ECO8000
User Manual

This document supports software version 2.0.

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Contents

Important Compliance and Safety Information

United States of America Compliance Notices

Class A Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15, Subpart B of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause unexpected operation.

Safety

UL 61010-1: 2012 R7.19: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements.

Environmental

Perchlorate Materials: this product contains one or more type CR lithium batteries. According to the state of California, CR lithium batteries are classified as perchlorate materials and require special handling.

See www.dtsc.ca.gov/hazardouswaste/perchlorate for additional information.

Canada Compliance Notices

Department of Communications Radio Interference Regulations

This digital apparatus does not exceed the Class A limits for radio-noise emissions from a digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications. This Class A digital apparatus complies with Canadian ICES-003.

Reglement sur le brouillage radioelectrique du Quadstere des Communications

Cet appareil numerique respecte les limites de bruits radioelectriques visant les appareils numeriques de classe A prescrites dans le Reglement sur le brouillage radioelectrique du Quadstere des Communications du Canada. Cet appareil numerique de la Classe A est conforme a la norme NMB-003 du Canada.

Safety

CAN/CSA-C22.2 NO. 61010-1-12 + GI1 + GI2 (R2017) + A1: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements.

Sécurité

CAN/CSA-C22.2 NO. 61010-1-12 + GI1 + GI2 (R2017) + A1: Exigences de sécurité pour l'électricité Matériel de mesure, de contrôle et d'utilisation en laboratoire - Partie 1: Généralités Exigences.

European Union, European Free Trade Association (EFTA), and United Kingdom Compliance Notices

This equipment may be operated in the countries that comprise the member countries of the European Union and the European Free Trade Association. These countries, listed in the following paragraph, are referred to as The European Community throughout this document:

AUSTRIA, BELGIUM, BULGARIA, CYPRUS, CROATIA, CZECHIA, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, IRELAND, ITALY, LATVIA, LITHUANIA, LUXEMBOURG, MALTA, NETHERLANDS, POLAND, PORTUGAL, ROMANIA, SLOVAKIA, SLOVENIA, SPAIN, SWEDEN, UNITED KINGDOM, ICELAND, LIECHTENSTEIN, NORWAY, SWITZERLAND

Declaration of Conformity

Marking by the “CE” symbol indicates compliance with the Essential Requirements of the EMC Directive of the European Union 2014/30/EU

This equipment meets the following conformance standards:

Safety

EN 61010-1: 2010 + A1: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements Low Voltage Directive 2014/35/EU

Emissions

EN 55032: 2015 + A11: 2020, CISPR 32: 2015, EN 61000-3-2: 2014, EN 61000-3-3: 2013

Immunity

EN 55035: 2017, EN 61000-4-2: 2009,

EN 61000-4-3: 2006 + A1: 2008 + A2: 2010, EN 61000-4-4: 2012,
EN 61000-4-5: 2014 + A1: 2017, EN 61000-4-6: 2014, EN 61000-4-8: 2010,
EN 61000-4-11: 2020

Environments: E2

Warnings

Warning! This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.

Achtung! Dieses ist ein Gerat der Funkstorgrenzwertklasse A. In Wohnbereichen konnen bei Betrieb dieses Gerates Rundfunkstorungen auftreten, in welchen Fallen der Benutzer fur entsprechende Gegenmal nahmen verantwortlich ist.

Attention! Ceci est un produit de Classe A. Dans un environnement domestique, ce produit risque de creer des interferences radioelectriques, ii appartiendra alors a l'utilisateur de prendre les mesures specifiques appropriees.

Notes:

1. For Compliance with the EMC standards listed here, high-quality shielded interface cables should be used.
2. Emissions which exceed the levels required by this standard may occur when this equipment is connected to a test object.

Environmental Compliance

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

Product end-of-life handling

Observe the following guidelines when recycling an instrument or component:

Equipment recycling

Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or

human health if improperly handled at the product's end of life. To avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.

This symbol on the product or its packaging indicates that this product complies with the applicable European Union requirements according to Directives 2012/19/EU and 2006/66/EC on waste electrical and electronic - equipment (WEEE) and batteries.

It also indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste for recycling, please contact your local authority, or where you purchased your product.

Battery Recycling

This product may contain a rechargeable battery, which must be recycled or disposed of properly. Please properly dispose of or recycle the battery according to local government regulations.

Transporting Batteries or products with Batteries in them

The capacity of the lithium-ion secondary battery shipped with this product is under 100 Wh. The lithium content of the installed primary battery is under 1 g. Each battery meets the applicable requirements of UN Manual of Tests and Criteria Part III Section 38.3. Battery quantity is under the limit for shipment according to Section II of the relevant Packing Instructions from the IATA Dangerous Goods Regulations. Consult your air carrier for applicability and determination of any special lithium battery transportation requirements.

Restriction of Hazardous Substances

This product is classified as an industrial monitoring and control instrument, and is required to comply with the substance restrictions of the RoHS 3 Directives 2011/65/EU and EU 2015/863.

Korea Compliance Statement

사 용 자 안 내 문
이기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다 .

Taiwan Compliance Statement

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

This is a Class A product based on the standard of the Bureau of Standards, Metrology and Inspection (BSMI) CNS 13438, Class A. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Japan Compliance Statement

この装置は、クラスA機器です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI–A

This is a Class A product based on the standard of the VCCI Council (VCCI 32: 2016). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

Important Safety Information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition. To safely perform service on this product, see the Service Safety Summary that follows the General Safety Summary.

General Safety Summary

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

Comply with Local and National Safety Codes

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

Product is Designed to be Used by Trained Personnel Only

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment. Before use, always check the product with a known source to be sure it is operating correctly.

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

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

To Avoid Fire or Personal Injury

Use proper power cord: Use only the power cord specified for this product and certified for the country of use. Do not use the provided power cord for other products.

Ground the product: This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded. Do not disable the power cord grounding connection.

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

Observe all terminal ratings: To avoid fire or shock hazard, observe all rating and markings on the product. Consult the product manual for further ratings information before making connections to the product. Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

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

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

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

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

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

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

Use Only Specified Replacement Parts

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

Do not operate in an explosive atmosphere.

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

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

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

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

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

Use only the Telestream rackmount hardware specified for this product.

Service Safety Summary

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

To avoid electric shock: Do not touch exposed connections.

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

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

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

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

Terms in the Manual

These terms may appear in this manual:

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

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

Terms on the Product

These terms may appear on the product:

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

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

CAUTION indicates a hazard to property including the product.

Symbols on the Product

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

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

General Safety Product Specific Statements

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

Carefully read all instructions. Retain these instructions for future reference.

Comply with local and national safety codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual. The product is designed to be used by trained personnel only.

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

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

This product is not intended for detection of hazardous voltages.

Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

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

WARNING: Injury or death can occur as the result of electrical shock. To avoid electrical shock, do not connect power to the instrument when the top cover is off. There are dangerous potentials present on the power supply circuit boards when the power cord is connected.

WARNING: To avoid personal injury and instrument damage, do not use slides provided with other instruments from other kits (for example, General Devices, Chassis Trak C-300) with the rails from this kit. The locking feature will not function and will result in an instrument that is not secured properly and could fall out of the rack, causing personal injury or instrument damage.

WARNING: To prevent the rack-mounted instrument from tipping forward onto the operator, install the instrument so the operator is able to access all of its rear-panel connectors without pushing down on the instrument. Verify that the rack does not become unstable with the instrument fully extended. Do not leave the instrument extended when finished accessing the rear panel.

WARNING: To reduce the risk of injury and equipment damage, make sure that levers are properly installed. An improperly installed lever can prevent the slide from locking or prevent the instrument from being removed from the rack. Make sure that the lever is installed so the long handle is facing forward and the short hook is facing downward.

WARNING: To prevent injury during product installation, use care not to pinch hands or fingers in the rails and slides.

WARNING: To prevent injury when removing the product from the rack, do not forcefully and abruptly pull the product from the rack. Pull with the minimum force required to move the instrument with a consistent, even motion.

WARNING: To reduce the risk of fire and shock, ensure the mains supply voltage fluctuations do not exceed 10% of the operating voltage range.

CAUTION: The instrument does not have a power switch. When you connect the power cable to the AC line connector, the instrument powers on.

CAUTION: Be careful to select the correct screw type for your instrument (metric or SAE). If the screws do not insert easily (do not use excessive force or you might damage the threads), it is possible you are using the wrong screw.

CAUTION: To prevent damage to the instrument and rackmount, do not force the instrument into the rack if it does not slide smoothly. The rails assembly might need to be adjusted to resolve the problem.

CAUTION: Damage to the instrument can occur if this instrument is powered on at temperatures outside the specified temperature range.

CAUTION: Do not enable the relay check function on channels that are not terminated, since the unterminated output looks similar to an open relay and will cause unfounded relay check events.

CAUTION: To prevent a loss of instrument configuration and a disruption in the output signals, do not initialize hardware while the instrument is in service.

CAUTION: To prevent an unexpected shutdown of the instrument, be sure to remove the correct power supply module if you are replacing a faulty module.

CAUTION: The firmware upgrade process may disrupt the sync signals. We recommend that you upgrade the firmware only when the instrument is not in service.

Do not remove power from the instrument until the upgrade process has completed.

Preface

This manual contains information to help you use the ECO8000 automatic changeover unit:

- How to operate the instrument using the front panel controls
- How to configure the instrument for network access and operate the instrument using the web interface
- How to monitor the status of the instrument during normal operation

Where to Find More Information

Other information about your product is available for download at www.telestream.net/video/resources.htm. The following table lists all the documentation for the ECO8000 changeover unit.

Document	Manual type	Part number	Description
ECO8000 User Manual	User	071371700x	Provides detailed operation information.
Release Notes	Release Notes	D00010045x	Describes the new features, improvements, and limitations of the instrument firmware.
Manual, Rackmount Slides, and Rails Kit	User	071370600x	Describes how to connect rack equipment to an ECO8000 changeover. Provides basic safety information.
ECO8000 Series Specifications and Performance Verification	Technical Reference	077087600x	Lists the product specifications and provides procedures to verify instrument performance.

Telestream Contact Information

To obtain product information, technical support, or provide comments on this guide, contact us using our website, email, or phone number listed.

Resource	Contact Information
Telestream Video Support	Website: www.telestream.net/telestream-support Email: videosupport@telestream.net US and Canada Toll-free: 1-844-219-5329 Outside of US and Canada: 1-503-967-9833
Telestream	Website: www.telestream.net Sales and Marketing Email: info@telestream.net Address: Telestream 848 Gold Flat Road, Suite 1 Nevada City, CA. USA 95959
International Distributor Support	Website: www.telestream.net See the Telestream website for your regional authorized Telestream distributor.
Telestream Technical Writers	Email: techwriter@telestream.net If you have comments or suggestions about improving this document, or other Telestream documents—or if you've discovered an error or omission, please email us.

Product Description

The ECO8000 is an automatic changeover unit for baseband synchronization and test signals. When used with the SPG9000 timing and reference system, it provides redundancy for the facility's critical synchronization and timing sources.

Two SPG9000 units, designated as Primary and Backup sources, are connected to the ECO8000 inputs. The ECO8000's outputs connect to the equipment in the facility, typically through distribution amplifiers (DAs). If one or more signals on the primary source fail, perhaps by a cable fault or by loss of power to the SPG9000, the ECO8000 will automatically switch to the signals from the backup source, thereby providing signal continuity with minimal disruption on the ECO8000's outputs. You can also manually switch from the primary SPG9000 to the backup and back again so that scheduled maintenance (such as firmware upgrades) can be performed on each SPG9000 with no discernible signal disruption for most equipment in the facility.

Capabilities

The ECO8000 includes a total of 13 channels, each with two inputs (primary and backup) and one output:

- Six channels with 50 MHz fast electronic switches that use BNC connectors. These are typically used for analog synchronization signals (NTSC/PAL black burst or HD tri-level) from the BLACK 1-6 outputs from the SPG9000. These channels are named "REF" or "ELSW" channels in the ECO8000 user interface.
- Three channels with 3 GHz relay switches that use BNC connectors. These are typically used for SDI test signals (SD-SDI, 1.5G HD-SDI or 3G-SDI) or for Word Clock (±1 V level) or DARS audio reference signals. These channels are named "HREF" or "Relay" channels in the ECO8000 user interface.
- Four channels for LTC signals that use a shared 15-pin D-sub connector.

Note: Older ECO8000 instruments sold by Tektronix could have different hardware configurations, with different numbers of REF or HREF channel types. Tektronix also sold the ECO8020 changeover, which had up to 20 signal channels. Version 2.0 or newer of the ECO8000 firmware will correctly support all configurations of the ECO8000 and ECO8020. This manual describes the channel configuration of the Telestream ECO8000 only.

The ECO8000 has a front-panel display and buttons for a local user interface. It can also be connected to a network for remote access using a web page interface. The network interface can also be used for notifications and configuration changes via the Simple Network Management Protocol (SNMP) with a remote management system. A General Purpose Interface (GPI) is also available for alarms and for some external control of the instrument.

For increased reliability, the ECO8000 is equipped with two power supply modules. Under normal operation, the standby supply is seldom used, ensuring that it has maximum remaining life should the active supply fail. The standby supply is load-tested each day to verify that it can serve as the active supply if necessary. The usage time of each supply is logged as “temperature-weighted hours”, a metric that best estimates the calculated life of the supply. If the active supply is interrupted for any reason, the system switches to the standby supply without any disruption to system operation. Power supply modules are hot-swappable for easy replacement.

Instrument Installation

This section describes:

- the environmental limits in which the ECO8000 can operate,
- how to install the ECO8000 into a standard 19-inch equipment rack, including a list of the parts in the mounting kit and the required tools (not included),
- how to connect the ECO8000 to external power,
- the physical connectors on the rear panel of the instrument and which signals are used with each connector, and
- where to connect SPG9000 outputs to ECO8000 inputs.

Environmental Operating Requirements

Check that the location of your installation has the proper operating environment as follows:

Parameter		Description
Temperature	Operating	0 °C to +50 °C
	Nonoperating	–20 °C to +60 °C
Relative Humidity	Operating	20% to 80% (No condensation) Maximum wet-bulb temperature 29.0 °C
	Nonoperating	5% to 90% (No condensation) Maximum wet-bulb temperature 40.0 °C
Altitude	Operating	To 3000 m (9842 feet) Maximum operating temperature decreases 1 °C for each 300 m above 1500 m
	Nonoperating	To 15,000 m (49,212 feet)

CAUTION: Damage to the instrument can occur if this instrument is powered on at temperatures outside the specified temperature range.

Rackmount Installation

The ECO8000 is typically installed in a standard 19-inch equipment rack. The rack mount kit consists of a pair of slides that are attached to the ECO8000 and a pair of rails that are attached to the rack. This section describes how to install the slides and rails.

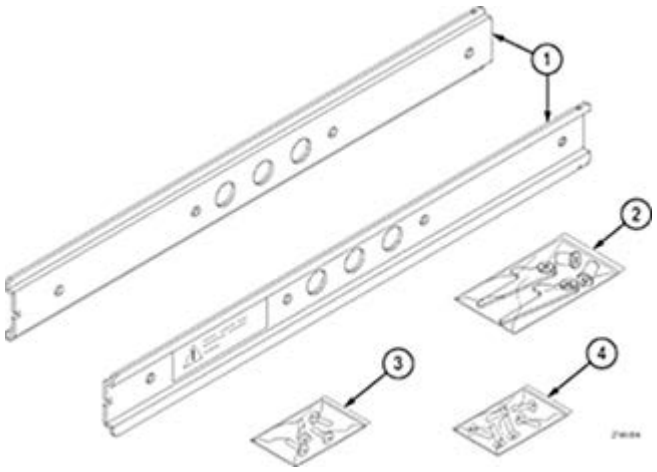
The rack mount kit can be ordered as option ECO8000 RACK at the same time as the base unit. In this case, the slides are preinstalled onto the ECO8000 before it is shipped. The kit can also be ordered as ECO800UP RACK as a standalone kit after the initial purchase.

Kit Parts List

The slides assembly parts list has the parts contained in this kit. The associated figures show what the parts look like. If your kit was shipped with your instrument, the slides are already installed.

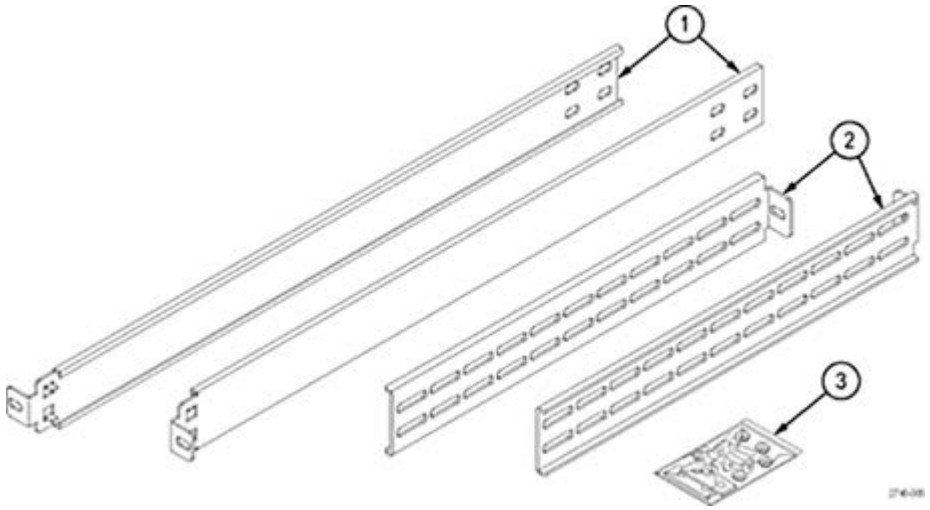
Slides assembly parts list

Number in example	Qty	Name and description
1	2	BRACKET, RACK, CHASSIS-SIDE
2	2	BRACKET, RACK, LEVER, CHASSIS-SIDE
	2	BUSHING, RACK, CHASSIS-SIDE
3	2	SCREW, MACHINE; 8-32 X 0.5, FLH, 100 DEG, STL, ZN PL, PHIL (SAE)
	6	SCREW, MACHINE; 8-32 X 0.375, PNH, STL, ZN PL, PHIL (SAE)
4	2	SCREW, MACHINE; M4X10MM L, FLH, STL, ZN PL, PHIL (metric)
	6	SCREW, MACHINE; M4 X 8MM L,PNH, STL, ZN PL, PHIL (metric)



Rails assembly parts list

Number in example	Qty	Name and description
1	2	BRACKET, RACK, STATIONARY
2	2	BRACKET, RACK, REAR CABINET
3	2	BRACKET, RACK, BAR NUT
	8	SCREW, MACHINE; 10-32 X 0.625,TRH, ZINC PLATED STEEL, PHIL
	4	NUT ASSY; 10-32 X 0.375 HEX, ZINC PLATED STEEL, LOCK WASHER



Installation Instructions

This section provides instructions:

- Installing the slides onto the ECO8000 if they are not already installed
- Installing the rails into a standard 19-inch equipment rack
- Installing the instrument into the rails in the rack

WARNING: To avoid personal injury and instrument damage, do not use slides provided with other instruments from other kits (for example, General Devices, Chassis Trak C-300) with the rails from this kit. The locking feature will not function and will result in an instrument that is not secured properly and could fall out of the rack, causing personal injury or instrument damage.

Equipment List

These tools are required to install the kit hardware:

- #2 crosshead screwdriver
- 3/8-inch wrench

WARNING: To prevent the rack-mounted instrument from tipping forward onto the operator, install the instrument so the operator is able to access all of its rear-panel connectors without pushing down on the instrument. Verify that the rack does not become unstable with the instrument fully extended. Do not leave the instrument extended when finished accessing the rear panel.

Install Slides

Screw Selection

For the slides installation, this kit provides two sets of screws (metric and SAE), but the ECO8000 only needs the 3 metric screws.

Procedure

Attach the slides to the instrument:

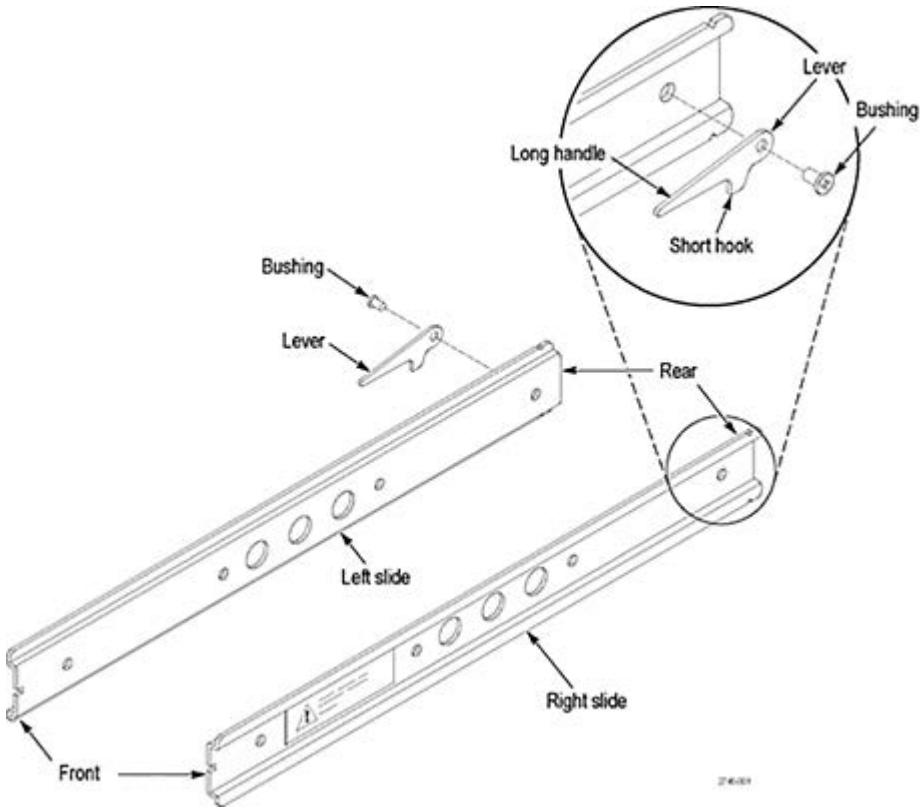
Note: The slides might already be installed on your instrument. If they are, skip this procedure and go to Installing the Rails.

1. Identify the right rear and left rear of each slide. A warning label is on the outside side of each slide.
2. Make sure that the rear of the slide is nearest to the rear of the instrument. The front of each slide has a notch in the center edge.
3. Align the mounting holes on the right slide to the mounting holes on the right side of the instrument.
4. Use the shorter screws provided (8mm) and a screwdriver with a #2 Phillips tip; attach the right slide to the right side of the instrument:

CAUTION: Be careful to select the correct screw type for your instrument (metric or SAE). If the screws do not insert easily (do not use excessive force or you might damage the threads), it is possible you are using the wrong screw.

   A. Insert the metric screws into the first two mounting holes.
   B. Place the lever, with the long handle facing the front of the slide and the short hook facing downward, over the rear mounting hole.
   C. Insert a metric screw into the bushing for the lever.
   D. Insert the bushing and screw into the lever so the lever is attached to the slide and the slide is secured to the instrument.

The example shows how to attach the slide levers for the ECO8000 instrument.



5. Rotate the instrument to face the left side and repeat this procedure to install the left slide.

WARNING: To reduce the risk of injury and equipment damage, make sure that levers are properly installed. An improperly installed lever can prevent the slide from locking or prevent the instrument from being removed from the rack. Make sure that the lever is installed so the long handle is facing forward and the short hook is facing downward.

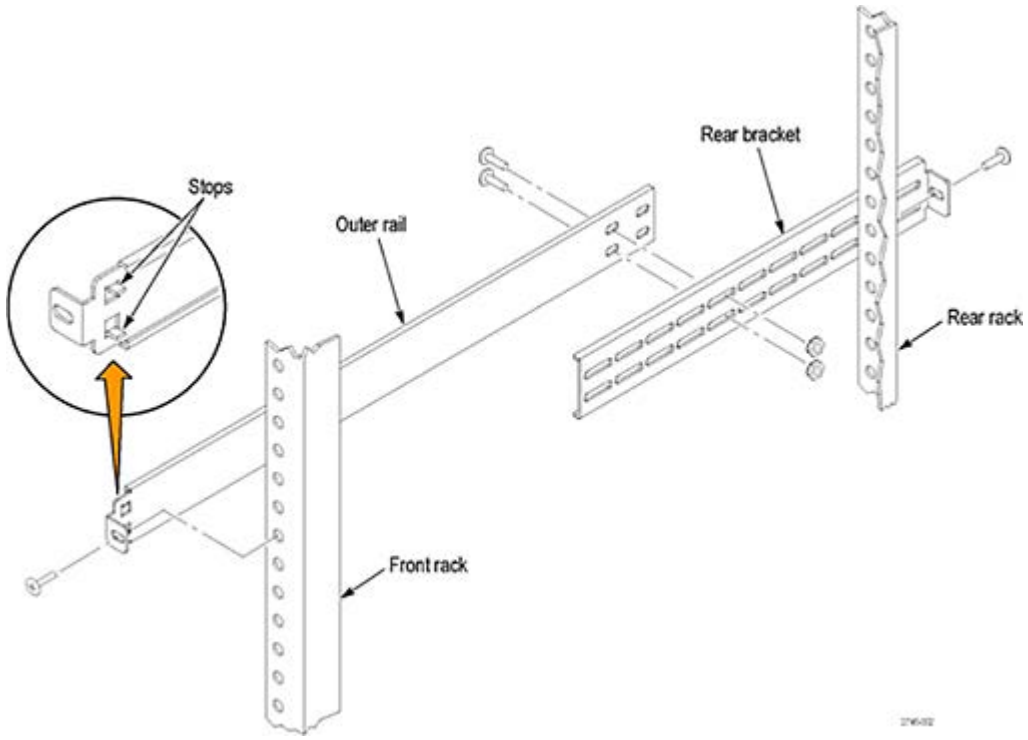
Install Rails

This two-part procedure describes how to assemble and install the rails in the equipment rack.

Assemble Rails

1. Measure the distance between the front and rear rail of the equipment rack.
2. Align the rear bracket to the right rail. Notice that the rear bracket has multiple pairs of mount-through holes. When aligning the bracket and rail, be sure to select a pair of holes that mount the rear bracket so the flange-to-flange distance matches the front rail to rear rail spacing of the rackmount rack just measured in step 2.

3. Using a screwdriver with a #2 Phillips tip, attach the rear bracket to the right rail using two 10-32 screws and 10-32 nuts or a bar nut as necessary. Leave the screws loose so you can adjust the overall length of the rail assembly in the rack.
4. Repeat this procedure to assemble the left rail assembly.



Mount Rails

1. Select a ½-inch-spaced hole in the front rack. This will be the middle hole of each group of three holes.
2. Select the mounting method according to your rack type:
   - Mount the rails with their front and rear flanges *outside* the front and rear racks; add a bar nut to the installation only if the rails have untapped holes.
   - Mount the rails with their front and rear flanges *inside* the front and rear racks; add a bar nut. This mounting method assumes untapped holes.
   - Some racks have square mounting holes and require cage nuts to be inserted. These are supplied from the rack vendor.
3. Using the method and hardware determined from step 2, attach the right rail assembly to the equipment rack front and rear rails. The screws should be fully, but lightly, seated so you can adjust the rack later.
4. Tighten the screws still loose when you assembled the rails, apply 28 inch-lbs of torque, to fix the front to rear flange spacing of the rail assembly.
5. Repeat this procedure to mount the left rail assembly.

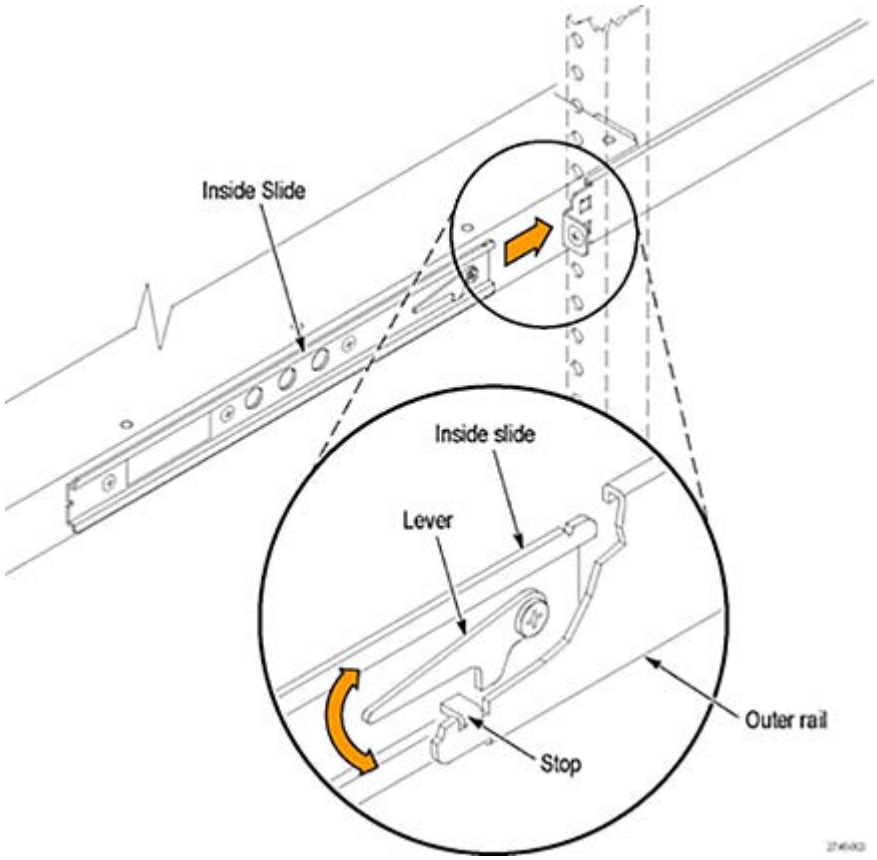
Install Instrument in Rack

This procedure describes how to install the instrument into the equipment rack.

WARNING: To prevent injury during product installation, use care not to pinch hands or fingers in the rails and slides.

1. Insert the instrument left and right slides into the ends of the rack rails while tilting the long handle of each lever upward.

Note: Be sure to insert the instrument slides *inside* the inner rack rails. You might need to tilt rear of the instrument up or down at a slight angle to fit the slides into the rails.



2. Push the instrument into the rack until it stops.

CAUTION: To prevent damage to the instrument and rackmount, do not force the instrument into the rack if it does not slide smoothly. The rails assembly might need to be adjusted to resolve the problem.

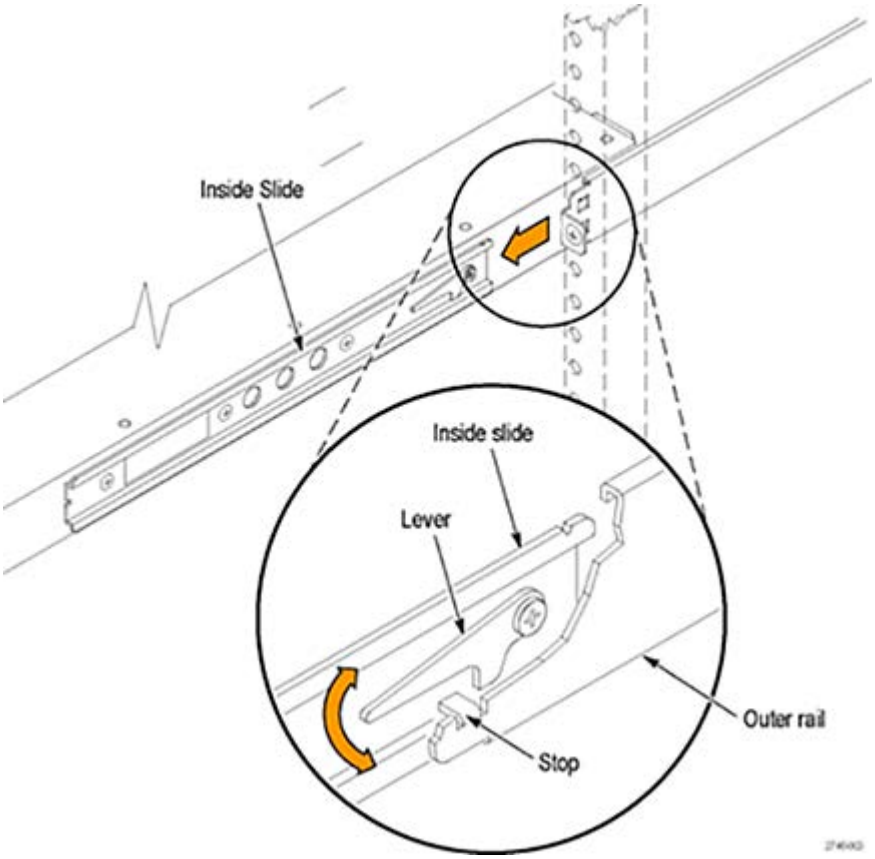
3. Retighten any loose screws and push the instrument all the way into the rack. If the tracks do not slide smoothly, readjust the rail assemblies.
4. When adjusting is completed, tighten all rail assembly 10-32 screws.
5. If the instrument has knob screws on the front corners, tighten them so they are secured in the rack.

Remove Instrument from Rack

This procedure describes how to remove the instrument from the equipment rack.

WARNING: To prevent injury when removing the product from the rack, do not forcefully and abruptly pull the product from the rack. Pull with the minimum force required to move the instrument with a consistent, even motion.

1. Loosen the knob screws, if present, at the front of the instrument.
2. Gently pull the instrument out until you can reach the levers on the inside slides.
3. Tilt both lever handles upward at the same time to clear the stops.



4. Pull the instrument past the stops and out of the rack.

Power Connection

The instrument operates from a single-phase power source with the neutral conductor at or near earth ground. The line conductor is fused for over-current protection. A protective ground connection through the grounding conductor in the locking power cord is essential for safe operation.

Two hot-swappable power supply modules are installed in the ECO8000. One is configured to be the primary supply and the other is configured to be the backup supply. In the event that the primary supply fails, the backup supply automatically provides power to maintain instrument operation. See *Power Supply Management* for details.

WARNING: Injury or death can occur as the result of electrical shock. To avoid electrical shock, do not connect power to the instrument when the top cover is off. There are dangerous potentials present on the power supply circuit boards when the power cord is connected.

Power Characteristics

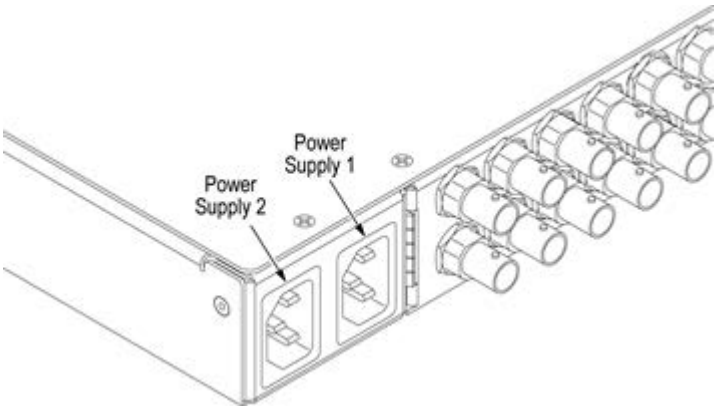
AC power source	
Rating voltage	100 V to 240 V
	WARNING: To reduce the risk of fire and shock, ensure the mains supply voltage fluctuations do not exceed 10% of the operating voltage range.
Frequency	50 or 60 Hz
Maximum power	50 VA

CAUTION: The instrument does not have a power switch. When you connect the power cable to the AC line connector, the instrument powers on.

Connect Power

Connect the two power cables to the instrument first and then connect them to the AC power source. Connecting at least one power cable causes the instrument to power on.

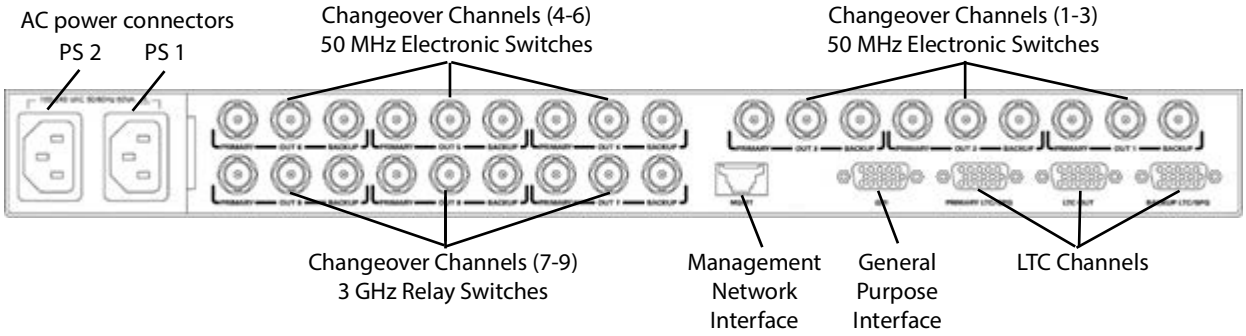
The power connectors on the rear panel are associated with the hot-swappable power supply modules that are inserted into front panel slots From the front panel, Power Supply 1 is to the left of Power Supply 2, so from the rear panel the connector for Power Supply 2 is on the left.



The front panel has two LED indicators for each power supply The upper LED (labeled "AC") refers to the state of the external mains connection and the lower LED (labeled "DC") refers to the state of the power supply module. See *Power Supply Status* for complete descriptions of these indicators.

Rear Panel Connectors

The rear panel of the ECO8000 has 27 BNC connectors, four D-sub connectors, one RJ45 connector and two power connectors as shown in the diagram.



Changeover Channels

The ECO8000 has 9 channels for synchronization and test signals, each with three BNC connectors. The two input connectors for each channel are labeled PRIMARY and BACKUP, and the output connector is labeled "OUT N", where N is the channel number (1–9).

Channels 1–6 have 50 MHz electronic fast switches and are intended for use with the BLACK 1–6 outputs from the SPG9000. Channels 7–9 have 3 GHz relay switches and are intended for use with SDI test signal outputs from the SPG9000 (HD-SDI, SD-SDI or 3G-SDI formats only). The Word Clock and DARS outputs from the SPG9000 can be used with either channel type.

LTC Channels

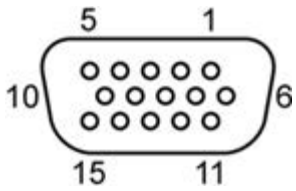
The ECO8000 has 4 channels for Linear Time Code (LTC) signals. These four channels share common 15-pin, D-sub connectors (DE-15 socket, also known as HD-15) along with a general-purpose trigger signal from the SPG9000. Standard VGA cables with DE-15 pin connectors can be used to connect each SPG9000 output to the ECO8000 inputs.

Note: Some lower-quality VGA cables do not connect all 15 pins from end-to-end. Ensure that you use high-quality cables, or use a multimeter or continuity tester to verify all 15 wires.

The PRIMARY LTC/SPG and BACKUP LTC/SPG inputs are used with the output connectors labeled LTC/GPI on the primary and backup SPG9000 units respectively.

A breakout cable is available for the LTC OUT connector, with XLR connectors for the four LTC channels and BNC connectors for the two SPG trigger outputs. It can be ordered as option ECO8000 XLR at the same time as the base ECO8000 purchase or as ECO800UP XLR, a standalone accessory purchased later.

The pin assignments for the two LTC/SPG connectors and one LTC OUT connector are shown:



Pin	LTC/SPG	LTC OUT
1	SPG trigger input	Primary SPG trigger output
2	Unused	Backup SPG trigger output
3	Unused	Unused
4	Unused	Unused
5	LTC 4 negative input	LTC 4 negative output
6	Ground	Ground
7	LTC 3 negative input	LTC 3 negative output
8	LTC 2 negative input	LTC 2 negative output
9	Ground	Ground
10	LTC 1 negative input/output	LTC 1 negative output/input

Pin	LTC/SPG	LTC OUT
11	Unused	Unused
12	LTC 3 positive input	LTC 3 positive output
13	LTC 2 positive input	LTC 2 positive output
14	LTC 1 positive input/output	LTC 1 positive output/input
15	LTC 4 positive input	LTC 4 positive output

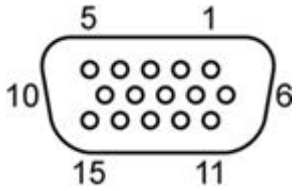
Note: The LTC 1 channel of the SPG9000 can be configured as either input or output. Therefore, the LTC 1 channel on the ECO8000 must also be configured for the matching mode. See *LTC Configuration Menu*.

GPI Connector

The General Purpose Interface (GPI) connector is a 15-pin D-sub connector (DE-15 socket) with five inputs and six outputs. One output (pin 10) is user-configurable for event reporting. See *Event Reporting Configuration*.

Inputs are intended to be used with a ground closure or open collector drive to activate. They have 10 kΩ pull-up resistance to 5 V. Outputs have 10 kΩ pull-up resistance to 5 V. When asserted, outputs have a pull-down that can sink 100 mA.

The pin assignments for the connector are shown:



Pin	Signal	Type	Function
1	Primary/Backup state	Output	High if Primary is selected, Low if Backup is selected
2	Primary fault	Output	Low if a Primary fault is present
3	Backup fault	Output	Low if a Backup fault is present
4	Mode state	Output	High if Manual mode is selected, Low if Auto mode is selected
5	Ground		

Pin	Signal	Type	Function
6	Power fault	Output	Low if a fault is present in the power subsystem as indicated by the AC or DC LEDs on the front panel
7	Manual mode select	Input	Assert to select Manual mode
8	Auto mode select	Input	Assert to select Auto mode
9	Fault reset	Input	Assert to reset all faults
10	Event report	Output	Low if any fault selected in the GPI EVENTS configuration is present Also low during any watchdog reboot.
11	Ground		
12	Unused		
13	Primary select	Input	Assert to select the Primary source
14	Backup select	Input	Assert to select the Backup source
15	Unused		

MGMT Connector

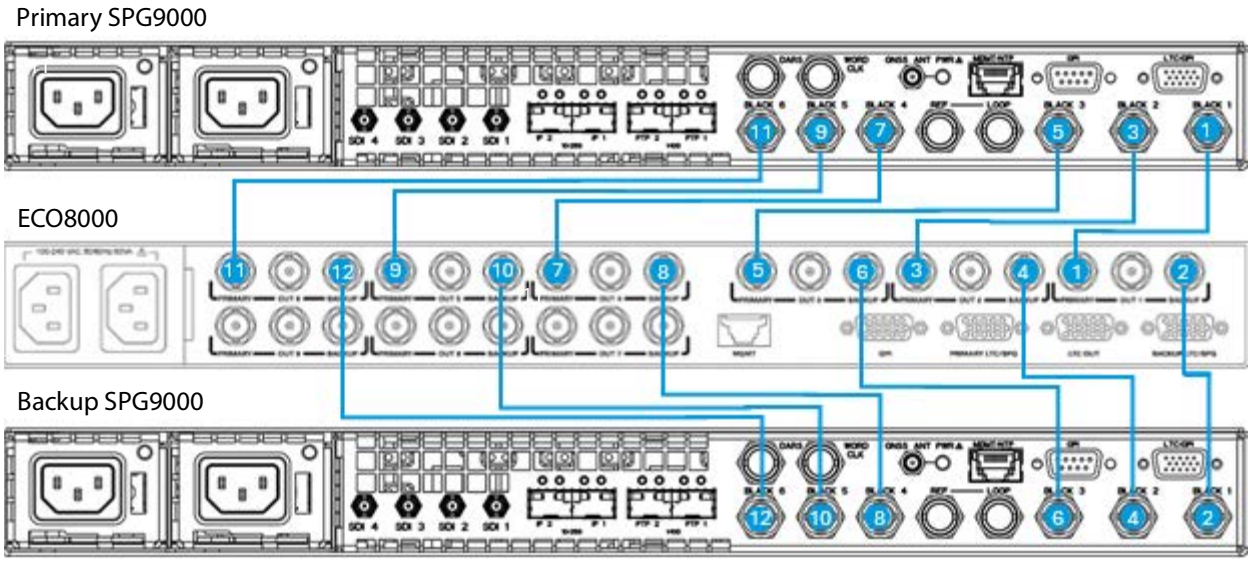
The management interface uses an 8P8C (RJ45) connector to connect to the local Ethernet network, with an interface speed of 100 Mbps or 10 Mbps. The instrument can be controlled remotely using the web-based user interface or using SNMP. See *Management Network Interface*.

Signal Connections

Output signals from the primary and backup SPG9000 units are typically connected to the ECO8000 as shown in the diagrams below.

Channels 1–6 on the ECO8000 should be used for the BLACK 1–6 outputs from the SPG9000. If fewer than 6 black outputs are in use, the WORD CLK and/or DARS outputs from the SPG9000 should also use any of channels 1–6 of the ECO8000.

Use short coaxial cables (e.g. 30 cm) with standard BNC connectors for these connections.



Channels 7–9 on the ECO8000 should be used for any of the SDI 1–4 outputs from the SPG9000. These three channels could also be used for WORD CLK and/or DARS outputs from the SPG9000 if 5 or 6 BLACK outputs are being used.

The SDI outputs on the SPG9000 use HD-BNC connectors, whereas the ECO8000 uses plain BNC connectors. Therefore, you will need to use a short coaxial cable with the appropriate connector at each end.

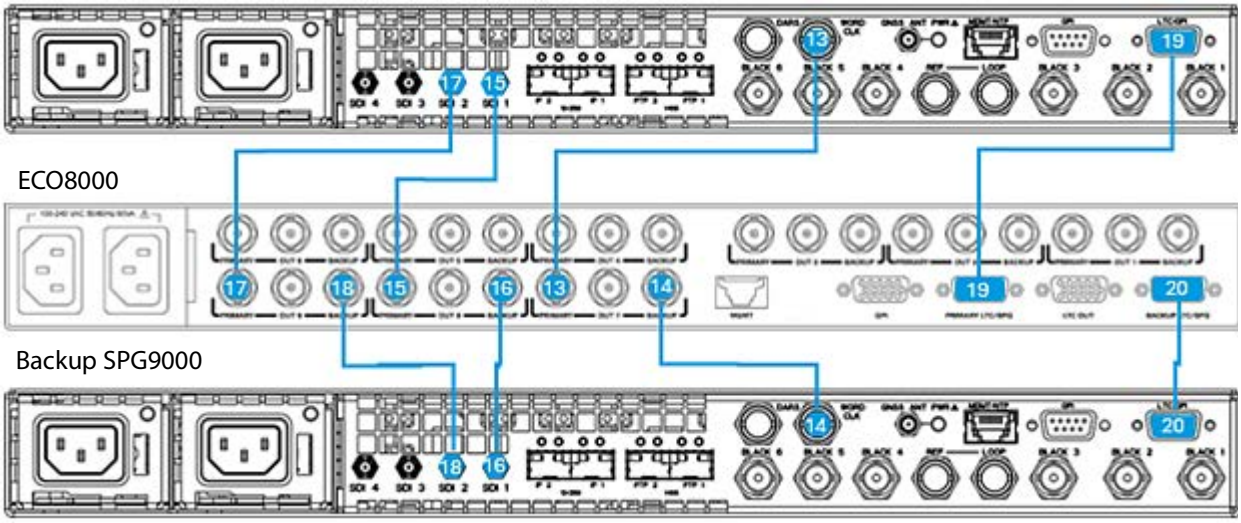
Note: The ECO8000 supports SDI signals of 270 Mbps (SD), 1.5 Gbps (HD) and 3 Gbps (HD), but does not support 12G-SDI or 6G-SDI signals. Therefore, if any of the SDI 1–4 outputs of the SPG9000 are configured for these formats, they cannot be used with the ECO8000.

The four LTC channels share a common 15-pin D-sub connector for both the connections to the primary and backup SPG9000s, and for the LTC OUT connector. Use a high-quality VGA-style video cable for the SPG9000 connections, and use the XLR breakout cable for the LTC OUT connector.

Note: The LTC 1 connection for the SPG9000 can be configured as an input time source or as an output time code signal. The ECO8000 LTC 1 channel must be configured to match the two SPG9000 units. See *LTC Configuration Menu*.

The following diagram shows the connections for two SDI signals (SDI 1–2 from the pair of SPG9000 units), the WORD CLK signal, and the LTC signals. This set of connections is one example; other combinations are supported.

Primary SPG9000



System Operation

This section describes the basic operation of the ECO8000. This includes descriptions of the front panel of the ECO8000 and how to navigate the on-screen menus. There are also details of how to use the web interface for remote control, configuration and status reporting. Lastly, this section also explains how to control the instrument through the application programming interface (API) and the general purpose interface (GPI).

Front-Panel Interface

This section provides information about operating the instrument using the front-panel buttons and display. These menus and selections are similar to those on the web interface.

Front-Panel Layout

The ECO8000 front panel includes a small display for configuration menus and status messages, and two clusters of buttons. The control buttons on the left side of the front panel are used by the Channel Control System. The menu buttons to the right of the display are used to access and navigate the configuration menus.

PANEL ENABLE: Press and hold for four seconds to enable or disable the other control buttons. The instrument beeps to indicate the change in the enable/disable status of the front-panel control buttons. This button is illuminated when the front panel is currently enabled. The menu buttons are not affected by the enable/disable status of the control buttons.

FAULT RESET: Press to clear the individual channel fault history on the front-panel LEDs. Any yellow LEDs (indicating a previous fault that has cleared) will change color to green. Any red LEDs will remain red.

AUTO: Press to select Automatic changeover mode. This button is illuminated when the ECO8000 is in Automatic mode. See *Channel Control System*.

MANUAL: Press to select Manual changeover mode. This button is illuminated when the ECO8000 is in Manual mode. See *Channel Control System*.

PRIMARY: Press to select the Primary SPG signal sources. The changeover mode must be set to Manual before you can change the source. This button is illuminated when the ECO8000 is switched to the Primary SPG.

BACKUP: Press to select the Backup SPG signal sources. The changeover mode must be set to Manual before you can change the source. This button is illuminated when the ECO8000 is switched to the Backup SPG.

Arrow buttons: Use the △ (up) and ▽ (down) buttons to scroll through the list of available menus, use the ◁ (left), and ▷ (right) buttons to view the list of available options for the current menu.

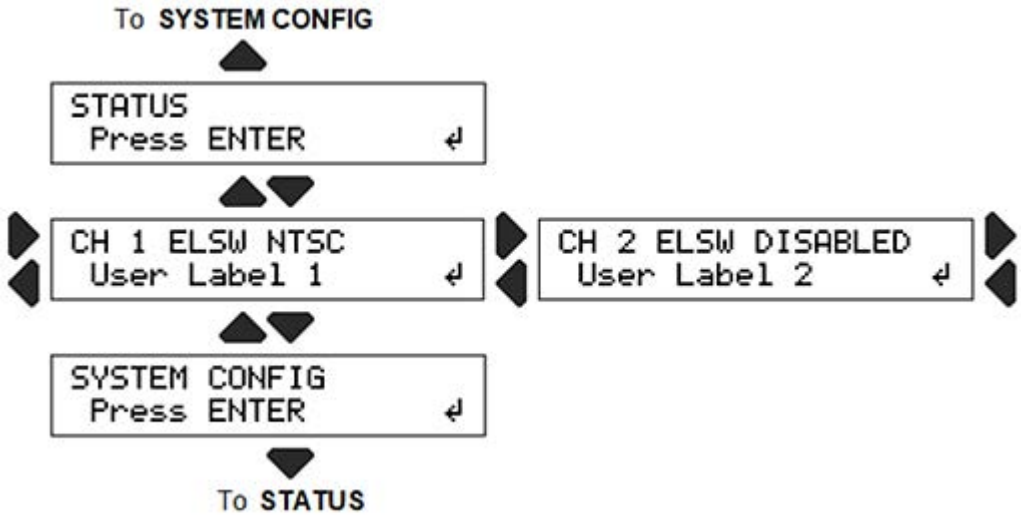
ENTER: Press to enter a submenu or to accept the selected option.

BACK: Press to return to a previous menu or to exit editing mode.

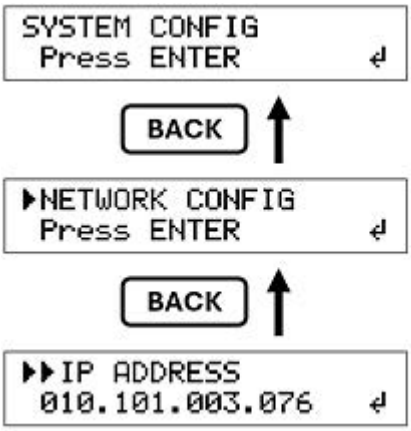
Menu System

The ECO8000 front-panel interface is organized with a hierarchical list of menus. The top line of the display shows the current menu name, and the bottom line shows the value for that menu. If the backlight for the display is turned off, press any menu button to turn on the backlight.

Menus are organized into a circular list. Press the down arrow button to move to the next menu, or the up arrow button to move to the previous menu. If you press the down arrow button at the bottom of the list, you will move back to the top. Similarly, pressing the up arrow button at the top of the list will move to the menu at the bottom of the list.



Submenus in the nested hierarchy are indicated by one or more arrow indicators preceding the menu name on the top line of the display. Press the **BACK** button to return to the previous level.



The top level of the menu hierarchy has three menus:

STATUS: Select this menu item and press **ENTER** to access the submenus from which you can view any faults and view the Event Log. See *Event Log*.

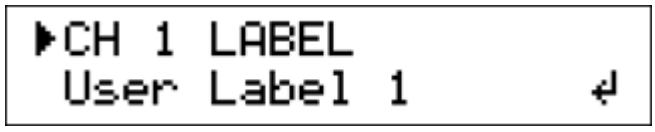
Channel menus: Use the left and right arrow buttons to cycle through the 13 channel menus (CH 1 to CH 9 and LTC 1 to LTC 4). The top line of each menu shows the channel number, the channel type (ELSW, RELAY or LTC), and the channel status or threshold level. The second line shows the user-configured label for the channel. Press **ENTER** to access the channel configuration submenu. See *Channel Configuration*.

SYSTEM CONFIG: Select this menu and press **ENTER** to access each of the system-wide configuration submenus. See *General System Configuration*.

Menu Operations

To navigate through the menu system, use the four arrow buttons in conjunction with the **ENTER** and **BACK** buttons. The display uses various symbols to help you navigate the menus and make selections:

- A "carriage return" symbol in the bottom right corner of the display indicates that the ENTER button can be used to access a submenu, accept the selected item, or enter editing mode for string values.



- When editing values such as a channel label or IP address, the currently editable character will be underlined. Press the left or right button to select the previous or next character. Press the up or down button to change the current character. For example, when editing a numeric value, pressing up or down will cycle through the

digits 0–9. Press **ENTER** to accept the new string value and exit editing mode or press **BACK** to exit editing mode to cancel any changes.

- A bullet symbol to the left of an option indicates the current selection for that menu. Press the left or right arrow buttons to cycle through all available options, then press **ENTER** to select a new option or **BACK** to exit the menu without making a change.

- A pair of left and right arrows in the bottom right of the display indicates more items to be viewed. This symbol is used on read-only status menus to view a long list of items from the two-line front-panel display.

Management Network Interface

The instrument has a 10/100 BASE-T Ethernet port on the rear panel that is used for management functions. You can remotely control the instrument through the web interface or using the Simple Network Management Protocol (SNMP).

This section provides instructions for configuring the network parameters of the management network interface.

NETWORK CONFIG Menu

From the top menu, go to the **SYSTEM CONFIG** menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **NETWORK CONFIG** submenu and press **ENTER**.

```
SYSTEM CONFIG
    ▶NETWORK CONFIG
      ▶▶DHCP
      ▶▶IP ADDRESS
      ▶▶SUBNET MASK
      ▶▶GATEWAY ADDRESS
      ▶▶MAC ADDRESS
```

DHCP

Enable to use Dynamic Host Configuration Protocol (DHCP) on the management interface. In this case, a DHCP server must be present on the network, and it assigns the IPv4 address, subnet mask, and gateway address to the DHCP client of the ECO8000. If

you enable DHCP, manual configuration of those values is disabled but the values provided by the DHCP server are displayed on read-only menus.

IP ADDRESS

Press **ENTER** to change the IPv4 address of the management interface. Enter the four octets of the IPv4 address, in dotted decimal notation. Each octet of the address uses three digits, with leading zeros if necessary. For example, an address of 10.101.3.76 would appear as 010.101.003.076 in this menu. If DHCP is enabled, the IPv4 address supplied by the DHCP server is displayed instead and cannot be edited.

SUBNET MASK

Enter the four octets of the subnet mask, in dotted decimal notation. If DHCP is enabled, the subnet mask supplied by the DHCP server is displayed instead and cannot be edited.

GATEWAY ADDRESS

Enter the four octets of the gateway address for this subnet, in dotted decimal notation. If DHCP is enabled, the gateway address supplied by the DHCP server is displayed instead and cannot be edited.

MAC ADDRESS

This is a read-only menu that displays the physical (MAC) address of the management port.

Web User Interface

After the management network interface has been configured, the SPG9000 can be accessed through a web-based user interface, using any modern browser. The default URL is:

`http://ip_address`

where `ip_address` is replaced with the IP address of the management network interface.

Access Control

The web interface must be enabled from the front panel. From the top menu, go to the **SYSTEM CONFIG** menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **WEB USER INTERFACE** submenu and press **ENTER**.

```
SYSTEM CONFIG
    ▶WEB USER INTERFACE
```

The four access control options are:

Disable: The web server responds with a message that the web interface is disabled.

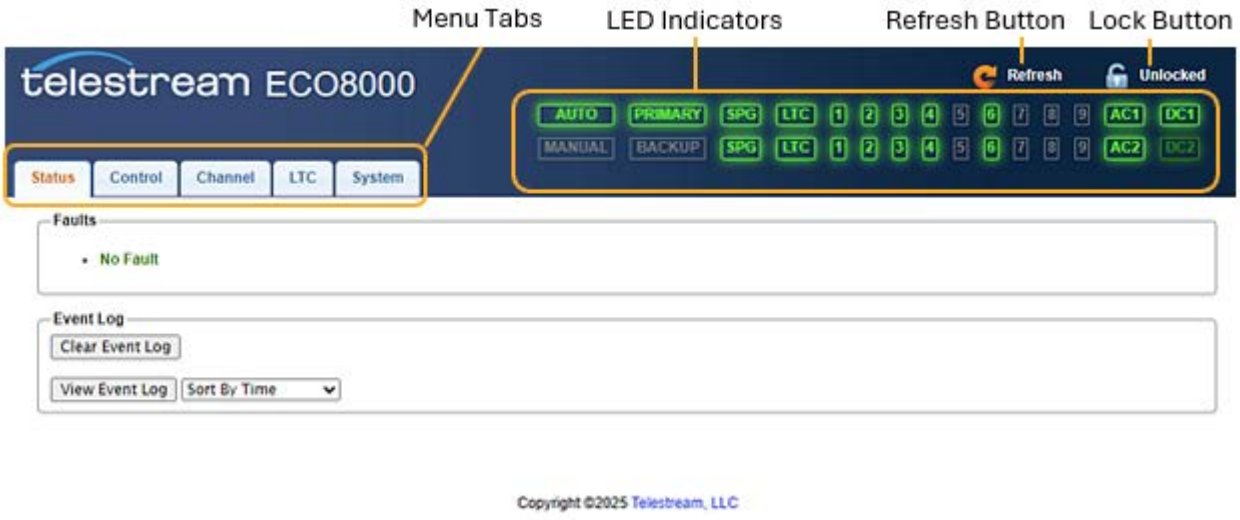
Read Only: The web interface cannot be unlocked, so you can only view the system status and configuration settings, without being able to make any changes. The Control tab is not available, so you cannot change between Auto or Manual mode.

Safe Control: The web interface can be unlocked, so you can change most configuration settings. The front panel must be set to Manual mode to make changes to any channel settings. However, the Control tab is not available on the web interface, so the front panel is required to change from Auto to Manual mode.

Extended Control: All web interface tabs are available, including the Control tab. The web interface user has full access to all configuration settings, including the ability to change between Auto or Manual mode and to select the Primary or Backup source in Manual mode.

Elements of the Web Interface

The web interface for the ECO8000 is a single-page application for viewing the current configuration and system state. The top banner (with a blue background) is always present, but the main page body (with a white background) depends on user navigation.

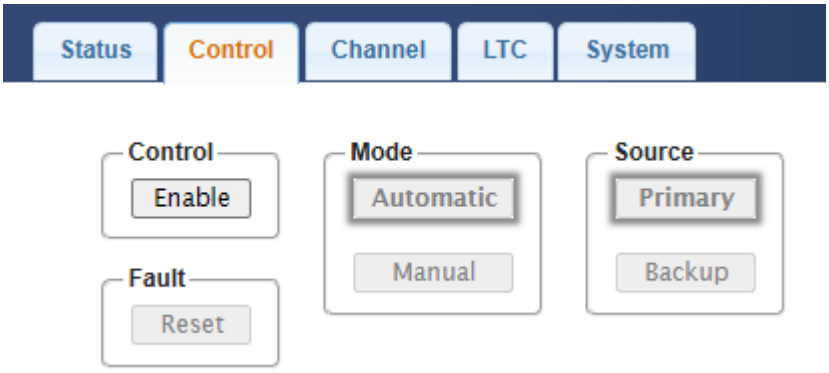


Menu Tabs

There are five tabs on the web interface page. Select a tab to view the appropriate buttons or menus for that tab.

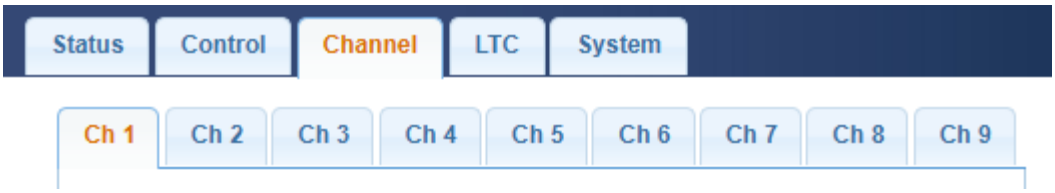
Select the **Status** tab to view any active faults and to view the fault history in the Event Log. See *Fault Status* and *Event Log*.

Select the **Control** tab to access the buttons for the channel control system. The web interface mimics the behavior of the front-panel buttons. For example, the Enable button must be highlighted before any other control buttons can be pressed. One of the two Mode buttons will be highlighted and one of the two Source buttons will be highlighted, based on the current state of the system.



This tab is only visible if Extended Control is selected from the WEB USER INTERFACE front-panel menu. See *Access Control*.

Select the **Channel** tab to configure any of the nine standard channels. Within this tab, a second set of tabs is used to select the specific channel.



Select the **LTC** tab to configure any of the four LTC channels. Within this tab, a second set of tabs is used to select the specific LTC channel.

Select the **System** tab to access system configuration settings, to change event reporting settings, or to view instrument diagnostics. See *General System Configuration*.

LED Indicators

The indicators on the top banner of the web interface page mirror the physical LED indicators on the front panel of the instrument. See *Channel Status Indicators*.

Refresh Button

Press this button to update the web interface. If configuration changes are made from the front-panel interface, they may not be reflected on the web interface unless the page is refreshed.

Lock Button

The web interface is locked when a new browser window is opened, to prevent accidental changes to the instrument configuration. Press the button to toggle between the Locked and Unlocked states.

If the page is unlocked, some configuration settings may still not be available to update. The instrument must also be in Manual mode to change the channel source or to change channel configuration settings.

SNMP

The ECO8000 uses the Simple Network Management Protocol (SNMP) as its Application Programming Interface (API). SNMP uses a Management Information Base (MIB) to describe the available objects that can be read by a GetRequest message or possibly updated by a SetRequest message. Some objects are read-only and can only be accessed by GetRequest messages.

The ECO8000 uses version 2c of SNMP, which uses two community strings as access passwords. The public community string is used for all read-only operations, and the private community string is used for read-write access.

SNMP includes a Trap message type for event notifications. The ECO8000 can be configured to send Trap messages to up to four SNMP Managers. See *Event Reporting Configuration*.

SNMP CONFIG Menu

To configure SNMP from the front panel, return to the **SYSTEM CONFIG** top-level menu and press **ENTER**. Press the up or down buttons to navigate to the **SNMP CONFIG** submenu and press **ENTER**.

```
SYSTEM CONFIG
    ▸SNMP CONFIG
      ▸▸TRAP EVENTS
          ▸▸▸PRIMARY FAULT
          … other event menus
      ▸▸PUBLIC COMMUNITY
      ▸▸PRIVATE COMMUNITY
      ▸▸TRAP ADDRESS 1
```

```
      ▸▸TRAP ADDRESS 2
      ▸▸TRAP ADDRESS 3
      ▸▸TRAP ADDRESS 4
```

TRAP EVENTS

Press **ENTER** for the submenus for the event list. Press the up or down arrow buttons to select the event type, and press the left or right arrow buttons and then **ENTER** to enable or disable the event type for SNMP Trap reporting.

PUBLIC COMMUNITY

Press **ENTER** to edit the public community string for read-only access to objects in the MIB. The default string is "public" and should be changed to a non-default value.

PRIVATE COMMUNITY

Press **ENTER** to edit the public community string for read/write access to objects in the MIB. The default string is "private" and should be changed to a non-default value.

Note: Do not use the same string for both public and private community strings. The ECO8000 requires different strings for correct operation.

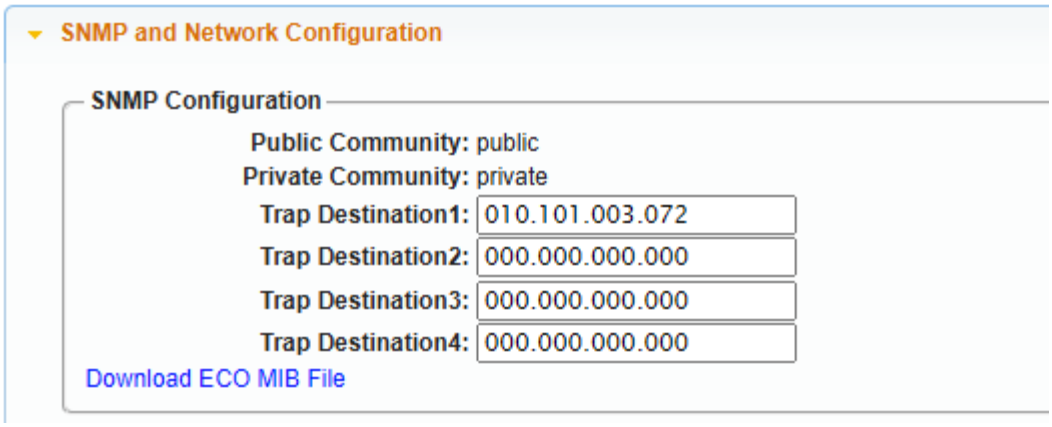
TRAP ADDRESS 1–4

Press **ENTER** to edit the IP address for the destination for Trap messages. The address is entered using dotted-decimal notation with leading zero digits if necessary. For example, an IPv4 address of 10.101.3.72 would be entered as 010.101.003.072. Use an address of 000.000.000.000 to disable any of the four Trap destinations.

Web Interface for SNMP

On the web interface, select the **System** tab and then select the **SNMP and Network Configuration** section. The public and private community strings cannot be edited from the web interface but must be set from the front panel menus.

You can download the MIB for the ECO8000 by selecting the **Download ECO MIB File** link on the web interface. This file can then be imported into the SNMP management system so that objects can be referenced by name instead of by object identifier (OID) strings.


SNMP and Network Configuration
SNMP Configuration
Public Community: public
Private Community: private
Trap Destination1: 010.101.003.072
Trap Destination2: 000.000.000.000
Trap Destination3: 000.000.000.000
Trap Destination4: 000.000.000.000
Download ECO MIB File

Changeover Configuration and Operation

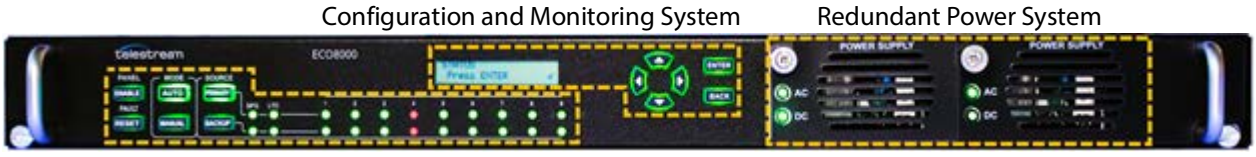
This section describes the functionality and operation of the changeover system and how to configure each channel for the appropriate signal type.

Operational Overview

The ECO8000 has three main subsystems:

- Channel control system
- Configuration and monitoring system
- Redundant power system

These three subsystems are loosely coupled to assume maximum reliability of the main ECO8000 function of sensing faults on the input signals and switching to a backup if necessary.



Channel Control System

The channel control system monitors the signal level on each input, and switches to the other source if a fault occurs. This subsystem is implemented as a simple hardware state machine to maximize reliability. This portion of the instrument is accessed by using the buttons on the left side of the front panel, and the status is displayed on the button lights and the per-channel LED indicators on the front panel.

If the instrument is in Auto mode, then the channel control system locks out any changes from the other subsystems. This prevents most issues in the other subsystems from impacting the basic operation of the ECO8000.

When the instrument is powered on, the channel control system restores all basic configuration settings that were in place when the instrument was powered off. This restoration is independent of the processor booting to run the display and the

configuration and monitoring system. If the configuration and monitoring system is rebooted, the channel control system is unaffected.

If the instrument loses power, the REF/ELSW channels will automatically switch from electronic to relay mode to maintain the signal throughput. These channels will automatically switch back to electronic mode when power is restored. When the REF/ELSW channels switch from electronic mode to relay mode and back, the sync on these channels will experience a momentary glitch.

In Auto mode, the channel control system will changeover only when necessary. If there is a signal fault on any enabled and triggered Primary channel, and the Backup channel has a good signal, the changeover will occur. If the Backup channel also has a faulty signal, the changeover will not occur. If the signal fault is cleared after a changeover event, the ECO8000 will continue to use the Backup channel and will avoid an unnecessary second changeover event. Use Manual mode to reset the Primary and Backup channel usage if desired. But if a signal fault on the Backup channel occurs and the Primary signal is good, the ECO8000 will switch back to the Primary channels.

Configuration and Monitoring System

The configuration and monitoring system is software based and includes the menu-based user interface. This system is accessed by using the buttons and display on the right side of the front panel and by using the web interface or API via the management network interface.

If the instrument is in Manual mode, then the configuration and monitoring system can program the settings in the channel control system. For example, it can set the level threshold on each channel or disable unused channels. When the instrument is in Auto mode, most configuration is disabled and this subsystem is used for monitoring only.

If the configuration and monitoring system processor stops running, a 20-minute watchdog timer in the channel control System will automatically cause a processor reboot. If the watchdog timer causes a reboot, the event is entered in the event log.

Under certain conditions, such as after several years of continued use, you may want to reboot the configuration and monitoring system. You can reboot this system by pressing and holding the **ENABLE** and **RESET** buttons for about five seconds until the instrument beeps about five times. Rebooting this system will have no effect on the other subsystems. When this system is rebooted, a power-on self test is performed. See *Power-on Self Test*.

Redundant Power System

The redundant power system monitors each power supply module and switches to the backup if the preferred supply has a problem. This subsystem is independent of the other two systems. The Configuration and Monitoring system can set some parameters in the Redundant Power system and display its status. See *Power Supply Management*.

Channel Configuration

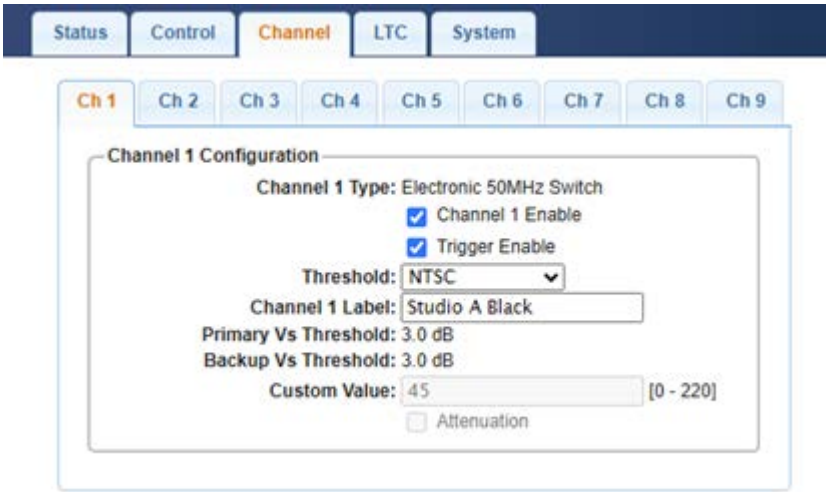
Channel configuration for the ECO8000 is done in Manual mode. When the system is fully configured, and all channels in use show green status LEDs and good signal margin, switch the instrument to Auto mode. When the instrument is in Auto mode, the channel configuration is disabled, and the system will react to input signal faults. In Auto mode, monitoring can be done locally through the front panel display or remotely through the web interface with no risk of accidental changes that would impact the basic changeover operation.

CH Configuration Menu

To configure any channel from the front panel, go to the top-level channel menu and press the left or right arrow buttons until the desired channel number is shown on the top menu row. Channels 1–6 will be identified as "ELSW" and channels 7–9 will be identified as "RELAY". The configured threshold or "DISABLED" will also be displayed in the menu name. The second row of the display will show the user-specified text label for that channel.

`CH n <type> <threshold>`	
▸`CH n ACTIVE`	
▸`CH n TRIGGER`	
▸`CH n THRESHOLD`	
▸▸`P: 0.0dB B: 0.0dB`	Only available if THRESHOLD is Custom
▸▸`ATTENUATION`	Only available for ELSW channels and if THRESHOLD is Custom
▸`CH n RELAY CHECK`	Only available for RELAY channels 7–9
▸`CH n LABEL`	

From the web interface, select the **Channel** tab and then select the tab for the specific channel number.



ACTIVE

Enable the channel to indicate that signals are present on the primary and backup inputs for this channel. Disable the channel if it is not used. Unused channels that are enabled will appear as faults for the status indicators and other alarms. Disabled channels will have unlit status indicators. Disabled channels are still switched if another channel causes a changeover event.

TRIGGER

Select to indicate that this channel can cause a changeover between sources if the signal level drops below the configured threshold. If a channel is enabled but its trigger is disabled, the channel will still switch sources if another channel causes the changeover.

THRESHOLD

Select the desired threshold level for the channel. Several predefined threshold levels are available for each channel type, or a custom threshold level can be configured.

ELSW (CH 1–6)	RELAY (CH 7–9)
NTSC	NTSC
PAL	PAL
TRILEVEL	TRILEVEL
AES	AES
WC 1V	WC 1V
WC 5V	SD-SDI
Custom	HD-SDI
	3G-SDI
	Custom

Custom Threshold

When the threshold is set to Custom, you can tune the digital-to-analog converter (DAC) more precisely. This setting is useful when using other signal types for the channel, such as NTSC-J (which uses 0 IRE for black instead of 7.5 IRE for NTSC-M) or color bars instead of black. Increase or decrease the DAC value (between 0 and 220) until the signal is close to +3 dB relative to the threshold level. The values of Primary Vs Threshold and Backup Vs Threshold are displayed on both the web interface and the front-panel menus. Adjust the signal level or custom threshold as necessary until these margins are both close to +3 dB.

ATTENUATION

When the threshold is set to Custom for ELSW channels (1–6), you can add additional attenuation of approximately 14 dB to the input signal before the threshold detection circuit. This setting is not needed for typical signal levels.

RELAY CHECK

For HREF channels (7–9), you can enable a relay check function. The HREF channels rely exclusively on relays for signal switching. On rare occasions after long periods of inactivity, the relay contacts can build up a nonconductive coating on the relay contacts. This coating can create a condition so that when a fault occurs and the ECO8000 switches between primary and backup sources, the signal will not pass through the ECO8000 to the output.

When enabled, the relay check function measures the signal level on each HREF input before and after every changeover switch. If the signal level indicates that the channel is not connected to an output load, then it is possible that the relay is not properly closed for that channel. In that case, the instrument will cycle the relay 20 times to attempt to wear through the layer of nonconductive coating to restore the connection.

CAUTION: Do not enable the relay check function on channels that are not terminated, since the unterminated output looks similar to an open relay and will cause unfounded relay check events.

LABEL

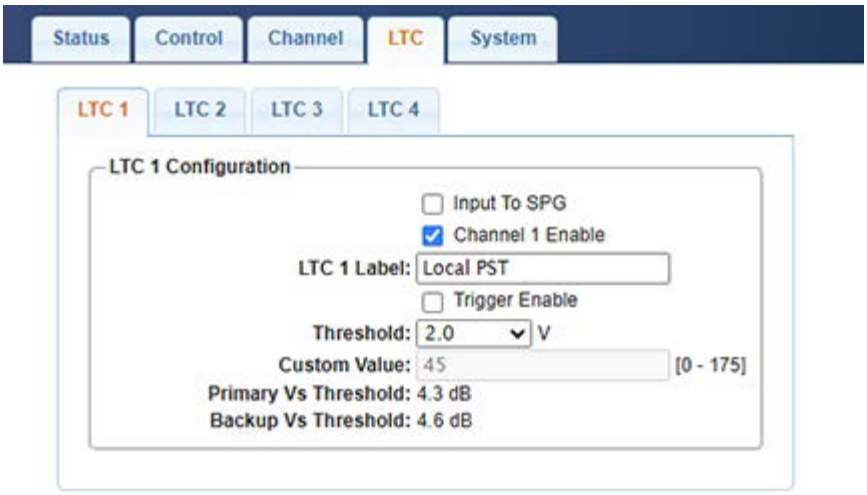
You can edit the user-specified label for each channel, to help identify channels using their signal type, physical location, or purpose instead of just by the channel number. On the front-panel display, each label is shown at the top-level channel menu when navigating between channels with the left and right arrow buttons.

LTC Configuration Menu

To configure any channel from the front panel, go to the top-level channel menu and press the left or right arrow buttons until the desired LTC channel number is shown on the top menu row. The configured threshold or "DISABLED" will also be displayed in the menu name. The second row of the display will show the user-specified text label for that channel.

`LTC n <threshold>`	
▸`LTC 1 INPUT-OUTPUT`	Only available for LTC 1
▸`LTC n ACTIVE`	
▸`LTC n TRIGGER`	
▸`LTC n THRESHOLD`	
▸▸`P: 0.0dB B: 0.0dB`	Only available if THRESHOLD is Custom
▸`LTC n LABEL`	

From the web interface, select the **LTC** tab and then select the tab for the specific channel number.



INPUT-OUTPUT

The LTC 1 channel (only) can be configured as Output from SPG or Input to SPG. This setting must match the configuration settings for LTC 1 Mode on both primary and backup SPG9000 systems.

When the SPG9000 LTC 1 Mode is configured as Output, the ECO8000 LTC 1 channel must be configured as Output from SPG. With these settings, the LTC 1 channel functions like the LTC 2–4 channels and the CH 1–9 channels, where the ECO8000 switches either the primary input or the backup input to its output for that channel.

If the SPG9000 LTC 1 Mode is configured as Input (so that the LTC signal can be used as a time-of-day source), the ECO8000 LTC 1 channel must be configured as Input to SPG. With these settings, the LTC 1 signal on the LTC OUT connector is instead always connected to both SPG9000 systems for their respective inputs.

ACTIVE

Enable the channel to indicate that signals are present on the primary and backup inputs for this channel. Disable the channel if it is not used. Unused channels that are enabled will appear as faults for the status indicators and other alarms. Disabled channels will have unlit status indicators. Disabled channels are still switched if another channel causes a changeover event.

TRIGGER

Select to indicate that this channel can cause a changeover between sources if the signal level drops below the configured threshold. If a channel is enabled but its trigger is disabled, the channel will still switch sources if another channel causes the changeover.

THRESHOLD

Select the desired threshold level for the LTC channel, as a voltage between 0.5 V and 5.0 V in 0.5 V steps, or as a Custom threshold.

When the threshold is set to Custom, you can tune the digital-to-analog converter (DAC) more precisely. Increase or decrease the DAC value (between 0 and 220) until the signal is close to +4 dB relative to the threshold level. The values of Primary Vs Threshold and Backup Vs Threshold are displayed on both the web interface and the front-panel menus. Adjust the signal level or custom threshold as necessary until these margins are both close to +4 dB.

LABEL

You can edit the user-specified label for each channel, to help identify channels using their signal type, physical location, or purpose instead of just by the channel number. On the front-panel display, each label is shown at the top-level channel menu when navigating between channels with the left and right arrow buttons.

Channel Status Indicators

There are two rows of colored LED indicators on the front panel of the instrument, that show the status of the changeover channels:

These indicators are mirrored on the web interface, on the right side of the banner at the top of the page. When a physical front-panel indicator changes state, the web page indicator also changes.

The web interface banner also includes indicators for the two power supply modules, and indicators that mirror the Mode and Source buttons on the front panel.

The top row of 11 LEDs show the status of the signals from the Primary SPG9000 source and the bottom row shows the status of the signals from the Backup SPG9000 source.

SPG: Shows the status of the SPG Trigger input. See *SPG Input Trigger*.

LTC: Shows the combined status of all LTC channels that are enabled.

1 to 9: Shows the status of the respective ELSW channels (1–6) and Relay channels (7–9).

The color of each LED indicates the status:

- **Green:** Indicates normal operation with no faults for the signal.
- **Red:** Indicates an active fault condition. The front-panel LED also blinks on and off to help draw attention to the fault.
- **Yellow:** Indicates a past fault condition that has since been cleared. Pressing the FAULT RESET button will clear the fault history and all yellow indicators will change to green.
- **Off:** Indicates that the channel is disabled. There may be an active signal on the input, but if the channel is configured as disabled, the signal level is not checked.

Fault and Event Reporting

The ECO8000 monitors several operational parameters and records events when any fault occurs. The instrument provides four methods for reporting fault events: SNMP trap, e-mail message, GPI output, and an audible beeper. You can configure which events are reported using any combination of these methods.

Faults and Events

The following table describes the faults and events that may be reported by the instrument:

Fault or Event	Description
Primary Fault	One or more of the active primary input channels is being driven by a signal that is below the configured level threshold for that channel.
Backup Fault	One or more of the active backup input channels is being driven by a signal that is below the configured level threshold for that channel.
Primary/Backup Switch	The instrument has switched sources from primary to backup (or vice-versa), either manually or automatically.
Power Supply (1 or 2) Load Test Fail	The indicated power supply module failed the last manual or automatic load test. See *Load Test*.
Power Supply (1 or 2) AC Fault	The AC input to the indicated power supply has failed.
Power Supply (1 or 2) DC Fault	The 12 V DC output of the indicated power supply has failed.
Power Supply (1 or 2) Fan Fault	The fan in the indicated power supply has failed.
Power Supply (1 or 2) Warning	The 12 V DC output level on the indicated supply is above or below the nominal range.

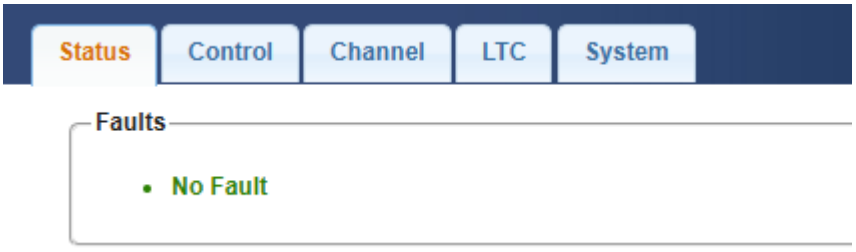
Fault or Event	Description
Power Supply (1 or 2) Temperature Fault	The indicated power supply is over temperature.
Power Supply (1 or 2) TWH Warning	The TWH limit has been exceeded on the indicated power supply. See *Temperature Weighted Hours*.
Power Supply Switch Over	The instrument has switched from using one power supply to using the other power supply.
Main Board Supply Fault	A power supply has failed on the indicated circuit board. See *System Diagnostics*.
Temperature Fault	The instrument is operating at too high a temperature.
Backup Test Due	The recommended test interval for checking the backup channels has been exceeded.
Power On Start Test Failed	A failure was detected during the power-on self test. See *Power-on Self Test*.
HREF Relay Failed	A relay failure was detected on one of the HREF channels.
Reboot Normal	The instrument was rebooted manually.
Reboot Watchdog	The CPU of the Configuration and Monitoring system was rebooted automatically when its watchdog signal was not detected.

Fault Status

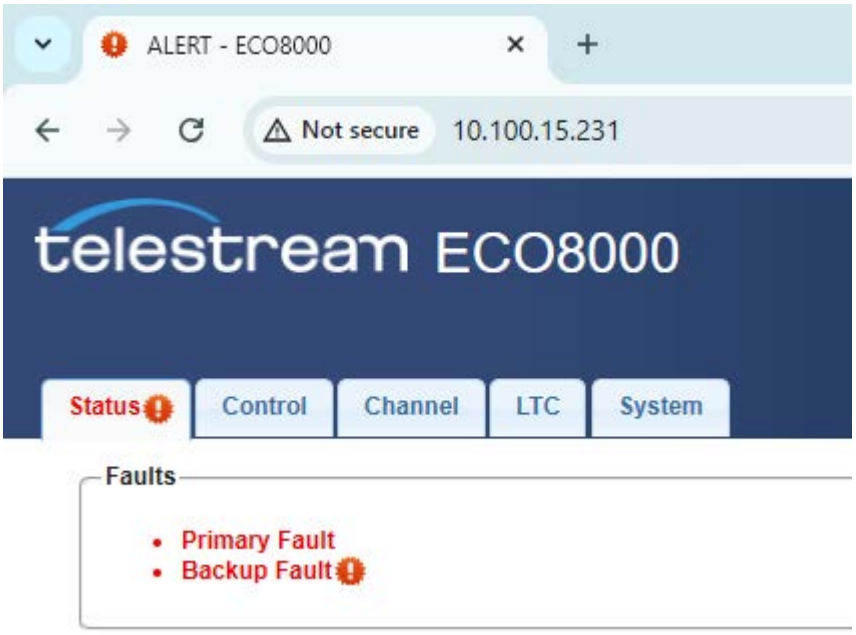
To view active faults from the front panel, go to the top-level **STATUS** menu and press **ENTER** to go to the FAULT submenu. Press the left or right arrow buttons to cycle through the list of active faults, if any.

```
STATUS
    ▸FAULT
```

To view active faults from the web interface, select the **Status** tab. The top section will show a list of any active faults.



If there are any active faults, the Status tab name will be colored red and an error indicator will be displayed, so if any other tab is currently open, you will see the fault notification. Additionally, the browser tab will display the red indicator and "ALERT" is added to the tab name, so if any other browser tab is open, you can be alerted to the ECO8000 fault.



Event Reporting Configuration

The ECO8000 can report faults and events by four different methods:

SNMP Trap Message: The instrument can send Trap messages to up to four SNMP managers. To configure the SNMP agent of the ECO8000, see *SNMP*.

Email Message: The instrument can send an email message to a local SMTP mail server, for delivery to a specific email address. See *Email Configuration*.

General Purpose Interface: The instrument can assert an output (pin 10) on the general-purpose interface. See *GPI Connector*.

Beeper: The audible beeper in the ECO8000 can emit a beep when enabled events occur. Some events, such as a primary/backup source switch, emit a single beep. Other events, such as a primary fault, emit one beep per second for as long as the event is active.

From the web interface, one menu is used to configure the desired reporting methods for each available fault or event type. Select the **System** tab and then select the **Event Reporting** section. Select the checkbox for each desired event and reporting combination:

Event Reporting

	Trap Events	Beeper Events	E-Mail Events	GPI Events
Primary Fault	☑	☐	☐	☑
Backup Fault	☑	☐	☐	☑
Primary / Backup Switch	☑	☐	☐	☐
PowerSupply1 Load Test Fail	☐	☑	☐	☐
PowerSupply2 Load Test Fail	☐	☑	☐	☐
PowerSupply1 AC Fault	☐	☑	☐	☐
PowerSupply1 DC Fault	☐	☑	☐	☐
PowerSupply2 AC Fault	☐	☑	☐	☐
PowerSupply2 DC Fault	☐	☑	☐	☐
PowerSupply1 Fan Fault	☐	☑	☐	☐
PowerSupply2 Fan Fault	☐	☑	☐	☐
PowerSupply1 Warning	☐	☑	☐	☐
PowerSupply2 Warning	☐	☑	☐	☐
PowerSupply1 Temperature Fault	☐	☑	☐	☐
PowerSupply2 Temperature Fault	☐	☑	☐	☐
PowerSupply1 TWH Warning	☐	☐	☑	☐
PowerSupply2 TWH Warning	☐	☐	☑	☐
PowerSupply Switch Over	☑	☐	☐	☐
Main Board Supply Fault	☐	☑	☐	☐
Temperature Fault	☐	☑	☐	☐
Backup Test Due	☐	☐	☑	☐
PowerOnStart Test Failed	☐	☑	☐	☐
HREF Relay Failed	☐	☑	☐	☐
Reboot Normal	☑	☐	☑	☐
Reboot Watchdog	☐	☑	☐	☐

From the front-panel menu, the four event selection menus are submenus within the **SYSTEM CONFIG** menu:

```
SYSTEM CONFIG
    ▶SNMP CONFIG
      ▶▶TRAP EVENTS
    ▶EMAIL REPORTING
      ▶▶EMAIL EVENTS
    ▶GPI EVENTS
    ▶BEEPER EVENTS
```

Press **ENTER** to view the selected event submenu, then press the up and down arrows to cycle through the list of available events. Press the left or right arrow and then press **ENTER** to enable or disable the event for the selected reporting method.

Event Log

The ECO8000 maintains an Event Log in non-volatile memory. The log is a list of up to 1024 event occurrences, with the date and time and the event type stored for each incident.

To view the Event Log from the front panel, go to the top-level **STATUS** menu and press **ENTER**. Press the up or down arrow button to select how to view the list of events.

```
STATUS
    ▸EVENT LOG (BY TYPE)
      ▸▸PRIMARY FAULT
      ...other event menus
    ▸EVENT LOG (BY TIME)
    ▸LAST EVENT BY TYPE
    ▸CLEAR EVENT LOG
```

From the web interface, select the **Status** tab to view the Event Log section. Select how to view the list of events from the pull-down menu, then press the **View Event Log** button.

Sort By Type

In this mode, each event type is listed separately, and within those lists the events are sorted by time.

On the front-panel menu, press the up or down arrow buttons to select the event type. Press the left or right arrow buttons to cycle through all recorded occurrences of that event type. The date and time of each event is shown.

On the web interface, a new browser tab is opened with the event log list. The page shows a table of event occurrences for each event type, sorted by date and time within each table.

Sort By Time

In this mode, a single list of all events is presented, ordered by the date and time of occurrence. Each item in the list shows the event type and time.

On the front-panel menu, press the left or right arrow button to browse the list. The first line of the submenu will show the event type and the second line will show the date and time.

On the web interface, a new browser tab is opened with the event log list. The page shows a single table of all events, with the event type and the time of occurrence for each item in the table.

Last Event By Type

In this mode, a single list of all possible events is presented, ordered by event type. The most recent time of occurrence for each event is shown, or "No occurrence found" is shown if that event is not one of the most recent 1024 logged events. At most, one event per type is presented.

On the front-panel menu, press the up or down arrow button to browse through the event list.

On the web interface, a new browser tab is opened with the event log list. The page shows a single table of all possible event types, with the time of occurrence (or "No occurrence found") shown for each event type.

Clear Event Log

Select to clear all entries from the event log.

General System Configuration

This section describes the system-wide configuration options for the ECO8000 that are not part of the channel configuration.

SPG Input Trigger

The SPG9000 can use one of its General Purpose Interface (GPI) outputs to trigger a source changeover on the ECO8000. For example, the GPI output of the SPG9000 can be configured to assert when there is a PTP grandmaster (GM) change from the active to passive state. Using this event as a changeover trigger would ensure that the black outputs are sourced from the same SPG9000 that is the current PTP GM.

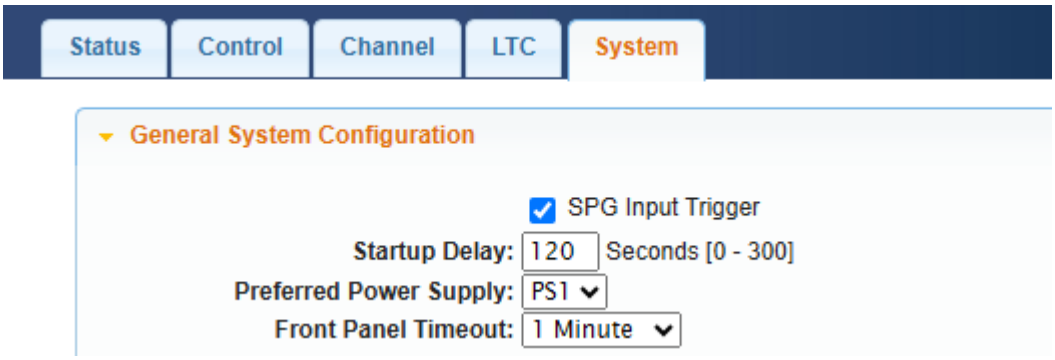
The SPG input trigger uses pin 1 of the D-sub connectors labeled PRIMARY LTC/SPG and BACKUP LTC/SPG on the rear panel. See *LTC Channels*. When 15-wire (VGA-style) cables are used to connect the ECO8000 to the two SPG9000s, these inputs are connected to the GPI output 1 from the two SPG9000s.

The SPG input trigger from the two SPG9000s can be monitored with the front-panel LED indicators labeled "SPG", with the same color coding as the channel inputs. See *Channel Status Indicators*.

To configure the SPG input trigger from the front panel, go to the top-level **SYSTEM CONFIG** menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **SPG INPUT TRIGGER** submenu.

```
SYSTEM CONFIG
    ▶SPG INPUT TRIGGER
```

To configure the SPG input trigger from the web interface, select the **System** tab and open the **General System Configuration** section. Select the checkbox to enable or disable the SPG input trigger. When enabled, the status indicator LEDs will be lit green or red, reflecting the state of the GPI output 1 signal from each SPG.



Startup Delay

The startup delay is the time period after the ECO8000 system powers on, during which the instrument will not make AUTO mode source switches. The Channel Control system and the basic changeover functions are fully operational a second or two after power is applied. However, when the SPG9000 powers on, its sync sources will not be ready for a longer duration. While the SPG9000s are initializing after being powered on, the ECO8000 could potentially make undesirable source switches as the various SPG9000 output signals turn on at different times.

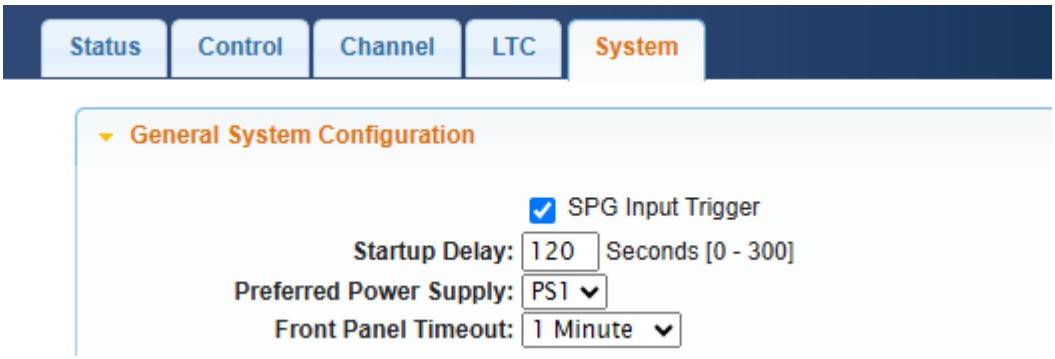
To prevent this, the ECO8000 can delay AUTO mode switching for a specified period. Additionally, at the end of the startup delay, any yellow LED states are cleared; this is effectively like asserting the FAULT RESET button at the end of the timeout period.

To configure the startup delay from the front panel, return to the **SYSTEM CONFIG** top-level menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **STARTUP DELAY** submenu.

```
SYSTEM CONFIG
    ▶STARTUP DELAY
```

Press the left or right arrow button to set the delay in seconds, to a maximum of 300 (5 minutes). For use with the SPG9000, a startup delay of at least 150–180 seconds is recommended. Some preset settings of the SPG9000 take longer to load, so the start time for the specific configuration should be measured and some extra margin added.

To configure the startup delay from the web interface, select the **System** tab and open the **General System Configuration** section. Select the checkbox to enable or disable the SPG Input Trigger. When enabled, the status indicator LEDs will be lit green or red.



Email Configuration

The ECO8000 can send email messages as part of its fault and event reporting function. See *Event Reporting Configuration* to select the events for which email messages should be sent.

The ECO8000 can send messages to a Simple Mail Transfer Protocol (SMTP) server using port 25. Authentication is not supported, so no username or password for the sender need to be specified.

To configure the email sender from the front-panel, return to the **SYSTEM CONFIG** top-level menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **EMAIL REPORTING** submenu.

```
SYSTEM CONFIG
    ▸EMAIL REPORTING
      ▸▸EMAIL SERVER ADDR
      ▸▸EMAIL ADDRESS FROM
      ▸▸EMAIL ADDRESS TO
      ▸▸SEND EMAIL
      ▸▸EMAIL EVENTS
```

To configure the email sender from the web interface, select the **System** tab and open the **E-Mail Setting** section.

EMAIL SERVER ADDR

Enter the IP address of the SMTP server, using dotted decimal notation. Each octet of the address uses three digits, with leading zeros if necessary. For example, an address of 10.101.2.50 would appear as 010.101.002.050 in this menu.

EMAIL SERVER FROM

Enter the email address that will appear as the sender of the message. This string is used with the MAIL FROM: command sent to the SMTP server.

EMAIL SERVER TO

Enter the email address for the recipient of the message. This string is used with the RCPT TO: command send to the SMTP server. The email address will need to be a valid destination for the server for deliver the message.

SEND EMAIL

Select to send a test message using the configured server address and email from/to addresses.

EMAIL EVENTS

Press **ENTER** for the list of submenus to select individual events for email reporting. See *Event Reporting Configuration*.

Internal Clock

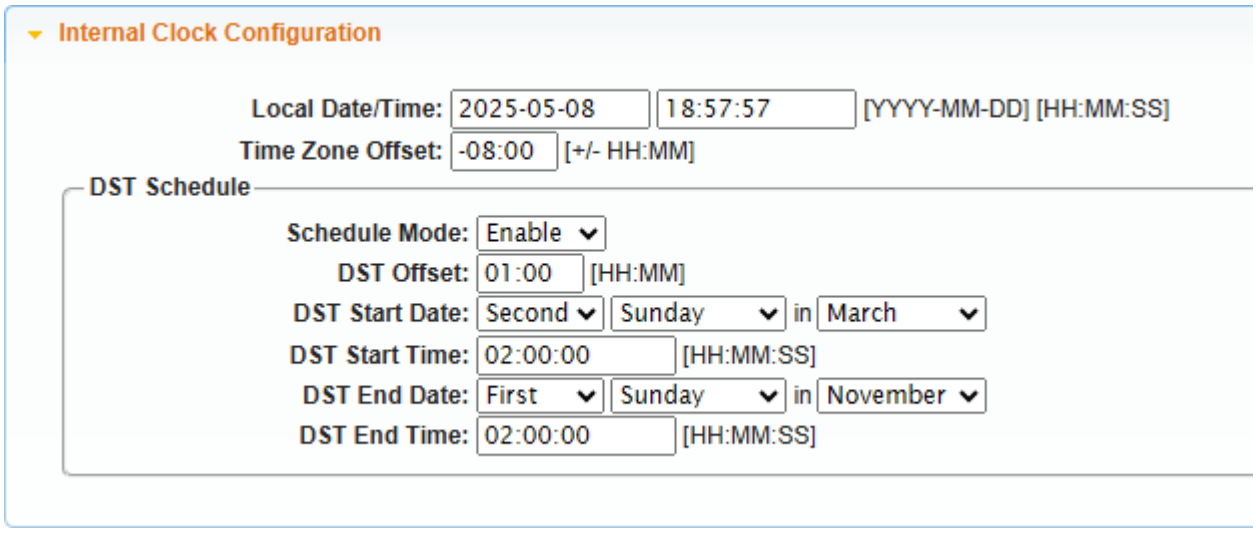
The system clock of the ECO8000 is used when events are recorded in the event log. The local time can be set by specifying the time zone offset and the start and end dates for daylight saving time.

To configure the system time from the front-panel, return to the SYSTEM CONFIG top-level menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **INTERNAL CLOCK** submenu.

```
SYSTEM CONFIG
    ▸INTERNAL CLOCK
      ▸▸LOCAL TIME
      ▸▸SET LOCAL TIME
          ▸▸▸SET LOCAL TIME
          ▸▸▸SET LOCAL DATE
          ▸▸▸TIMEZONE OFFSET
      ▸▸DST SCHEDULE
          ▸▸▸DST ENABLE
          ▸▸▸DST OFFSET
          ▸▸▸DST START DATE
```

```
▶▶▶DST START TIME
▶▶▶DST END DATE
▶▶▶DST END TIME
```

To configure the system time from the web interface, select the **System** tab and then open the **Internal Clock Configuration** section.



LOCAL TIME

The front panel **LOCAL TIME** submenu displays the current time (with time zone and DST offsets applied if applicable) on a read-only submenu.

SET LOCAL TIME

Press **ENTER** for the local time submenus. Enter the time as HH:MM:SS and the date as YYYY-MM-DD. Enter the time zone offset relative to UTC, without any DST offset. For example, the Pacific Time Zone is –08:00 from UTC, even though the offset is 7 hours during Daylight Saving Time.

DST SCHEDULE

A Daylight Saving Time offset can be added to or subtracted from the local time on a scheduled basis. The scheduled start and end dates and times are described in relative terms, such as "Second Sunday in March" so that you do not have to re-configure the DST start and end dates every year when those dates change naturally. You can configure the DST schedule as a permanent setting unless local legislation changes the rules.

The Daylight Saving Time rules (as of 2025) for several parts of the world are listed:

Regions	Start	End
Most of the United States and Canada	Second Sunday in March at 02:00	First Sunday in November at 02:00
European Union	Last Sunday in March at 01:00 UTC	Last Sunday in October at 01:00 UTC
Parts of Australia	First Sunday in October at 02:00	First Sunday in April at 03:00

Note: In European countries that observe daylight saving time, the local clocks change simultaneously at 01:00 UTC, which can be 01:00, 02:00, or 03:00 local time. Be sure to use local time when setting the DST start and end times on the ECO8000.

Front Panel Timeout

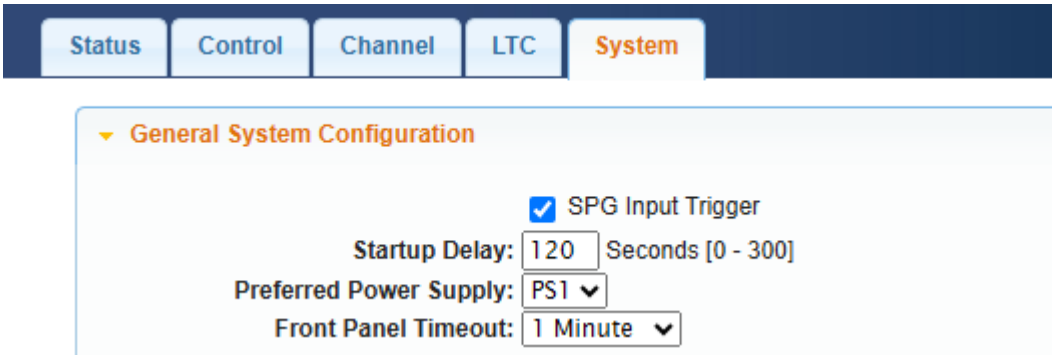
To protect against accidental changes to the Channel Control System, the front panel will automatically be disabled after a period of inactivity. You must manually press the **PANEL ENABLE** button to re-enable the buttons for the Channel Control System.

Note: The backlight of the LCD display has an independent timeout interval, to preserve the life of the backlight. The Front Panel Timeout setting does not affect the display backlight timeout. The display will be dim after 5 minutes of inactivity. Press any of the menu navigation buttons to turn on the display backlight.

To configure the timeout interval from the front-panel, return to the **SYSTEM CONFIG** top-level menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **FRONT PANEL TIMEOUT** submenu. Press the left or right arrow button and then press **ENTER** to select 1 minute or 5 minutes for the timeout interval.

```
SYSTEM CONFIG
    ▸FRONT PANEL TIMEOUT
```

To configure the front panel timeout interval from the web interface, select the **System** tab and then open the **General System Configuration** section.



LCD Contrast

The contrast of the front panel LCD can be adjusted. This setting can only be changed from the front-panel menu system.

Return to the **SYSTEM CONFIG** top-level menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **LCD CONTRAST** submenu. Press the left or right arrow button to adjust the contrast value, between 0 and 8.

```
SYSTEM CONFIG
    ▸LCD CONTRACT
```

Force Relay Path

The ELSW channels (1–6) have two signal paths: an electronic switch path that works when the power is on and a backup path through latching relays that is used when the instrument is turned off or loses power. When the Force Relay Path function is enabled, the relay path is used at all times. This function is intended for troubleshooting, but is generally not helpful or useful for normal operation. This setting can only be changed from the front-panel menu system.

Return to the **SYSTEM CONFIG** top-level menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **FORCE RELAY PATH** submenu. Press the left or right arrow button enable or disable and press **ENTER**.

```
SYSTEM CONFIG
    ▸FRONT RELAY PATH
```

Initialize Hardware

The ECO8000 can be reset to a factory default state if desired. The following settings are reset:

- All channels are enabled
- All ELSW and Relay channels are set as changeover triggers
- All ELSW and Relay thresholds are set to NTSC

- All LTC thresholds are set to 2 V
- The Relay Check function is disabled
- The SPG Input Trigger is disabled
- The Startup Delay is set to 15 seconds

CAUTION: To prevent a loss of instrument configuration and a disruption in the output signals, do not initialize hardware while the instrument is in service.

This function can only be performed from the front-panel menu system.

Return to the **SYSTEM CONFIG** top-level menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **INITIALIZE HW** submenu and press **ENTER**. A confirmation message will be shown; press **ENTER** again to proceed.

```
SYSTEM CONFIG
   ▸INITIALIZE HW
```

System Maintenance

This section describes how to maintain the ECO8000 system functionality, including how to:

- manage the redundant power system,
- view the system diagnostic measurements, and
- upgrade the instrument firmware.

Power Supply Management

The ECO8000 has two hot-swappable power supply modules that can be accessed from the front panel. When both supplies are functioning normally, the system will use one supply for main power and the second supply will operate on hot standby. This ensures that the two supplies are not used with the same load for the same amount of time. When the backup supply is needed, it will have its maximum remaining life.

If both supplies are good, the system will use the supply that is configured to be the preferred (active) supply. If one power supply has a problem, the system will automatically switch to the other supply. If either supply can support the instrument load, even if it has a non-fatal problem, the system will choose the best supply and attempt to continue to operate.

This section describes how to monitor and manage the redundant power system, and how to remove and replace a power supply module if necessary.

Power Supply Status

Two LEDs on the front panel indicate the power status and module status. The LEDs are located on the instrument, not to the power supply module itself, so status is available when the module is removed.

The AC LED shows the state of the power input from the mains connector on the back panel:

Power State	AC LED
Normal voltage	Green
AC voltage is < 75 V and module is installed	Red
No module power and module is not installed	Off

The DC LED shows the module status:

Power Supply State	DC LED
Normal, active	Green
Normal, backup	Dim green
Power supply module fault	Red
Marginal low or high DC, active	Orange
Marginal low or high DC, backup	Yellow
Load test fail, backup	Red
Load test fail, active	Orange
Fan fail, backup	Red
Fan fail, active	Orange
Module is not installed	Off

If the instrument loses power from both supplies, the LEDs continue to provide status to help troubleshoot the root of the problem. In this mode, the LEDs flash to conserve the power in the storage capacitor. Typically, the LED flashing should last for 10 minutes after the loss of power.

Power Supply State	AC LED	DC LED
AC present, DC bad	Flash green	Flash red
AC present, DC present, on-board converter failure	Flash green	Flash green
AC present, supply not installed	Flash green	Off
AC missing, DC missing	Flash red	Off
AC missing, supply not installed	Off	Off

When troubleshooting any power supply issues, follow these steps:

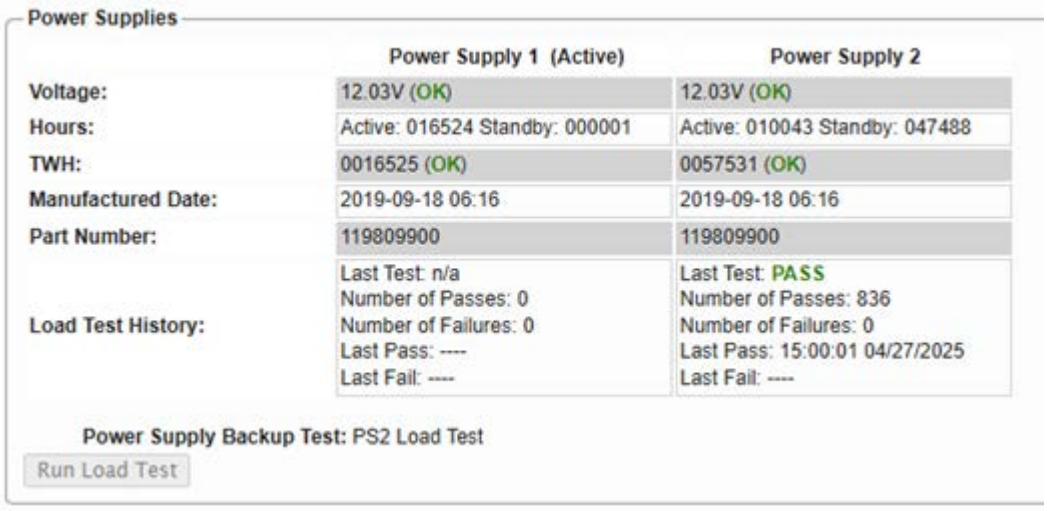
1. If the AC LED is red, check the power source connecting to the back panel of the instrument.
2. If the DC LED is red, replace the power supply module. New modules can be ordered from Telestream with the product code ECO800UP DPW.
3. If one supply shows a red DC LED and the other supply shows an orange DC LED, both supplies need to be replaced, but the system is currently operating with the orange supply. Replace the red supply first to prevent power loss.
4. Check the Diagnostics for system voltages, fan speed and temperature measurements. See *System Diagnostics*.

Temperature Weighted Hours

The instrument keeps track of the age of each power supply module by calculating a metric of temperature-weighted hours (TWH). When the operating temperature is 25 °C or cooler, the power supply module is expected to last 15 years. At the maximum operating temperature of 50 °C, the expected life of the supply decreases to only 5 years.

Every hour, the instrument measures the temperature and updates the TWH total for each power supply. The active supply operates at a warmer temperature than the backup supply so the TWH of the active supply increases faster than the TWH of the backup supply. When the TWH value reaches 131400 hours, an entry will be added to the Event Log and notifications will be sent to indicate that the power supply should be replaced. See *Fault and Event Reporting*.

The current TWH values for the power supplies can be viewed on the diagnostics menus. On the web interface, go to the **System** tab and open the **Diagnostics** section.



On the front-panel interface, return to the top menu, go to the **SYSTEM CONFIG** menu, and press **ENTER**. Press the up or down arrow buttons to navigate to the **DIAGNOSTICS** submenu and press **ENTER**. Press the up or down arrow buttons to navigate to the **PS1 HOURS** and **PS2 HOURS** submenus. Press the left or right arrow

buttons to view the active, standby and temperature-weighted hours for the power supply module.

```
SYSTEM CONFIG
    ▸DIAGNOSTICS
      ▸▸PS1 HOURS
      ▸▸PS2 HOURS
```

Preferred Power Supply

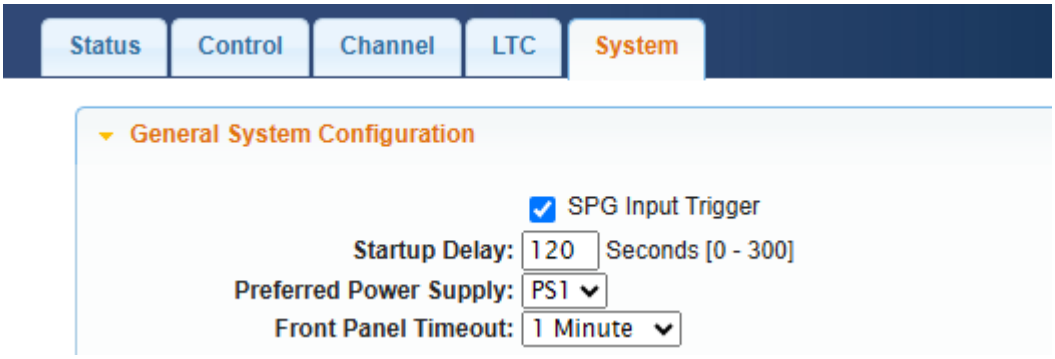
When two power supply modules are installed in the instrument, one is configured as the primary supply and the other is configured as the backup supply. If the primary supply fails, the backup supply automatically provides power to maintain instrument operation.

The preferred supply configuration only applies if both modules are installed and both modules are connected to a power source. If one supply has a failure, the other supply will be used to power the instrument regardless of the preferred supply configuration.

The DC LEDs on the front panel indicate which supply is active (preferred) and which one is the backup. The active supply LED is lit bright green and the backup supply is lit dim green. These LEDs are also mirrored at the top right of the web interface page.

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

To select the preferred power supply on the web interface, select the **System** tab and open the **General System Configuration** section. Select **PS1** or **PS2** from the **Preferred Power Supply** pull-down menu.



On the front-panel interface, return to the top menu, go to the **SYSTEM CONFIG** menu, and press **ENTER**. Press the up or down arrow buttons to navigate to the **PREFERRED SUPPLY** submenu and press **ENTER**. Select **PS1** or **PS2**.

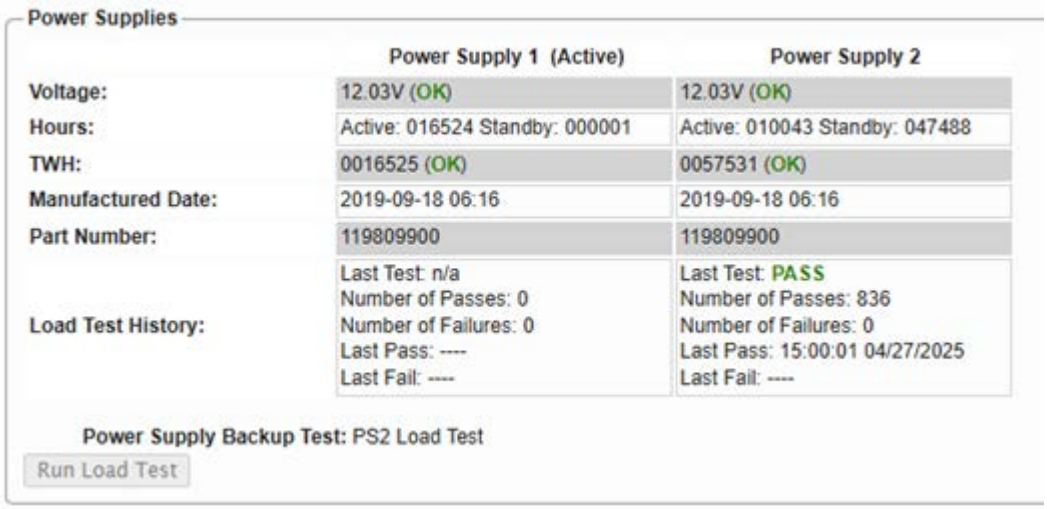
```
SYSTEM CONFIG
    ▸PREFERRED SUPPLY
```

Load Test

One time every 24 hours the backup power supply undergoes a load test. The load test is run when the instrument is first powered on and every 24 hours from that time. The backup supply, which normally runs as a powered standby, has a load applied to it, similar to that of the operating instrument, for several seconds. The voltage is measured to check if it is within tolerance for the expected 12 V value. The load test results are reported on the Diagnostics section of the web interface and the front-panel interface, and notifications can be generated if a load test failure event occurs.

If the load test passes, that power supply can be selected as the preferred supply. The system switches the preferred supply to active if possible. Depending on which power supply starts first when the system is powered up, the preferred supply may not be used as the active supply until the first successful load test (either manually or scheduled).

The load test history for the power supplies can be viewed on the Diagnostics menus. On the web interface, select the **System** tab and open the **Diagnostics** section. To manually perform a load test on the backup supply, select the **Run Load Test** button. The test status will be displayed on the web page, including the time remaining in the 30 second cooling period after the test has completed. The Load Test History will be updated with the results of the most recent test.



On the front-panel interface, return to the top menu, go to the **SYSTEM CONFIG** menu, and press **ENTER**. Press the up or down arrow buttons to navigate to the **PS LOAD TEST** submenu and press **ENTER**. If the standby power supply is ready, the load test will

run and the display will report the pass or fail result. If ENTER is pressed to run the load test again too soon, a cooldown time before the test can be run again is displayed.

```
SYSTEM CONFIG
    ▶PS LOAD TEST
```

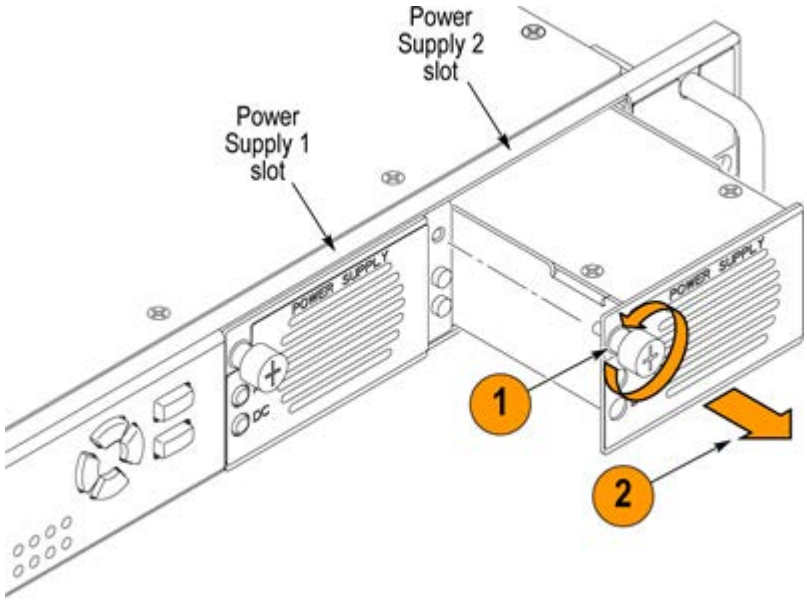
Hot-Swap Power Supply Module

Perform these steps to hot swap a power supply module (replace the power supply while the instrument is in operation).

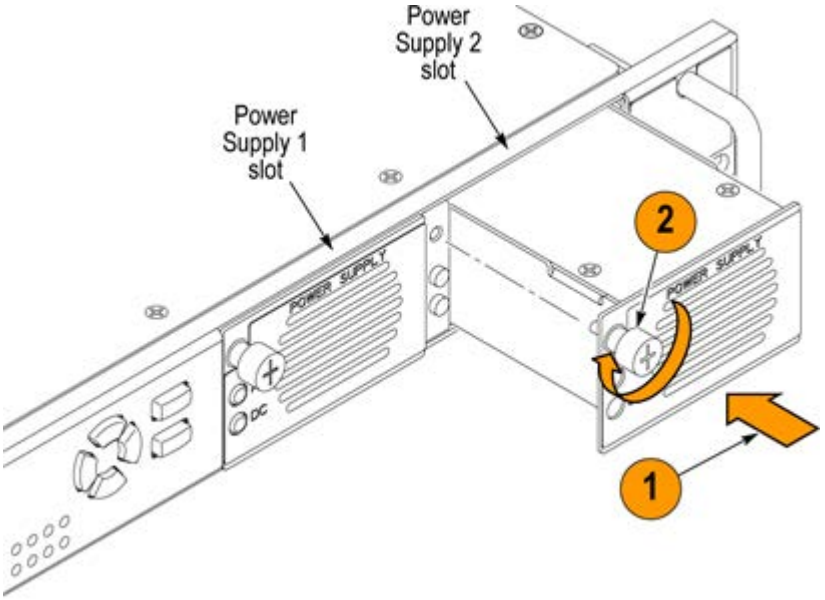
Identify the module to be replaced. When viewed from the front of the instrument, power supply 1 is the left module and power supply 2 is the right module.

CAUTION: To prevent an unexpected shutdown of the instrument, be sure to remove the correct power supply module if you are replacing a faulty module.

Unscrew the retaining screw by turning counterclockwise and then pull the module out of the instrument



Insert the replacement supply module into the instrument until it latches into place and then turn the retaining screw clockwise to secure the module in the chassis.



Check the power LEDs to ensure that the new module is operating correctly.

System Diagnostics

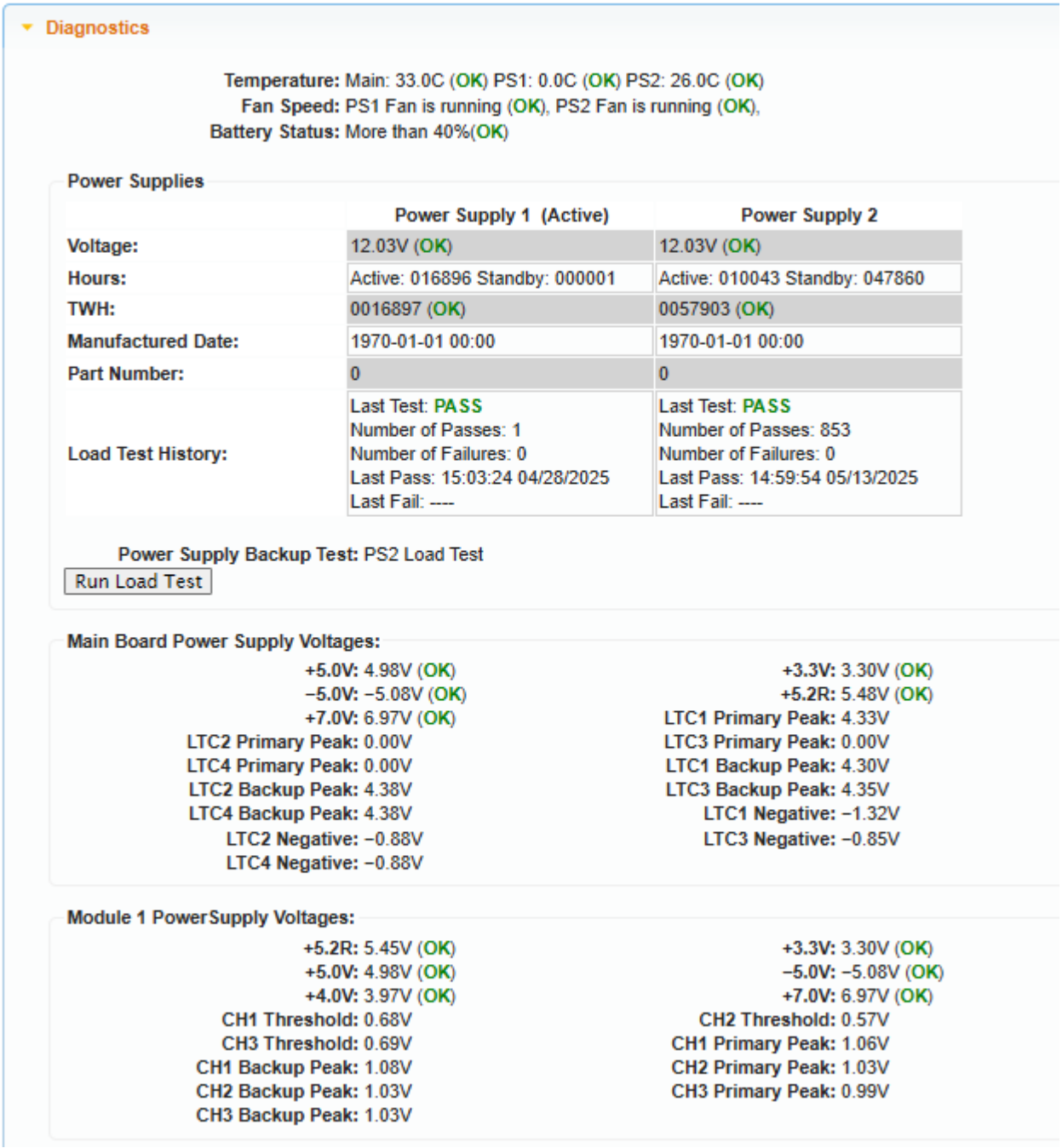
You can view various instrument diagnostics values, such as voltages, temperatures, and channel threshold measurements.

On the front-panel interface, return to the **SYSTEM CONFIG** top-level menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **DIAGNOSTICS** submenu and press **ENTER**. Press the up or down arrow buttons to select a diagnostics submenu. If the double-arrow indicator is displayed in the bottom right of the display, press the left or right arrow buttons within each submenu to view additional information.

```
SYSTEM CONFIG
    ▸DIAGNOSTICS
      ▸▸TEMPERATURE
      ▸▸CH1 PRI vs THRES
      ▸▸CH1 BACK vs THRES
      ▸▸MAIN BOARD
      ▸▸MODULE 1
      ▸▸MODULE 2
      ▸▸MODULE 3
      ▸▸MODULE 4
      ▸▸FAN STATUS
```

```
    ▶▶PS1 HOURS
    ▶▶PS2 HOURS
    ▶▶RTC BATTERY LEVEL
    ▶▶FP LED TEST
    ▶▶PS2 LOAD TEST PASS
```

On the web interface, select the **System** tab and open the **Diagnostics** section.



Diagnostics

Temperature: Main: 33.0C (OK) PS1: 0.0C (OK) PS2: 26.0C (OK)
Fan Speed: PS1 Fan is running (OK), PS2 Fan is running (OK),
Battery Status: More than 40%(OK)

Power Supplies

	Power Supply 1 (Active)	Power Supply 2
Voltage:	12.03V (OK)	12.03V (OK)
Hours:	Active: 016896 Standby: 000001	Active: 010043 Standby: 047860
TWH:	0016897 (OK)	0057903 (OK)
Manufactured Date:	1970-01-01 00:00	1970-01-01 00:00
Part Number:	0	0
Load Test History:	Last Test: PASS Number of Passes: 1 Number of Failures: 0 Last Pass: 15:03:24 04/28/2025 Last Fail: ----	Last Test: PASS Number of Passes: 853 Number of Failures: 0 Last Pass: 14:59:54 05/13/2025 Last Fail: ----

Power Supply Backup Test: PS2 Load Test
Run Load Test

Main Board Power Supply Voltages:

+5.0V: 4.98V (OK)
−5.0V: −5.08V (OK)
+7.0V: 6.97V (OK)
LTC2 Primary Peak: 0.00V
LTC4 Primary Peak: 0.00V
LTC2 Backup Peak: 4.38V
LTC4 Backup Peak: 4.38V
LTC2 Negative: −0.88V
LTC4 Negative: −0.88V
+3.3V: 3.30V (OK)
+5.2R: 5.48V (OK)
LTC1 Primary Peak: 4.33V
LTC3 Primary Peak: 0.00V
LTC1 Backup Peak: 4.30V
LTC3 Backup Peak: 4.35V
LTC1 Negative: −1.32V
LTC3 Negative: −0.85V

Module 1 PowerSupply Voltages:

+5.2R: 5.45V (OK)
+5.0V: 4.98V (OK)
+4.0V: 3.97V (OK)
CH1 Threshold: 0.68V
CH3 Threshold: 0.69V
CH1 Backup Peak: 1.08V
CH2 Backup Peak: 1.03V
CH3 Backup Peak: 1.03V
+3.3V: 3.30V (OK)
−5.0V: −5.08V (OK)
+7.0V: 6.97V (OK)
CH2 Threshold: 0.57V
CH1 Primary Peak: 1.06V
CH2 Primary Peak: 1.03V
CH3 Primary Peak: 0.99V

Temperature

Displays the temperature of several internal components. If the measured temperature is within the normal operating range, “OK” status is displayed. If the temperature is out of range, “WARN” is displayed.

Channel Primary/Backup vs Threshold

Displays the signal level for the selected primary or backup channel compared to the configured threshold level. The value should be close to +3.0 dB for changeover channels and +4.0 dB for LTC channels.

A missing signal would result in a value close to -14.0 dB. Values above +3.0 dB may be normal depending on the signal type. Black signal levels should be close to +3.0 dB but color bar signals will have a higher level. Signals with a higher threshold level will switch more slowly.

Note: The HREF/Relay outputs should be terminated for correct measurements on the channel inputs. The unselected primary or backup channel is terminated in the ECO8000, but the selected primary or backup channel drives through to the output. Be sure to connect the channel output to the actual load during setup to ensure proper configuration.

Main Board and Module Voltages

Displays several voltage measurements for each of the internal circuit boards. If the measured voltage is within the normal operating range, “OK” status is displayed. If the voltage is out of range, “WARN” is displayed.

Note: The Module 4 voltages are only available for the Tektronix ECO8020 changeover.

Fan Status

Displays the fan status for each power supply module. If the fan speed is within normal operating range, “Fan running” is displayed. If the fan speed is low, “Fan stopped” is displayed.

PS1 and PS2 Hours

Displays information about the power supply modules.

- **Active hours:** The number of hours the supply has been active.
- **Standby hours:** The number of hours the supply has been the backup.
- **TW hours:** The calculated number of temperature-weighted hours. See *Temperature Weighted Hours*.

- **+12 V output:** The current level of the DC supply. If the voltage is within operating limits, "OK" status is shown. If the voltage is out of range, "WARN" is shown.
- **Part Number:** the Telestream part number for the power supply module.
- **MFG Date:** The date when the power supply module was manufactured.

RTC Battery Level

Displays the status of the Real-Time Clock battery power level. The status will be one of:

- **More than 40% (OK):** The battery power is good.
- **20% to 40% (WARN):** The battery power is getting low and should be replaced soon.
- **Less than 20% (LOW):** The battery should be replaced immediately.

The RTC is only used for the local time when events are recorded in the Event Log. It has no impact on the critical functions of the changeover system.

Front-Panel LED Test

Press **ENTER** to perform a test of all front-panel LED indicators. Each LED will be illuminated in all possible colors to verify they are functioning properly.

PS1/PS2 Load Test

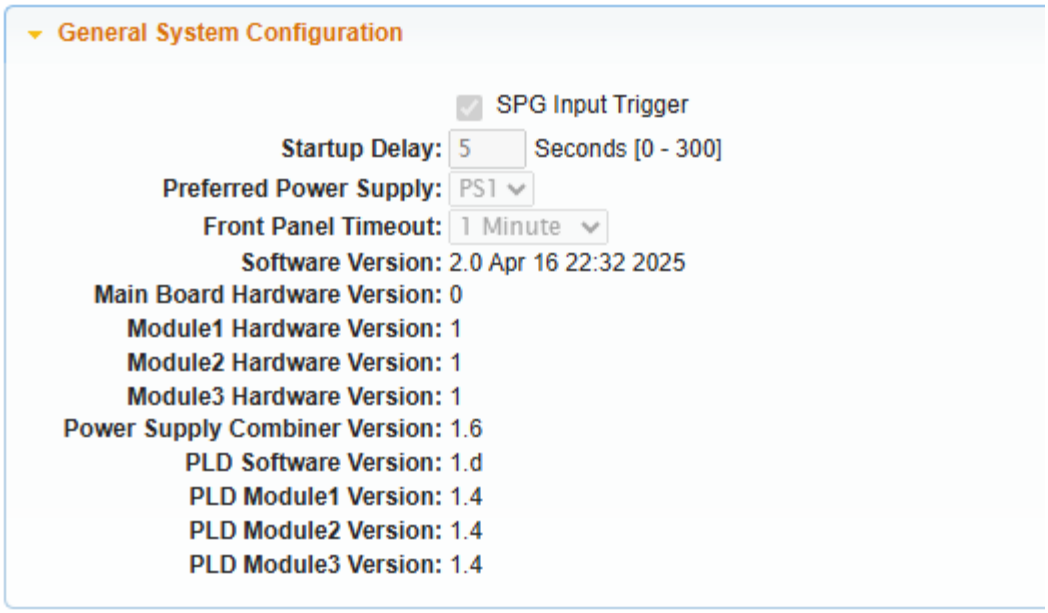
Displays the status of the most recent load test of the backup power supply. See *Load Test*.

Upgrade Instrument Firmware

Telestream releases software and firmware updates for products to add new features and to fix product problems. You can find the latest firmware for your product at the Telestream website: www.telestream.net/video/resources.htm#Software and select **Signal and Synchronization Generators**.

Check Current Firmware Version

You can check the current version of the instrument firmware from the web interface. Select the **System** tab and open the **General System Configuration** section. The Software Version (including the build date) and hardware version numbers are displayed.



On the front-panel interface, go to the **SYSTEM CONFIG** menu and press **ENTER**. Press the up or down arrow buttons to navigate to the **FW VERSION** submenu. Press the left or right arrow button to see both the version number and date.

```
SYSTEM CONFIG
    ▸HW VERSION
    ▸PLD VERSION
    ▸PS COMBINER VERSION
    ▸FW VERSION
```

Upgrade Procedure

The ECO8000 firmware can be upgraded by using a Windows utility program to transfer the firmware package file to the instrument.

The ECO8000 firmware package available on the Telestream website is a ZIP archive file. Download the .zip file and then extract these three files:

Filename	Description
firmware.pkg	ECO8000 firmware package
transfer.exe	Windows utility program
ECO8000-MIB.mib	Management Information Base (MIB) for SNMP API

On your Windows PC, the firmware.pkg and transfer.exe files must be located in the same folder.

CAUTION: The firmware upgrade process may disrupt the sync signals. We recommend that you upgrade the firmware only when the instrument is not in service.

Do not remove power from the instrument until the upgrade process has completed.

The upgrade process involves both front-panel operation and a Windows PC to transfer the firmware package.

1. Press and hold the **PANEL ENABLE** button to unlock the Channel Control System.
2. Press the **MANUAL MODE** button.
3. Go to the **SYSTEM CONFIG** top-level menu and press **ENTER**.
4. Press the up or down arrow buttons to navigate to the **FIRMWARE UPGRADE** submenu and press **ENTER**. A confirmation message is shown.

```
*Begin FW upgrade?
* Yes:ENTER No:BACK
```

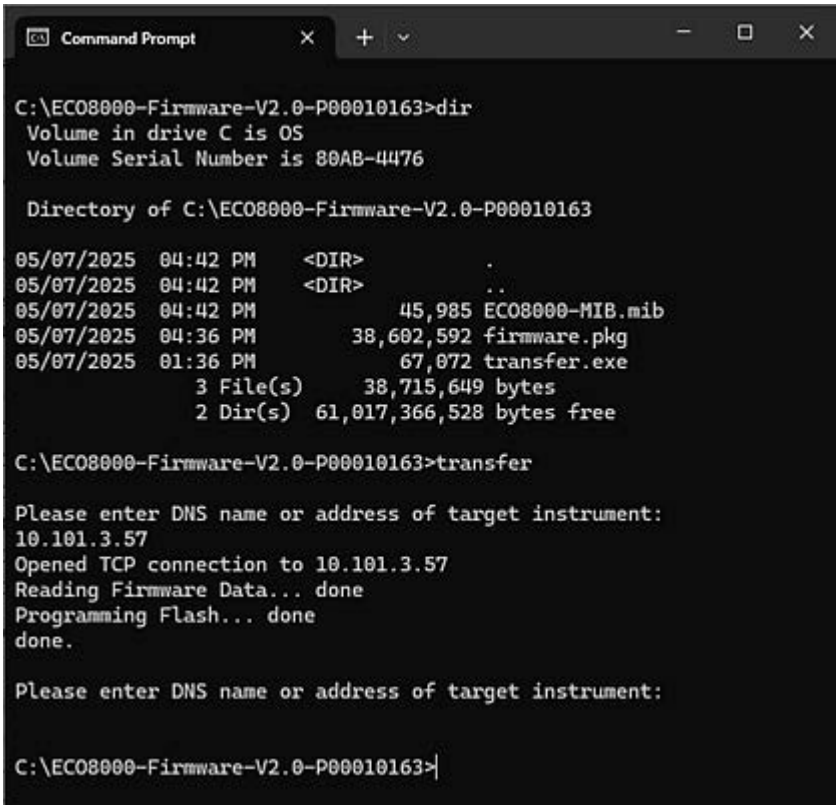
5. Press **ENTER** again to proceed or press **BACK** to cancel the upgrade. A second confirmation is displayed.

```
*Continue upgrading?
* Yes:ENTER No:BACK
```

6. Press **ENTER** and the display will show a message that the instrument is waiting to receive the package on the management network interface.

```
Waiting for network
IP: 10.101.3.76
```

7. On the Windows PC, open a Command Prompt window.
8. Change to the folder in which the ECO8000 firmware package has been unpacked. Verify that the firmware.pkg and transfer.exe files are both present in this folder.
9. Run the transfer program. You will be prompted to enter the IP address of the ECO8000. Type the address that is shown on the front-panel display.
10. The upgrade process will continue without interruption. Several progress messages will appear in both the Command Prompt window and on the front-panel display.
11. When complete, the instrument will reboot, and the transfer program will prompt for another ECO8000 IP address. Simply press **Enter** to exit the transfer utility.



Verify the upgrade by checking the instrument firmware version on the **FW VERSION** submenu on the front panel, or on the web interface.

Power-on Self Test

The power-on self test is performed when the Configuration and Monitoring System is powered up or restarted. To manually restart this sub-system and perform the self test, press and hold the **ENABLE** and **RESET** buttons on the front panel.

If any failure occurs, it will be reported in several ways:

- An error message is shown on the LCD display for about 2 seconds.
- The STATUS >FAULT submenu will display the event code.
- The fault is logged in the Event Log. See *Event Log*.
- Any user-configured notifications (SNMP Trap, Beeper, E-Mail, and GPI) will be performed. See *Event Reporting Configuration*.

The self-test event code is an 8-bit value, with each bit set as follows:

Test Type	Bit
Front panel	0 (LSB)
Main board	1
Module 1	2
Module 2	3
Module 3	4
Module 4	5
Power supply combiner	6
MRAM	7
RTC	8 (MSB)