  
Typically 0.5 ms to 2 ms

**Channel switch settling time (Base and Option REF only with identical signals on both inputs)** Time that it takes for the channel to switch and settle

<b>Bi-level and Tri-level sync</b>	Typically 5 ns glitch, then 125 ns to 90% of final value
<b>AES and 1 V word clock</b>	Typically 5 ns glitch, then 250 ns to 90% of final value
<b>5 V word clock</b>	Typically 25 ns glitch, then 500 ns to 90% of final value

## Inputs and outputs

### Preset threshold signal types

**Base and Option REF 50 MHz Electronic Fast Switch channels** NTSC, PAL, Tri-level, AES, 1 V word clock, 5 V word clock, custom

**Opt HREF 3 GHz Relay Switch channels** NTSC, PAL, Tri-level, AES, 1 V word clock, SD-SDI, HD-SDI, 3G-SDI, custom

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**Signal level range to detect fault with preset thresholds** -2 dB to -4 dB from the nominal level for the selected signal type

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### LTC channels

**LTC threshold presets** 0.5 to 5 V<sub>p-p</sub> in 0.5 V steps, differential or single ended

**LTC load range** 600 Ω to open circuit

**Crosstalk** < -60 dB for LTC signals

**Switching interruption duration** Typically 1 ms

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## Power source

### Mains ranges

**Voltage** 100 to 240 VAC

**Frequency** 50/60 Hz

**Power consumption** 50 VA maximum

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## Environmental

### Temperature

**Operating** 0 °C to +50 °C (+32 °F to +122 °F)

**Nonoperating** -20 °C to +60 °C (-4 °F to +140 °F)

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### Altitude

**Operating** To 9842 ft. (3000 m)

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## Regulatory

**EMC** Complies with EMC Directive 2004/108/EC

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### Safety

**Approved to:** UL61010-1, CAN/CSA-C22.2 No.61010-1.

**Complies with:** EN61010-1, IEC61010-1.

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**Physical characteristics****Dimensions**

<b>Height</b>	43.7 mm (1.72 in.)
<b>Width</b>	483 mm (19.0 in.)
<b>Depth</b>	557 mm (21.9 in.)

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**Weight**

<b>Net</b>	4.5 kg (10.0 lb.)
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## Ordering information

### Models

<b>ECO8000</b>	ECO (automatic changeover) base unit
	Includes: 3x 50 MHz Electronic Fast Switch channels (black burst, HD tri-level sync, AES/DARS, word clock) and a Quick Start User Manual (Tektronix part number 071-3221-xx)

### Options

#### Instrument options

<b>DPW</b>	Add a second hot-swappable redundant (backup) power supply and second power cord
<b>REF<sup>3</sup></b>	Add 3x 50 MHz Electronic Fast Switch channels (black burst, HD tri-level sync, AES/DARS, word clock)
<b>HREF<sup>3</sup></b>	Add 3x 3 GHz Relay Switch channels (3G-SDI, HD-SDI, SD-SDI, as well as black burst, HD tri-level sync, AES/DARS, word clock)
<b>LTC</b>	Add 4x LTC channels
<b>XLR</b>	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)
<b>RACK</b>	Rackmount slides and rails kit (1 RU height, standard full depth)

#### Possible channel configurations

Ordering configuration	Slot 1 (Ch. 1-3)	Slot 2 (Ch. 4-6)	Slot 3 (Ch. 7-9)
Base	50 MHz ELSW channels	Empty	Empty
Opt. REF	50 MHz ELSW channels	50 MHz ELSW channels	Empty
Opt. REF, REF	50 MHz ELSW channels	50 MHz ELSW channels	50 MHz ELSW channels
Opt. REF, HREF	50 MHz ELSW channels	50 MHz ELSW channels	3 GHz Relay channels
Opt. HREF	50 MHz ELSW channels	3 GHz Relay channels	Empty
Opt. HREF, HREF	50 MHz ELSW channels	3 GHz Relay channels	3 GHz Relay channels

#### Power plug options<sup>4</sup>

<b>Opt. A0</b>	North America power plug (115 V, 60 Hz)
<b>Opt. A1</b>	Universal Euro power plug (220 V, 50 Hz)
<b>Opt. A2</b>	United Kingdom power plug (240 V, 50 Hz)
<b>Opt. A3</b>	Australia power plug (240 V, 50 Hz)
<b>Opt. A5</b>	Switzerland power plug (220 V, 50 Hz)
<b>Opt. A6</b>	Japan power plug (100 V, 110/120 V, 60 Hz)
<b>Opt. A10</b>	China power plug (50 Hz)
<b>Opt. A11</b>	India power plug (50 Hz) (No locking cable)
<b>Opt. A12</b>	Brazil power plug (60 Hz) (No locking cable)
<b>Opt. A99</b>	No power cord

<sup>3</sup> You can add any combination of Option REF and HREF channel modules, but the total number of additional modules is limited to two. When both REF and HREF modules are ordered, the REF modules are always installed so that they have lower channel numbers than the HREF modules.

<sup>4</sup> All power cords include a locking mechanism except as otherwise noted.

## Service options

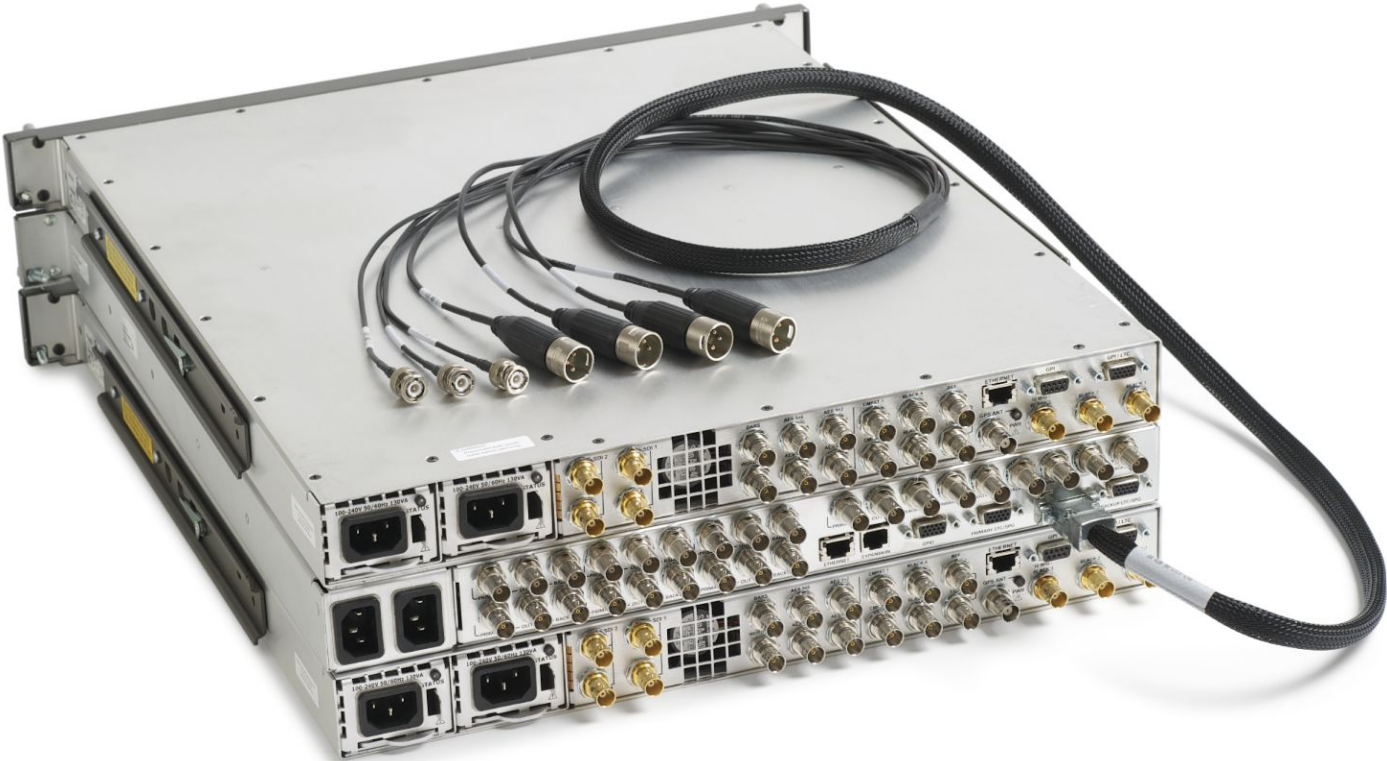
Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. D1	Calibration Data Report
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. G3	Complete Care 3 Years (includes loaner, scheduled calibration, and more)
Opt. G5	Complete Care 5 Years (includes loaner, scheduled calibration, and more)
Opt. R3	Repair Service 3 Years (including warranty)
Opt. R5	Repair Service 5 Years (including warranty)

## ECO800UP field upgrade options

DPW	Add a replacement or a second hot-swappable redundant (backup) power supply. A power cord option must be specified. (See <i>Power Cord Options</i> .)
LTC	Add 4x LTC channels (software upgrade option)
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)
RACK	Rackmount slides and rails kit for ECO8000 (1 RU height, standard full depth)
IF	Upgrade installation service
IFC	Service installation and calibration



Option DPW backup power supply



Option XLR adapter cable



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.





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**For Further Information.** Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit [www.tektronix.com](http://www.tektronix.com).

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