

Ultimate Bar Graph Engine Analyzer

(UBG-16 and UBG-16T)

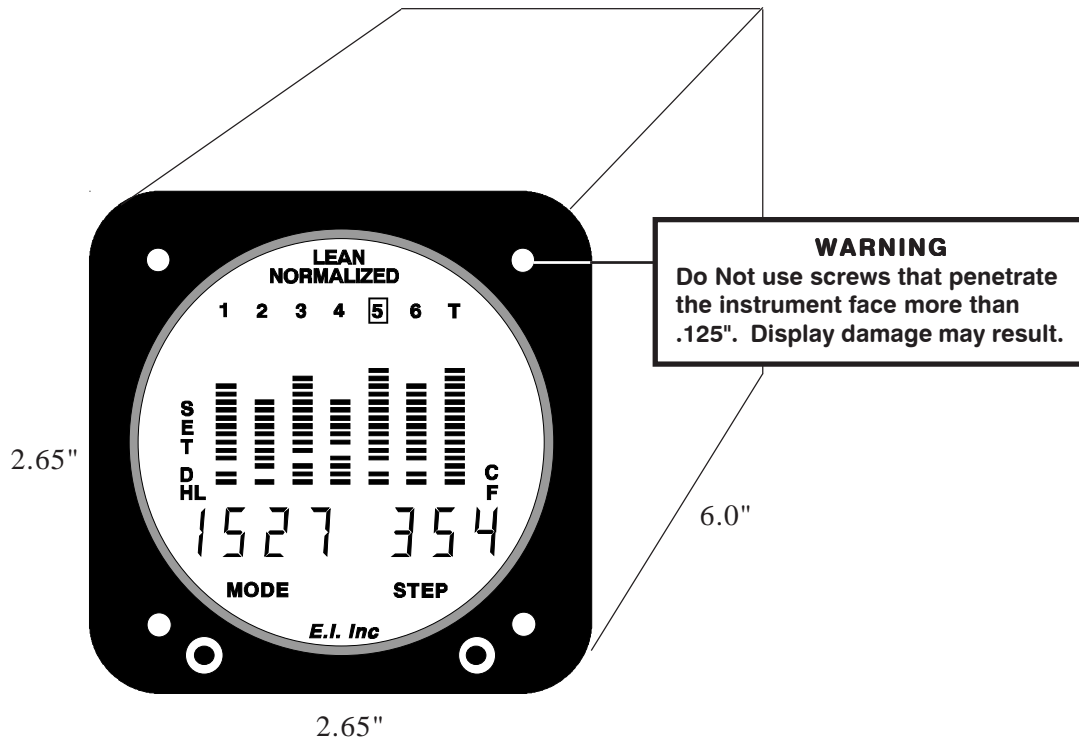
Installation Instructions

II 1111981

11/11/98

Rev. A 12/29/04

You must read this manual before installing or operating the instrument. This manual contains warranty and other information that may affect your decision to install this product and/or the safety of your aircraft.



S/N: _____



Electronics International Inc.®

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Important Notice

******* MUST READ *******

If you think it is not important to read this manual, you're wrong! This manual contains important installation information that may affect the safety of your aircraft, delay your installation or affect the operation of your instrument. You Must read this manual prior to installing your instrument. Any deviation from these installation instructions is the sole responsibility of the installer/pilot and may render the STC invalid.

Read the Warranty / Agreement. There is information in the Warranty / Agreement that may alter your decision to install this product. If you do not accept the terms of the Warranty / Agreement, do not install this product. This product may be returned for a refund. Contact Electronics International inc. for details.

If you are not an FAA Certified Aircraft Mechanic familiar with the issues of installing aircraft EGT/CHT instruments, Do Not attempt to install this instrument. The installer should use current aircraft standards and practices to install this instrument (refer to AC 43.13).

Before starting the installation make sure the unit will fit in the location you intend to install it without obstructing the operation of any controls.

The pilot **must** understand the operation of this product before flying the aircraft. Do not allow anyone to operate the aircraft that does not know the operation of this product. Keep the Operating Manual in the aircraft at all times.

It is possible for any instrument to fail thereby displaying inaccurate high, low or jumpy readings. Therefore, you must be able to recognize an instrument failure and you must be proficient in operating your aircraft safely in spite of an instrument failure. If you do not have this knowledge, contact the FAA or a local flight instructor for training.

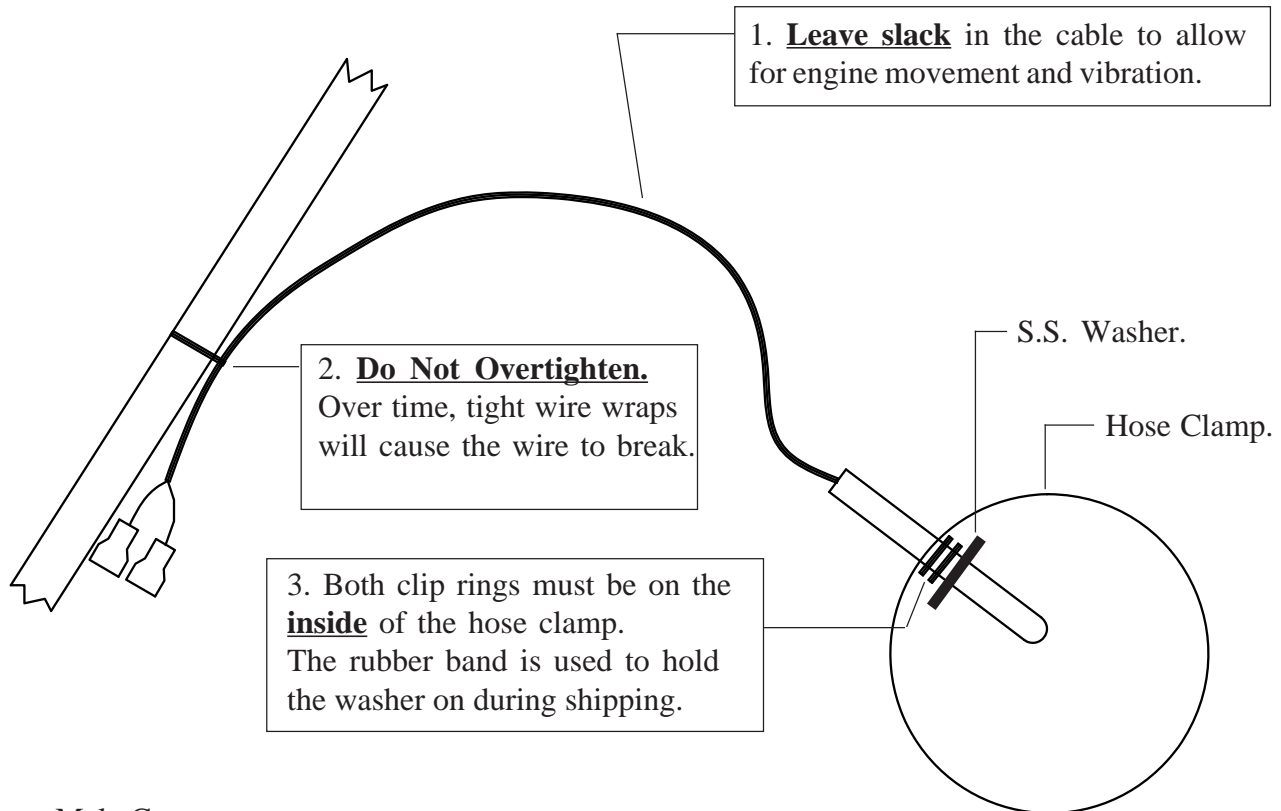
WARNING

Do Not use screws that penetrate the instrument face more than .125". Display damage may result.

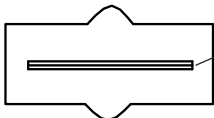
Important Installation Information

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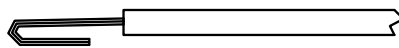
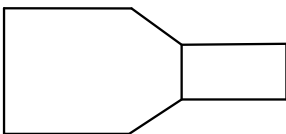
👉 All steps must be read before installing a probe. 👈



Male Conn.



4. The tab inside the male connector **must be centered** (not bent up or down) to mate properly. Check each connector before installation. **Two drops of oil on the connector will protect it from corrosion for many years.**



5. If you remove a connector, **double over the wire** before installing it into a new connector. Each connector must be double crimped very tightly.

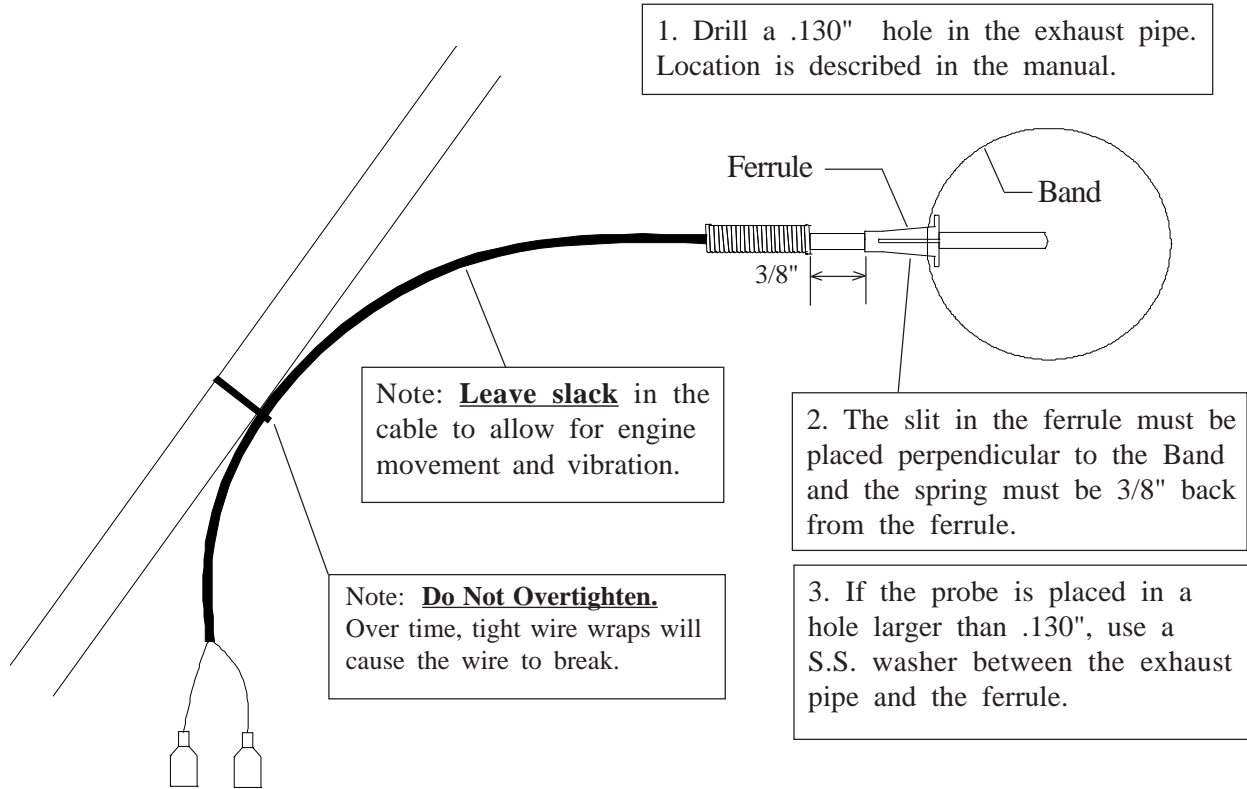
6. If connectors have been disconnected several times the female connector may become loose. If this happens use a pair of needle nose pliers to **retighten the female receptacle** then mate the connectors.

P-110 Fast Response EGT Probe

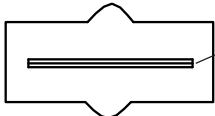
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Important Installation Information

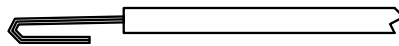
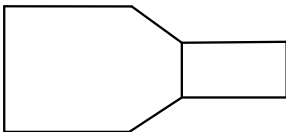
All steps must be read before installing a probe.



Male Conn.



Note: The tab inside the male connector **must be centered** (not bent up or down) to mate properly. Check each connector before installation. **Two drops of oil on the connector will protect it from corrosion for many years.**



Note: If you remove a connector, **double over the wire** before installing it into a new connector. Each connector must be double crimped very tightly.

Note: If connectors have been disconnected several times the female connector may become loose. If this happens use a pair of needle nose pliers to **retighten the female receptacle** then mate the connectors.

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Warranty / Agreement

Electronics International Inc. warrants this instrument and system components to be free from defects in materials and workmanship for a period of one year from the user invoice date. Electronics International Inc. will repair or replace any item under the terms of this Warranty provided the item is returned to the factory prepaid.

1. This Warranty shall not apply to any product that has been repaired or altered by any person other than Electronics International Inc., or that has been subjected to misuse, accident, incorrect wiring, negligence, improper or unprofessional assembly or improper installation by any person. **This warranty does not cover any reimbursement for any person's time for installation, removal, assembly or repair.** Electronics International retains the right to determine the reason or cause for warranty repair.
2. This warranty does not extend to any machine, vehicle, boat, aircraft or any other device to which the Electronics International Inc. product may be connected, attached, interconnected or used in conjunction with in any way.
3. The obligation assumed by Electronics International Inc. under this warranty is limited to repair, replacement or refund of the product, at the sole discretion of Electronics International Inc.
4. Electronics International Inc. is not liable for expenses incurred by the customer or installer due to factory updates, modifications, improvements, upgrades, changes, or any other alterations to the product that may affect the form, fit, function or operation of the product.
5. Personal injury or property damage do to misinterpretation or lack of understanding this product is solely the pilots responsibility. The pilot **must** understand the operation of this product before flying the aircraft. Do not allow anyone to operate the aircraft that does not know the operation of this product. Keep the Operating Manual in the aircraft at all times.
6. Electronics International Inc. is not responsible for shipping charges or damages incurred under this Warranty.
7. No representative is authorized to assume any other liability for Electronics International Inc. in connection with the sale of Electronics International Inc. products.
8. **If you do not agree to and accept the terms of this warranty, you may return the product for a refund.**

This Warranty is made only to the original user. **THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR OBLIGATIONS: EXPRESS OR IMPLIED. MANUFACTURER EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. PURCHASER AGREES THAT IN NO EVENT SHALL MANUFACTURER BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS OR LOSS OF USE OR OTHER ECONOMIC LOSS. EXCEPT AS EXPRESSLY PROVIDED HEREIN, MANUFACTURER DISCLAIMS ALL OTHER LIABILITY TO PURCHASER OR ANY OTHER PERSON IN CONNECTION WITH THE USE OR PERFORMANCE OF MANUFACTURER'S PRODUCTS, INCLUDING SPECIFICALLY LIABILITY IN TORT.**

UBG-16 and UBG-16T

INSTALLATION INSTRUCTIONS

1. "UBG-16" Over View:

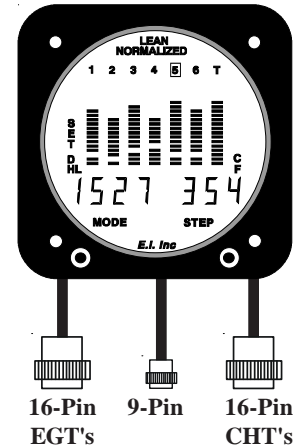
The UBG-16 was designed for use in a single engine aircraft. (For twin engines, use either one UBG-16T or two UBG-16's. See the UBG-16T Overview below.)

On the back of the UBG-16 are three circular connectors. As seen in the diagram to the right:

The first 1 to 7 channels of the LEFT 16-pin connector are used to monitor EGT's. Any remaining channels may be used to monitor other functions.

The first 1 to 7 channels of the RIGHT 16-pin connector are used to monitor CHT's. Any remaining channels may be used to monitor other functions.

The small 9-pin connector connects the instrument to power, ground, display intensity control, RS232 Recorder and any warning devices.



The UBG-16 comes with three preassembled wire harnesses which simply plug into the three circular connectors at the back of the instrument. Two of the wire harnesses are identical. One will be used to connect the EGT probes to the UBG-16 and the other will be use to connect the CHT probes to the UBG-16. The wire harnesses were assembled with only enough cables to accommodate the EGT and CHT channels. Any additional temperature measurement (TIT, OAT, Carb Temp, Cowl, etc.) requires a Type K thermocouple extension cable be added to the appropriate harness. Any desired function such as RPM, M.P., Oil Pressure, Fuel Pressure, Fuel Flow, Gyro Vacuum, Volts, Amps, etc., requires an Electronics International Functional Module be added to the appropriate harness.

The UBG-16 does not require any programming before installation. All setup can be accomplished on the face of the instrument. The UBG-16 does not use any internal batteries, so once installed the instrument never has to be removed from the panel.

Read step #3 below then perform only the remaining steps that apply to your configuration:

2. **"UBG-16T" Over View:**

The UBG-16T was designed for use in a twin engine aircraft.

On the back of the UBG-16T are three circular connectors. As seen in the diagram to the right:

The first 1 to 7 channels of the LEFT 16-pin connector are used to monitor EGT's on the LEFT engine. Any remaining channels may be used to monitor other functions.

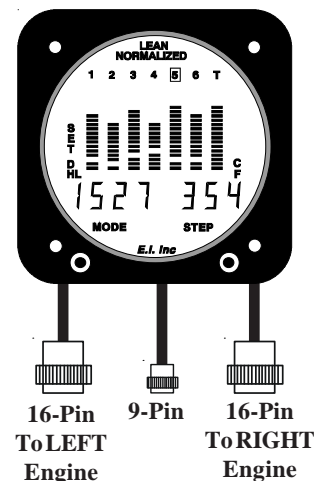
The first 1 to 7 channels of the RIGHT 16-pin connector are used to monitor EGT's on the RIGHT engine. Any remaining channels may be used to monitor other functions.

The small 9-pin connector connects the instrument to power, ground, display intensity control, RS232 Recorder and any warning devices.

The UBG-16T comes with three preassembled wire harnesses which simply plug into the three circular connectors at the back of the instrument. Two of the wire harnesses are identical. One will be used to connect the left engine EGT and CHT probes to the UBG-16 and the other will be used to connect the right engine EGT and CHT probes to the UBG-16T. The wire harnesses were assembled with only enough cables to accommodate the EGT and CHT channels. Any additional temperature measurement (TIT, OAT, Carb Temp, Cowl, etc.) requires a Type K thermocouple extension cable be added to the appropriate harness. Any desired function such as RPM, M.P., Oil Pressure, Fuel Pressure, Fuel Flow, Gyro Vacuum, Volts, Amps, etc., requires an Electronics International Functional Module be added to the appropriate harness.

The UBG-16T does not require any programming before installation. All setup can be accomplished on the face of the instrument. The UBG-16 does not use any internal batteries, so once installed the instrument never has to be removed from the panel.

Read step #3 below then perform only the remaining steps that apply to your configuration:



3. Important Information and Initial Check Out:

- A. **The installer and aircraft owner must read the Warranty before starting the installation.** There is information in the Warranty that may alter your decision to install this instrument. **If you do not accept the terms of the Warranty, do not install this instrument.**
- B. **If you are not an FAA Certified Aircraft Mechanic familiar with the issues of installing aircraft EGT/CHT instruments, Do Not attempt to install this instrument.** The installer should use current aircraft standards and practices to install this instrument (refer to AC 43.13).
- C. **Check that any necessary FAA Approvals (STC's, etc.) are available for your aircraft before starting the installation. A copy of the AML is located at the back of this manual. Resolve any issues you may have before starting the installation.**
- D. Read the entire Installation Instructions and resolve any issues you may have before starting the installation. This may eliminate any delays once the installation is started.
- E. **Inspect the contents of this package prior to installation.** Look for the following items:
- 1) Proper instrument (UBG-16 for a single engine, UBG-16T for a twin engine).
 - 2) Correct length and number of extension cables (one for each temperature probe).
 - 3) Correct number and type of temperature probes.
 - 4) Correct Functional Modules (if required).

If you did not receive the proper instrument, probes, cables, functional modules or hardware for your installation, contact either the dealer you purchased the instrument from or Electronics International Inc. for assistance. In most cases E.I. can exchange parts for only the cost of shipping. Please have the purchase date, dealer name and serial number of the unit available when you call.

- F. **Before starting the installation make sure the instrument will fit in the location you intend to install it without obstructing the operation of any controls. Note: The UBG requires two non-standard holes be drilled in the aircraft instrument panel outside the bezel area.**
- G. If this instrument is to replace an existing gauge in the aircraft, it is the installer's responsibility to move or replace any existing instruments or components in accordance with FAA approved methods and procedures.

<p style="text-align: center;">WARNING Do Not use screws that penetrate the instrument face more than .125". Display damage may result.</p>
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4. "UBG-16" Configuration Form:

If you are installing the UBG-16, fill out the following configuration form. This form will document which Temperature probes or Functional Modules will be connected to specific input channels on the UBG-16.

LEFT Channels:	Function:	Comments:
1 to _____	<u>EGTs</u>	Up to 7 channels may be used to monitor EGTs. Each channel will be displayed on a column of bars. A total of 7 columns are available. Enter the number of EGTs you will be monitoring.
(BAR 7)	<u>TIT, Oil T, OFF</u>	The 7th column of bars is intended to display EGT (on a 7-cylinder engine) or TIT or Oil Temp or it may be turned off (circle one). However, the TIT or Oil Temp probe must be connected to the next channel after the last EGT channel (e.g., #5 on a 4-cylinder engine or #7 on a 6-cylinder engine).
L_____	_____	In order, list the unused channels on the LEFT connector and indicate the functions to be monitored on each channel. OAT or Carb Temp must only be connected to channel L7, L8, R7 or R8 (these are precision channels). If a channel is not used, write "OFF" in the Function Column for that channel.
L_____	_____	
L_____	_____	
L_ 8	_____	
Right Channels:	Function:	Comments:
1 to _____	<u>CHTs</u>	The number of CHTs monitored must be the same as the number of EGT's monitored. The CHTs are monitored on the RIGHT Channels. Enter the number of CHTs you will be monitoring.
R_____	_____	In order, list the unused channels on the RIGHT connector and indicate the functions to be monitored on each channel. OAT or Carb Temp must only be connected to channel L7, L8, R7 or R8 (these are precision channels). If a channel is not used, write "OFF" in the Function Column for that channel.
R_____	_____	
R_____	_____	
R_ 8	_____	

Note: The UBG-16 digital display steps through the channels starting with number one on the LEFT and ending with number 8 on the RIGHT.

5. EGT Probe Installation:

Look at each exhaust stack and determine the best location at which all of the EGT probes can be mounted at the same distance down from the exhaust ports. The ideal location is 1 1/2", but ease of installation should prevail. Drill a 13/64" diameter hole in each exhaust stack. Insert the probe and tighten the hose clamp. As the hose clamp is heated and cooled, it will become loose as it conforms to the exhaust stack. After the first 10 hours of operation, each hose clamp should be retightened.

IMPORTANT NOTE: For Cessna 210's or any aircraft using a slip joint in the exhaust system, install the EGT probes ABOVE OR BELOW THE SLIP JOINT. Installing a EGT probe in the slip joint can damage the probe.

6. CHT Probe Installation:

A single CHT probe should be placed on the hottest cylinder. In a 6-cylinder engine this would be one of the center cylinders. On a 4-cylinder engine this would be one of the back cylinders.

If a second CHT probe is to be installed it should be placed on one of the front unobstructed cylinders. This will allow the UBG-16 to detect shock-cooling automatically.

Most engines have a port just below the lower spark plug for the CHT probe. If your engine has a primary CHT probe in one of the cylinders, do not remove it. The UBG-16 is not STC'd as a primary replacement instrument. Select another cylinder for your probe. If you're putting a CHT probe on every cylinder use our P-102 Gasket CHT Probe for your primary cylinder.

7. TIT Probe Installation:

If you currently have a TIT gauge mounted in the aircraft it may be a primary engine instrument. If this is the case you will need to install a secondary TIT probe. The TIT probe should be installed on the inlet of the Turbo-charger one to two inches before the Turbo-charger flange. Drill a 13/64" diameter hole in the exhaust stack. Insert the probe and tighten the hose clamp. As the hose clamp is heated and cooled, it will become loose as it conforms to the exhaust stack. After the first 10 hours of operation, each hose clamp should be retightened.

8. OIL Temperature Probe Installation:

Sometimes finding a location for a secondary oil temperature probe can be a problem. The P-120, P-100, P-111, P-112, P-114 and P-128 are all sealed probes appropriate for measuring oil temperature. See the "Probes" section of the price sheet for dimension information.

LYCOMING
IO 320, IO 360 and IO 540

Remove the 5/8" - 18 plug located on the rear engine accessory case above and forward of the oil filter adaptor or oil screen as applicable. Install E.I.'s P-120 Oil Probe with a new oil seal and torque to Lycoming's specifications. Check for oil leaks after the first flight.

All Other Engines
Equipped with a 5/8"-18 Secondary Oil Drain Plug

Remove the 5/8"-18 Secondary oil drain plug located on the bottom of the engine. Install E.I.'s P-120 Oil Probe with a new oil seal and torque to specifications. Check for oil leaks after the first flight.

If another location is used to measure oil temperature, make sure the probe does not interfere with the operation of the engine.

9. Carb Temp Probe Installation:

Remove the threaded plug located in the carburetor housing just below the throttle valve. Install the Carburetor Temperature Probe (P-128) in this hole using a lock washer. Care should be taken not to over-tighten the probe and strip the threads in the carburetor housing.

NOTE: A Carb Temp Probe should be connected to a precision channel on the UBG. That would be channel 7 or 8 on the left and right Circular Connector. A three to four degree F error can occur in some instances if the Carburetor Probe is not connected to a precision channel.

10. OAT Probe Installation:

Mount the OAT Probe in an appropriate location on the aircraft, using the hardware supplied. The OAT Probe is sensitive to air temperature changes. For this reason, do not mount the OAT probe in the path of the cowl or engine exiting air (i.e., on the belly of the aircraft). Also, if the probe is mounted in the cowling area near a turbo or hot cylinder head, radiant heat may influence the probe temperature. Other than these consideration the OAT Probe may be mounted in an air intake vent, on the side of the cowling or anywhere else on the aircraft.

NOTE: An OAT Probe should be connected to a precision channel on the UBG. That would be channel 7 or 8 on the left and right Circular Connector. A three to four degree F error can occur in some instances if the OAT Probe is not connected to a precision channel.

11. Other Temperature Probe Installation:

Other temperature probes (Cowl Temp, CDI Temp, Water Temp, etc.) may be installed using current aircraft standards and practices (refer to AC 43.13). Make sure these probes do not interfere with the operation of the engine or aircraft.

12. Install Additional Temperature Cables and Mark The Cables for the "UBG-16":

There are two identical pre-wired Extension Cable Harnesses in the installation kit. One end of each harness has a 16-pin Circular Connector and the other end has red Slip-on connectors on the individual extension cables (see the Wiring Diagram at the back of this manual). There is a type K thermocouple extension cable for each EGT and CHT temperature to be measured. The end of each extension cable in the harness has a piece of yellow heat shrink marked with its channel number. One of these harnesses is to be connected to the EGT probes (and LEFT connector on the UBG-16) and the other is to be connected to the CHT probes (and the RIGHT connector on the UBG-16). Refer to step 4 (Configuration Form) to identify which harness will be used for EGT's and which will be used for CHT's.

Mark the Circular Connector that will be connected to the EGT probes. The first 4 or 6 channels (starting with channel #1) are used to monitor EGT's. Any additional channels may be used to monitor other temperatures or functions. There are 8 channels available on each 16-pin Circular Connector. Any channel used to measure a temperature other than EGT or CHT (TIT, OAT, Carb Temp, etc.) will have a type K thermocouple extension cable lose in the kit. Plug any additional extension cables into the appropriate pins of the Circular Connector (see "Appendix A" at the back of this manual).

Any channel used to monitor functions other than temperature (RPM, M.P., Oil Pressure, Volts, Amps, etc.) will require a Functional Module. Installation of a Functional Module will be covered later in this manual.

Mark each of the Type K thermocouple extension cables in this harness (on the yellow heat shrink) with the temperature function for which it will be used (i.e., CHT, EGT, Oil, etc.). An ink pen or marker works well.

Note: If a cable needs to be removed from a connector, you **must** use an extraction tool. This tool may be purchased from E.I.

Mark the Circular Connector that will be connected to the CHT probes. The first 4 or 6 channels (starting with channel #1) are used to monitor CHT's. Any additional channels may be used to monitor other functions. There are 8 channels available on each 16-pin Circular Connector. Any channel used to measure a temperature other than EGT or CHT (TIT, OAT, Carb Temp, etc.) will have a type K thermocouple extension cable lose in the kit. Plug any additional extension cables into the appropriate pins of the Circular Connector (see "Appendix A" at the back of this manual).

Any channel used to monitor a function other than temperature (RPM, M.P., Oil Pressure, Volts, Amps, etc.) will require a Functional Module. Installation of a Functional Module will be covered later in this manual.

Mark each of the Type K thermocouple extension cables in this harness (on the yellow heat shrink) with the temperature function for which it will be used (i.e., CHT, EGT, Oil, etc.). An ink pen or marker works well.

Note 1: Any channel will accept any one of E.I.'s probes or Functional Module.

Note 2: Some temperatures require a yellow Precision Connector (OAT, Carb Temp). Match these cables with the appropriate probes and plug them into a precision channel.

13. Mark Each Extension Cable for the "UBG-16T":

There are two pre-wired Extension Cable Harnesses in the installation kit. One end of each harness has a 16-pin Circular Connector and the other end has no connectors. There will be a type K thermocouple extension cable for each temperature to be measured. The ends of each of the extension cables in the harness has a piece of yellow heat shrink marked with its channel number. One of these harnesses is to be connected to the Left engine's temperature probes and/or Functional Modules and the other harness is to be connected to the Right engine's temperature probes and/or Functional Modules. Refer to UBG-16T Configuration Form to identify which harness will be used for each engine.

Mark the Circular Connector that will be connected to the Left engine's temperature probes. The first 4 or 6 channels (starting with channel #1) are used to monitor the Left engine's EGT's. Any additional channels may be used to monitor other functions. There are 8 channels available on each 16-pin Circular Connector. Any channel used to measure a temperature (CHT, TIT, OAT, etc.) should have a type K thermocouple extension cable. Any channel used to monitor functions other than temperature (RPM, M.P., Oil Pressure, Volts, Amps, etc.) will require a Functional Module. Installation of a Functional Module will be covered later in this manual.

Mark each of the Type K thermocouple extension cables in this harness (on the yellow heat shrink) with the temperature function for which it will be used (i.e., CHT, EGT, Oil, etc.). An ink pen or marker works well.

Note: If a wire needs to be removed from a connector, you **must** use an extraction tool. This tool may be purchased from E.I.

Mark the Circular Connector that will be connected to the Right engine's temperature probes. The first 4 or 6 channels (starting with channel #1) are used to monitor the Right engine's EGT's. Any additional channels may be used to monitor other functions. There are 8 channels available on each 16-pin Circular Connector. Any channel used to measure a temperature (CHT, TIT, OAT, etc.) should have a type K thermocouple extension cable. Any channel used to monitor a function other than temperature (RPM, M.P., Oil Pressure, Volts, Amps, etc.) will require a Functional Module. Installation of a Functional Module will be covered later in this manual.

Mark each of the Type K thermocouple extension cables in this harness (on the yellow heat shrink) with the temperature function for which it will be used (i.e., EGT, CHT, Oil, etc.). An ink pen or marker works well.

Note 1: Any channel will accept any one of E.I.'s probes or Functional Modules.

Note 2: For channels requiring Precision Connectors (OAT, Carb Temp), you will remove the Slip-on Connectors and install the yellow Precision Connector as described later in this installation procedure.

Note 3: The wire harnesses for a twin-engine aircraft will arrive with the red Slip-on Connectors removed. The connectors are left off to facilitate installation. Slip-on Connectors are supplied in the accessory kit and will be installed after the harnesses have been routed out to the engine cells.

14. Route the 16-pin Circular Connectors:

Do not continue with this step unless each Extension Cable has been marked as previously described.

Starting from under the instrument panel, route the 16-pin circular connector wire harness up to the instrument mounting location. (See the wiring diagram at the back of this manual). Place the circular connector about 9 inches back from the panel. Tie wrap the harness in place approximately 1 foot back from the circular connector. This will allow the harness to be flexible and accommodate varying lengths in instrument wires. **Be sure these wires do not obstruct the freedom of travel of any controls.**

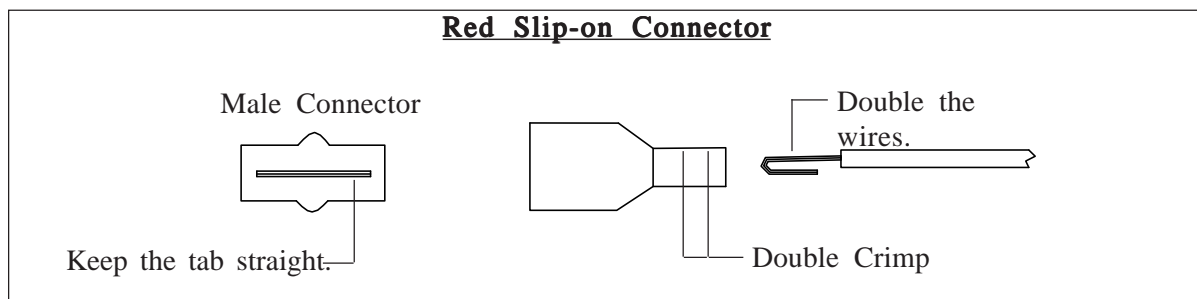
15. Route Each Extension Cable:

Starting from under the instrument panel, route each Extension Cable to its appropriate probe. If new connectors are to be installed on the ends of the cables, you may want to pull any excess cable length through the fire wall and cut it off at this time. However, it is recommended you leave some extra wire length under the instrument panel in case you choose to move the UBG to a different location at a later date. **Varying cable lengths will not affect the accuracy of this instrument.** The Extension Cables and Probe Wires are made of type K thermocouple wire that must not be substituted or extended with regular copper wire. Also, it is important these wires not be kinked (i.e., **do not bend the wires on a radius less than 1 inch.**)

Attach the appropriate connectors to the ends of each of the Extension Cables as described below:

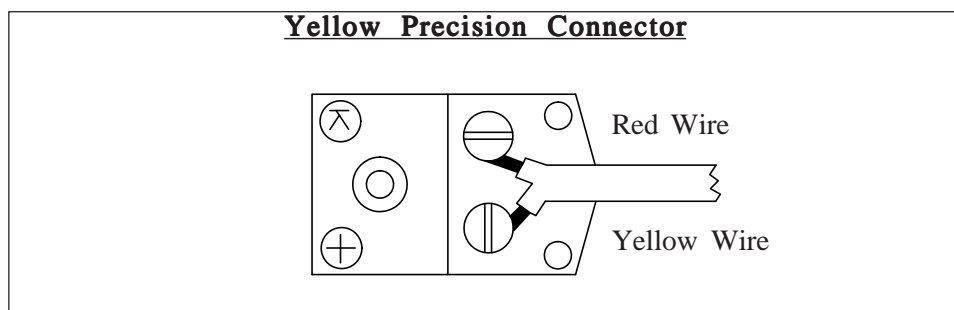
Red Slip-on Connectors

- A. Strip the over braid back 3 1/2". Be careful not to nick the wires.
- B. Shrink a piece of 1" heat shrink over the cut portion of the over braid.
- C. Split the two wires back 3". Be careful not to nick the wires.
- D. Strip each wire and double the wires over. **These wires must be doubled over.**
- E. Place a male connector on the red wire and a female connector on the yellow wire. Double crimp these connectors. A good crimp is very important. Poor crimps will cause jumpy readings and are the biggest source of problems.



Yellow Precision Connector

- A. Strip the over braid back 1". Be careful not to nick the wires. Shrink a piece of 1" heat shrink over the cut portion of the over braid.
- B. Remove the yellow cap on the Precision Female Connector.
- C. Strip the insulation from the wires back 1/2".
- D. Connect the yellow lead of the Extension Cable to the terminal marked "+" and the red lead to the other terminal. The insulation on these wires should almost touch the mounting screws. Replace the yellow cap on the Female Precision Connector. Be careful not to overtighten any screws or twist the wires when installing the connector.



Plug each probe into its associated Extension Cable. **Be sure the connectors mate properly.** When tie wrapping these cables down, be sure there is no strain or pull on the cable against the probe or connectors. Dress each cable up to the instrument keeping them away from any hot areas such as exhaust stacks, cylinder heads, etc.

Note: One drop of oil on the red slip-on connectors before mating them together will help prevent corrosion for many years.

Tie off any excess cable under the instrument panel. **Be sure these cables do not obstruct the freedom of travel of any controls.**

16. Install UBG-16 Functional Modules & Accessories:

If a channel on the UBG-16 is to be used to monitor a function other than temperature, an appropriate Functional Module must be installed. A Functional Module is a small box with circuitry used to convert pressure, RPM, Voltage, Amps, etc. to an appropriate signal the UBG can display. This signal can be connected to any unused channel on the UBG-16. These modules are small and light and are tie wrapped under the instrument panel. They come with a Circular Connector so they may be installed and removed easily. Below is a list of the functional modules available:

FM-OP - Oil Pressure	FM-FP - Fuel Pressure
FM-MP - Manifold Pressure	FM-Gyro - Gyro Vacuum
FM-RPM - RPM	FM-VA - Volts/Amps
FM-Flow - Fuel Flow (Flow only)	

You may install any Functional Modules at any time. Installation Instructions for the various Functional Modules are included with the modules.

The UBG-16 has optional items that may be installed. These items are listed below.

MUX-8A - Data Recorder	AV-17 - Voice Annunciator
AP-7V - Vertical Annunciator Panel	AP-7H - Horizontal Annunciator Panel
ATG-1 - Annunciator Tone Generator	CP-1 - LED Intensity Control Pot
AL-1(x) - Chrome Annunciator Light	A-103 - 3 1/8" Adaptor Plate

You may install any of the options at any time. Installation Instructions for the various options are included with the options.

17. Route the Power and Ground Wires:

Route the red wire in the 9-pin wire harness to the aircraft's 12 or 24 volt **RADIO BUS** as applicable via an independent five amp circuit breaker, **the UBG-16 must be OFF during engine start**. An alternate method would be to route the red lead to the bus via a five amp in-line fuse. If the latter method is used, a spare fuse should be kept in the aircraft.

Route the black wire in the harness to a good ground . **Tie wrap these wires so they do not obstruct the freedom of travel of any controls.**

18. Route the Display Intensity Control Wire:

Connect the white/orange wire to Electronics International's Intensity Control Pot (CP-1). If a CP-1 has not been previously installed in the aircraft panel, do so at this time. This CP-1 will dim the display on the UBG for night operation. If this line is left open, the display will remain at full intensity at all times.

An alternate method is to connect the white/orange wire to the panel light rheostat. When the panel lights are turned on for night operation the UBG display will dim. With this method there is no guarantee that the panel lights and UBG display intensity will match.

Tie wrap all wires so they do not obstruct the freedom of travel of any controls.

19. Route the (Optional) External Warning Control Line:

The white/yellow wire can be connected to an external light (an AL-1 is supplied in this kit), buzzer (ATG-1), voice annunciator (AV-17), a relay, etc. This wire grounds when a warning is activated in the UBG. The current in this line must be limited to 1/10 of an amp maximum. Exceeding this limit will damage the unit. If this feature is not used, leave this line open. **Tie wrap this wire so it does not obstruct the freedom of travel of any controls.**

20. Route the (Optional) RS-232 Data Output Line:

The white/green wire can be connected to Electronics International's MUX-8A for data recording. Refer to the MUX-8A Operating and Installation Instructions for details.

21. Drill Two Holes for the Mode and Step Switch:

A drill template is enclosed in the kit. Mount the drill template to the front of the aircraft instrument panel. Punch the two holes in the drill template for the Mode and Step Switch. Remove the drill template and drill the two holes using a 1/4" drill bit. You may want to drill a pilot hole first.

22. Install the Instrument in the Panel:

Install the instrument from behind the instrument panel using 6 x 32 screws. **DO NOT USE SCREWS THAT PENETRATE THE INSTRUMENT FRONT PANEL MORE THAN 1/8", DOING SO WILL BREAK THE GLASS DISPLAY.**

Connect all the Circular Connectors to the UBG in the following manner:

- A) Push the two mating connectors together and twist them until they snap into position.
- B) Turn the locking ring on the instrument connector clockwise (1 1/2 turns) until it locks into position.

If you are using the optional remote head for the UBG-16, secure the body of the UBG-16 underneath the instrument panel in a location that will not obstruct the freedom of travel of any controls. Route the wires from the body to the remote head making sure that the wires do not obstruct the freedom of travel of any controls. Connect the cable from the head to the body.

23. Configure the UBG for Your Aircraft:

To configure the UBG to operate with the temperature probes and Functional modules installed in your aircraft, refer to the Power-up Programming section in the Operating Instructions. Use the Configuration Form found in this manual as a reference.

24. System Ground Test:

- A. Turn the master switch on and look for a near ambient temperature reading on each temperature channel. If the instrument does not power-up (display a reading), check the power and ground leads (red and black leads) for an open, loose or poor connection.

If you suspect that any channel is not receiving a signal, remove the probe from the engine (leaving it connected to the Extension Cable) and apply a temperature to it. Look for an increase in reading on the display for that channel. Check the other channels for an increase in reading. You may have connected the probe to the wrong Extension Cable. If the reading is decreasing, you may have reversed the connectors on the Extension Cable leads (the yellow wire on the probe must connect to the yellow wire on the Extension Cable).

- B. Start the engine and check each channel for a proper reading. On the ground (after a few minutes) EGT's will read around 900°F and CHT's will read around 200°F. If you suspect any channel is not receiving a signal properly, see step A of the "Troubleshooting" section of this manual.

TROUBLESHOOTING SUGGESTIONS

Because high reliability is designed into Electronics International's equipment, there is no reason to put up with poor operation. We have few problems with our probes, cables and units and installation is simple. Usually fixing a problem is just a matter of inspecting the installation at a few key points.

Strategy:

If you have more than one problem, **FIX ONE PROBLEM AT A TIME**. Trying to fix all of them at once can be confusing and misleading. In many cases fixing one problem first will lead you to the solution for fixing all of the problems. Therefore, take one problem on one channel and proceed with the following:

A. Instrument Check Out:

If there is an identical symptom on each channel, then the instrument may have a problem. But if even one channel of the instrument is operating properly, the instrument probably does not have a problem. A good method to test the instrument is to remove all the Extension Cables by disconnecting the Extension Cable Circular Connector. Then look for a reading on all channels to be near cabin temperature for temperature channels or zero for channels measuring functions other than temperature (RPM, Oil Pressure, etc.). The only inputs the UBG requires to operate properly and measure cabin temperature is power (red lead) and ground (black lead). Check the power and ground leads for proper connection (pull on the wire at each connector).

Note: Few problems turn out to be the instrument.

B. Probe Check Out:

There are two good methods of testing a probe. Perform one or both of the following:

1. A probe can be tested with an ohmmeter. Disconnect the probe from the Extension Cable. When testing the resistance between the connectors, the probe should measure a "short" (less than 5 ohms). When measuring from one lead (either lead) of the probe to the probe sheath (metal tip), there should be an "open" (10k or greater).
2. Another method of checking a probe is to plug the suspected bad probe into a channel that is working properly. If the problem follows the probe, you have a defective probe.

C. Extension Cable Check Out:

With the Extension Cable connected to the UBG, remove the probe from the suspected bad Extension Cable. Set the UBG to the proper channel and look for a near cabin temperature reading. A very high or low reading indicates a short to ground in the cable. Next, connect an ohmmeter, set to 10K range, to the open

probe ends of the suspected bad Extension Cable. Set the UBG to the proper channel and look for a high (+ or -) reading. A near cabin temperature reading or no change in reading indicates an open in the cable or its connectors. Most problems of this kind are usually one of the following:

- 1. Poor Connections:** When plugging the probe into the extension cable it is possible to accidentally wedge the tab on the male connector between the red nylon and metal receptacle in the female connector. This connection may work for a few weeks or even months and then you will start to see jumpy readings. Disturbing the connection, without actually fixing it, will get it to work for a short time and then the problem will reappear. Physically check your connections at the probe for a proper mate.

- 2. Loose Connections:** The female slip-on connector between the Extension cable and probe can become loose if the connector has been used many times. This loose connection may work for a few weeks or even months and then you will start to see jumpy readings. A good connection is difficult to pull apart. If your connector is loose it can be tightened using a pair of needle nose pliers. Check your connectors at the probe for a good tight connection.

- 3. Poor Crimp:** This is usually only a problem if you have removed the connectors and replaced them. This connection may work for a few weeks or even months and then you will start to see jumpy readings. To check a crimp, give a sharp pull on the wire and connector. The wire should be tight in the crimp (no movement). When putting a new connector on a wire, double the wire over and put two tight crimps on the connector.

SPECIFICATIONS and OPERATING FEATURES

S1111981

11/11/98

Model: UBG-16 and UBG-16T

Weight: Unit only: 22 oz., One probe and 6 foot cable: 3.5 oz., One Probe and 20 foot cable: 7 oz.

Environmental: Meets TSO C43a

Power Requirements: 10.5 to 30 Volts, 3/10 Amp.

Display: Plasma (viewable in direct sunlight). Display dims for night operation.

Accuracy: 1/2% in accordance with TSO C43a.

Power-up Test: Flashes all bars, segments and nomenclature.

Probes: Type K, Ungrounded (for improved accuracy, stability and reliability).

Extension Cables: Type K, any length or size. Non-Temp cables are tin/copper.

Channels: Maximum of 16 Channels.

EGT and CHT Analyzer Channels: 1 to 7, programmable from front panel (left channels for EGTs and right channels for CHTs).

EGT Bar Resolution: 1 to 104°F per Bar, programmable from front panel.

CHT Bar Resolution: 33°F per Bar.

Lean Operating Mode:

- A. Activated after 10°F rise in hottest EGT.
- B. Peak detected when 5°F decrease in any EGT or TIT.

Scan Rate: Programmable from 1 to 9 second per channel.

UBG-16

RS-232 (5-volt) Output

0721991

7/21/99

1. General Description:

The UBG transmits serial RS-232 (5-volt) data on the white/green wire (pin 9). The serial data transmitted is the same as that shown on the digital display as each channel is selected. The white/green wire may be connected to a PC through Electronics International's 8 Channel Multiplexer Unit (MUX-8). If the transmitted signal is inverted, it may be connected directly to a PC. The serial data is transmitted in a comma delimited format, suitable for importing into most spreadsheet and data base programs.

2. Instrument Operation:

The UBG outputs RS232 (5-volt) data in all operating modes.

3. Transmit Specifications:

- * Baud Rate: 9600
- * Data Bits: 8
- * Start Bit: 1 (Logic Low)
- * Stop Bit: 1 (Logic High 5-volts)
- * Parity: None
- * Transmit Rate: 5 seconds to transmit all 16 channels.

4. Transmit Format: The UBG transmits the following record:

UBG,L1,R1,L2,R2,L3,R3,L4,R4,L5,R5,L6,R6,L7,R7,L8,R8CrLf

UBG Instrument identifier.

, A comma separates data fields.

L1 Left channel 1 reading (-999 to 1999 decimal points are not transmitted).

Other left channels are L2, L3, etc.

R1 Right channel 1 reading (-999 to 1999 decimal points are not transmitted).

Other right channels are R2, R3, etc.

Cr Carriage return (0Dh)

Lf Line feed (0Ah)

WARNING
Do Not use screws that penetrate the instrument face more than .125". Display damage may result.

UBG-16 Wiring Diagram

Right Channels

For monitoring CHT's and other temperatures or functions.

- Channel #1. 1
- Channel #2. 2
- Channel #3. 3
- Channel #4. 4
- Channel #5. 5
- Channel #6. 6
- Channel #7. 7
- Channel #8. 8

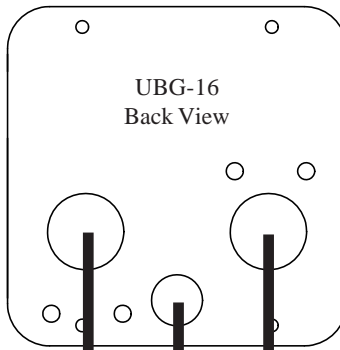
Right Extension Cable Harness.

Left Channels

For monitoring EGT's and other temperatures or functions.

- Channel #1. 1
- Channel #2. 2
- Channel #3. 3
- Channel #4. 4
- Channel #5. 5
- Channel #6. 6
- Channel #7. 7
- Channel #8. 8

Left Extension Cable Harness.



Connecting Wire Harness.

Note: Any channel used to measure a temperature must be connected to a Type K thermocouple extension cable.

Note: The first 4 or 6 channels on the left and right must be used to monitor EGT and CHT respectively.

Note: If using the 7th column of bars to display TIT or Oil Temp, the probe **must** be connected to the next LEFT channel after the last EGT channel.

Note: OAT or Carb Temp must be connected to channel 7 or 8 on the left or right. These are "precision" channels.

Note: Any left or right channel will accept any one of E.I.'s probes or Functional Modules.

Note: Varying cable lengths will not affect accuracy.

Description	Connects To:
White/Orange	Display Dimming. CP-1 Intensity Control Pot.
Red	Power Lead. 12/24 Volt, Radio Bus , via 5 amp fuse.
Black	Ground Lead. Ground
White/Grn	(Optional) RS232 Data Output Line. Connect to MUX-8 to record data.
White/Yel	(Optional) External Warning Control Line. Can be connected to a relay to control an external light, buzzer, etc. This line grounds when a warning is blinking on the display. Current must be limited to 1/10 amp maximum.

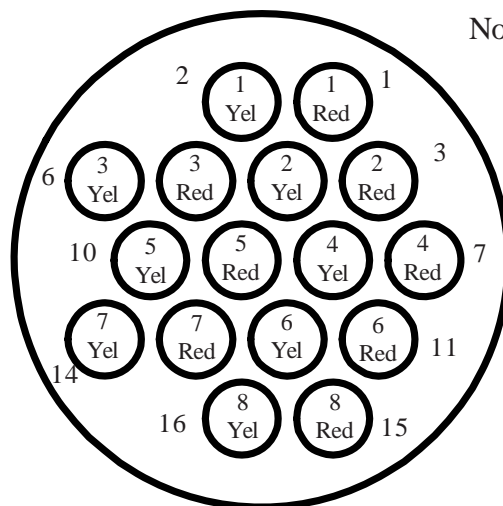
Appendix A

Adding a Temperature Probe to the UBG-16 or UBG-16T

If you have an unused channel and would like to add an extension cable and probe to your instrument, perform the following steps:

1. Order an XCS Extension Cable (at the proper length) and appropriate probe from Electronics International Inc.
2. Disconnect the cable harness at the Circular Connector on the back of the UBG.
3. Insert the the XCS Extension Cable into the Circular Connector at the proper location (see below). Once these connectors are installed do not try to remove them without an extraction tool. Unless an extraction tool is used you can damage the Circular Connector. An extraction tool may be purchased from Electronics International Inc.
4. Follow the appropriate steps in the Installation Instructions for mounting the probes and routing the Extension Cables.
5. Reconnect the cable harness to the Circular Connector at the back of the UBG.

Extension Cable Harness
Back View (wire side)



Note: 1 Red = Channel#1 Red wire.
1 Yel = Channel#1 Yel wire.

Appendix B

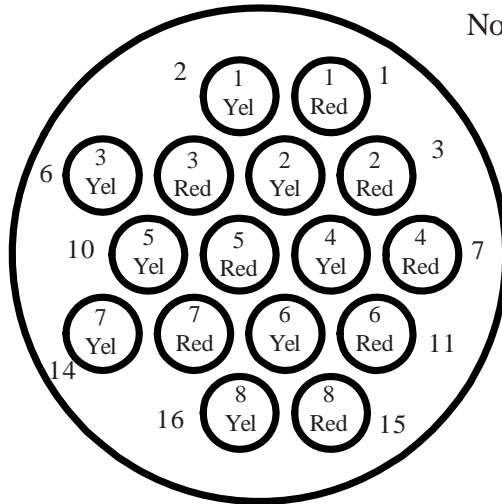
UBG-16 or UBG-16T

Circular Connectors

Extension Cable Harness, Back View (wire side)

OR

Instrument Connector, Front View

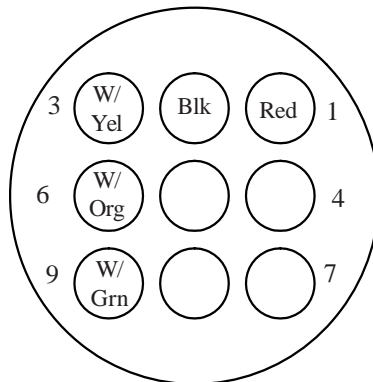


Note: 1 Red = Channel #1 Red wire (Gnd)
1 Yel = Channel #1 Yel wire (Signal)

Connecting Cable Harness, Back View (wire side)

OR

Instrument Connector, Front View

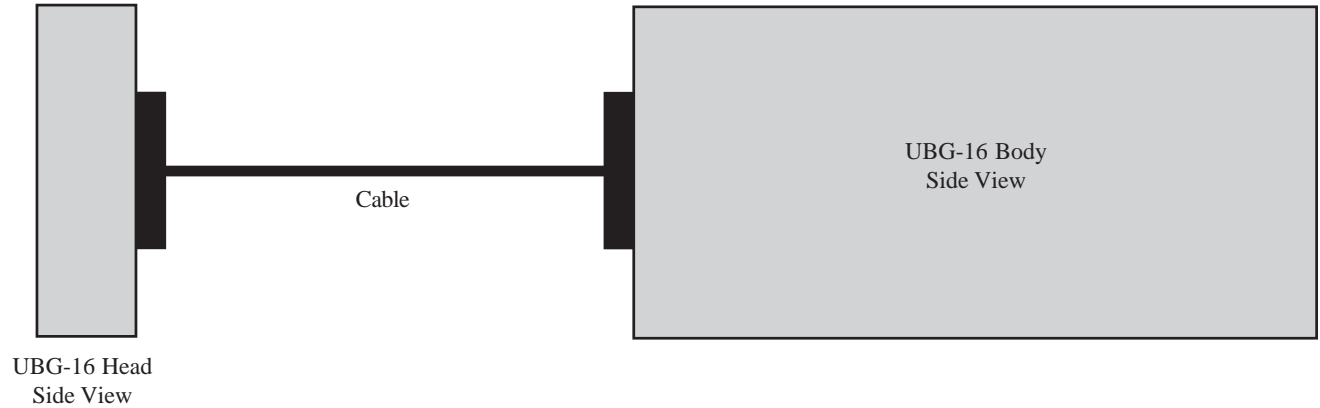


Note: See Wiring Diagram for hook up information.

Appendix C

UBG-16 Remote Head

Wiring Diagram



WARNING
Do Not use screws that penetrate the remote face more than .125".
Display damage may result.

