ECO8000 Series Automatic Changeover Unit Specifications and Performance Verification

Technical Reference

Warning

The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

077-0876-00

Tektronix

Contacting Tektronix

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

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

Warranty

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product. Parts, modules and replacement products used by Tektronix for warranty work may be new or reconditioned to like new performance. All replaced parts, modules and products become the property of Tektronix.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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[W2 – 15AUG04]

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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.

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.

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

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

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.

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 Tektronix 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 symbols may appear on the product:

CAUTION
Refer to Manual

Protective Ground
(Earth) Terminal

Preface

This document lists the product specifications and provides procedures to verify instrument performance.

Related documents

To perform the procedures in this document, you may need access to the ECO8000 Series manuals listed below. These manuals are available on the Tektronix Web site at www.tektronix.com/downloads.

Document	Tektronix part number	Description
User Manual	071-3221-xx (English) 077-0873-xx (Japanese) 077-0874-xx (Russian)	Describes how to install the instrument and provides basic operating information
Specifications and Performance Verification	077-0876-xx	Lists the product specifications and provides procedures for verifying the performance of the instrument
Service Manual	077-0880-xx	Describes how to service the instrument to the module level (such as circuit boards and fuses)
Declassification and Security Instructions	077-0879-xx	Describes how to clear or sanitize the data storage (memory) devices in the product for customers with data security concerns
Release Notes	077-0878-xx	Describes the new features, improvements, and limitations of the instrument firmware
Video Sync Pulse Generator and Electronic Changeover Unit System Integration Technical Reference	077-0877-xx	Provides information for system integrators who are designing systems for high-definition (HD) and standard-definition (SD) digital video content where Tektronix electronic changeover units and video sync pulse generators are to be deployed

Specifications

This chapter contains specifications for the instrument. All specifications are guaranteed unless noted as "typical." Typical specifications are provided for your convenience but are not guaranteed.

Specifications or functionality that are marked with the ✓ symbol are checked in the performance verification procedures. See *Performance verification* on page 13.

All specifications apply to all models unless noted otherwise. To meet specifications, the instrument must have been operating continuously for 20 minutes within the specified operating temperature range.

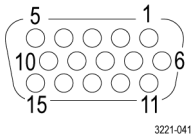
Interface

✓ **Keyboard**	Six main operation buttons with red/yellow/green backlight; six menu navigation buttons with green backlight; 22 (ECO8000) or 44 (ECO8020) fault indicators with red/yellow/green backlight
Display	LCD with two lines x 20 characters with backlight, 8 x 45 mm active area
Ethernet	
✓ **Functionality**	100Base-TX and 10Base-T compliant with IEEE 802.3-2000 and ANSI X3.264-1995 standards
Connector	8P8C (RJ45) connector supporting 10/100 BaseT; wiring follows TIA/EIA-568-B T568A standard Ethernet pin assignments Connector has built-in LEDs; the blinking green LED indicates an active connection; the second green LED indicates speed: On = 100BaseT, Off = 10BaseT
✓ **Expansion port**	Standard RJ45 connector which allows two ECO8000 Series units to work in tandem Proprietary interface between the hardware state machines of the two instruments; intended for short runs over Cat 5 cable with a common ground reference between the two units

GPI (General Purpose Interface)

Connector

15-pin high density DSUB



GPIO connector signal pinouts

Pin	Signal	Function
1	State – Primary Backup	Output – high if Primary is selected, low if Backup is selected
2	Primary fault	Output – goes low if a Primary fault is present
3	Backup fault	Output – goes low if a Backup fault is present
4	State – Manual Auto	Output – high if Manual mode is selected, low if Auto mode is selected
5	GND	Ground
6	Power fault	Output – goes low if a fault is preset in the power subsystem as indicated by the AC or DC LEDs on the supplies
7	Manual mode	Input – drive this pin low to assert Manual mode (10 KΩ pullup resistor)
8	Auto mode	Input – drive this pin low to assert Auto mode (10 KΩ pullup resistor)
9	Fault reset	Input – drive this pin low to assert a fault reset (10 KΩ pullup resistor)
10	Configurable fault	Output – goes low if any fault selected in the GPI EVENTS menu are present; also goes low during any watchdog reboot
11	GND	Ground
12		Not used
13	Primary select	Input – drive this pin low to select the Primary source (10 KΩ pullup resistor)
14	Backup select	Input – drive this pin low to select the Backup source (10 KΩ pullup resistor)
15		Not used

Logical functions

The functions of some input and outputs are configurable from the user interface; the outputs can be configured to trigger on a variety of conditions

Ground closure input signaling

TTL thresholds of 0.8 V low and 2.0 V high; maximum input of +5 V; minimum input of –0.5 V; pull low to assert; has an internal 10 kΩ pull-up resistor to +5 V on each input

Ground closure input timing (typical)

Inputs must be asserted and stable for at least 30 ms to be recognized reliably; inputs that are stable for 20 ms or less will not be recognized

Ground closure output characteristics

Five open collector outputs; pulled up by 10 kΩ to +5 V

Output maximum current (typical)	100 mA; on resistance approximately 35 Ω
Output duration (typical)	Signal alarms asserted as long as the error conditions exists

Power input

Electrical rating	The actual power varies with the type and number of modules installed; the base instrument without modules typically draws 10 watts
Voltage	100 to 240 VAC
Frequency	50/60 Hz
Power consumption	50 VA maximum
Inrush current, average half-cycle RMS (typical)	2 A Per EN55103-1:2009 Annex B
Power connections	Two detachable IEC cord sets; locking versions available for some geographies For units without the optional dual power supply (Option DPW), only one AC input is operational Locking cords are available for USA, Japan, UK, Europe, Switzerland, China, and Australia; no locking cords are currently available for Brazil or India
Dual power supplies	Option DPW only
✓ Hot swap	The instrument can run with either or both supplies; any plugging or unplugging of the supplies or the AC input to the supplies does not cause disruption in the system as long as at least one supply is active; the supplies take 1-2 seconds to power up after AC is applied
✓ Operation	When two supplies are present, one is used to power the instrument and the other is in an unloaded backup mode
Power supply life tracking	Each supply maintains usage history by tracking time in use and time in standby mode A Temperature Weighted Hours (TWH) calculation helps predict the end of life on the supply and allows for recommending a replacement of the supply; the TWH calculation uses the temperature at each hour and the Arrhenius model to predict the failure point of the supply
✓ Power supply load testing	The backup supply is periodically tested to ensure it can support the instrument load should the primary supply fail; the test load is approximately 20 watts and is applied for about 6 seconds
✓ Power supply status indicators	Both the AC in and the DC out of each supply is monitored and the status of both signals is indicated by separate LEDs on the front panel When the instrument is running, the LEDs indicate the status of the supplies, including the internal fans and which of the supplies is currently powering the instrument 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

If both supplies are good, the system will use the supply that is configured as the preferred supply; if one supply has a problem, the system will choose 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

For troubleshooting, if the AC LED is red, look at the power coming into the instrument; if the DC LED is red, replace the supply module; the status screen and event log should provide details on the nature of the faults

Power on – AC LED states (many states require the other supply to be running to supply power)

Functional state	AC LED state
Normal	Green
AC <75 V	Red
Supply not installed, AC present	Green
Supply not installed, AC absent	Off

Power on – DC LED states (many states require the other supply to be running to supply power)

Functional state	DC LED state
Normal, Active supply	Green
Normal, Backup supply	Dim green
Marginal high or low voltage	Yellow
DC fault, high or low voltage	Red
Fan fault	Red
Load test failure	Red
Fault detected, but in use by necessity	Orange
Not installed	Off

Power off – LED flash states (at least one supply must have been running in last 10 minutes to charge capacitor)

Functional state	AC LED flash	DC LED flash
AC present, DC bad	Green	Red
AC missing, DC missing	Red	Off
AC present, supply not installed	Green	Off
AC missing, supply not installed	Off	Off
AC present, DC present, on-board converter failure	Green	Green

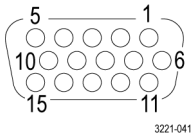
Base unit and Option REF (50 MHz Electronic Fast Switch) channels

Number of outputs	ECO8000: Three channels ECO8020: Five channels
Connectors	ECO8000: BNC ECO8020: HD BNC
Signals supported	Each channel can support low-bandwidth signals Intended for Bi-level sync, Tri-level sync, Word clock, and AES; other signals may be used if they meet the frequency and voltage limitations
Standards supported	RS170A, SMPTE RP154, SMPTE318M, EBU N14, SMPTE240M, 274M, 296M, RP211
Preset thresholds supported	NTSC, PAL, Tri-level, AES, 1 V Word clock, 5 V Word clock
User threshold range (typical)	Sufficient to detect attenuation on signals in the 0.5 to 5 V_{p-p} range
User threshold resolution (typical)	No more than 0.5 dB over the useable range
↙ **Threshold accuracy**	Threshold for detecting loss of signal is 2 to 4 dB less than the nominal level
Switching delay on loss of signal (typical)	10 to 30 ms for thresholds set at the nominal 3 dB below the expected signal
Impedance	75 Ω
Return loss (typical)	35 dB from 300 kHz to 6 MHz 25 dB to 30 MHz Active and inactive inputs; power on or off; inputs and output
↙ **Insertion loss**	< ±0.2 dB to 10 MHz With power on, the signal is buffered and the signal may have gain or loss; with power off, the relays have some attenuation
Insertion flatness (typical)	< –1 dB to 50 MHz
Off isolation (typical)	60 dB from DC to 6 MHz 40 dB from 6 MHz to 50 MHz

Channel switch interruption and settling time with identical signals on both inputs (typical)	
Bi-level and Tri-level sync signals	5 ns glitch, then 125 ns to 90% of final value
AES and 1 V Word clock signals	5 ns glitch, then 250 ns to 90% of final value
5 V Word clock signals	25 ns glitch, then 500 ns to 90% of final value
Signal interruption during power up and power down (typical)	1.0 ms; as switched between buffer mode and relay mode
Input voltage range	–3 V to +5 V

Option LTC channels

Formats	23.98, 24, 25, 30, 30 drop as per SMPTE 12 M
Connector	15-pin high density DSUB, pinout compatible with SPG8000 and GPS7 module Input connections to SPG trigger always present; output connections only present when Option LTC is installed



LTC/SPG connector signal pinouts

Pin	Signal	Function
1	SPG trigger	Input – Used to receive a fault-condition trigger signal from the sync generator
2		Not used
3		Not used
4		Not used
5	LTC4–	Input – LTC4– signal
6	GND	Ground
7	LTC3–	Input – LTC3– signal
8	LTC2–	Input – LTC2– signal
9	GND	Ground
10	LTC1–	Input or output – LTC1– signal [1]
11		Not used

[1] The LTC 1 channel can be configured as an input or output in the CHANNEL menu.

Pin	Signal	Function
12	LTC3+	Input – LTC3+ signal
13	LTC2+	Input – LTC2+ signal
14	LTC1+	Input or output – LTC1+ signal[1]
15	LTC4+	Input – LTC4+ signal

LTC OUT connector signal pinouts

Pin	Signal	Function
1	Primary SPG trigger	Output – SPG trigger signal from the primary input
2	Backup SPG trigger	Output – SPG trigger signal from the backup input
3		Not used
4		Not used
5	LTC4–	Output – LTC4– signal
6	GND	Ground
7	LTC3–	Output – LTC3– signal
8	LTC2–	Output – LTC2– signal
9	GND	Ground
10	LTC1–	Output or input – LTC1– signal[1]
11		Not used
12	LTC3+	Output – LTC3+ signal
13	LTC2+	Output – LTC2+ signal
14	LTC1+	Output or input – LTC1+ signal[1]
15	LTC4+	Output – LTC4+ signal

Signal type	Combined GPI and differential LTC; LTC can be converted to single-ended by grounding the negative signal; single-ended signals are 2x nominal amplitude
Switching mode	The switching is through latching relays
Number of channels	Four
Input accommodation	Channel 1 can be an output or an input; in input mode, the common port drives both SPGs and is not affected by switching; the input connection is maintained during power loss
Status reporting	The level sensing for all four channels is combined into one indicator for the primary source and one for the backup source
Insertion loss, 600 Ω load	<0.5 dB at 2 kHz
Off isolation (typical)	>90 dB for LTC signals
Switching interruption duration (typical)	1 ms
Termination on unused input	15 kΩ, AC coupled at 10 Hz

Preset thresholds supported	0.5 to 5 V in 0.5 V steps
User threshold range (typical)	Sufficient to detect attenuation on signals in the 0.5 to 5 V_{p-p} range
User threshold resolution (typical)	No more than 0.5 dB over useable range 0.8 dB at 0.5 V range
Threshold accuracy, fault start	Threshold for a loss of signal to be detected is 3 to 5 dB less than the nominal level
Threshold accuracy, fault stop (typical)	Threshold that the signal is present after a fault is 2 to 4 dB less than the nominal level
Threshold hysteresis (typical)	1.5 dB
Switching delay on loss of signal (typical)	60 ms for thresholds set at the nominal 3 dB below the expected signal
Input voltage range	±5 V

Option HREF (3 GHz Relay Switch) channels

Number of outputs	ECO8000: Three channels ECO8020: Five channels
Connectors	ECO8000: BNC ECO8020: HD BNC
Signals supported	Each channel can support both high and low-bandwidth signals Intended for SDI signals at SD, HD and 3 Gb rates, but can also support 1.575 GHz GPS antenna feeds and low-band signals including Bi-level sync, Tri-level sync, 1 V Word clock, and AES; other signals may be used if they meet the frequency and voltage limitations
Preset thresholds supported	NTSC, PAL, Tri-level, AES, 1 V Word Clock, SD-SDI, HD-SDI, 3G-SDI
User threshold range (typical)	Sufficient to detect attenuation on signals in the 0.5 to 1.6 V_{p-p} range for signals with 50% duty cycle; signals with other duty cycles may have less range
User threshold resolution (typical)	No more than 0.5 dB over useable range
Threshold accuracy	Threshold for detecting loss of signal is 2 to 4 dB less than the nominal level
Switching delay on loss of signal (typical)	10 to 30 ms for thresholds set at the nominal 3 dB below the expected signal
Switching interruption duration (typical)	0.5 to 2 ms

Impedance	75 Ω
Output return loss (typical)	≥40 dB from 300 kHz to 6 MHz ≥30 dB from 6 MHz to 30 MHz ≥18 dB from 30 MHz to 1.5 GHz ≥13 dB from 1.5 GHz to 3 GHz The output return loss is affected by the source driving the active input; a source with good return loss must be used to achieve this specification
Input return loss (typical)	≥40 dB from 300 kHz to 6 MHz ≥30 dB from 6 MHz to 30 MHz ≥15 dB from 30 MHz to 1.5 GHz ≥10 dB from 1.5 GHz to 3 GHz Unused input is terminated internally; active Input is terminated by the load on the output; the output must be terminated in a load with good return loss to achieve this specification
Insertion loss	<0.1 dB from DC to 10 MHz
Frequency response variation (typical)	<3 dB from DC to 3 GHz
Effective cable length (typical)	Equivalent to 5 m of Belden 1694 cable
Rise and fall times for HD and 3 Gb (typical)	85 ps maximum (20% to 80%)
Off isolation (typical)	48 dB to 1.5 GHz 40 dB to 3 GHz
Input voltage range	±2.5V peak, 1.5 V_{RMS}

Physical characteristics

Dimensions	
Height	43.7 mm (1.72 in.)
Width	483 mm (19.0 in.)
Depth	557 mm (21.9 in.)
Weight	
Net	4.5 kg (10.0 lb.)
Shipping (typical)	Packaged weight of the product: 8.2 to 11.4 kg (18 to 25 lbs.) depending on the installed options Package dimensions: 23 in. (width) x 30 in. (length) x 10.5 in. (height).

Environmental

Temperature	
Operating	0 °C to +50 °C (+32 °F to +122 °F), with 15 °C/hour maximum gradient, non-condensing, derated 1 °C per 300 m above 1500 m altitude
Nonoperating	-20 °C to +60 °C (-4 °F to +140 °F), with 15 °C/hour maximum gradient
Humidity	
Operating	20% to 80% relative humidity (% RH) at up to +30 °C, maximum wet-bulb temperature of +29 °C (derates relative humidity to 20% RH at +50 °C)
Nonoperating	5% to 90% relative humidity (% RH) at up to +40 °C, maximum wet-bulb temperature of +40 °C (derates relative humidity to 30% RH at +60 °C)
Altitude	
Operating	Up to 3000 m (9842 ft.), derate maximum operating temperature by 1 °C per 300 m above 1.5 km altitude
Nonoperating	Up to 15 km (50,000 ft.)
Random vibration	
Operating	0.27 G_{RMS} 5 to 500 Hz, 10 minutes per axis, 3 axes (30 minutes total)
Nonoperating	2.28 G_{RMS} 5 to 500 Hz, 10 minutes per axis, 3 axes (30 minutes total)
Mechanical shock	
Operating	Half-sine mechanical shocks, 30 g peak amplitude, 11 ms duration, 3 drops in each direction of each axis (18 total)

Performance verification

This section provides procedures to verify the performance and functionality of the ECO8000 and ECO8020 instrument, including any installed options. Procedures that only apply to specific options will be noted as such.

Preparation

Warm up period. The ECO8000 Series instruments must have had a warm-up period of at least 20 minutes before you start a performance verification procedure. Refer to the documentation provided with the test equipment for any preparation the test equipment may require.

Overview of instrument operation. In the following procedures, the names of the front-panel buttons are shown in all capitals or as direction arrows.

There are three top-level menus. Pressing the BACK button several times will always return the instrument display to one of these menus. The top-level menus are: Status, System Config, and Channel. The Channel menu readout always displays one of the channels, such as "CH1 ELSW NTSC".

Press the up (▲) or down (▼) arrow buttons to cycle between the three top menus.

In the Channel menu, press the left (◄) or right (►) arrow button to cycle through the installed channels.

In the desired top-level menu or channel, press the ENTER button to go into that selection, then use the navigation arrows to browse to various items and to select options. Press the ENTER button to make a change, or to allow editing on Text strings and numeric fields.

At each deeper level of the menu, an arrow ">" is added to the left end of the top line on the display to indicate the relative position in the menu tree.

For detailed information about how to operate the instrument, refer to the appropriate product manual. *Related documents*

Front panel locking. The left keyboard of the instrument front panel locks after five minutes of inactivity. During the procedure you may need to occasionally unlock the left keyboard by pressing and holding ENABLE until you hear a beep.

Required equipment

The following table lists the equipment that is required to perform the performance verification procedures.

Item	Qty.	Minimum requirement	Recommended equipment	ECO 8000	ECO 8020	Test number / name
120/240 V Power Meter	1	Measure power in the 20 to 100 watt range	- Tektronix PA4000 1CH with BB1000-NA Breakout Box - Tektronix PA1000 with BB1000-NA Breakout Box - Valhalla Scientific 2101 or equivalent	✓	✓	4 - PS load test
Multi-outlet strip	1	To allow two power cords to connect to the power adapter		✓	✓	4 - PS load test
Black Burst signal source	1	Black Burst signal	Tektronix SPG8000	✓	✓	7 - ECO function 14 - GPI input 15 - Expansion port
PC with network connection	1	To test Web interface		✓	✓	16 - Ethernet port
Arbitrary function generator	1		Tektronix AFG3252	✓	✓	7 - ECO function 8 - REF insertion loss 9 - HREF insertion loss 10 - REF/HREF threshold 11 - LTC insertion loss 12 - LTC threshold
Digital multi-meter (DMM) with voltage test leads	1	30 kHz RMS AC measurement capability	Fluke 87 or equivalent	✓	✓	8 - REF insertion loss 9 - HREF insertion loss 11 - LTC insertion loss 13 - GPIO output
15-pin HD DSUB breakout adapters	2		Winford BRKSD15HDM-C or equivalent	✓	✓	11 - LTC insertion loss 12 - LTC threshold 13 - GPIO output 14 - GPI input
22 gauge hook-up wire	1	3 meters		✓	✓	11 - LTC insertion loss 12 - LTC threshold 14 - GPI input
RJ45 cable	1	18 inches to 10 feet		✓	✓	15 - Expansion port 16 - Ethernet port
Tektronix ECO8000 or ECO8020	1	To test the Expansion Port	Tektronix ECO8000 or ECO8020	✓	✓	15 - Expansion port
Precision 75 Ω terminator	1			✓	✓	7 - ECO function 8 - REF insertion loss 9 - HREF insertion loss
BNC T	1			✓	✓	8 - REF insertion loss 9 - HREF insertion loss

Item	Qty.	Minimum requirement	Recommended equipment	ECO 8000	ECO 8020	Test number / name
BNC-to-banana plug adapter	1			✓	✓	8 - REF insertion loss 9 - HREF insertion loss 11 - LTC insertion loss
BNC-to-banana jack adapter	3			✓	✓	11 - LTC insertion loss 12 - LTC threshold
600 or 602 Ω resistor	1	1/4 watt or 1/8 watt; 1%		✓	✓	11 - LTC insertion loss
ECO8000 Series spare power supply module	1	Needed only if Option DPW is not installed		✓	✓	3: PS hot-swap and LEDs 4: PS load test 13 - GPIO output
BNC-to-BNC cable	3	1 meter, 75 Ω wideband		✓		7 - ECO function (ECO8000 only) 8 - REF insertion loss (ECO8000 only) 9 - HREF insertion loss 10 - REF/HREF threshold 14 - GPI input (ECO8000 only) 15 - Expansion port
75 Ω BNC barrel (ECO8000 only)	1		AMP 222117-1 or equivalent	✓		8 - REF insertion loss 9 - HREF insertion loss
BNC-to-HD BNC cable (ECO8020 only)	2		Tektronix 174-6333-00		✓	7 - ECO function 8 - REF insertion loss 9 - HREF insertion loss 10 - REF/HREF threshold 14 - GPI input 15 - Expansion port
75 Ω HD BNC barrel (ECO8020 only)	1		APH-HDBNCJ-J		✓	8 - REF insertion loss 9 - HREF insertion loss

Test record

Print the following Test Record table and use it to record the results of the performance tests. The Test Record table accommodates both the 9-channel ECO8000 and the 20-channel ECO8020.

Each of the instrument models may be configured with different numbers of optional REF/ELSW and HREF/Relay channel modules. During the procedure, you will use the "Installed?" column of the Test Record table to indicate the type and number of optional channel modules that are installed in the instrument.

Table 7: ECO8000 Series performance verification Test Record

Test	Channel number / parameter	Installed?	Pass / Fail	Min.	Measure	Max.
1 - Front panel LEDs	N/A	N/A		N/A	N/A	N/A
2 - Keyboards and beeper	Beeper	N/A		N/A	N/A	N/A
	Keyboards	N/A		N/A	N/A	N/A
3 - Power Supply module hot-swap and LEDs	PS1 hot-swap	N/A		N/A	N/A	N/A
	PS1 LEDs	N/A		N/A	N/A	N/A
	PS2 hot-swap	N/A		N/A	N/A	N/A
	PS2 LEDs	N/A		N/A	N/A	N/A
4 - Power Supply module load test	PS1	N/A		N/A	N/A	N/A
	PS2	N/A		N/A	N/A	N/A
5 - Diagnostics	Temperature	X		N/A	N/A	N/A
	Main board	X		N/A	N/A	N/A
	Channel module 1	X		N/A	N/A	N/A
	Channel module 2 (if installed)			N/A	N/A	N/A
	Channel module 3 (if installed)			N/A	N/A	N/A
	Channel module 4 (if installed)			N/A	N/A	N/A
	Fan status	X		N/A	N/A	N/A
	RTC battery level	X		N/A	N/A	N/A
6 - Channel configuration	N/A	N/A		N/A	N/A	N/A
7 - Basic ECO channel-switching function	N/A	N/A		N/A	N/A	N/A

Test	Channel number / parameter	Installed?	Pass / Fail	Min.	Measure	Max.
8a - REF (ELSW) channel insertion loss (Primary, power on) Tolerance: 1 V ±0.2 dB	CH1	X	N/A	0.9773		1.0222
	CH2	X	N/A	0.9773		1.0222
	CH3	X	N/A	0.9773		1.0222
	CH4		N/A	0.9773		1.0222
	CH5		N/A	0.9773		1.0222
	CH6		N/A	0.9773		1.0222
	CH7		N/A	0.9773		1.0222
	CH8		N/A	0.9773		1.0222
	CH9		N/A	0.9773		1.0222
	CH10		N/A	0.9773		1.0222
	CH11		N/A	0.9773		1.0222
	CH12		N/A	0.9773		1.0222
	CH13		N/A	0.9773		1.0222
	CH14		N/A	0.9773		1.0222
	CH15		N/A	0.9773		1.0222
	CH16		N/A	0.9773		1.0222
	CH17		N/A	0.9773		1.0222
	CH18		N/A	0.9773		1.0222
	CH19		N/A	0.9773		1.0222
	CH20		N/A	0.9773		1.0222

Test	Channel number / parameter	Installed?	Pass / Fail	Min.	Measure	Max.
8b - REF (ELSW) channel insertion loss (Backup, power on) Tolerance: 1 V ±0.2 dB	CH1	X	N/A	0.9773		1.0222
	CH2	X	N/A	0.9773		1.0222
	CH3	X	N/A	0.9773		1.0222
	CH4		N/A	0.9773		1.0222
	CH5		N/A	0.9773		1.0222
	CH6		N/A	0.9773		1.0222
	CH7		N/A	0.9773		1.0222
	CH8		N/A	0.9773		1.0222
	CH9		N/A	0.9773		1.0222
	CH10		N/A	0.9773		1.0222
	CH11		N/A	0.9773		1.0222
	CH12		N/A	0.9773		1.0222
	CH13		N/A	0.9773		1.0222
	CH14		N/A	0.9773		1.0222
	CH15		N/A	0.9773		1.0222
	CH16		N/A	0.9773		1.0222
	CH17		N/A	0.9773		1.0222
	CH18		N/A	0.9773		1.0222
	CH19		N/A	0.9773		1.0222
	CH20		N/A	0.9773		1.0222

Test	Channel number / parameter	Installed?	Pass / Fail	Min.	Measure	Max.
8c - REF (ELSW) channel insertion loss (Primary, power off) Tolerance: 1 V ±0.2 dB	CH1	X	N/A	0.9773		1.0222
	CH2	X	N/A	0.9773		1.0222
	CH3	X	N/A	0.9773		1.0222
	CH4		N/A	0.9773		1.0222
	CH5		N/A	0.9773		1.0222
	CH6		N/A	0.9773		1.0222
	CH7		N/A	0.9773		1.0222
	CH8		N/A	0.9773		1.0222
	CH9		N/A	0.9773		1.0222
	CH10		N/A	0.9773		1.0222
	CH11		N/A	0.9773		1.0222
	CH12		N/A	0.9773		1.0222
	CH13		N/A	0.9773		1.0222
	CH14		N/A	0.9773		1.0222
	CH15		N/A	0.9773		1.0222
	CH16		N/A	0.9773		1.0222
	CH17		N/A	0.9773		1.0222
	CH18		N/A	0.9773		1.0222
	CH19		N/A	0.9773		1.0222
	CH20		N/A	0.9773		1.0222

Test	Channel number / parameter	Installed?	Pass / Fail	Min.	Measure	Max.
8d - REF (ELSW) channel insertion loss (Backup, power off) Tolerance: 1 V ±0.2 dB	CH1	X	N/A	0.9773		1.0222
	CH2	X	N/A	0.9773		1.0222
	CH3	X	N/A	0.9773		1.0222
	CH4		N/A	0.9773		1.0222
	CH5		N/A	0.9773		1.0222
	CH6		N/A	0.9773		1.0222
	CH7		N/A	0.9773		1.0222
	CH8		N/A	0.9773		1.0222
	CH9		N/A	0.9773		1.0222
	CH10		N/A	0.9773		1.0222
	CH11		N/A	0.9773		1.0222
	CH12		N/A	0.9773		1.0222
	CH13		N/A	0.9773		1.0222
	CH14		N/A	0.9773		1.0222
	CH15		N/A	0.9773		1.0222
	CH16		N/A	0.9773		1.0222
	CH17		N/A	0.9773		1.0222
	CH18		N/A	0.9773		1.0222
	CH19		N/A	0.9773		1.0222
	CH20		N/A	0.9773		1.0222
9a - HREF (Relay) channel insertion loss (Primary) Tolerance: 1 V ±0.1 dB	CH4		N/A	0.9886		1.0115
	CH5		N/A	0.9886		1.0115
	CH6		N/A	0.9886		1.0115
	CH7		N/A	0.9886		1.0115
	CH8		N/A	0.9886		1.0115
	CH9		N/A	0.9886		1.0115
	CH10		N/A	0.9886		1.0115
	CH11		N/A	0.9886		1.0115
	CH12		N/A	0.9886		1.0115
	CH13		N/A	0.9886		1.0115
	CH14		N/A	0.9886		1.0115
	CH15		N/A	0.9886		1.0115
	CH16		N/A	0.9886		1.0115
	CH17		N/A	0.9886		1.0115
	CH18		N/A	0.9886		1.0115
	CH19		N/A	0.9886		1.0115
	CH20		N/A	0.9886		1.0115

Test	Channel number / parameter	Installed?	Pass / Fail	Min.	Measure	Max.
9b - HREF (Relay) channel insertion loss (Backup) Tolerance: 1 V ±0.1 dB	CH4		N/A	0.9886		1.0115
	CH5		N/A	0.9886		1.0115
	CH6		N/A	0.9886		1.0115
	CH7		N/A	0.9886		1.0115
	CH8		N/A	0.9886		1.0115
	CH9		N/A	0.9886		1.0115
	CH10		N/A	0.9886		1.0115
	CH11		N/A	0.9886		1.0115
	CH12		N/A	0.9886		1.0115
	CH13		N/A	0.9886		1.0115
	CH14		N/A	0.9886		1.0115
	CH15		N/A	0.9886		1.0115
	CH16		N/A	0.9886		1.0115
	CH17		N/A	0.9886		1.0115
	CH18		N/A	0.9886		1.0115
	CH19		N/A	0.9886		1.0115
	CH20		N/A	0.9886		1.0115
10a - REF (ELSW) and HREF (Relay) channel threshold (Primary) Tolerance: -2 to -4 dB	CH1	X	N/A	0.631		0.794
	CH2	X	N/A	0.631		0.794
	CH3	X	N/A	0.631		0.794
	CH4		N/A	0.631		0.794
	CH5		N/A	0.631		0.794
	CH6		N/A	0.631		0.794
	CH7		N/A	0.631		0.794
	CH8		N/A	0.631		0.794
	CH9		N/A	0.631		0.794
	CH10		N/A	0.631		0.794
	CH11		N/A	0.631		0.794
	CH12		N/A	0.631		0.794
	CH13		N/A	0.631		0.794
	CH14		N/A	0.631		0.794
	CH15		N/A	0.631		0.794
	CH16		N/A	0.631		0.794
	CH17		N/A	0.631		0.794
	CH18		N/A	0.631		0.794
	CH19		N/A	0.631		0.794
	CH20		N/A	0.631		0.794

Test	Channel number / parameter	Installed?	Pass / Fail	Min.	Measure	Max.
10b - REF (ELSW) and HREF (Relay) channel threshold (Backup) Tolerance: -2 to -4 dB	CH1	X	N/A	0.631		0.794
	CH2	X	N/A	0.631		0.794
	CH3	X	N/A	0.631		0.794
	CH4		N/A	0.631		0.794
	CH5		N/A	0.631		0.794
	CH6		N/A	0.631		0.794
	CH7		N/A	0.631		0.794
	CH8		N/A	0.631		0.794
	CH9		N/A	0.631		0.794
	CH10		N/A	0.631		0.794
	CH11		N/A	0.631		0.794
	CH12		N/A	0.631		0.794
	CH13		N/A	0.631		0.794
	CH14		N/A	0.631		0.794
	CH15		N/A	0.631		0.794
	CH16		N/A	0.631		0.794
	CH17		N/A	0.631		0.794
	CH18		N/A	0.631		0.794
	CH19		N/A	0.631		0.794
	CH20		N/A	0.631		0.794
11a - LTC1 channel insertion loss (1 V ±0.5 dB)						
Primary	LTC1		N/A	0.944		1.059
Backup	LTC1		N/A	0.944		1.059
11b - LTC2 channel insertion loss (1 V ±0.5 dB)						
Primary	LTC2		N/A	0.944		1.059
Backup	LTC2		N/A	0.944		1.059
11c - LTC3 channel insertion loss (1 V ±0.5 dB)						
Primary	LTC3		N/A	0.944		1.059
Backup	LTC3		N/A	0.944		1.059
11d - LTC4 channel insertion loss (1 V ±0.5 dB)						
Primary	LTC4		N/A	0.944		1.059
Backup	LTC4		N/A	0.944		1.059
12a - LTC1 channel threshold						
Primary, green/yellow to red	LTC1		N/A	0.703		0.884
Primary, red to green/yellow	LTC1		N/A	0.787		0.993
Primary, calculated hysteresis	LTC1		N/A	0.100		0.200
Backup, green/yellow to red	LTC1		N/A	0.703		0.884
Backup, red to green/yellow	LTC1		N/A	0.787		0.993

Test	Channel number / parameter	Installed?	Pass / Fail	Min.	Measure	Max.
Backup, calculated hysteresis	LTC1		N/A	0.100		0.200
12b - LTC2 channel threshold						
Primary, green/yellow to red	LTC2		N/A	0.703		0.884
Primary, red to green/yellow	LTC2		N/A	0.787		0.993
Primary, calculated hysteresis	LTC2		N/A	0.100		0.200
Backup, green/yellow to red	LTC2		N/A	0.703		0.884
Backup, red to green/yellow	LTC2		N/A	0.787		0.993
Backup, calculated hysteresis	LTC2		N/A	0.100		0.200
12c - LTC3 channel threshold						
Primary, green/yellow to red	LTC3		N/A	0.703		0.884
Primary, red to green/yellow	LTC3		N/A	0.787		0.993
Primary, calculated hysteresis	LTC3		N/A	0.100		0.200
Backup, green/yellow to red	LTC3		N/A	0.703		0.884
Backup, red to green/yellow	LTC3		N/A	0.787		0.993
Backup, calculated hysteresis	LTC3		N/A	0.100		0.200
12d - LTC4 channel threshold						
Primary, green/yellow to red	LTC4		N/A	0.703		0.884
Primary, red to green/yellow	LTC4		N/A	0.787		0.993
Primary, calculated hysteresis	LTC4		N/A	0.100		0.200
Backup, green/yellow to red	LTC4		N/A	0.703		0.884
Backup, red to green/yellow	LTC4		N/A	0.787		0.993
Backup, calculated hysteresis	LTC4		N/A	0.100		0.200
13 - GPIO output function	N/A	N/A		N/A	N/A	N/A
14 - GPI input function	N/A	N/A		N/A	N/A	N/A
15 - Expansion port function	N/A	N/A		N/A	N/A	N/A
16 - Ethernet port function	N/A	N/A		N/A	N/A	N/A

ECO8000 Series connector pin outs

The following tables list the pin-outs of the ECO8000 Series multi-pin connectors for use as a reference.

Table 8: LTC OUT connector

Pin	Signal
1	GPI1 output (trigger signal from the Primary input)
2	GPI2 output (trigger signal from the Backup input)
3	
4	
5	LTC4– output
6	GND
7	LTC3– output
8	LTC2– output
9	GND
10	LTC1– output or input [1]
11	
12	LTC3+ output
13	LTC2+ output
14	LTC1+ output or input[1]
15	LTC4+

[1] The LTC1 channel can be configured as an input or output in the CHANNEL menu.

Table 9: GPIO connector

Pin	Signal
1	State Primary_Backup output (high if Primary is selected, low if Backup is selected)
2	Primary fault output (goes low if a Primary fault is present)
3	Backup fault output (goes low if a Backup fault is present)
4	State Manual_Auto output (high if Manual is selected, low if Auto is selected)
5	GND
6	Power fault output (goes low if a fault is preset in the power subsystem)
7	Manual mode input (drive this pin low to assert Manual mode (10 kΩ pull-up resistor))
8	Auto mode input (drive this pin low to assert Auto mode (10 kΩ pull-up resistor))
9	Fault reset input (drive this pin low to assert a fault reset (10 kΩ pull-up resistor))
10	Configurable fault output (goes low if any fault selected in the GPI EVENTS menu are present; also goes low during any watchdog reboot)
11	GND
12	
13	Primary select input (drive this pin low to select the Primary source (10 kΩ pull-up resistor)
14	Backup select input (drive this pin low to select the Backup source (10 kΩ pull-up resistor)
15	

Table 10: EXPANSION connector

Pin	Signal
1	Fault Primary
2	Fault Backup
3	Auto enable
4	Primary enable
5	
6	Fault reset
7	Master present
8	GND

Performance verification tests

Test 1: Front panel LEDs

This test checks the front-panel LEDs.

Required equipment

- None

Procedure

1. Run the LED diagnostic test:
   a. Press **BACK** as necessary to access the top-level menu.
   b. Press the up (▲) or down (▼) arrow to select **SYSTEM CONFIG**, and then press **ENTER** to access the SYSTEM CONFIG menu.
   c. Press the up (▲) arrow to select **DIAGNOSTICS**.
   d. Press **ENTER** to access the DIAGNOSTICS submenu.
   e. Press the up (▲) or down (▼) arrow to select **FP LED TEST**, and then press **ENTER** to start the test.
2. Observe the LEDS to verify that each LED lights up independently and that the intensity and color are uniform over all LEDs.
3. Record **Pass** or **Fail** in the Test Record for **Test 1**.

Test 2: Keyboards and beeper

This test checks the two front-panel keyboards and the internal beeper:

- The left keyboard has six buttons: ENABLE, RESET, AUTO, MANUAL, PRIMARY and BACKUP.
- The right keyboard has six buttons: ENTER, BACK, and four navigation arrows (▲ ▼ ◄ ►).

Required equipment

- None

Procedure

1. Test the left keyboard to observe correct action:
   a. Press and hold **ENABLE** for about 3 seconds. You will hear a beep and the button will light up indicating the panel is enabled.
   b. Record **Pass** or **Fail** in the Test Record for **Test 2, Beeper**.
   c. Press **MANUAL**, then **AUTO**, and then **MANUAL** to test those buttons.
   d. While the MANUAL button is lit, press **PRIMARY**, then **BACKUP**, and then **PRIMARY** to see that the buttons both work.
2. Test the right keyboard to observe correct action:
   a. Press **BACK** as necessary to access the top-level menu.
   b. Press the up (▲) or down (▼) arrow to select **STATUS**, and then press **ENTER** to access the STATUS menu.
   c. Use the arrow buttons to navigate in the menu.
   d. If all of the buttons work, press **BACK** to exit the STATUS menu.
3. Record **Pass** or **Fail** in the Test Record for **Test 2, Keyboards**.

Test 3: Power Supply module hot-swap and LEDs

This test checks that the instrument maintains operation when the Power Supply modules are hot-swapped and that the power LEDs are operating. If the instrument to be tested does not have a second supply installed, use a spare supply.

Required equipment

- Spare Option DPW Power Supply module (only if Option DPW is not installed in the test instrument)

Procedure

1. If the instrument does not have Option DPW installed, install the spare supply in the instrument and apply power to the supply.
2. Check that the LEDs on the Power Supply modules are both green.
3. Check the left Power Supply module:
   a. Pull the left Power Supply module out from the front of the instrument and verify that the instrument maintains continuous operation.
   b. Record **Pass** or **Fail** in the Test Record for **Test 3, PS1 hot-swap**.
   c. Check that AC LED remains green and the DC LED turns off for the removed supply.
   d. Reinstall the left Power Supply module.
   e. Check that the DC LED turns red for a few seconds and then turns green.
   f. Record **Pass** or **Fail** in the Test Record for **Test 3, PS1 LEDs**.
4. Check the right Power Supply module:
   a. Pull the right Power Supply module out from the front of the instrument and verify that the instrument maintains continuous operation.
   b. Record **Pass** or **Fail** in the Test Record for **Test 3, PS2 hot-swap**.
   c. Check that AC LED remains green and the DC LED turns off for the removed supply.
   d. Reinstall the right Power Supply module.
   e. Check that the DC LED turns red for a few seconds and then turns green.
   f. Record **Pass** or **Fail** in the Test Record for **Test 3, PS2 LEDs**.
5. If you installed a spare Option DPW supply for this test, remove the supply.

Test 4: Power Supply module load test

This test checks the ability of the ECO8000 Series to perform a load test on each of the installed Power Supply modules. If the instrument to be tested does not have a second supply installed, use a spare supply.

Required equipment

- 120/240 V power meter (Tektronix PA4000 1CH with BB1000-NA Breakout Box)
- Multi-outlet power strip
- Spare Option DPW Power Supply module (only if Option DPW is not installed in the test instrument)

Procedure

1. Connect the Breakout Box to the power meter.

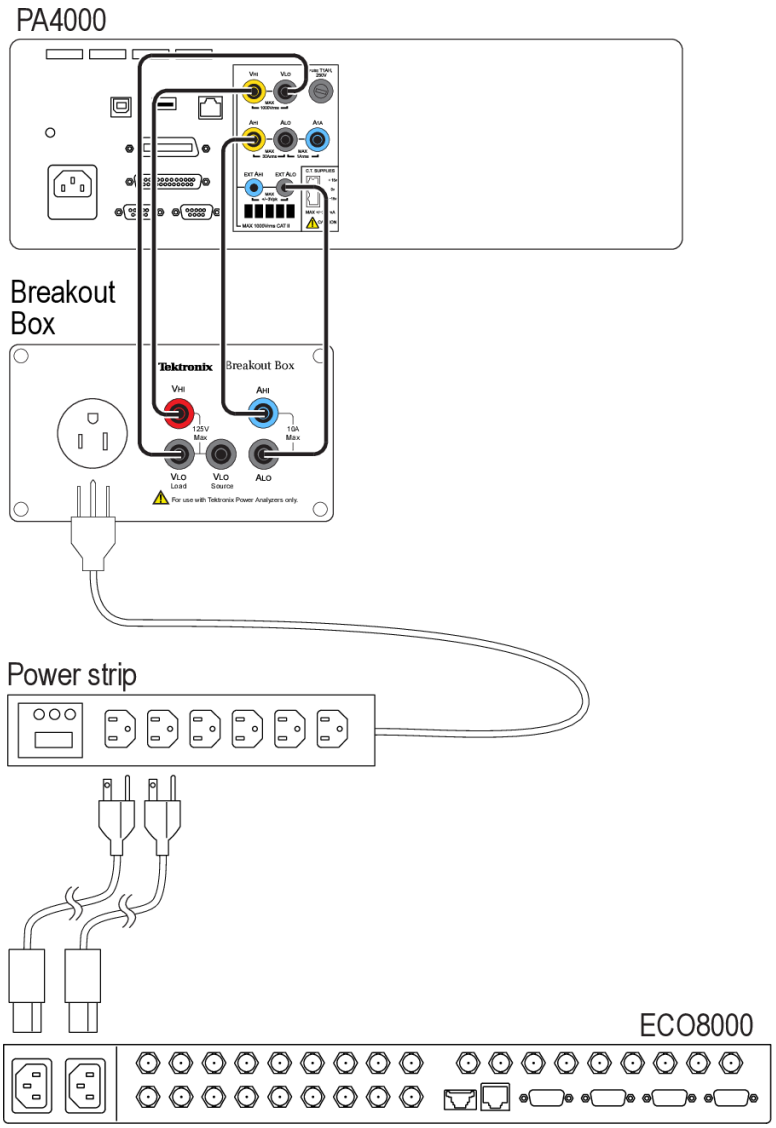


Figure 1: Equipment connections for Test 4 (ECO8000 shown)

2. If the instrument does not have Option DPW installed, install the spare supply in the instrument.
3. Connect the power cords from both ECO8000 Series supplies to a multi-outlet power strip.
4. Connect the power cord for the multi-outlet power strip to the Breakout Box.
5. Set the power meter readout for wattage.
6. Remove and reinstall the left Power Supply module while you watch the power meter. The power should increase approximately 30 watts during the 4 second load test.
7. Record **Pass** or **Fail** in the Test Record for **Test 4, PS1**.

8. Wait at least 30 seconds for the load resistor to cool down.
9. Remove and reinstall the right Power Supply module while you watch the power meter. The power should increase approximately 30 watts during the 4 second load test.
10. Record **Pass** or **Fail** in the Test Record for **Test 4, PS2**.
11. If you installed a spare Option DPW supply for this test, remove the supply.

Test 5: Diagnostics

This test checks that the diagnostic readouts of various internal parameters are within the operating range.

Required equipment

- None

Procedure

1. Press **BACK** as necessary to access the top-level menu.
2. Press the up (▲) or down (▼) arrow to select **SYSTEM CONFIG**, and then press **ENTER** to access the SYSTEM CONFIG menu.
3. Press the up (▲) arrow to select **DIAGNOSTICS**.
4. Press **ENTER** to access the DIAGNOSTICS submenu.
5. Check the temperature readouts:
   a. If necessary, use the up (▲) or down (▼) arrow to select **TEMPERATURE**.
   b. Press the right (►) arrow to scroll through the temperature readouts. Check that each temperature is **OK**.
   c. Record **Pass** or **Fail** in the Test Record for **Test 5, Temperature**.
6. Check the Main board readouts:

   NOTE. *The diagnostics display three types of voltages. Only the Power Supply voltage readouts are important for this test. Power supply voltages will be followed by "OK" if they are within the recommended limit or "WARN" if they are outside the recommended limit.*

   a. Press the down (▼) arrow to select **MAIN BOARD**.
   b. Press the right (►) arrow and check that each of the voltage readouts is **OK**. Ignore the LTC readouts.
   c. Record **Pass** or **Fail** in the Test Record for the **Test 5, Main board**.
7. Check the channel module readouts:
   a. Press the down (▼) arrow to select **MODULE 1**.
   b. Press the right (►) arrow and check that each of the voltage readouts is **OK**. Ignore the threshold, peak, and unused readouts.
   c. Record **Pass** or **Fail** in the Test Record for **Test 5, Channel module 1**.
   d. For each installed module (2-4), repeat steps a through c.
8. Check the fan status:
   a. Press the down (▼) arrow to select **FAN STATUS**.
   b. Press the right (►) arrow and check that the readout for each installed supply reads **Fan running**.
   c. Record **Pass** or **Fail** in the Test Record for **Test 5, Fan status**.
9. Check the RTC battery level:
   a. Press the down (▼) arrow to select **RTC BATTERY LEVEL**.
   b. Check that the second line of the display shows **More than 40% (OK)**.
   c. Record **Pass** or **Fail** in the Test Record for **Test 5, RTC battery level**.

Test 6: Channel configuration

This test checks that the CHANNEL menu properly displays the installed channel types. As you check the channels, you will update the Test Record for the installed channel types.

Required equipment

- None

Procedure

1. Press **BACK** as necessary to access the top-level menu.
2. Press the up (▲) or down (▼) arrow to select the CHANNEL menu.
3. Press the right (►) arrow to cycle through all the channels. As you scroll through the channel readouts, perform the following steps to update the Test Record:

   NOTE. *Since the ECO8000 Series can be optioned to have a variety of channel types, it is necessary to customize the Test Record as you check the installed channels.*

   a. Verify that you can view all of the channels present on the rear panel of the instrument, and that the channel type matches the channel options that were ordered.

   b. For each channel, note the type (either ELSW or RELAY). For each ELSW channel, put an "**X**" in the Test Record for the appropriate channel of the four categories for ELSW channel insertion loss (**Tests 8a, 8b, 8c, and 8d**).

   c. For each RELAY channel, put an "**X**" in the Test Record for the appropriate channel of the two categories for Relay channel insertion loss (**Tests 9a and 9b**).

   d. For all installed ELSW and RELAY channels, put an "**X**" in the Test Record for the two categories of threshold tests (**Tests 10a and 10b**). Both types of channels use the same test.

   NOTE. *In the Test Record, the first three channels are already marked since all instruments have at least three channels of ELSW in all configurations.*

4. Compare the channels that are displayed in the CHANNEL menu to the number and type of channels that were ordered with the instrument and the channels that are visible on the rear panel.
5. Record **Pass** or **Fail** in the Test Record for **Test 6**.

Test 7: Basic ECO channel-switching function

This test checks the basic ECO channel-switching function.

Required equipment

- Two Black Burst signal sources or a dual-channel Arbitrary Function Generator
- Two BNC-to-BNC cables (ECO8000 only)
- Two BNC-to-HD BNC cables (ECO8020 only)
- 75 Ω terminator

NOTE. *ECO8020 only: If you do not have an HD BNC terminator, you can use a third BNC-to-HD BNC cable to connect a standard BNC terminator to the instrument.*

Procedure

1. Press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
2. Press **MANUAL** to put the instrument in Manual mode.
3. Enable Channel 1 and set the CH 1 threshold to NTSC:
   a. From the top-level menu, press the up (▲) or down (▼) arrow to select the CHANNEL menu.
   b. Press the left (◄) or right (►) arrow to select **CH 1**.
   c. Press the **ENTER** button to access the CH 1 submenu.
   d. If necessary, press the up (▲) or down (▼) arrow to select **CH 1 ACTIVE**.
   e. Press the left (◄) or right (►) arrow to select **ENABLED**.
   f. Press **ENTER** to enable the channel.
   g. Press the down (▼) arrow to select **CH 1 TRIGGER**.
   h. Press the left (◄) or right (►) arrow to select **ENABLED**.
   i. Press **ENTER** to enable the channel trigger.
   j. Press the up (▲) or down (▼) arrow to select **CH 1 THRESHOLD**.
   k. Press the left (◄) or right (►) arrow to select **NTSC**.
   l. Press **ENTER** to set the channel threshold.
   m. Press **BACK** to exit the CH 1 submenu.
4. Disable all other channels:
   a. Press the left (◄) or right (►) arrow to select **CH 2**.
   b. Press the **ENTER** button to access the CH 2 submenu.
   c. If necessary, press the up (▲) or down (▼) arrow to select **CH 2 ACTIVE**.
   d. Press the left (◄) or right (►) arrow to select **DISABLED**.
   e. Press **ENTER** to disable the channel.
   f. Repeat steps a through e for each installed channel including the LTC channels if Option LTC is installed.

5. Connect Black Burst signals to channel 1:
   a. Connect a Black Burst signal to both the **PRI** and **BACK** connectors for channel 1.
   b. Terminate the channel 1 **OUT** connector in 75 Ω.

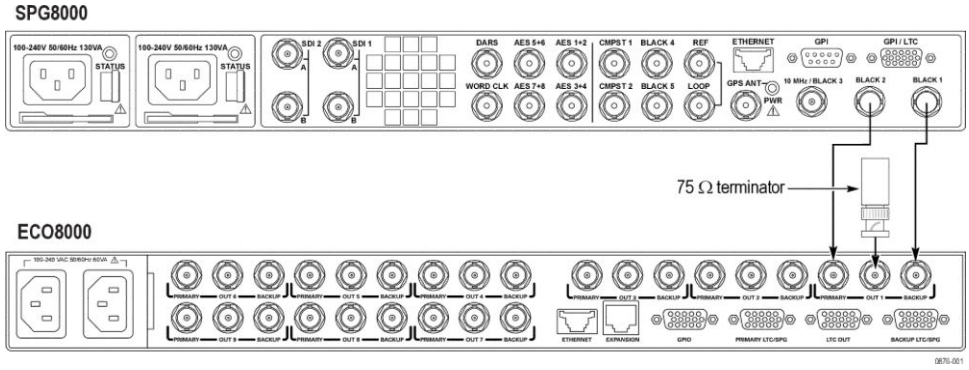


Figure 2: Equipment connections for Test 7 (ECO8000 shown)

6. On the ECO8000 Series, press **PRIMARY** and then press **AUTO**.
7. Remove the Black Burst signal from the PRI connector for channel 1.
8. Check that the signal source switches to BACKUP (the BACKUP button illuminates and flashes).
9. Reconnect the Black Burst signal to the PRI connector for channel 1.
10. Remove the Black Burst signal from the BACK connector for channel 1.
11. Check that the signal source switches to PRIMARY (the PRIMARY button illuminates).
12. Record **Pass** or **Fail** in the Test Record for **Test 7**.

Test 8: REF (ELSW) channel insertion loss

This test checks the insertion loss on the REF (ELSW) channels.

Required equipment

- Arbitrary function generator (AFG)
- Two BNC-to-BNC cables (ECO8000 only)
- BNC barrel (ECO8000 only)
- Two BNC-to-HD BNC cables (ECO8020 only)
- HD BNC barrel (ECO8020 only)
- BNC T connector
- Precision 75 Ω terminator
- BNC-to-Banana plug adapter
- Digital Multi Meter (DMM)

Procedure

1. Press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
2. Press **MANUAL** to put the instrument in Manual mode.
3. Press **PRIMARY** to select the Primary source.
4. For the ECO8000 only:
   a. Connect one end of a 1 meter BNC-to-BNC cable to the AFG.
   b. On the other end of the cable, connect a BNC barrel, and then connect a second 1 meter BNC-to-BNC cable.
5. For the ECO8020 only:
   a. Connect the BNC end of a 18 inch BNC-to-HD BNC cable to the AFG.
   b. On the other end of the cable, connect a HD BNC barrel, and then connect a second 18 inch BNC-to-HD BNC cable.

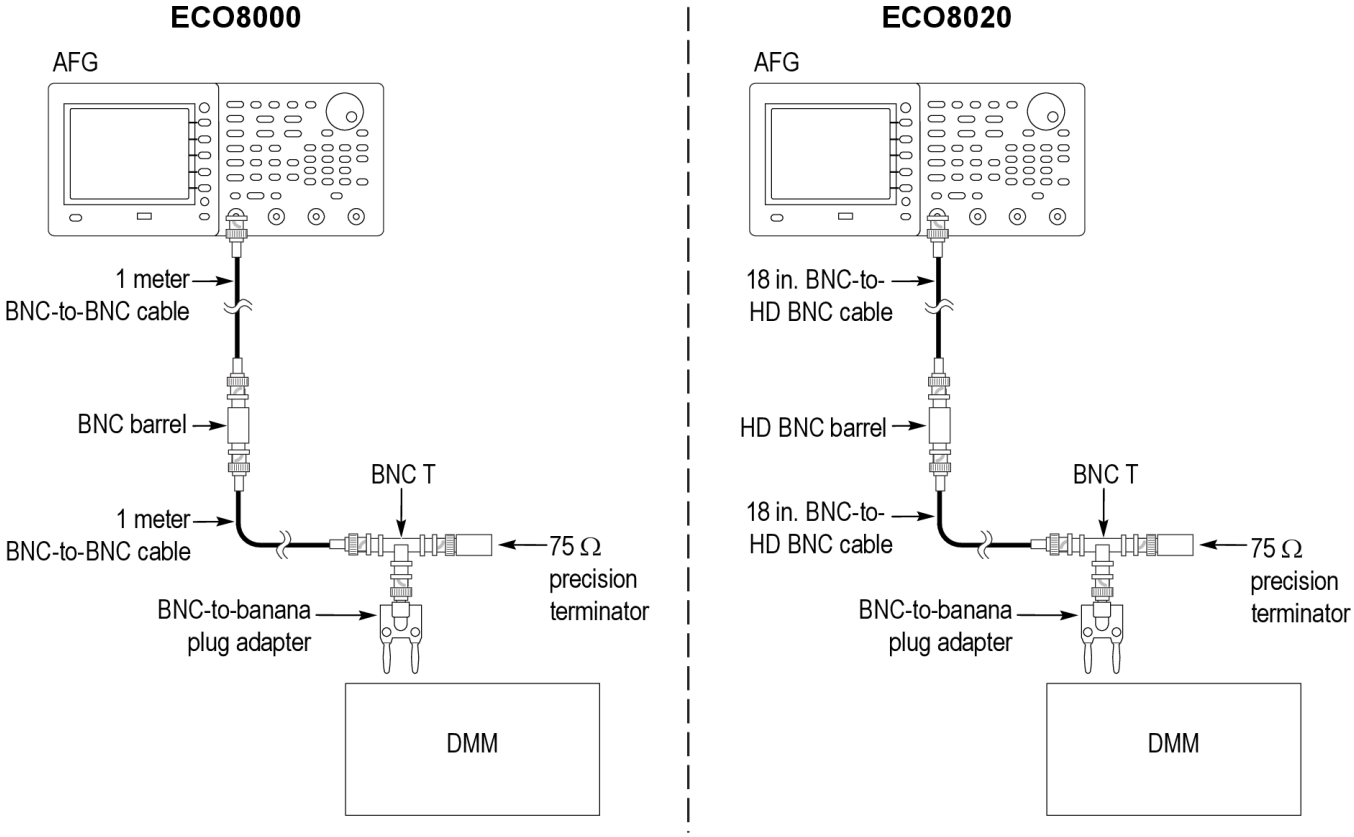


Figure 3: Initial equipment connections for Tests 8 and 9

6. Connect the end of the second cable to one side of the BNC T connector, and then put the precision 75 Ω terminator on the opposite side of the BNC T connector.
7. Connect the third leg of the BNC T connector to a BNC-to-Banana plug adapter.

8. Plug the ends of the banana adapter into the DMM. Be sure to observe polarity on the input to the DMM.
9. On the DMM, set the readout for AC voltage, 2 V range.
10. On the AFG, set the output to: square wave, 75 Ω, 2.0 V_{p-p}, 0 V offset, 10 kHz.
11. Check that the amplitude on the DMM is near 1 V RMS.
12. On the AFG, adjust the output amplitude to get 1.000 V RMS on the DMM.
13. Remove the barrel connector between the two cables.
14. Check the Primary channel insertion loss (power on):
    a. Connect the cable from the AFG to the **CH1 Primary** connector.
    b. Connect the cable from the DMM to the **CH 1 Output** connector.
    c. Record the measured level from the DMM in the Test Record for **Test 8a, CH1**.
15. Repeat step 14 for each REF (ELSW) channel installed in the instrument. The test record should have an "X" marked for each REF (ELSW) channel as detected in Test 6.
16. If necessary, press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
17. On the ECO8000 Series, press **BACKUP** to select the Backup source.
18. Check the Backup channel insertion loss (power on):
    a. Connect the cable from the AFG to the **CH1 Backup** connector.
    b. Connect the cable from the DMM to the **CH 1 Output** connector.
    c. Record the measured level on the DMM in the Test Record for **Test 8b, CH1**.
19. Repeat step 18 for each REF (ELSW) channel installed in the instrument. The test record should have an "X" marked for each REF (ELSW) channel as detected in Test 6.
20. If necessary, press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
21. Press **PRIMARY** to select the Primary source.
22. Remove the power source from the instrument.
23. Check the Primary channel insertion loss (power off):
    a. Connect the cable from the AFG to the **CH1 Primary** connector.
    b. Connect the cable from the DMM to the **CH 1 Output** connector.
    c. Record the measured level on the DMM in the Test record for **Test 8c, CH1**.

24. Repeat step 23 for each REF (ELSW) channel installed in the instrument. The test record should have an "X" marked for each ELSW channel as detected in Test 6.
25. Reconnect the power source to the instrument.
26. If necessary, press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
27. Press **BACKUP** to select the Backup source.
28. Again remove the power source from the instrument.
29. Check the Backup channel insertion loss (power off):
    a. Connect the cable from the AFG to the **CH1 Backup** connector.
    b. Connect the cable from the DMM to the **CH 1 Output** connector.
    c. Record the measured level on the DMM in the Test Record for **Test 8d, CH1**.
30. Repeat step 29 for each REF (ELSW) channel installed in the instrument. The test record should have an "X" marked for each ELSW channel as detected in Test 6.
31. Reconnect the power source to the instrument.

Test 9: HREF (Relay) channel insertion loss

This test checks the insertion loss on the HREF (Relay) channels. If your instrument has only REF (ELSW) channels, proceed to the next test.

Required equipment

- Arbitrary function generator (AFG)
- Two BNC-to-BNC cables (ECO8000 only)
- BNC barrel (ECO8000 only)
- Two BNC-to-HD BNC cables (ECO8020 only)
- HD BNC barrel (ECO8020 only)
- BNC T connector
- Precision 75 Ω terminator
- BNC-to-Banana plug adapter
- Digital Multi Meter (DMM) with test leads

Procedure

1. Press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
2. Press **MANUAL** to put the instrument in Manual mode.
3. Press **PRIMARY** to select the Primary source.

4. For the ECO8000 only:

   NOTE. *The initial equipment setup for this test is the same as for the previous Test 8. See Figure 3: Initial equipment connections for Tests 8 and 9 on page 36.*

   a. Connect one end of a 1 meter BNC-to-BNC cable to the AFG.

   b. On the other end of the cable, connect a BNC barrel, and then connect a second 1 meter BNC-to-BNC cable.

5. For the ECO8020 only:

   a. Connect the BNC end of a 18 inch BNC-to-HD BNC cable to the AFG.

   b. On the other end of the cable, connect a HD BNC barrel, and then connect a second 18 inch BNC-to-HD BNC cable.

6. Connect the end of the second cable to one side of the BNC T connector, and then put the precision 75 Ω terminator on the opposite side of the BNC T connector.

7. Connect the third leg of the BNC T connector to a BNC-to-Banana plug adapter.

8. Plug the ends of the banana adapter into the DMM. Be sure to observe polarity on the input to the DMM.

9. On the DMM, set the readout for AC voltage, 2 V range.

10. On the AFG, set the output to: square wave, 75 Ω, 2.0 V_{p-p}, 0 V offset, 10 kHz.

11. Check that the amplitude on the DMM is near 1 V RMS.

12. On the AFG, adjust the output amplitude to get 1.000 V RMS on the DMM.

13. Remove the barrel connector between the two cables.

14. Check the Primary channel insertion loss:

    a. Connect the cable from the AFG to the **Primary** connector on the first HREF (Relay) channel installed in the instrument as detected in Test 6.

    b. Connect the cable from the DMM to the **Output** connector of the same HREF (Relay) channel.

    c. Record the measured level from the DMM into the Test Record for **Test 9a, CHx** (tested channel number).

15. Repeat step 14 for each HREF (Relay) channel installed in the instrument. The test record should have an "X" marked for each Relay channel as detected in Test 6.

16. If necessary, press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.

17. On the ECO8000 Series, press **BACKUP** to select the Backup source.

18. Check the Backup channel insertion loss:
    a. Connect the cable from the AFG to the **Backup** connector on the first HREF (Relay) channel installed in the instrument as detected in Test 6.
    b. Connect the cable from the DMM to the **Output** connector of the same HREF (Relay) channel.
    c. Record the measured level on the DMM into the Test Record for **Test 9b, CHx** (tested channel number).
19. Repeat step 18 for each HREF (Relay) channel installed in the instrument. The test record should have an "X" marked for each Relay channel as detected in Test 6.

Test 10: REF (ELSW) and HREF (Relay) channel threshold

This test checks the threshold on the REF (ELSW) and HREF (Relay) channels installed in the instrument.

Required equipment

- Arbitrary function generator (AFG)
- ECO8000 only: BNC-to-BNC cable
- ECO8020 only: BNC-to-HD BNC cable

Procedure

NOTE. *For this test, the signal source is set to Backup while measuring the Primary channels so that the HREF (Relay) channel inputs are terminated. To measure the threshold on the active input of a HREF (Relay) channel, you must put a terminator on the Output connector.*

---

1. Put the ECO8000 Series in Manual mode:
    a. Press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
    b. Press **MANUAL** to put the instrument in Manual mode.
2. Enable Channel 1 and set the threshold to 1 V:
    a. On the ECO8000 Series, press **BACK** as necessary to access the top-level menu.
    b. Press the up (▲) or down (▼) arrow to select the CHANNEL menu.
    c. Press the left (◄) or right (►) arrow to select **CH 1**.
    d. Press the **ENTER** button to enter the CH 1 submenu.
    e. Press the up (▲) or down (▼) arrow to select **CH 1 ACTIVE**.
    f. Press the left (◄) or right (►) arrow to select **Enabled**.
    g. Press the **ENTER** button to make the selection.
    h. Press the up (▲) or down (▼) arrow to select **CH 1 THRESHOLD**.

i. Press the left (◄) or right (►) arrow to select **WC 1V**.

j. Press **ENTER** to make the selection.

k. Press **BACK** to exit the CH 1 menu.

3. Repeat step 2 for each REF (ELSW) and HREF (Relay) channel installed in the instrument as detected in Test 6.

4. Set the signal source to Backup:

   a. Press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.

   b. Press **MANUAL** to put the instrument in Manual mode.

   c. Press **BACKUP** to select the Backup source.

5. Configure the AFG output:

   a. Set the output to: square wave, 75 Ω, 700 mV, 0 V offset, 48 kHz.

   b. Set the knob to adjust the amplitude in 1 mV steps.

6. Check the Channel 1 Primary threshold:

   a. Connect the AFG output to the **CH 1 Primary** connector.

   b. If the front-panel Channel 1 status LED is red, adjust the amplitude level up on the AFG until the LED turns yellow.

   c. Slowly adjust the amplitude level down on the AFG until the Channel 1 status LED turns red.

   d. Record the displayed amplitude level on the AFG at the point where the LED turned red in the Test Record for **Test 10a, CH1**.

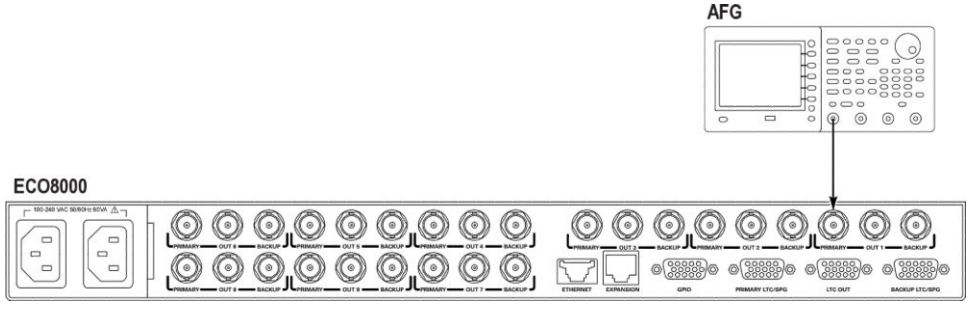


Figure 4: Initial equipment connection for Test 10 (ECO8000 shown)

7. Repeat step 6 for the Primary input for each of the REF (ELSW) and HREF (Relay) channels installed in the instrument as detected in Test 6.

8. If necessary, press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.

9. On the ECO8000 Series, press **PRIMARY** to select the Primary source.

10. Check the Channel 1 Backup threshold:
    a. Connect the AFG output to the **CH 1 Backup** connector.
    b. If the front-panel Channel 1 status LED is red, adjust the amplitude level up on the AFG until the LED turns yellow.
    c. Adjust the amplitude level down on the AFG until the Channel 1 status LED turns red.
    d. Record the displayed amplitude level on the AFG output at the point where the LED turned red in the Test Record for **Test 10b, CH1**.
11. Repeat step 10 for the Backup input for each of the REF (ELSW) and HREF (Relay) channels installed in the instrument as detected in Test 6.

Test 11: LTC channel insertion loss (Option LTC only)

This test checks the insertion loss on the LTC channels.

Required equipment

- Arbitrary function generator (AFG)
- Digital multi meter (DMM) with test leads
- Two 15-pin HD-DSUB (Winford) breakout adapters
- 602 Ω resistor
- Three BNC-to-banana jack adapters
- BNC-to-banana plug adapter
- Two 22 gauge, 1 meter wires

Procedure

1. Create a DMM setup with a 600 Ω load:
    a. Loosen both screw terminals on a BNC-to-banana jack adapter, and insert the 602 Ω resistor into the two holes. Tighten the screw terminals to secure and connect the resistor to the adapter.
    b. Connect the BNC end of that adapter to a BNC-to-banana plug adapter.
    c. Plug the assembled banana plugs into the DMM.
    d. Attach the DMM probe leads to the terminals on the BNC-to-banana adapter and resistor assembly.

e. Set the DMM to measure AC volts.

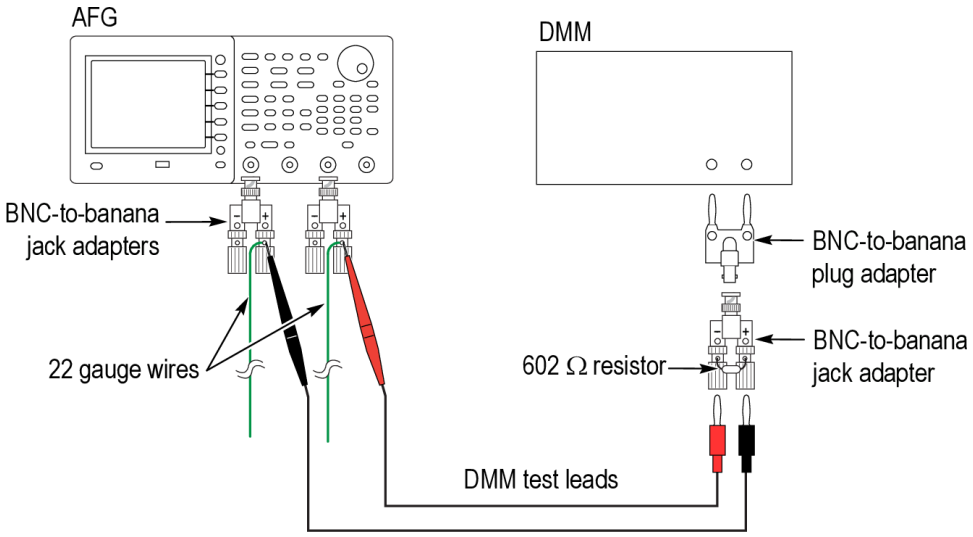


Figure 5: Equipment connections to characterize the AFG output for Test 11

2. Set up the AFG to differentially drive the LTC 1 input at 1 V_{RMS}:

NOTE. *Steps 2 and 3 set up the AFG to differentially drive the LTC input at 1* V_{RMS}.

a. Cut two 1 meter wires, 22 gauge, and strip 1 cm on each end.

b. Loosen the screw terminal on the positive side of a BNC-to-banana jack adapter, and install one end of a 22 gauge, 1 meter wire. Tighten the terminal to secure the wire to the adapter.

c. Repeat step b using the other wire and a second BNC-to-banana jack adapter.

d. Install the two BNC-to-banana jack adapters on the two outputs of the AFG.

e. On the AFG, set the CH1 output to square wave, 2 kHz, 600 Ω output impedance, 1.1 V_{p-p}.

f. On the AFG, set the CH2 output to follow CH1 inverted (three settings: Output menu CH2=CH1 complement, Amplitude CH2=CH1, Frequency CH2=CH1).

g. Connect the test leads from the DMM setup you created in step 1 to the outputs of the AFG by probing at the point where the 22 gauge wire attaches to each of the BNC-to-banana jack adapters.

h. Adjust the AFG output amplitude to get a reading of 1.000 ±0.001 V on the DMM.

3. Put the ECO8000 Series in Manual mode:
   a. Press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
   b. Press **MANUAL** to put the instrument in Manual mode.
4. Install a Winford adapter on the LTC OUT connector:

NOTE. *This procedure uses two Winford adapters. One adapter is referred to as the "output adapter" since it connects to the LTC OUT connector. The other adapter is referred to as the "input adapter" since it connects to the Primary or Backup LTC/SPG input connector.*

---

   a. On the Winford output adapter, tighten all the screws.

CAUTION. *You need to tighten all of the connection screws on the Winford output adapter to prevent erroneous measurement readings in the following steps.*

---

   b. Connect the Winford output adapter to the LTC OUT connector on the instrument.
5. Check the LTC 1 Primary insertion loss:

a. Connect the loose ends of the 22 gauge wires from the AFG setup to the Winford input adapter. To test LTC 1, use pins 10 and 14 (polarity is not important).

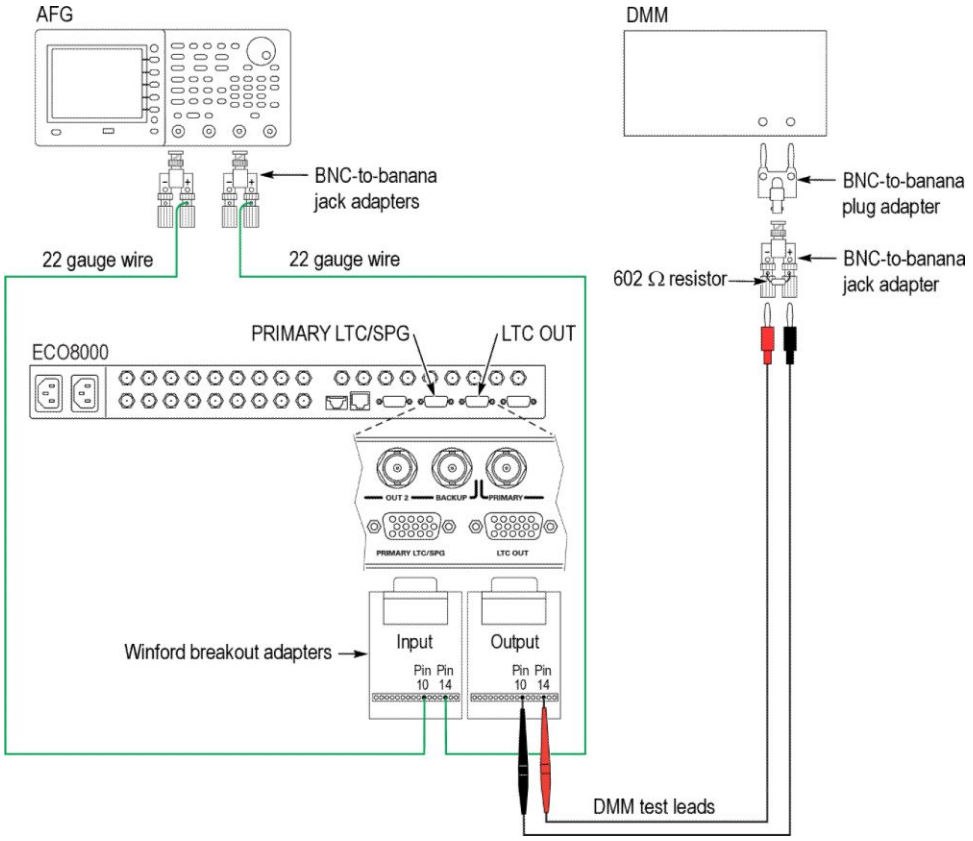


Figure 6: Equipment connections to test LTC 1 for Test 11

b. Connect the Winford input adapter to the Primary LTC/SPG input on the instrument.

c. Press **PRIMARY** to select the Primary source.

d. On the Winford output adapter connected to LTC OUT, use the DMM test leads to measure the output voltage across pins 10 and 14 (same pins as driven on the Winford input adapter).

e. Record the measured DMM level in the Test Record for **Test 12a, Primary**.

6. Check LTC 1 Backup insertion loss:

a. Move the Winford input adapter from the LTC 1 Primary input to the LTC 1 Backup input.

b. On the ECO8000 Series, press **BACKUP** to select the Backup source.

c. On the Winford output adapter connected to LTC OUT, use the DMM test leads to measure the output voltage across pins 10 and 14 (same pins as driven on the Winford input adapter).

d. Record the measured DMM level in the Test Record for **Test 11a, Backup**.

7. Check the LTC 2 insertion loss:

   a. Repeat step 5 for LTC 2 Primary using pins 8 and 13 on the breakout adapter. Record the measured DMM level in the Test Record for **Test 11b, Primary**.

   b. Repeat step 6 for LTC 2 Backup using pins 8 and 13 on the breakout adapter. Record the measured DMM level in the Test Record for **Test 11b, Backup**.

8. Check the LTC 3 insertion loss:

   a. Repeat step 5 for LTC 3 Primary using pins 7 and 12 on the breakout adapter. Record the measured DMM level in the Test Record for **Test 11c, Primary**.

   b. Repeat step 6 for LTC 2 Backup using pins 7 and 12 on the breakout adapter. Record the measured DMM level in the Test Record for **Test 11c, Backup**.

9. Check the LTC 4 insertion loss:

   a. Repeat step 5 for LTC 4 Primary using pins 5 and 15 on the breakout adapter. Record the measured DMM level in the Test Record for **Test 11d, Primary**.

   b. Repeat step 6 for LTC 2 Backup using pins 5 and 15 on the breakout adapter. Record the measured DMM level in the Test Record for **Test 11d, Backup**.

Test 12: LTC channel threshold and hysteresis (Option LTC only)

This test checks the threshold and hysteresis on the LTC channels.

Required equipment

- Arbitrary function generator (AFG)
- 15-pin HD-DSUB (Winford) breakout adapter
- Two BNC-to-banana jack adapters
- Two 22 gauge, 1 meter wires

Procedure

1. Set up the AFG to differentially drive the LTC 1 input at 1 V_{RMS}:

   NOTE. *This AFG setup is similar to the one used in Test 13, except the DMM setup is not used.*

   a. Cut two 1 meter wires, 22 gauge, and strip 1 cm on each end.

   b. Loosen the screw terminal on the positive side of a BNC-to-banana jack adapter, and install one end of a 22 gauge, 1 meter wire. Tighten the terminal to secure the wire to the adapter.

   c. Repeat step b using the other wire and a second BNC-to-banana jack adapter.

   d. Install the two BNC-to-banana jack adapters on the two outputs of the AFG.

   e. Set CH1 of the AFG for square wave, 2 kHz, high-impedance output, 1.1 V_{p-p}.

   f. Set CH2 of the AFG to follow CH1 inverted (three settings: Output menu CH2=CH1 complement, Amplitude CH2=CH1, Freq CH2=CH1).

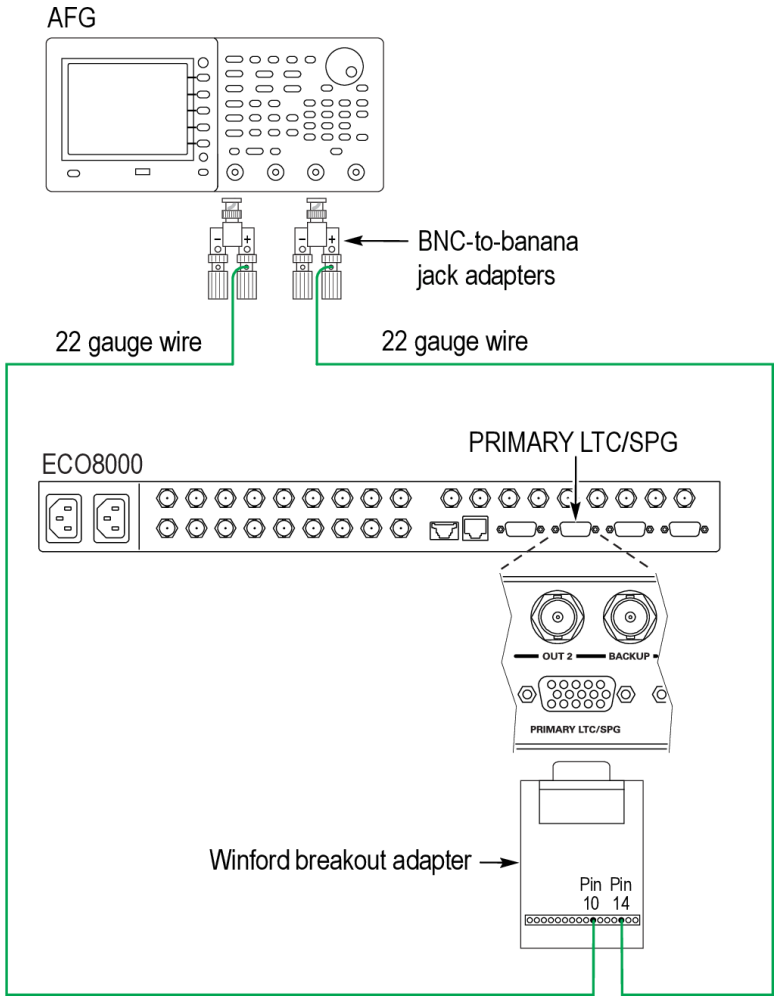


Figure 7: Initial equipment connections for Test 12

2. If necessary, set the ECO8000 Series to Manual mode:
   a. Press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
   b. Press **MANUAL** to put he instrument in Manual mode.
3. Connect the loose ends of the 22 gauge wires to the Winford breakout adapter. For LTC 1 use pins 10 and 14 (polarity is not important).
4. Enable LTC 1, set LTC 1 to output mode, set the LTC 1 threshold to 2.5 V, and disable all other LTC channels:
   a. On the ECO8000 Series, press **BACK** as necessary to access the top-level menu.
   b. Press the up (▲) or down (▼) arrow to select the CHANNEL menu.
   c. Press the left (◄) or right (►) arrow to select **LTC 1**.
   d. Press the **ENTER** button to enter the LTC 1 channel submenu.
   e. Press the up (▲) or down (▼) arrow to select **LTC 1 INPUT-OUTPUT**.
   f. If necessary, press the left (◄) or right (►) arrow to select **Output**

g. Press the **ENTER** button to make the selection.

h. Press the up (▲) or down (▼) arrow to select **LTC 1 ACTIVE**.

i. Press the left (◄) or right (►) arrow to select **Enabled**.

j. Press the **ENTER** button to make the selection.

k. Press the up (▲) or down (▼) arrow to select **LTC 1 THRESHOLD**.

l. Press the left (◄) or right (►) arrow to select **2.5 Volt**.

m. Press the **ENTER** button to make the selection.

n. Press the **BACK** button to exit the LTC 1 channel submenu.

o. Press the left (◄) or right (►) arrow to select **LTC 2**.

p. If the top line does not read **LTC 2 DISABLED**, press the **ENTER** button to access the LTC 2 submenu. Otherwise proceed to step q.

q. Press the left (◄) or right (►) arrow to select **Disabled**.

r. Press the **ENTER** button to make the selection.

s. Press the **BACK** button to exit the LTC 2 channel submenu.

t. Repeat steps o through s for the LTC 3 and LTC 4 channels.

5. Check the LTC 1 Primary thresholds:

a. Connect the Winford adapter to the **LTC 1 Primary** input on the instrument.

b. If the LTC Primary LED is red, then increase the amplitude on the AFG until the LED turns yellow.

c. Set the AFG so that the knob adjusts the amplitude in 1 mV steps.

d. Slowly decrease the amplitude on the AFG until the LTC Primary LED turns red.

CAUTION. *You need to adjust the amplitude slowly since you cannot easily back up to get the LED to turn back to yellow.*

e. Record the displayed amplitude level on the AFG at the point where the LED turned red in the Test Record for **Test 12a - Primary, green/ yellow to red**.

f. Increase the amplitude on the AFG until the LED turns yellow. You will have to increase the level quite a bit before the LED will change color.

g. Record the displayed amplitude level on the AFG at the point where the LED turned yellow in the Test Record for **Test 12a - Primary, red to green/yellow**.

h. Calculate the difference between these two threshold levels and record the difference in the Test Record for **Test 12a - Primary, calculated hysteresis**.

6. Check the LTC 1 Backup thresholds:
   a. Move the Winford adapter to the **LTC 1 Backup** input on the instrument.
   b. If the LTC Backup LED is red, then increase the amplitude on the AFG until the LED turns yellow.
   c. Slowly decrease the amplitude on the AFG until the LTC Backup LED turns red.

CAUTION. *You need to adjust the amplitude slowly since you cannot easily back up to get the LED to turn back to yellow.*

   d. Record the displayed amplitude level on the AFG at the point where the LED turned red in the Test Record for **Test 12a - Backup, green/ yellow to red**.
   e. Increase the amplitude on the AFG until the LED turns yellow. You will have to increase the level quite a bit before the LED will change color.
   f. Record the displayed amplitude level on the AFG at the point where the LED turned yellow in the Test Record for **Test 12a - Backup, red to green/yellow**.
   g. Calculate the difference between these two threshold levels and record the difference in the Test Record for **Test 12a - Backup, calculated hysteresis**.
7. Check the LTC 2 thresholds:
   a. Repeat steps 3 through 6 for LTC 2 using pins 8 and 13 on the breakout adapter.
   b. Record the measured DMM levels in the Test Record for **Test 12b**.
8. Check the LTC 3 thresholds:
   a. Repeat steps 3 through 6 for LTC 3 using pins 7 and 12 on the breakout adapter.
   b. Record the measured DMM levels in the Test Record for **Test 12c**.
9. Check the LTC 4 thresholds:
   a. Repeat steps 3 through 6 for LTC 4 using pins 5 and 15 on the breakout adapter.
   b. Record the measured DMM levels in the Test Record for **Test 12d**.

Test 13: GPIO output function

This test checks the function of the GPIO outputs. In this test you will measure the unasserted output level with a DMM, cause an error, and then measure the asserted level.

Required equipment

- Digital Multi Meter (DMM) with test leads
- 15-pin HD-DSUB (Winford) breakout adapter
- Spare Option DPW Power Supply module (only if Option DPW is not installed in the test instrument)

Procedure

1. On the ECO8000 Series, disable all channels except CH 1:
   a. Press **BACK** as necessary to access the top-level menu.
   b. Press the up (▲) or down (▼) arrow to select the CHANNEL menu.
   c. Press the left (◄) or right (►) arrow to select **CH 2**.
   d. Press **ENTER** to enter the CH 2 submenu.
   e. Press the up (▲) or down (▼) arrow to select **CH 2 ACTIVE**.
   f. Press the left (◄) or right (►) arrow to select **Disabled**.
   g. Press **ENTER** to make the selection.
   h. Press **BACK** to exit the CH 2 menu.
   i. Repeat steps c through h for each installed channel as detected in Test 6, including the LTC channels if Option LTC is installed.
2. Enable CH 1 and set the CH 1 threshold to NTSC:
   a. Press **BACK** as necessary to access the top-level menu.
   b. Press the up (▲) or down (▼) arrow to select the CHANNEL menu.
   c. Press the left (◄) or right (►) arrow to select **CH 1**.
   d. Press the **ENTER** button to enter the CH 1 submenu.
   e. Press the up (▲) or down (▼) arrow to select **CH 1 ACTIVE**.
   f. Press the left (◄) or right (►) arrow to select **Enabled**.
   g. Press the **ENTER** button to make the selection.
   h. Press the down (▼) arrow to select **CH 1 TRIGGER**.
   i. Press the left (◄) or right (►) arrow to select **ENABLED**.
   j. Press **ENTER** to enable the channel trigger.
   k. Press the up (▲) or down (▼) arrow to select **CH 1 THRESHOLD**.
   l. Press the left (◄) or right (►) arrow to select **NTSC**.
   m. Press **ENTER** to make the selection.
   n. Press **BACK** to exit the CH 1 menu.

3. Connect an NTSC signal such as Black Burst to both the Primary and Backup inputs for CH 1.

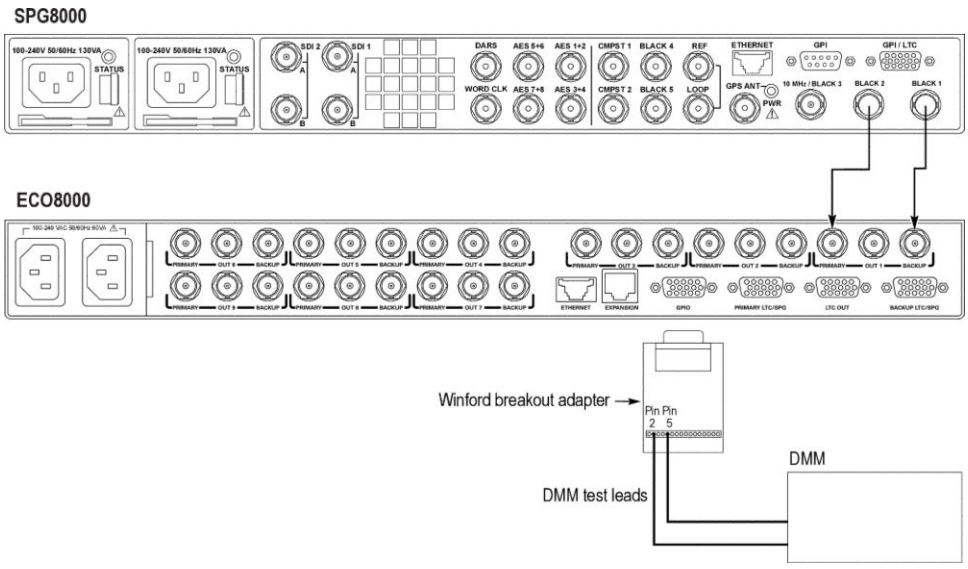


Figure 8: Initial equipment connections for Test 13

4. Install the Winford breakout adapter on the GPIO connector of the ECO8000 Series.
5. Check the CH 1 Primary input:
   a. Use the voltmeter to check that the voltage between pins 5 and 2 is above 4.5 V.
   b. Remove the NTSC signal from the CH 1 Primary input.
   c. Use the voltmeter to check that the voltage between pins 5 and 2 is less than 0.5 V.
   d. Reconnect the NTSC signal to the CH 1 Primary input.
6. Check the CH 1 Backup input:
   a. Use the voltmeter to check that the voltage between pins 5 and 3 is above 4.5 V.
   b. Remove the NTSC signal from the CH 1 Backup input.
   c. Use the voltmeter to check that the voltage between pins 5 and 3 is less than 0.5 V.
   d. Reconnect the NTSC signal to the CH 1 Backup input.
7. Check the Primary and Backup sources:
   a. Press **PRIMARY** to select the Primary source.
   b. Use the voltmeter to check that the voltage between pins 5 and 1 is above 4.5 V.

c. Press **BACKUP** to select the Backup source.

d. Use the voltmeter to check that the voltage between pins 5 and 1 is less than 0.5 V.

8. Check the Manual and Auto modes:

a. Press **MANUAL** to enable Manual mode.

b. Use the voltmeter to check that the voltage between pins 5 and 4 is above 4.5 V.

c. Press **AUTO** to enable Auto mode.

d. Use the voltmeter to check that the voltage between pins 5 and 4 is less than 0.5 V.

9. Enable only the Primary Fault for the GPIO port:

a. Press **BACK** as necessary to access the top-level menu.

b. Press the up (▲) or down (▼) arrow to select **SYSTEM CONFIG**, and then press **ENTER** to access the SYSTEM CONFIG menu.

c. Press the up (▲) or down (▼) arrow to select **GPI EVENTS**, and then press **ENTER** to access the GPI EVENTS submenu.

d. If necessary, press the up (▲) or down (▼) arrow to select **PRIMARY FAULT**.

e. Press the left (◄) or right (►) arrow to select **GPI ENABLED**, and then press **ENTER** to make the selection.

f. Press the down (▼) arrow to select **BACKUP FAULT**.

g. Press the left (◄) or right (►) arrow to select **GPI DISABLED**, and then press **ENTER** to make the selection.

h. Repeat step f and g for each of the remaining GPI events.

i. Press **BACK** to exit the GPI EVENTS submenu.

10. Check the Primary Fault on the GPIO port:

a. Check that the CH 1 Primary LED is either yellow or green. If not, reconnect the NTSC signal.

b. Use the voltmeter to check that the voltage between pins 5 and 10 is above 4.5 V.

c. Remove the NTSC signal from the CH 1 Primary input.

d. Use the voltmeter to check that the voltage between pins 5 and 10 is less than 0.5 V.

e. Reconnect the NTSC signal to the CH 1 Primary input.

11. Check the Power Supply module source switching:

a. If Option DPW is not installed, temporarily install and apply power to a second Power Supply module for this test.

b. Check that there are no red LEDs on either Power Supply module.

c. Use the voltmeter to check that the voltage between pins 5 and 6 is above 4.5 V.

d. Remove the power cord from one of the two Power Supply modules.

e. Use the voltmeter to check that the voltage between pins 5 and 6 is less than 0.5 V.

f. For instruments without Option DPW, remove the spare supply that was installed in step a.

12. Record **Pass** or **Fail** in the Test Record for **Test 13**.

Test 14: GPI input function

This test checks the function of the GPI inputs by connecting input pins on the GPIO port to ground and observing changes in the state of the instrument.

Required equipment

- 15-pin HD-DSUB (Winford) breakout adapter
- 22 gauge wire, 20 cm minimum length (you can use the 1 meter wire from Tests 12 and 13)
- SPG8000 Master Sync / Clock Reference Generator (NTSC signal source)
- ECO8000 only: BNC-to-BNC cable
- ECO8020 only: BNC-to-HD BNC cable

Procedure

1. Install the Winford breakout adapter on the GPIO connector of the ECO8000 Series.
2. Connect one end of a 22 gauge wire to pin 5 of the Windord adapter.

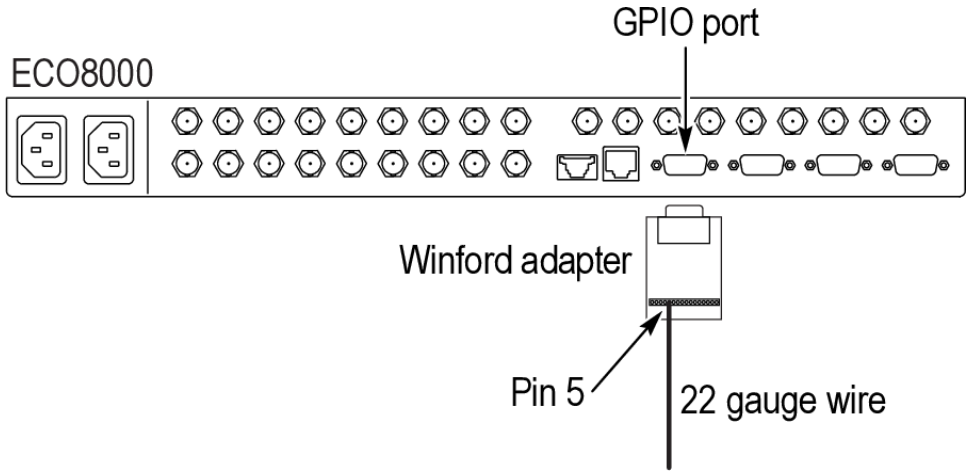


Figure 9: Initial equipment connections for Test 14

3. Check the AUTO and MANUAL mode functions:
   a. Alternate touching the other end of the wire to pin 7 and 8 of the Winford adapter.
   b. Check that when you touch pin 7, the instrument changes to MANUAL mode.
   c. Check that when you touch pin 8, the instrument changes to AUTO mode.
   d. When done, touch pin 7 to set the instrument to MANUAL mode.
4. Check the PRIMARY and BACKUP mode functions:
   a. Alternate touching the other end of the wire to pin 13 and 14 of the Winford adapter.
   b. Check that when you touch pin 13, the instrument changes to PRIMARY mode.
   c. Check that when you touch pin 14, the instrument changes to BACKUP mode.
   d. When done, touch pin 7 to set the instrument to MANUAL mode.
5. On the ECO8000 Series, enable CH 1 and set the CH 1 threshold to NTSC:
   a. Press **BACK** as necessary to access the top-level menu.
   b. Press the up (▲) or down (▼) arrow to select the CHANNEL menu.
   c. Press the left (◄) or right (►) arrow to select **CH 1**.
   d. Press the **ENTER** button to access the CH 1 submenu.

e. If necessary, press the up (▲) or down (▼) arrow to select **CH 1 ACTIVE**.

f. Press the left (◄) or right (►) arrow to select **ENABLED**.

g. Press **ENTER** to enable the channel.

h. Press the up (▲) or down (▼) arrow to select **CH 1 THRESHOLD**.

i. Press the left (◄) or right (►) arrow to select **NTSC**.

j. Press **ENTER** to set the CH 1 threshold.

k. Press **BACK** to exit the CH 1 submenu.

6. Connect an NTSC signal such as Black Burst to the CH 1 Primary connector.
7. Check that the channel 1 Primary LED is yellow.
8. On the Winford adapter, touch the end of the wire from pin 5 on the adapter to pin 9.
9. Check that the channel 1 Primary LED turns to green.
10. Record **Pass** or **Fail** in the Test Record for **Test 14**.

Test 15: Expansion port function

This test checks the function of the Expansion port.

Required equipment

- A second ECO8000 Series Automatic Changeover Unit (can be either ECO8000 or ECO8020)
- SPG8000 Master Sync / Clock Reference Generator (NTSC signal source)
- RJ45 (Ethernet) cable
- ECO8000 only: Two BNC-to-BNC cables
- ECO8020 only: Two BNC-to-HD BNC cables

Procedure

1. Connect an RJ45 Ethernet cable between the Expansion port on the ECO8000 Series (DUT) and the Expansion port on a second ECO8000 Series.

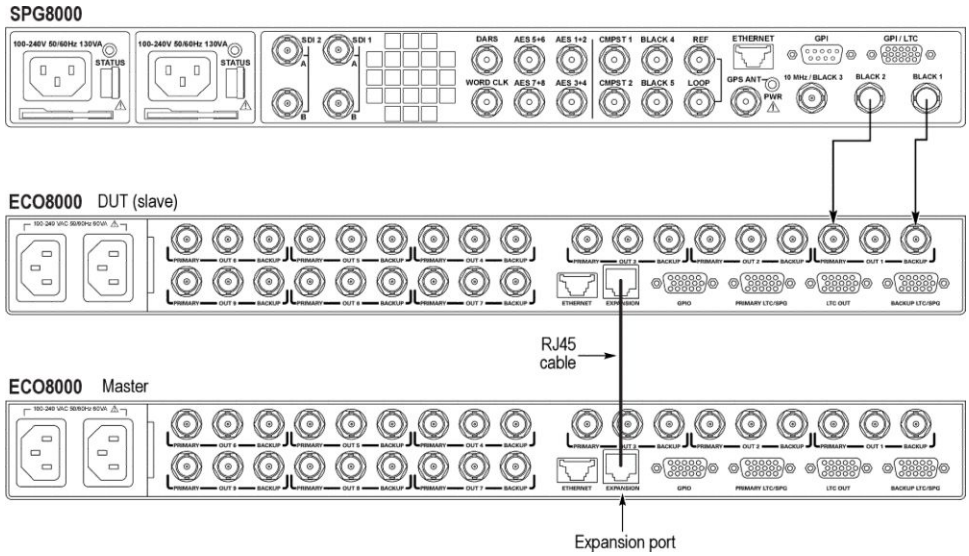


Figure 10: Initial equipment connections for Test 15

2. On the DUT, set the Expansion port to Slave mode:
   a. Press **BACK** as necessary to access the top-level menu.
   b. Press the up (▲) or down (▼) arrow to select **SYSTEM CONFIG**, and then press **ENTER** to access the SYSTEM CONFIG menu.
   c. Press the up (▲) or down (▼) arrow to select **EXPANSION PORT**.
   d. Press the left (◄) or right (►) arrow to select **Slave**.
   e. Press **ENTER** to make the selection.
3. On the second ECO8000 Series, set the Expansion port to Master mode:
   a. Press **BACK** as necessary to access the top-level menu.
   b. Press the up (▲) or down (▼) arrow to select **SYSTEM CONFIG**, and then press **ENTER** to access the SYSTEM CONFIG menu.
   c. Press the up (▲) or down (▼) arrow to select **EXPANSION PORT**.
   d. Press the left (◄) or right (►) arrow to select **Master**.
   e. Press **ENTER** to make the selection.
4. On the second ECO8000 Series, verify the Master mode function:
   a. Press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
   b. Press **AUTO** and verify that the DUT also changes to AUTO mode.
   c. Repeat step b for each of the MANUAL, PRIMARY, and BACKUP buttons.

5. On the second ECO8000 Series, disable all installed channels:
   a. Press **BACK** as necessary to access the top-level menu.
   b. Press the up (▲) or down (▼) arrow to select the CHANNEL menu.
   c. Press the left (◄) or right (►) arrow to select **CH 1**.
   d. Press **ENTER** to access the CH 1 submenu.
   e. If necessary, press the up (▲) or down (▼) arrow to select **CH 1 ACTIVE**.
   f. Press the left (◄) or right (►) arrow to select **DISABLED**.
   g. Press **ENTER** to disable the channel.
   h. Press **BACK** to exit the CH 1 submenu.
   i. Repeat steps b through g for each installed channel.
6. On the DUT, enable only CH 1 and set the CH 1 threshold to NTSC:
   a. Press **BACK** as necessary to access the top-level menu.
   b. Press the up (▲) or down (▼) arrow to select the CHANNEL menu.
   c. Press the left (◄) or right (►) arrow to select **CH 1**.
   d. Press the **ENTER** button to access the CH 1 submenu.
   e. If necessary, press the up (▲) or down (▼) arrow to select **CH 1 ACTIVE**.
   f. Press the left (◄) or right (►) arrow to select **ENABLED**.
   g. Press **ENTER** to enable the channel.
   h. Press the down (▼) arrow to select **CH 1 TRIGGER**.
   i. Press the left (◄) or right (►) arrow to select **ENABLED**.
   j. Press **ENTER** to enable the channel trigger.
   k. Press the up (▲) or down (▼) arrow to select **CH 1 THRESHOLD**.
   l. Press the left (◄) or right (►) arrow to select **NTSC**.
   m. Press **ENTER** to set the CH 1 threshold.
   n. Press **BACK** to exit the CH 1 submenu.
   o. Press the left (◄) or right (►) arrow to select **CH 2**.
   p. Press the **ENTER** button to access the CH 2 submenu.
   q. If necessary, press the up (▲) or down (▼) arrow to select **CH 2 ACTIVE**.
   r. Press the left (◄) or right (►) arrow to select **DISABLED**.
   s. Press **ENTER** to enable the channel.
   t. Press **BACK** to exit the CH 2 submenu.
   u. Repeat steps l through q for each installed channel.

7. On the DUT, connect an NTSC signal such as Black Burst from the SPG8000 generator to both the Primary and Backup inputs for channel 1.
8. On the DUT, check that the LEDs for channel 1 are yellow.
9. On the second ECO8000 Series, press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
10. On the second ECO8000 Series, press **RESET** and verify that on the DUT, the channel 1 LEDs turn to green.
11. On the second ECO8000 Series, press **PRIMARY** and **AUTO**. The DUT should change to the same modes.
12. On the DUT, remove the signal from the CH 1 Primary input.
13. Verify that on both ECO8000 Series instruments, the source changes to **BACKUP**.
14. On the DUT, reconnect the signal to the CH 1 Primary input.
15. On the DUT, remove the signal from the CH 1 Backup input.
16. Verify that on both ECO8000 Series instruments, the source changes to **PRIMARY**.
17. On the DUT, set the Expansion port to Master mode:
    a. Press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
    b. Press **MANUAL** to put the instrument in Manual mode.
    c. Press **BACK** as necessary to access the top-level menu.
    d. Press the up (▲) or down (▼) arrow to select **SYSTEM CONFIG**, and then press **ENTER** to access the SYSTEM CONFIG menu.
    e. Press the up (▲) or down (▼) arrow to select **EXPANSION PORT**.
    f. Press the left (◄) or right (►) arrow to select **Master**.
    g. Press **ENTER** to make the selection.
18. On the second ECO8000 Series, press **MANUAL** to set the instrument in Manual mode.
19. On the second ECO8000 Series, set the Expansion port to Slave mode:
    a. Press **BACK** as necessary to access the top-level menu.
    b. Press the up (▲) or down (▼) arrow to select **SYSTEM CONFIG**, and then press **ENTER** to access the SYSTEM CONFIG menu.
    c. Press the up (▲) or down (▼) arrow to select **EXPANSION PORT**.
    d. Press the left (◄) or right (►) arrow to select **Slave**.
    e. Press **ENTER** to make the selection.

20. On the DUT, verify the Master mode function:

- **a.** Press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.
- **b.** Press **AUTO** and verify that the second ECO8000 Series also changes to AUTO mode.
- **c.** Repeat step b for each of the MANUAL, PRIMARY, and BACKUP buttons.

21. On the DUT, disable all installed channels:

- **a.** Press **BACK** as necessary to access the top-level menu.
- **b.** Press the up (▲) or down (▼) arrow to select the CHANNEL menu.
- **c.** Press the left (◄) or right (►) arrow to select **CH 1**.
- **d.** Press **ENTER** to access the CH 1 submenu.
- **e.** If necessary, press the up (▲) or down (▼) arrow to select **CH 1 ACTIVE**.
- **f.** Press the left (◄) or right (►) arrow to select **DISABLED**.
- **g.** Press **ENTER** to disable the channel.
- **h.** Press **BACK** to exit the CH 1 submenu.
- **i.** Repeat steps b through g for each installed channel.

22. On the second ECO8000 Series, enable only CH 1 and set the CH 1 threshold to NTSC:

- **a.** Press **BACK** as necessary to access the top-level menu.
- **b.** Press the up (▲) or down (▼) arrow to select the CHANNEL menu.
- **c.** Press the left (◄) or right (►) arrow to select **CH 1**.
- **d.** Press the **ENTER** button to access the CH 1 submenu.
- **e.** If necessary, press the up (▲) or down (▼) arrow to select **CH 1 ACTIVE**.
- **f.** Press the left (◄) or right (►) arrow to select **ENABLED**.
- **g.** Press **ENTER** to enable the channel.
- **h.** Press the down (▼) arrow to select **CH 1 TRIGGER**.
- **i.** Press the left (◄) or right (►) arrow to select **ENABLED**.
- **j.** Press **ENTER** to enable the channel trigger.
- **k.** Press the up (▲) or down (▼) arrow to select **CH 1 THRESHOLD**.
- **l.** Press the left (◄) or right (►) arrow to select **NTSC**.
- **m.** Press **ENTER** to set the CH 1 threshold.
- **n.** Press **BACK** to exit the CH 1 submenu.
- **o.** Press the left (◄) or right (►) arrow to select **CH 2**.

p. Press the **ENTER** button to access the CH 2 submenu.

q. If necessary, press the up (▲) or down (▼) arrow to select **CH 2 ACTIVE**.

r. Press the left (◄) or right (►) arrow to select **DISABLED**.

s. Press **ENTER** to enable the channel.

t. Press **BACK** to exit the CH 2 submenu.

u. Repeat steps l through q for each installed channel.

23. On the second ECO8000 Series, connect an NTSC signal such as Black Burst from the SPG8000 generator to both the Primary and Backup inputs for channel 1.

24. On the second ECO8000 Series, check that the LEDs for channel 1 are yellow.

25. On the DUT, press **RESET** and verify that on the second ECO8000 Series, the channel 1 LEDs turn to green.

26. On the DUT, press **PRIMARY** and **AUTO**. The second ECO8000 Series should change to the same modes.

27. On the second ECO8000 Series, remove the signal from the CH 1 Primary input.

28. Verify that on both ECO8000 Series instruments, the source changes to **BACKUP**.

29. On the second ECO8000 Series, reconnect the signal to the CH 1 Primary input.

30. On the second ECO8000 Series, remove the signal from the CH 1 Backup input.

31. Verify that on both ECO8000 Series instruments, the source changes to **PRIMARY**.

32. On the DUT, disable the Expansion port:

a. Press and hold **ENABLE** for a few seconds to enable the front panel. A beep will sound when the panel is enabled.

b. Press **MANUAL** to put the instrument in Manual mode.

c. Press **BACK** as necessary to access the top-level menu.

d. Press the up (▲) or down (▼) arrow to select **SYSTEM CONFIG**, and then press **ENTER** to access the SYSTEM CONFIG menu.

e. Press the up (▲) or down (▼) arrow to select **EXPANSION PORT**.

f. Press the left (◄) or right (►) arrow to select **Disable**.

g. Press **ENTER** to make the selection.

33. Repeat step 32 for the second ECO8000 Series.

34. Record **Pass** or **Fail** in the Test Record for **Test 15**.

Test 16: Ethernet port function

This test checks the function of the Ethernet port. In this test you will connect to the instrument over an Ethernet network and verify the operation of the Web UI.

Required equipment

- PC or computer
- RJ45 cable
- Optional: Ethernet network that can connect to the ECO8000 Series

NOTE. *There are two methods to connect the ECO8000 Series to a computer via an Ethernet network. Use the appropriate procedure in this section for the method you use to make the connection:*

- ***Method 1 (network connection)*** *- Connect a standard RJ45 Ethernet cable between the Ethernet port on the instrument and the Ethernet hub port of your local network. By connecting to a local Ethernet network, you can access the instrument using any PC on the network.*
- ***Method 2 (direct connection)*** *- Connect a standard RJ45 Ethernet cable between the Ethernet port on the instrument and the Ethernet port on the computer.*

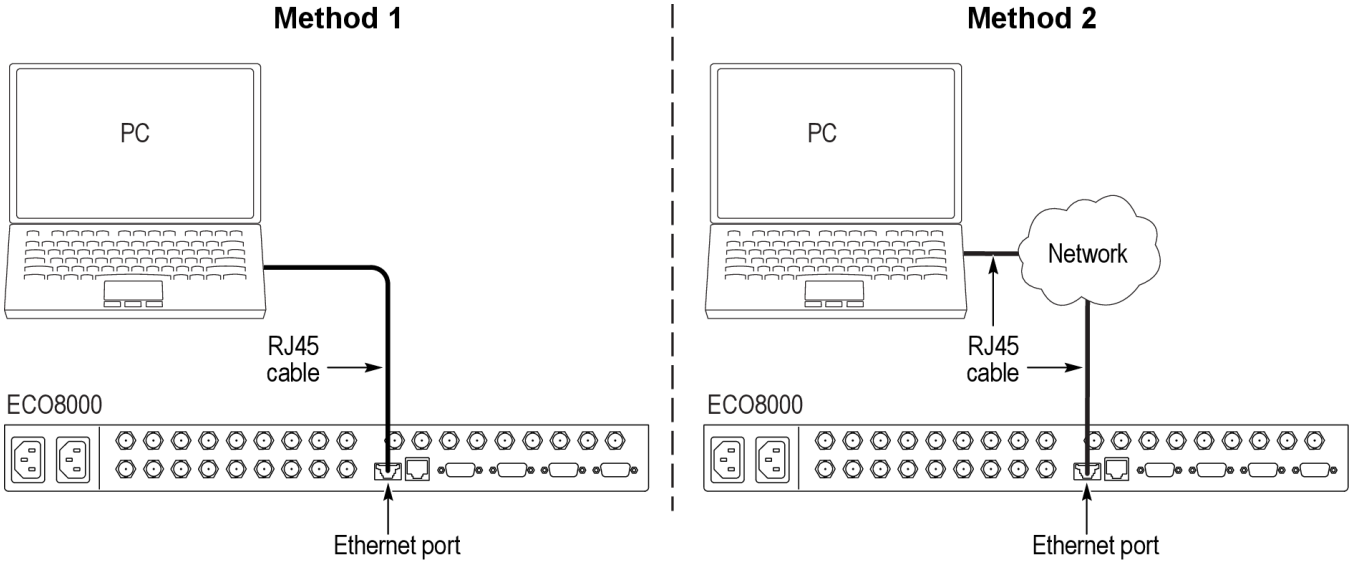


Figure 11: Equipment connections for Test 16

Method 1 (network connection) procedure

1. On the ECO8000 Series, enable or disable DHCP service:
   a. On the ECO8000 Series, press **BACK** as necessary to access the top-level menu.
   b. Press the up (▲) or down (▼) arrow to select **SYSTEM CONFIG**, and then press **ENTER** to access the SYSTEM CONFIG menu.
   c. Press the up (▲) or down (▼) arrow to select **NETWORK CONFIG**, and then press **ENTER** to access the NETWORK CONFIG submenu. The display shows whether DHCP is enabled or not.
   d. If your network supports DHCP, press the left (◄) or right (►) arrow to select **Enable**, and then press **ENTER** to implement the selection. Proceed to step 2.
   e. If your network does not support DHCP, press the left (◄) or right (►) arrow to select **Disable**, and then press **ENTER** to implement the selection. Proceed to step 3.
2. If you enabled DHCP service in step 1, verify the IP address assigned to the instrument:
   a. Make a note of the IP address listed on the second line.

   NOTE. *Under some network environments, the instrument may not be able to get the IP address automatically from a DHCP server. In this case, you need to manually enter the appropriate network parameter values by performing step 3.*

   b. Press **BACK** to exit the NETWORK CONFIG submenu.
   c. Proceed to step 4.

3. If you disabled DHCP service in step 1, manually assign an IP address to the instrument:

CAUTION. *To prevent communication conflicts on your Ethernet network, ask your local network administrator for the correct numbers to enter in the NETWORK CONFIG submenu if you connect the instrument to your local Ethernet network.*

---

   a. In the NETWORK CONFIG submenu, press the up (▲) or down (▼) arrow to select **IP ADDRESS**.

   b. Press **ENTER** to enter the address edit mode.

   c. Use the arrow buttons to set the IP address to the address supplied by the network administrator, and then press **ENTER** to implement the new address.

   d. Press the up (▲) or down (▼) arrow to select **SUBNET MASK**, and then press **ENTER** to enter the address edit mode.

   e. Use the arrow buttons to set the Subnet Mask to the address supplied by the network administrator, and then press **ENTER** to implement the new address.

   f. Press the up (▲) or down (▼) arrow to select **GATEWAY**, and then press **ENTER** to enter the address edit mode.

   g. Use the arrow buttons to set the Gateway to the address supplied by the network administrator, and then press **ENTER** to implement the new address.

   h. Press **BACK** to exit the NETWORK CONFIG submenu.

4. Verify the Ethernet connection by using a ping command from the computer.

5. Enable the Web User Interface on the ECO8000 Series:

   a. In the SYSTEM CONFIG menu, press the up (▲) or down (▼) arrow to select **WEB USER INTERFACE**.

   b. Press the left (◄) or right (►) arrow to select **Full Control**, and then press **ENTER** to implement the selection.

6. On the computer, enter the IP address of the instrument into a Web browser.

NOTE. *For best results, use Google Chrome, Mozilla Firefox, Safari, or Internet Explorer 9.0 or later when you connect to the ECO8000 Series Web Interface.*

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7. After the instrument Web UI appears, click on various tabs to get status and configure the instrument settings.

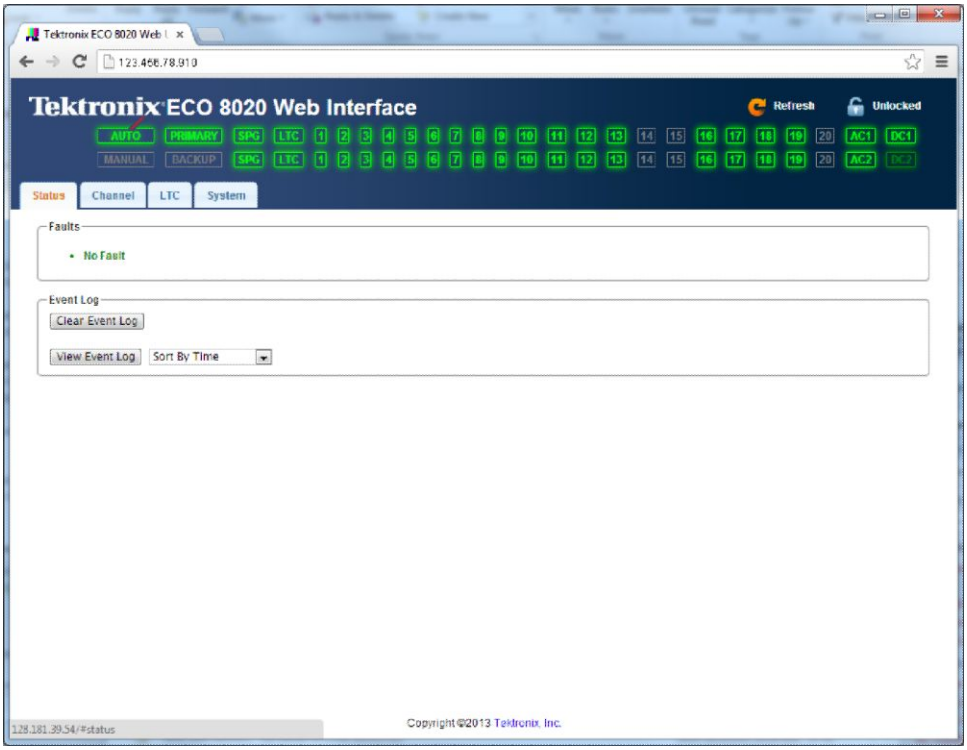

Figure 12: Web User Interface (ECO8020 shown)

8. Record **Pass** or **Fail** in the Test Record for **Test 16**.

Method 2 (direct connection) procedure

1. If you connected the instrument directly to the computer, configure the network parameters of the ECO8000 Series as follows:
   a. Make a note of the IP address and Subnet Mask of the computer.
   b. On the ECO8000 Series, press **BACK** as necessary to access the top-level menu.
   c. Press the up (▲) or down (▼) arrow to select **SYSTEM CONFIG**, and then press **ENTER** to access the SYSTEM CONFIG menu.
   d. Press the up (▲) or down (▼) arrow to select **NETWORK CONFIG**, and then press **ENTER** to access the NETWORK CONFIG submenu. The display shows whether DHCP is enabled or not.
   e. If necessary, press the left (◄) or right (►) arrow to select **Disable**, and then press **ENTER** to implement the selection.
   f. Press the up (▲) or down (▼) arrow to select **IP ADDRESS**, and then press **ENTER** to enter the address edit mode.
   g. Use the arrow buttons to set the IP address to be the same IP address as the PC's address except for the last number, and then press **ENTER** to implement the new address. The last number in the IP address must be different than the last number in the PC's IP address.
   h. If the computer has a Subnet Mask address, press the up (▲) or down (▼) arrow to select **SUBNET MASK**, and then press **ENTER** to enter the address edit mode.
   i. Use the arrow buttons to set the Subnet Mask to be the same net mask (subnet mask) used by the PC, and then press **ENTER** to implement the new address. Do not enter a number if the PC does not have a net mask.

   NOTE. *You do not need to enter a Gateway address if you are directly connected to a single PC.*

   j. Press **BACK** to exit the NETWORK CONFIG submenu.
2. Enable the Web User Interface on the ECO8000 Series:
   a. In the SYSTEM CONFIG menu, press the up (▲) or down (▼) arrow to select **WEB USER INTERFACE**.
   b. Press the left (◄) or right (►) arrow to select **Full Control**, and then press **ENTER** to implement the selection.
3. On the computer, enter the IP address of the instrument into a Web browser.

NOTE. *For best results, use Google Chrome, Mozilla Firefox, Safari, or Internet Explorer 9.0 or later when you connect to the ECO8000 Series Web Interface.*

4. After the instrument Web UI appears, click on various tabs to get status and configure the instrument settings. *Figure 12: Web User Interface (ECO8020 shown)* on page 65.
5. Record **Pass** or **Fail** in the Test Record for **Test 16**.