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## Introduction

The attitude and heading reference system (AHRS) is a compact and light inertial measurement unit that can replace your traditional mechanical gyro without compromising your safety. Unlike the majority of mechanical gyros, our AHRS series are designed to work in 360 degrees of pitch and roll. They are specifically designed for pilots to easily interface their AHRS with any PC computer.

This flexible system is integrated with an embedded engine pod and static/dynamic connections for altitude and airspeed monitoring. You should calibrate each gauge according to your aircraft specifications before flying.

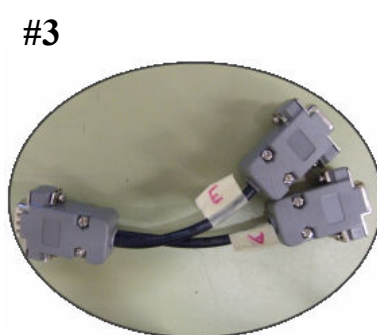
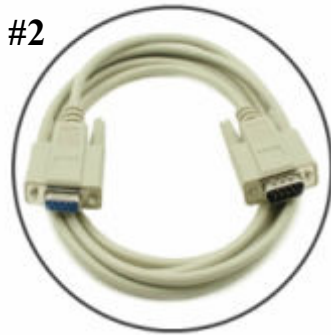
The EFIS-1831 is a Touch-Screen display with Windows Operating System. This unit communicates with the AHRS box and allows users to integrate external hardware or personal choice's navigation software resulting in a more enjoyable flying experience.

This product is meant for VFR use only and can only be installed on experimental aircraft. You should read, understand and agree with the Disclaimer Policy at the end of this package before using this product. It is the responsibility of those installing this product to determine that the aircraft installation conditions are within their country's standards.

# Included in this package

When you first open your package, you should be able to see all the items listed below. Make sure you received all items necessary to start using your product.

1. AHRS box
2. 1 DB9 extension cable
3. 1 Harness for two DB9 connectors
4. 1 DB15 male extension cable and connector
5. 1 DB25 male extension cable and connector
6. 1 DB25 Hub
7. 1 Cannon Plug
8. 1 DB15 Hub
9. 1 USB-GPS
10. 1 PS/2 Harness (for external keyboard and mouse)
11. Hub Din rail
12. AHRS - Calibration software
13. EFIS-1831 Display and Software



#6,8



# What you need

In order to start setting up your product, you will need the following items:

- 8.3 to 19V (airplane power supply)
- Engine Probes ( see page 5 for sensor requirements and installation)
- Static and dynamic pressure input (1/4 inch tubing)
- Four 3 mm screws to attach display to instrument panel

# Installation Overview

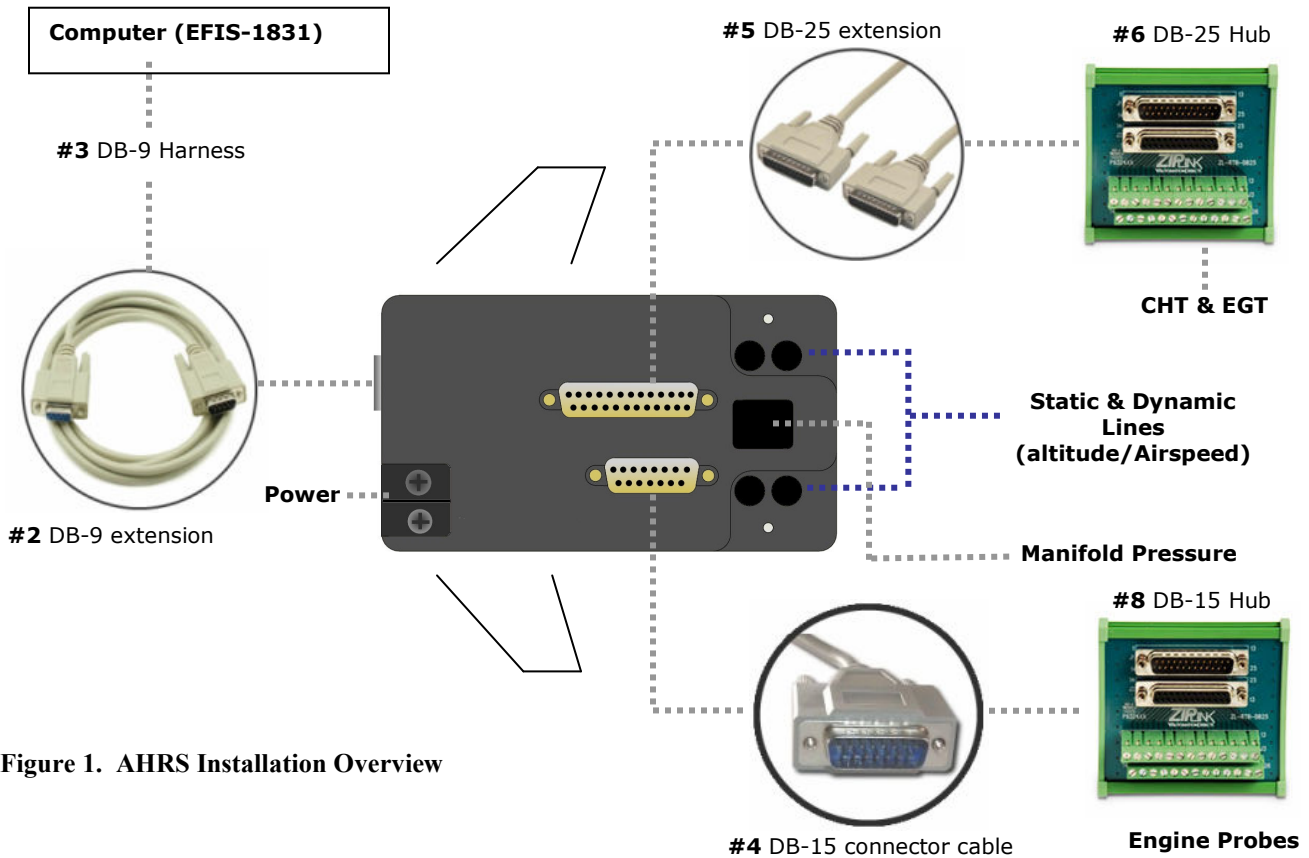


Figure 1. AHRS Installation Overview

## Setting up AHRS

1. Position AHRS box away from ferrous materials to avoid magnetic deviations of the internal compass.
2. Position AHRS box in a flat surface while airplane is straight and level. For optimal results, position the box as close as possible to the center of the aircraft.
3. Secure your AHRS box tightly to your airplane reducing any room for vibration.
4. Power connector should be facing the nose of the aircraft, Static and Dynamic line connections should be facing the empennage.

### Power Requirements

Operating Voltage	9 to 32 VDC
Running Current	14 VDC: 0.2 AMP Max 28 VDC: 0.1 AMP Max
Circuit breaker size	1 AMP

Static and Dynamic Pressure	Static	Dynamic
Altimeter	3/16" (5 mm) inside tubing	No tubing
Velocity	3/16" (5 mm) inside tubing	3/16" (5 mm) inside tubing
Manifold P(if using external transducer)	2 mm ID	

# Setting up Engine POD

## 1. Check Probe's Output Compatibility

Please refer to the following list for sensor output requirements before purchasing your probes.

RPM	Analog RPM Transducer(0-6V) or Digital Pulse Freq. (5V)
MAP	Analog Pressure Transducer (0-6V) or Air Pressure line
FUEL	Analog Float Transducer (0-6V) or capacitive transducers with analog output.
OIL T	Analog Temperature transducer (0-6V)
OIL P	Analog Pressure Transducer (0-6V)
FUEL P	Analog Pressure Transducer (0-6V)
AMPs	Shunt (0.00025 Ohms)
CHT	J or K Thermocouple (J default)
EGT	K Thermocouple
FUEL Flow	Digital Pulse Freq. (5V)

## 2. Probe Installation/Wiring

Please refer to the following procedures before installing any of your probes. There are two DB female connectors on the top of the AHRS (see Figure 1). Install the clip-on terminal hubs (green hubs) close to the engine. All your sensor wires should go to the terminal hub. Then, using the extension cables, connect the terminal hub to the AHRS' DB female connectors. Use the DB-25 connector for CHT and EGT thermocouple inputs and use the DB-15 connector for the rest of your sensors as shown below.

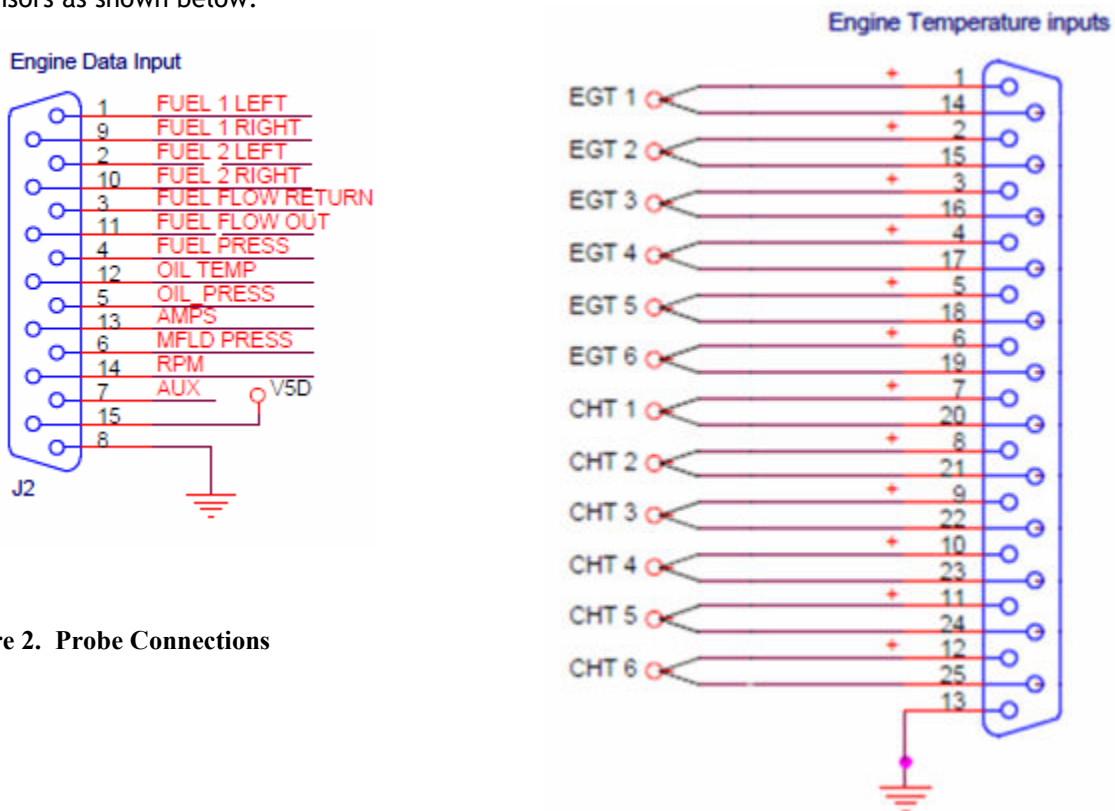


Figure 2. Probe Connections

# RPM

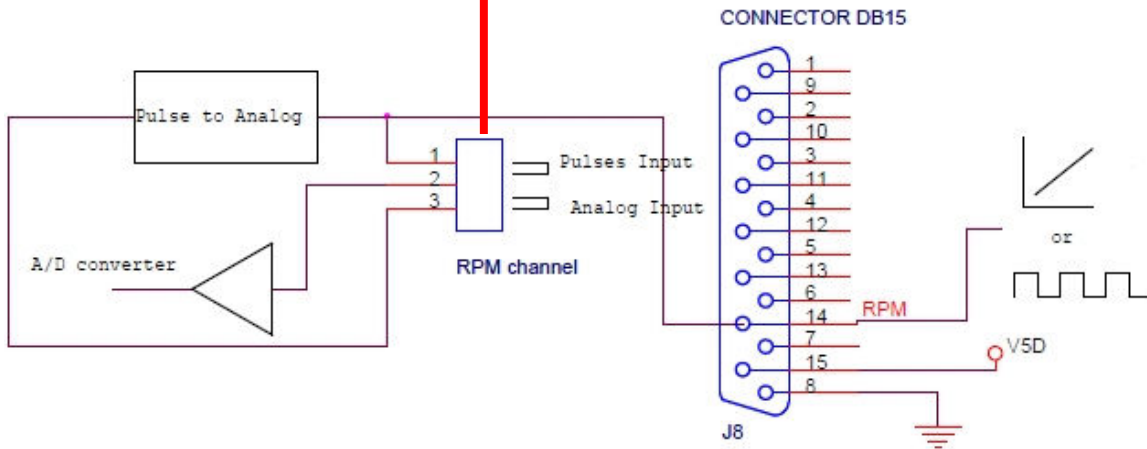
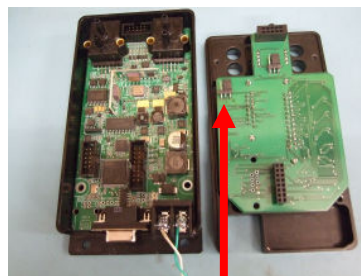
	<b>AHRS –G</b>	<b>AHRS – G Plus</b>
<b>Probe Compatibility</b>	Analog RPM Transducer(0-6V)	A - Analog RPM Transducer(0-6V) B - Digital Pulse Freq. (5V) <b>Default</b>

A - For analog signal use a 0-6V transducer connected to PIN#14

B - For digital pulse freq. use a hall sensor installed at the magneto window. You can also use a pulse generating device with voltages no greater than 12V. Connect to PIN#14

**NOTE:** Connection to the magneto P-lead is not recommended.

If using option A (analog signal) on an AHRS G-plus you should change the jumper of the RPM channel located on the inside board of the AHRS to “analog” (see figure below).



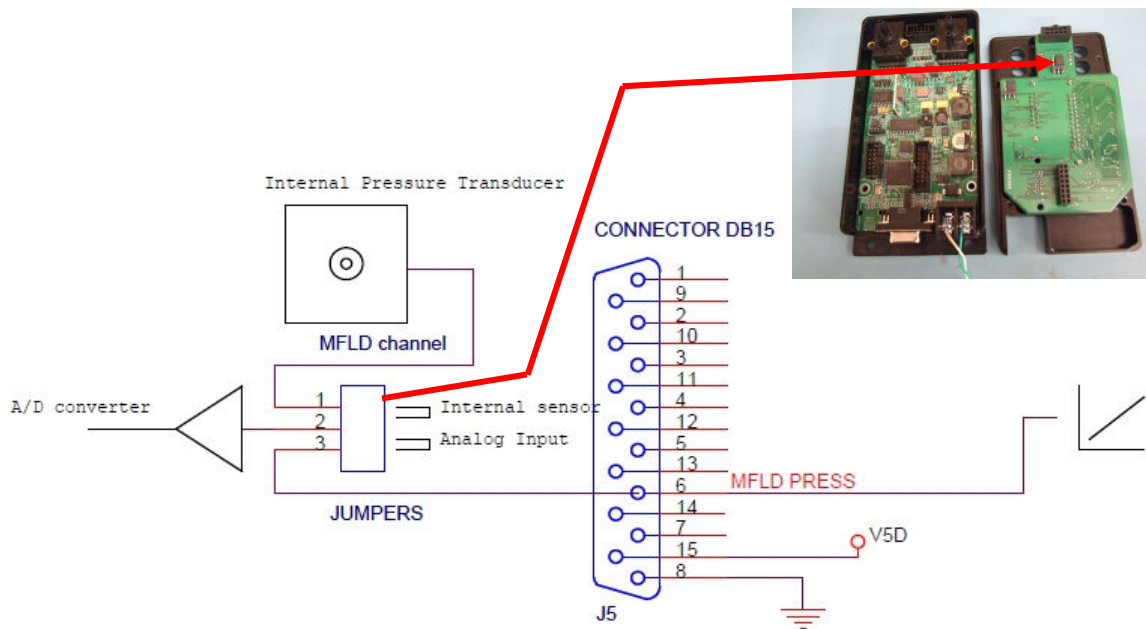
## Manifold Pressure

	<b>AHRS –G</b>	<b>AHRS – G Plus</b>
<b>Probe Compatibility</b>	Analog Pressure Transducer(0-6V)	A - Analog Pressure Transducer(0-6V) B – Air pressure. <b>Default</b>

A - For analog signal use a 0-6V pressure transducer connected to PIN#6

B - Connect manifold pressure tube directly to the air pressure transducer on the AHRS board (1/16" ID tube).

NOTE: If using option A (analog signal) on an AHRS G-plus you should change the jumper of the MAP channel located on the inside board of the AHRS to "analog" (see figure below).



## Fuel Tanks

	<b>AHRS –G</b>	<b>AHRS – G Plus</b>
<b>Probe Compatibility</b>	- Analog Float Transducer(0-6V)	- Analog Float Transducer (0-6V)

For float gauges you need a series resistor to the gauge to produce an analog signal. See Figure below.

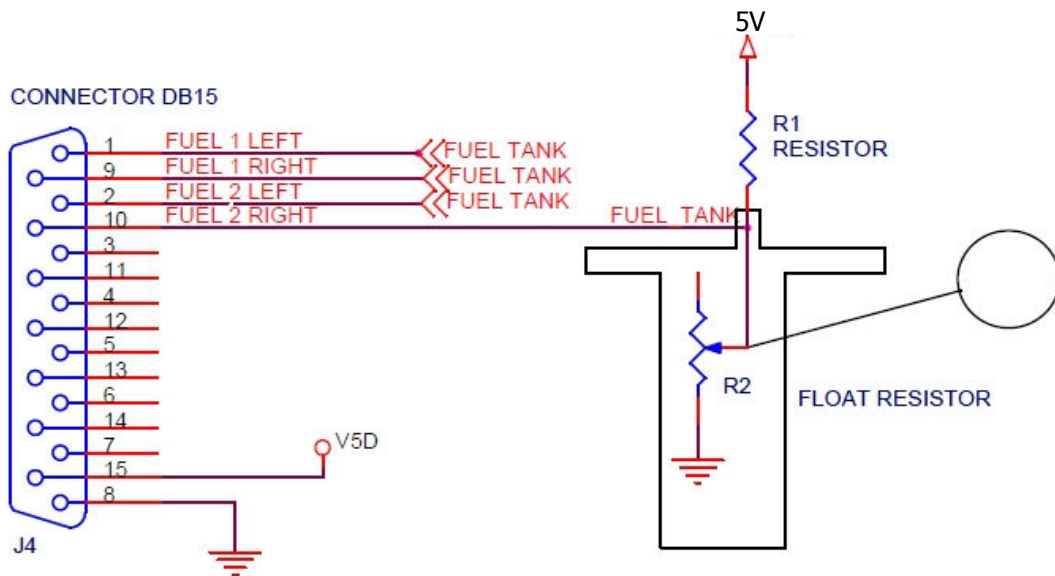
NOTE: Choose R1 to give an appropriate range in voltage. Usually  $R1 = R2$  to obtain 6 volts at maximum travel in 12 volts systems. For 24 volt systems  $(3 \times R1) = R2$

Size of resistor to dissipate heat is calculated as follows:  $Power = (4 \times V \times V) / R1$

where V = voltage = 12 or 24 volt

R1 should never be less than 1500hms.

Connect to DB-15 male cable connector PIN #1, #2, #9 and #10.

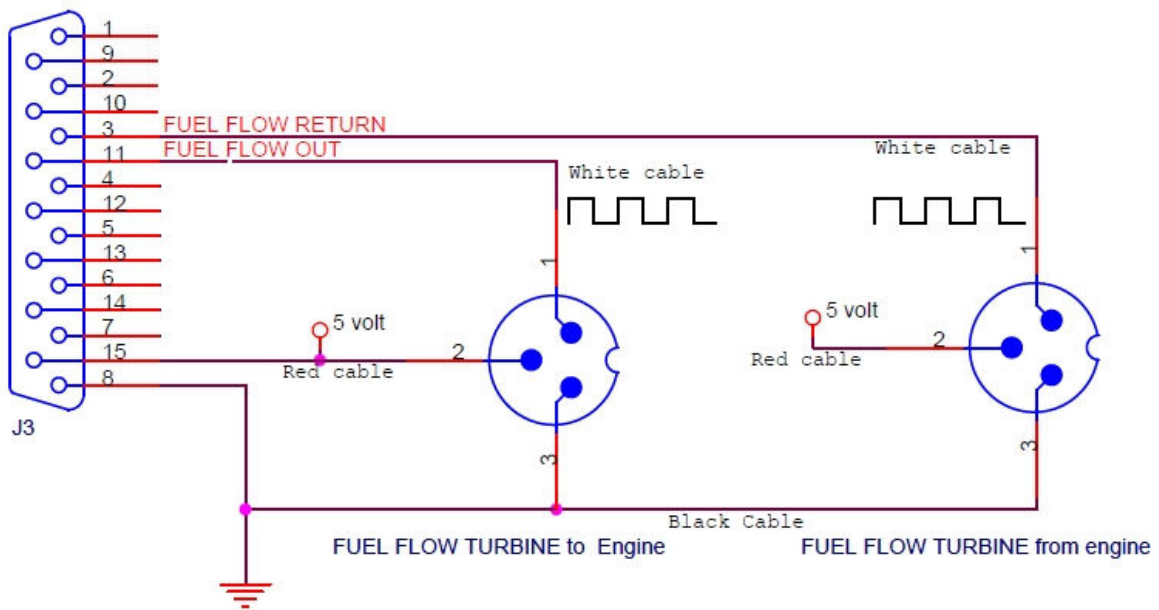


## Fuel Flow

	<b>AHRS –G</b>	<b>AHRS – G Plus</b>
<b>Probe Compatibility</b>	Not available	- Digital Pulse freq. (5V)

For carbureted engines, only FUEL FLOW OUT (to engine) connection is required to PIN #11  
 For injected engines connect FUEL FLOW RETURN to PIN #3 and FUEL FLOW OUT to PIN #11

CONNECTOR DB15



## OIL Temperature, OIL Pressure, Fuel Pressure

Probe Compatibility	AHRS –G	AHRS – G Plus
Oil Temperature	Analog Temperature transducer (0-6V)	Analog Temperature transducer (0-6V)
Oil Pressure	Analog Pressure Transducer (0-6V)	Analog Pressure Transducer (0-6V)
Fuel Pressure	Analog Pressure Transducer (0-6V)	Analog Pressure Transducer (0-6V)

For pressure and temperature gauges you need a series resistor to generate a voltage from 0-6 volt. See Figure below.

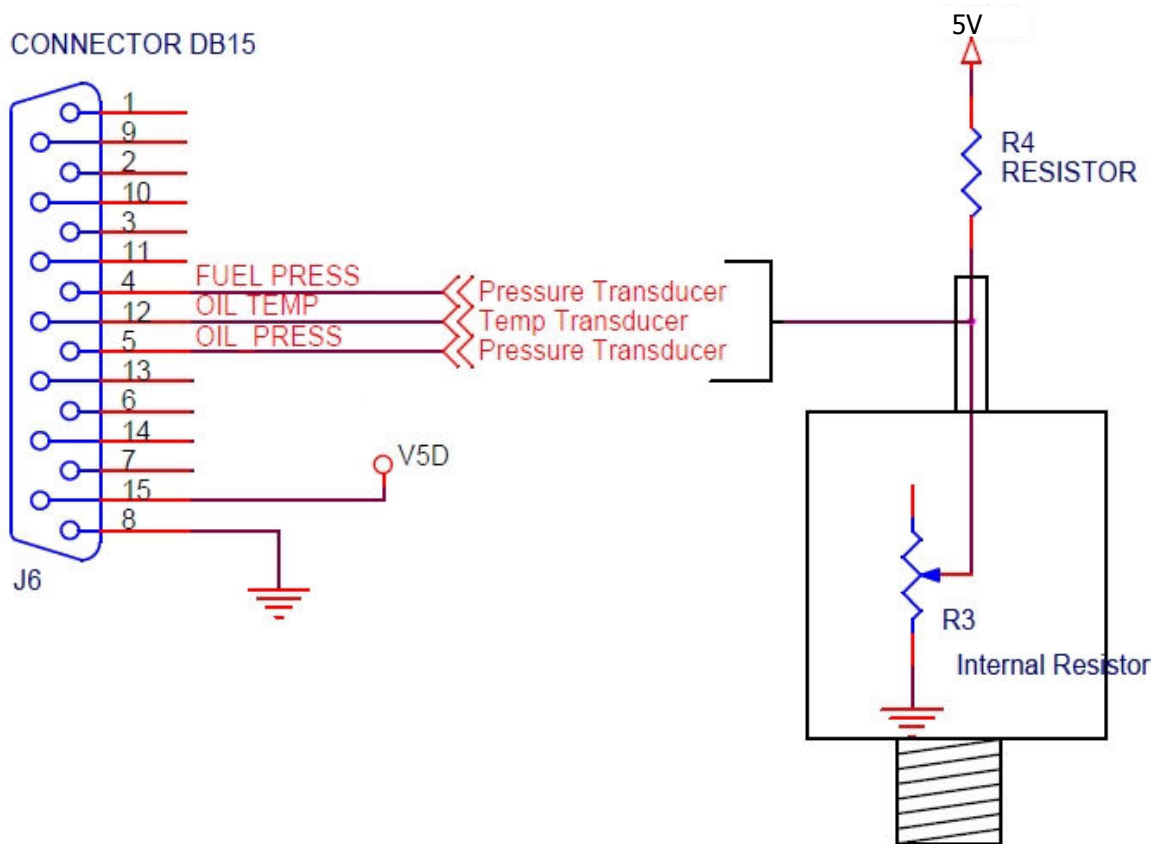
NOTE: Choose R4 to give an appropriate range in voltage. Usually  $R4 = R3$  in 12 volt systems to obtain 6 volts at maximum travel. For 24 volt systems  $(3 \times R4) = R3$

Size of resistor for power dissipation is calculated as follows:  $Power = (4 \times V \times V) / R4$

where V = voltage = 12 or 24 volt.

R4 should never be less than 150 Ohms.

Connect to DB-15 male cable connector PIN #4 (Fuel P), PIN #12 (Oil temp) and PIN #5 (Oil P).

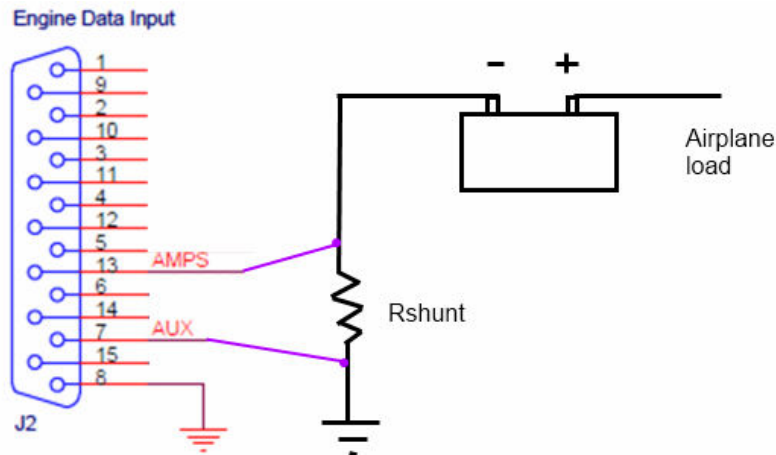


## Amps

	<b>AHRS –G</b>	<b>AHRS – G Plus</b>
<b>Probe Compatibility</b>	Shunt (0.00025 Ohms)	Shunt (0.00025 Ohms)

### Option A (recommended):

Using a shunt resistor (0.00025 ohms) Connect the amp lead (PIN 13) to one side of the shunt resistor and connect the AUX lead (PIN 7) to the other side of the shunt resistor. The shunt resistor should be located at the ground side of the battery.



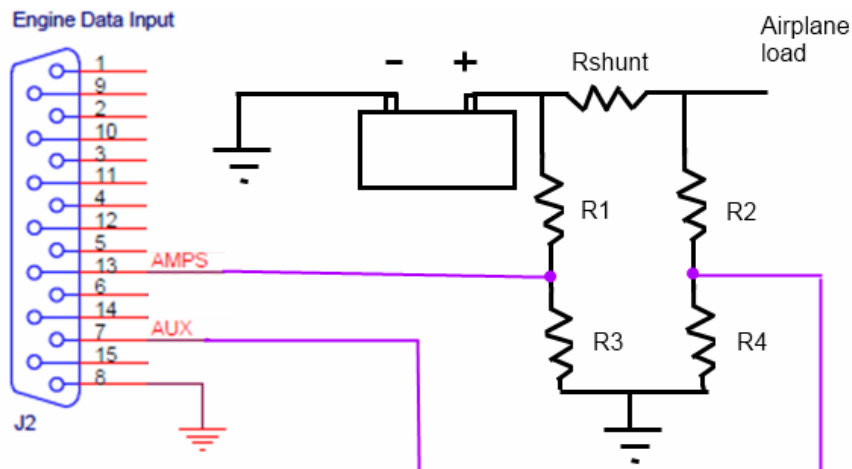
### Option B:

If the shunt resistor is located at the + side of the battery, divider resistors should be used to lower the voltage input to the AHRS box to less than 5 volts.

Ex. R1 and R3 should be attached in series. One side of the shunt to R1, the junction between R1 and R3 to the AMP input and the other side of R3 to ground. Do the same for the other side of the shunt and connect the junction to the AUX input.

For 12V: R1 = R2 = 20K , R3 = R4 = 10K

For 24V: R1 = R2 = 40K , R3 = R4 = 10K



## CHT & EGT

Probe Compatibility	AHRS –G	AHRS – G Plus
<b>CHT</b>	Not Available	- J-type Thermocouples (6). <b>Default</b> - K-type Thermocouples (6)
<b>EGT</b>	Not Available	- K-type Thermocouples (6)

Connect the + and - sides of your thermocouples to the corresponding PIN# according the diagram below.

**Option A:** (The head of the thermocouple is touching ground)

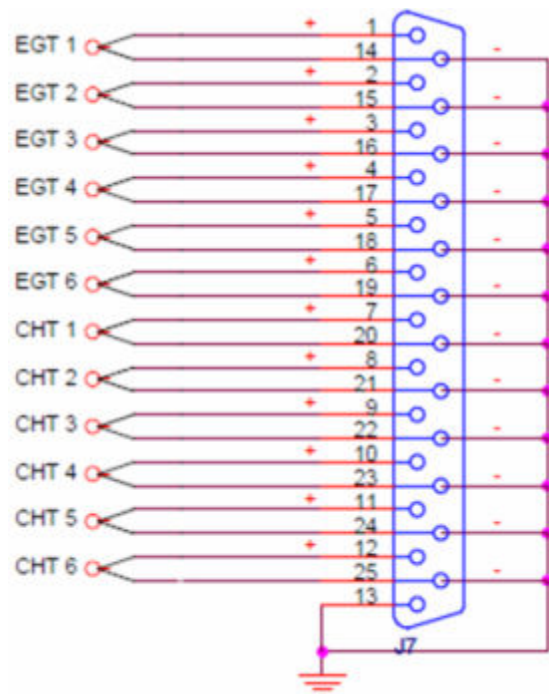
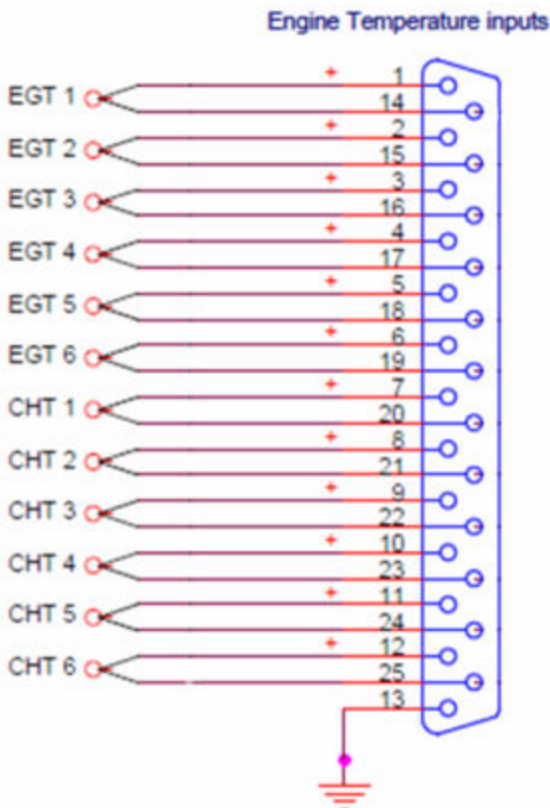
When installing a thermocouple, make sure the junction is grounded (firmly touching surrounding metal)

**Option B:** (The head of the thermocouple is not grounded)

When installing a thermocouple, make sure the junction is not touching its surroundings. The negative side of the thermocouple should then be grounded..

**Option A (non-insulated thermocouples)**

**Option B (insulated thermocouples)**



## Wiring Tips & Tricks

When creating your harness you should follow recommended wiring guidelines. The following steps are meant as an easy alternative to the traditional way of wiring resistors.

Wiring harness for: Fuel Gauges, OIL P, OIL T and Fuel Pressure transducers.

1. Find the DB15 Female connector included in your package
2. Collect the corresponding resistors for each sensor
3. Solder one side of the resistor to the corresponding PIN on the DB15 F connector (see Fig A)
4. Solder the other side of the resistors to the 5V pin on the connector (PIN 15). (see Figure B)
5. Surround the resistors with a heat shrink cover
6. Connect it to the DB15 Male plug on the green terminal hub. (see Figure C)
7. You can now connect the sensor wire directly to the terminal hub.

Figure A

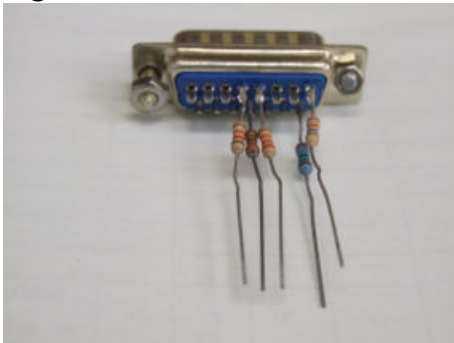


Figure B

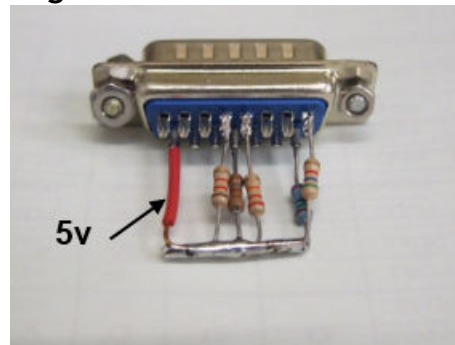
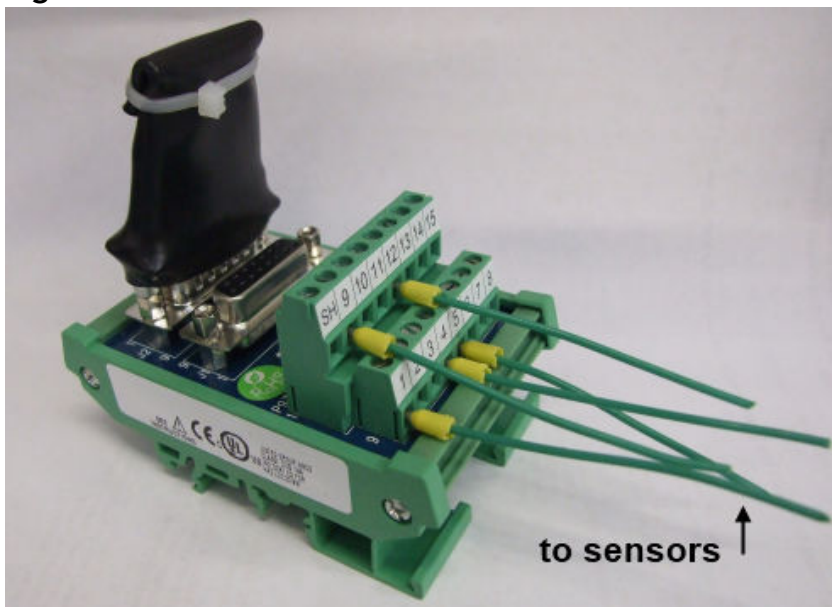


Figure C

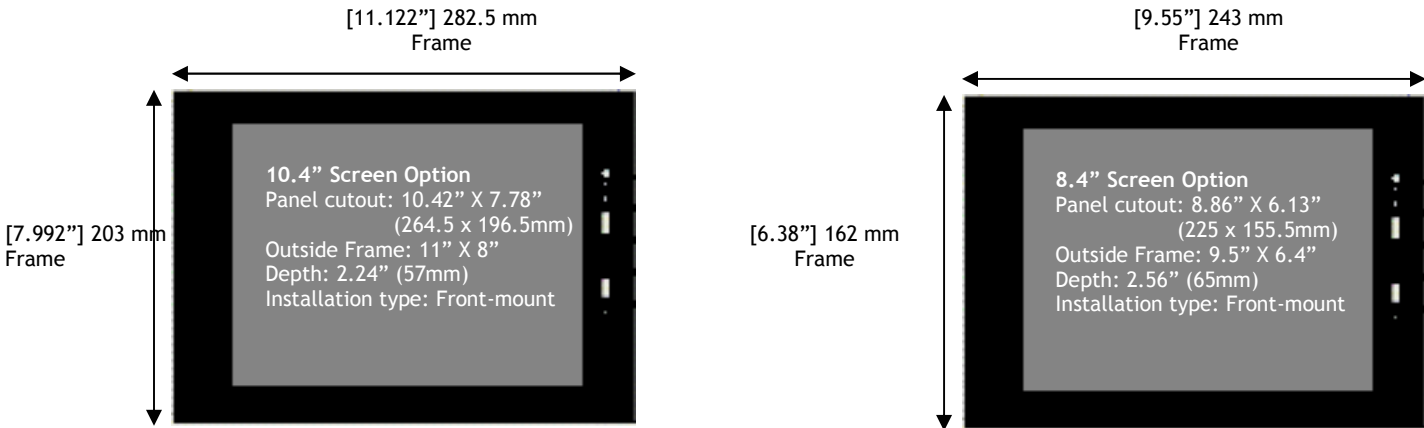


Wiring harness for: CHT & EGT

1. If you are using shielded thermocouples (Installation Option B), then you can follow the same concept above in order to connect the - inputs to ground. Using a DB25 Female

connector, solder a wire that connects all the pins (14 to 25) to pin #13 (ground). You can then connect the thermocouple end directly to the terminal.

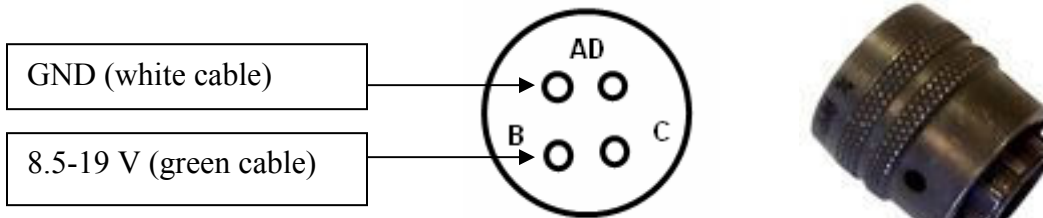
## L1000c Touch-Screen Display



CPU	1.56 GHz ATOM processor
Operating System	Windows XP Pro
Memory	32 GB Solid-state Hard-Drive, 1GB RAM
Ports	3 USB, 4 COM Ports, 2 Ethernet, VGA
Screen Size	10.4" or 8.4" Touch-Screen LCD
Brightness	LED Backlight of 1100 nits
Resolution	Natural resolution of 800x600 pixels
System Weight	4.1 lbs
Outside Frame	8" x 11" x 1/8" (280 mm X 202 mm)
Voltage Range	8.5V - 19V Connection to main bus
System Power Consumption	2.55 Amps at 13.8 V
Circuit breaker size	5 AMPs

## Display Installation

1. Refer to the figure above for display and cutout dimensions.
2. There is a cannon plug included in the package that connects to the aircraft electrical power (Refer to Figure 4 below)
3. Connect the two ends of the DB9 Harness from the AHRS to the COM ports in your computer. (AHRS to COM2, EPOD to COM3)
4. Attach aircraft electrical connector to the display and insert the display into the instrument panel cutout.
5. Secure Display with four 3 mm screws (6-32 UNC-2b screws)



**Figure 3. Display Power Connector (Cannon Plug)**

## Communicating with your AHRS

The AHRS sends data through the front serial connector. The harness included in this package divides the Engine and PFD data into two channels that connect to your computer.

1. Using the DB9 extension cable, connect the male-side to the DB-9 female connector on the AHRS-G box and the other side to the Harness.
2. Connect the “AHRS” side of the Harness to COM2 and the “engine” side to COM3.
3. **Bluetooth** users only: You can go wireless and skip steps 1 and 2 by communicating your primary flight data via Bluetooth (no engine data).
4. Open EFIS-1831.exe on your computer.
5. Supply power to the AHRS box and check that the unit is working. If no AHRS attitude is shown, check the ports connections under “Settings” tab.

## Calibration Process

Calibrating your instruments is necessary since each probe is different for every manufacturer. We try to accommodate a wide range of probes to be compatible with your AHRS, therefore, it does not matter what brand you have as long as you calibrate them accordingly.

Please read and follow these steps carefully in order to facilitate the calibration process:

1. Close all programs.
2. Run the file EPOD\_Calibrate.exe (This is the Calibration Software)
3. Supply power to the AHRS box.
4. Follow calibration instructions step by step. You will need a keyboard for this operation. You can use the “On-Screen Keyboard” found under:  
**Start - Programs - Accessories - Accessibility**

## Starting Communication

At the top left of the calibration software there are 2 important buttons:

**Open/Close Port:** Opens and closes the COM Port.

**Stop AHRS:** Stops data streaming. AHRS is now in calibration mode.

1. Select the COM port being used for AHRS communication, NOT THE ENGINE PORT.

2. Click on the “OPEN PORT” button and you should see data scrolling down on the AHRS output textbox.
3. Click on the “Stop AHRS” button and data streaming should stop. You are now ready to start the calibration process.

## Start Calibration

Most sensors are calibrated using two data points (a low reading and a high reading) to generate a linear function for each engine gauge. For those readings that are not linear, such as Fuel quantity, 5 data points are used to generate a more accurate function. The calibration is unit-less except for Altitude (Feet), Airspeed (knots) and CHT-EGT (Fahrenheit).

### 1. Measure a low reading

- a. Pick the gauge you want to calibrate and maintain it at a constant low value while you calibrate the low reading.
- b. Click on the “R” or READ button that belongs to the gauge you want to calibrate under LOW Read. The number that appears on the next textbox represents the internal sensor reading.
- c. Type the true value on the second textbox (i.e if the airplane is currently running at 1000 RPM, type in 1000 under “RPM Low” textbox)
- d. Click on the “W” or WRITE button. Make sure the AHRS box acknowledges the incoming information under the “incoming” textbox. You should see the following: \$AKL,(true low value),(low Read value)

EGT	R	ExhTempL		W	R	ExhTempH		W
RPM	R	253	1000	W	R	RPMHigh1		W
Fuel flow	R	FuelFlowLo		W	R	FuelFlowHi		W

### 2. Measure a High reading

- a. Now increase the gauge reading to a higher number and maintain it at a constant high value while you calibrate the high reading.
- b. Click on the “R” or READ button that belongs to the gauge you want to calibrate under High READ. The number that appears on the next textbox represents the internal sensor reading.
- c. Type the true value on the second textbox (i.e if the airplane is currently running at 2400 RPM, type in 2400 under “RPM High” textbox)
- d. Click on the “W” or write button to the right of the second textbox. Make sure the AHRS box acknowledges the incoming data under the “incoming” textbox. You should see the following: \$AKL,(true High value),(High Read value)

EGT	R	ExhTempL		W	R	ExhTempH		W
RPM	R	253	1000	W	R	678	2400	W
Fuel flow	R	FuelFlowLo		W	R	FuelFlowHi		W

**NOTE:** It is important to see the acknowledge text when reading and writing data. You might have to click twice on the buttons. If you see sudden data streaming, click on “STOP AHRS” and continue calibration. The best way to trouble shoot is to turn the AHRS off/on.

### 3. Manual Calibration

If you check mark the manual calibration box, you will be able to read the current parameters inside the AHRS and write directly to the memory by editing the parameters on a text file. Users normally don't use manual calibration, but if you find yourself wondering which parameters were imported on the last calibration, this is the way to find out.

Also, manual calibration disables the "read-only" property of the Low Read and High Read textboxes for each gauge. As long as the Manual calibration window is open, you will have read-write access to those boxes.

### Fuel Quantity

- a. Empty the tanks but leave only the "unusable" gasoline.
- b. Click on the "R" button for the left and right tanks under the "Empty" section. A number from 0 to 1000 shows on the window.
- c. Click on the "W" or write button. Make sure the AHRS box acknowledges the incoming information under the "incoming" textbox.
- d. Fill your tank until it is  $\frac{1}{4}$  full and repeat steps b and c at the  $\frac{1}{4}$  fill section.
- e. Repeat for  $\frac{1}{2}$ ,  $\frac{3}{4}$  and FULL.
- f. For auxiliary tanks checkmark the Auxiliary Tanks checkbox and repeat steps a through e. (The sensor range will change to 6,000 - 22000)

### Compass Calibration

- g. Point the nose of the aircraft to  $360^\circ$  (Use an external compass for this process)
- h. Click the "R" button. Compass reading is shown under "Compass (not corrected)" window.
- i. Type the deviation of the Compass reading to  $360^\circ$  on the "Deviation  $360^\circ$ " window. For example, if the nose of the aircraft is pointing north, and the Compass window is indicating a  $350^\circ$  heading, then on the "Deviation  $360^\circ$ " window you should write 10. If Compass reading is  $05^\circ$ , then the deviation is -5
- j. Click on the "W" button. Make sure the AHRS box acknowledges the incoming information under the "incoming" textbox.
- k. Repeat steps "a" to "d" for the remaining three headings.

### Altitude (in Feet)

This is calibrated similar to the RPM example above. Using an external altimeter for reference, calibrate a Low and a High altitude value (at 29.92 inHg). Therefore, the altimeter setting of the reference altimeter should be set to 29.92 inHg at the time of calibration. Altitude values should be in FEET for calibrating purposes. As soon as you click the "W" button the altitude is translated to pressure. Make sure the AHRS box acknowledges the incoming information under the "incoming" textbox.

NOTE: Your system's altimeter is calibrated before shipping. To better tune your altimeter, perform calibration as indicated above.

### Air Speed (in Knots)

This is calibrated similar to the RPM example above. Using GPS data or an external airspeed indicator for more precision, calibrate a Low and a High airspeed value. Airspeed values should be in KNTS for calibrating purposes. As soon as you click the

“W” button the airspeed is translated to pressure. Make sure the AHRS box acknowledges the incoming information under the “incoming” textbox.

NOTE: Your system’s airspeed indicator is calibrated before shipping. To better tune your instrument, perform calibration as indicated above. Airspeed range: 30 Knots to 215 Knots.

## OIL Pressure

When calibrating OIL Pressure just follow instructions for high and low point calibrations. However, if you are entering “bars” instead of “PSI”, multiply the value by 10. Ex: when writing “4 bars” at the high calibration point, you should enter a “40” instead.

## CHT and EGT (in Fahrenheit)

The internal sensors come pre-calibrated for thermocouples (K-type for EGT, J-type for CHT) in Fahrenheit. If you will be using K type thermocouples for your CHTs then follow these instructions:

1. Check mark the Manual Calibration check box.
2. Click on READ DATA on the small window that appears next.
3. A text file will open, you will have to edit the CHT values as follows:  
CHT\_L=220    CHT\_H=520
4. Save the text file then click SEND

Note: If you want to use Celsius, go to EFIS-1831.exe -> Settings-> Gauges and specify the units that you want to use for all your gauges. The program will make the conversion; however, the calibration must be done in Fahrenheit.

## Closing Communications

1. After you are finished calibrating your instruments, turn the AHRS OFF/ON
2. Click on the “Close Port” button to close communications. Your product is now calibrated.

# AHRS Limitations/Performance

There are no flight limitations to the AHRS Series. The instrument will operate in a full 360 degrees of turn and may be used in light aerobatic type maneuvers. Extreme turns may cause the instrument to temporarily disable itself (150 degrees/sec max turn rate). This is indicated by a “flashing” behavior (pitch goes from 0-90 degrees). The instrument automatically resets itself within 3 to 10 seconds. This will not cause any harm to the instrument.

## Performance

When the AHRS is turned on, it requires a two minute interval to calibrate itself. To achieve better performance, it is recommended that the aircraft stays in a steady position (or taxiing) during this two minute period. During flight, the instrument utilizes the indicated airspeed from the pitot-static for roll and pitch calculations. If your instrument is not connected to the dynamic pressure, the AHRS will “estimate” the speed of the aircraft. In order to better estimate the speed, a +15 deg bank turn to the left for 10 seconds, then a +15 deg bank turn to the right is recommended at the beginning of each flight. Power off/on during flight will not damage the instrument even at an unusual attitude.

There are no flight limitations to the AHRS-G Series. The instrument will operate in a full 360 degrees of turn and may be used in light aerobatic type maneuvers. Extreme turns may cause the instrument to temporarily disable itself (200 degrees/sec max turn rate). This is indicated by a

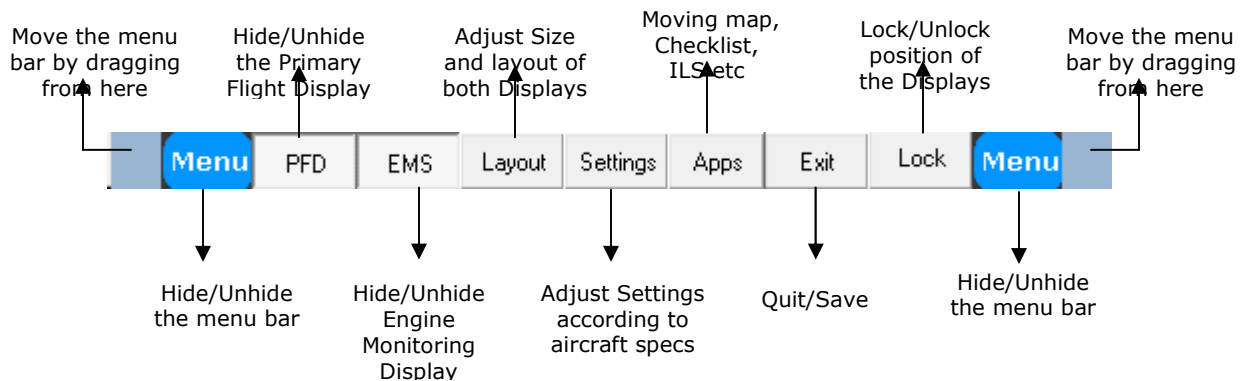
“flashing” behavior (pitch goes from 0->90 degrees, and roll from 0->180degrees). The instrument automatically resets itself within 4 seconds if kept steady during that time, otherwise the instrument will recover within 15-40 seconds. This will not cause any harm to the instrument.

## EFIS-1831.exe

EFIS-1831 is the standard primary flight that comes with your system. You can change the size and layout of the program in order to interact with other software, such as a moving map. When you close EFIS-1831.exe it will save your layout and gauge settings for future use.

First time users should follow these steps:

1. Click on the “Settings” button at the menu bar.
2. Modify the settings for your Aircraft (Number and V Speeds), click Done.
3. Under “Gauges” tab, select the type of AHRS you are using and check the gauges that are applicable for your aircraft. You can adjust the limits for each gauge, click Done.
4. Under “Connections” tab, select the COM Port being used for AHRS and engine POD.
5. Adjust the layout of your display by using the arrows under the “Layout” tab. Note: You can tap anywhere on the screen and drag your display to the desired position. Make sure the “Lock” button is not down.
6. There is a *Checklist* folder on your desktop that contains individual text files. You can edit those files according to your aircraft specs and requirements.
7. When you are finish adjusting the layout and all the settings, close and restart the program.



## Features

### Bring to Front Time

Pilots are usually running multiple applications such as MAP, weather etc, along with the PFD. The EFIS-1831 menu is designed so that it will always stay on top of other applications so that the pilot always has access to the PFD and EMS. The time at which the menu is re-activated and re-focused is called the Bring to front time and you can access it on the Settings window -> Display.

### Lock/Unlock

By unlocking the display position, you can click anywhere on the PFD or EMS display and drag them to your desired position.

### Layout

Use the layout window to resize the screen and select different layouts for the EMS.

## Apps

This is where you access other applications outside of the EFIS-1831 software. For example, instead of double clicking on the desktop to open your Moving MAP software, you can access it by opening the APP window -> MAP. Make sure you browse the application path if using for the first time.

## BUGS

Altitude, Heading and Speed bugs are available at the Settings window -> BUGS. If a number other than Zero is entered, the bugs will appear automatically. Another faster way to access each individual BUG is to click on the "Altitude", "Speed" or "Heading" indicator boxes. A keypad will come up asking you to enter the BUG settings. See example to the left.



## APIC MAP

You will find installed on your computer APIC MAP navigation software from Approach Systems. It utilizes GPS information to display your geographical position. If using APIC MAP follow these instructions:

1. Go to the Approach Systems' website and download applicable geographical data. (North America terrain data is included by default unless other data was requested at the time of purchase).
2. Install data on your EFIS computer using a USB flash drive.
3. Connect USB GPS included in this package to a USB port on your EFIS.
4. Open APIC MAP - Settings - Connections, and update the GPS port (usually it will say Prolific USB port #)
5. Restart APIC Map and make sure the GPS recognizes your location. (Make sure you are on an open area for the GPS to obtain satellite signal)

Any questions, complains or support should be directed to them. You should read and understand the Terms and Conditions of flying with APIC MAP. Level Technology is not responsible for any personal injuries or losses occasioned by, or in connection of using third party software, including APIC MAP. See Disclaimer policy below.

## Using other software (Mountain Scope, etc)

You may update or install different software using USB memory flash drives. Before installing any software, make sure they are compatible with Windows XP. Remember that a COM port can be accessed by only one software at a time. Therefore, when using a third party software to display AHRS information and running EFIS-1831.exe at the same time, you must disconnect the AHRS on the EFIS-1831.exe. It is possible to show AHRS information on both software with a split extension to the connecting harness.

# Instrument Care

The most easily damaged part of your instrument is the screen. Special care should be taken when cleaning the screen to prevent scratches and other damage. To clean light spots and dust, use a soft lint free cotton cloth slightly moistened with distilled water.

For harder to clean spots, use a 50/50 solution of isopropyl alcohol and distilled. Vinegar may also be used in a 50% solution with water. You may use cleaners approved for LCD TV's and laptop computer screens.

Always apply the cleaner to the cloth and not the screen.

**CAUTION:** Do not use acetone or cleaners containing ammonia. Do not use paper towels, facial tissue or napkins, these products are made from recycled paper and may contain metals and wood chips that scratch the screen.

Apply gentle pressure when using the touch-screen feature. You may re-calibrate the touch-screen using the calibration software on your computer.

## One-Year Limited Warranty

LEVIL TECHNOLOGY CORP warrants only to the original purchaser of this product from a Levil Technology-authorized reseller or distributor that this product will be free from defects in material and workmanship under normal use and service for one year after date of purchase. Levil Technology reserves the right, before having any obligation under this limited warranty, to inspect the damaged product, and all costs of shipping the product to Levil Technology for inspection shall be borne solely by the purchaser. In order to recover under this limited warranty, Purchaser must make claim to Levil Technology within 60 days of occurrence, and must present acceptable proof of original ownership (such as original receipt, warranty card registration, on-line registration, or other documentation Levil Technology deems acceptable) for the product. Levil Technology, at its option, shall repair or replace the defective unit covered by this warranty. Please retain the dated sales receipt as evidence of the original purchaser's date of purchase. You will need it for any warranty service. In order to keep this limited warranty in effect, the product must have been handled and used as prescribed in the instructions accompanying this warranty. This limited warranty does not cover any damage due to accident, misuse, abuse or negligence. This limited warranty is valid only if the product is used with the equipment specified on the product box. Please check product box for details or call Levil Technology technical support. This limited warranty is non-transferable and does not apply to any purchaser who bought the product from a reseller or distributor not authorized by Levil Technology, including but not limited to purchases from internet auction sites. This warranty does not affect any other legal rights you may have by operation of law. Contact Levil Technology at [www.aviation.levil.com](http://www.aviation.levil.com) or 407-542-3971.

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