AITHRE
TECHNOLOGY FOR MONITORING HEALTH IN FLIGHT

AITHRE SHIELD EX INSTALLATION MANUAL

GENERAL INFORMATION: The Aithre Shield EX 1.0, 2.0, and 3.0 integrate behind-the-panel with your avionics using a simple analog voltage output(s). The EX 1.0, 2.0, and 3.0 each feature carbon monoxide detection with long life, high sensitivity, fast response time, simple wiring, temperature/pressure independence, and a small form factor. The EX 2.0 also supports the iOS and WatchOS Aithre Connect application that is available from the APPLE store. The EX 3.0 adds the wireless reception of tank psi from the Aithre Altus portable oxygen tank pressure gauge and wireless reception of spo2 oximeter data from the Aithre Illyrian and outputs the tank psi and the spo2 as a simple analog voltage output.

WIRING INSTRUCTIONS

- Red – **5V Power Input ONLY (WARRANTY VOID 12V/24V)**
  - Do NOT connect to 12V or 24V power supplies
  - Total current draw is very low at around 5 milliamp
- Black – Aircraft Ground
- White – Analog Voltage of Carbon Monoxide
  - Minimum 0 ppm CO gas = 0V
  - Maximum 255 ppm CO gas = 3.3V
  - Linear voltage output between 0 ppm and 255 ppm
  - Connect to available analog input pin on engine monitor module
- Yellow (EX 3.0 only) – Analog Voltage of Oxygen Tank PSI
  - Requires the Aithre Altus wireless portable oxygen tank pressure gauge
  - Minimum 0 psi Oxygen = 0V
  - Maximum 2500 psi Oxygen gas = 3.3V
  - Linear voltage output between 0 psi and 2500 psi
  - Connect to available analog input pin on engine monitor module
- Blue (EX 3.0 only) – Analog Voltage of Pilot SPO2 Blood Oxygen %
  - Requires the Aithre Illyrian wireless smart oximeter
  - Minimum 0% SPO2 = 0V
  - Maximum 100% SPO2 = 3.3V
  - Linear voltage output between 0% and 100% SPO2
  - Connect to available analog input pin on engine monitor module

TESTING

- You can test for CO with bamboo incense at your own risk – do not do this around AVGAS and do so in a well-ventilated area.
- On startup, the CO white analog output goes full scale for 1 minute to provide a graphical indication that the EX is on (featured added to devices made after 10/18/2019).

- EX 2.0 and 3.0: Download the Aithre Connect App on the APPLE store and verify automatic pairing with the EX 2.0 and 3.0 on startup of the app.
- EX 3.0: SPO2 and PSI will only work with the Illyrian and the Altus turned on. When the Illyrian or Altus are turned on there is automatic wireless pairing to the FIRST Illyrian or Altus in range. The data for SPO2 and PSI should appear within 15-30 seconds of turning on your Illyrian or Altus. You can use the iOS app to reinforce the signal between the Illyrian/Altus and the EX 3.0.

MOUNTING INSTRUCTIONS

- Mount behind or under the avionics panel at any location with access to general cabin air
- Do NOT tape or cover over the housing intake holes in the case
- For optimal wireless range of EX 2.0 and EX 3.0 mount unit away from radio and high current wires
  - Try temporary mounting positions before permanently mounting to ensure satisfactory wireless range.
  - For the EX 3.0, first ensure that the Illyrian and Altus pair without using any iOS device. Note that the EX will present the last received data from the Altus for about 6 minutes and the last received data from the Illyrian for about 3 minutes. So, make sure to give 10 minutes in different mounting positions to make sure that the EX is able to retrieve new data.
  - For the EX 3.0, after initial setup, run the iOS application in the foreground or the background to reinforce and boost the strength of the BLE signal between the Aithre Altus and Illyrian and the EX 3.0. The iOS device acts as a relay for the Altus and Illyrian when used and will significantly improve the signal strength.

RECOMMEND RANGES

- CO: Calibrate your avionics with these suggested ranges
  - Normal Range: 0 ppm (0V) - 9 ppm (0.12V)
  - Caution Range: 10 ppm (0.12V) – 49 ppm (0.64V)
  - Warning Range: 50 ppm (0.64V) – 255 ppm (3.3V)
- O2 PSI (EX 3.0 only): Calibrate your avionics with these suggested ranges
  - Normal Range: 500 psi (0.66V) – 2500 psi (3.3V)
  - Caution Range: 100 psi (0.13V) – 500 psi (0.66V)
  - Warning Range: 0 psi (0V) – 100 psi (0.13V)
- PILOT SPO2% (EX 3.0 only): Calibrate your avionics with these suggested ranges
  - Normal Range: 90% SPO2 (2.97V) – 100% SPO2 (3.3V)
  - Caution Range: 85% SPO2 (2.8V) – 90% SPO2 (2.97V)
  - Warning Range: 0% SPO2 (0V) – 85% SPO2 (2.8V)

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SAFETY INFORMATION – CO

- Detects carbon monoxide in the range of 0 – 255 ppm
- The advanced solid electrochemical sensor used has a lifespan of 10 years without recalibration
- Normal in-use temperatures are -10C to +50C. Required temperatures for storage between use are -40C to +60C
- Do not expose to liquids or extreme dust
- In an event that carbon monoxide is detected, attempt to reduce carbon monoxide levels by increasing clean air flow and turning off cabin heat. Before any emergency action, it is important to verify any detected carbon monoxide values by evaluating your symptoms
- Never try to dismantle or open the device yourself, or push objects of any kind into the device

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ADDENDUM A: ADVANCED FLIGHT SYSTEMS (CURRENTLY DOES NOT SUPPORT SPO2 PORTION OF EX 3.0)

Hook up the red 5V power, black ground, white (CO ppm) analog output wire, and yellow (O2 PSI for EX 3.0 only) analog output wire.

USING SV-EMS

For the EX 1.0 or 2.0, the white analog output wire goes to pin 1 of the SV-EMS.

For the EX 3.0, the white analog output wire goes to pin 1 and the yellow analog output wire should go to pin 2 of the SV-EMS.

USING AF-EMS (only for Aithre Shield EX 1.0 and EX 2.0 – NO SUPPORT FOR EX 3.0 ON AF-EMS)

For the EX 1.0 and 2.0, the white analog output wire should go to the rudder trim pin of the AF-EMS.

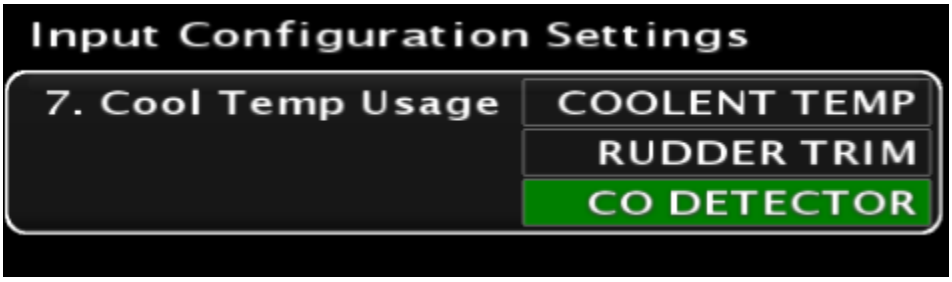
The EX 3.0 does not work with the AF-EMS.

Contact Ken Chard at Dynon/Advanced support for the most recent Advanced Flight Software update with EX 1.0, 2.0, and 3.0 support.

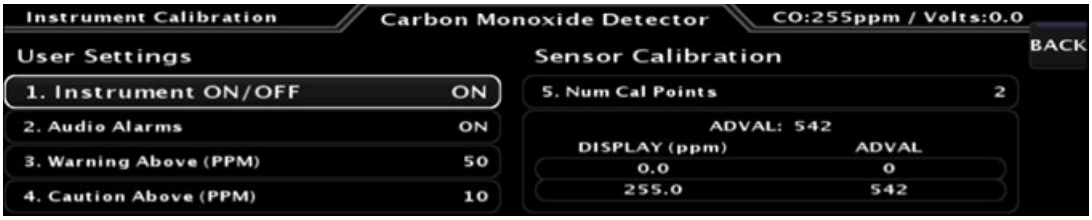
After wiring and installing the most current software, go to calibration settings.

If using the SV-EMS, simply verify that the CO and/or O2 psi instruments are turned on.

If using the AF-EMS for the EX 1.0 or EX 2.0, the calibration settings are different. Go to item '**3. Aircraft Info**' and press SEL. After that, set item '**7. Cool Temp Usage**' to CO DETECTOR like this:



Next go to item '**43. CO Detector**' and press SEL. You will need to set your configuration to match the following.



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ADDENDUM B: DYNON SKYVIEW

Hook up the red 5V power, black ground, white (CO) analog output wire, yellow analog output wire (tank psi – EX 3.0 only), blue analog output wire (pilot SPO2 – EX 3.0 only) using the SV-EMS. The red power wire can go to any available 5V power pin, including pin 18. The black ground wire can go to aircraft ground, including pin 30. The white, yellow, and blue analog output wires should go to one of the following enhanced general purpose input pins of the SV-EMS: 4, 6-12, 20-23, and 31.

Download to thumb drive the Dynon widget from our resources page on our website – www.aithreaviation.com.

Enter the setup menu on the Dynon Skyview, open the "load Software" menu.

Load the Aithre widget file. This file installs the Aithre Shield as an available sensor in the on-board database.

In the EMS setup page, enter the sensor mapping menu. Navigate to the sensor pin you connected to the Aithre Sheild, select pressure sensor. The Aithre family of sensors will be options in the drop down sensor menu.

Enter the EMS display menu, add a sensor gauge, selecting the type and size of your choice and selecting the range of the color bands in the EMS setup menu.

Note, you have to use the PSI choice, basically it sets up the input as a 0-5v Analogue Input. So do that. Then if you want to have a round gauge widget, you can just not have PSI displayed. See instructions below. You may find just setting the widget up as instructed except selecting a numerical display is actually neat and tidy.

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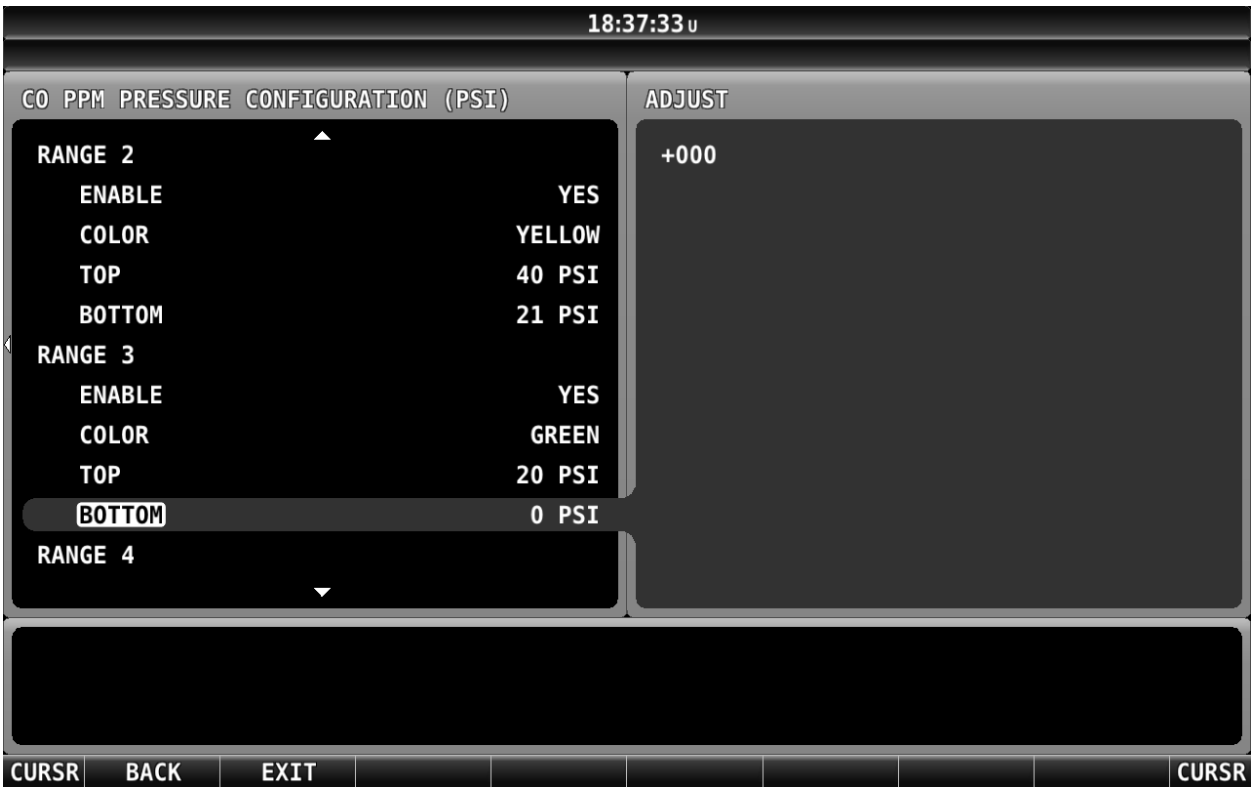

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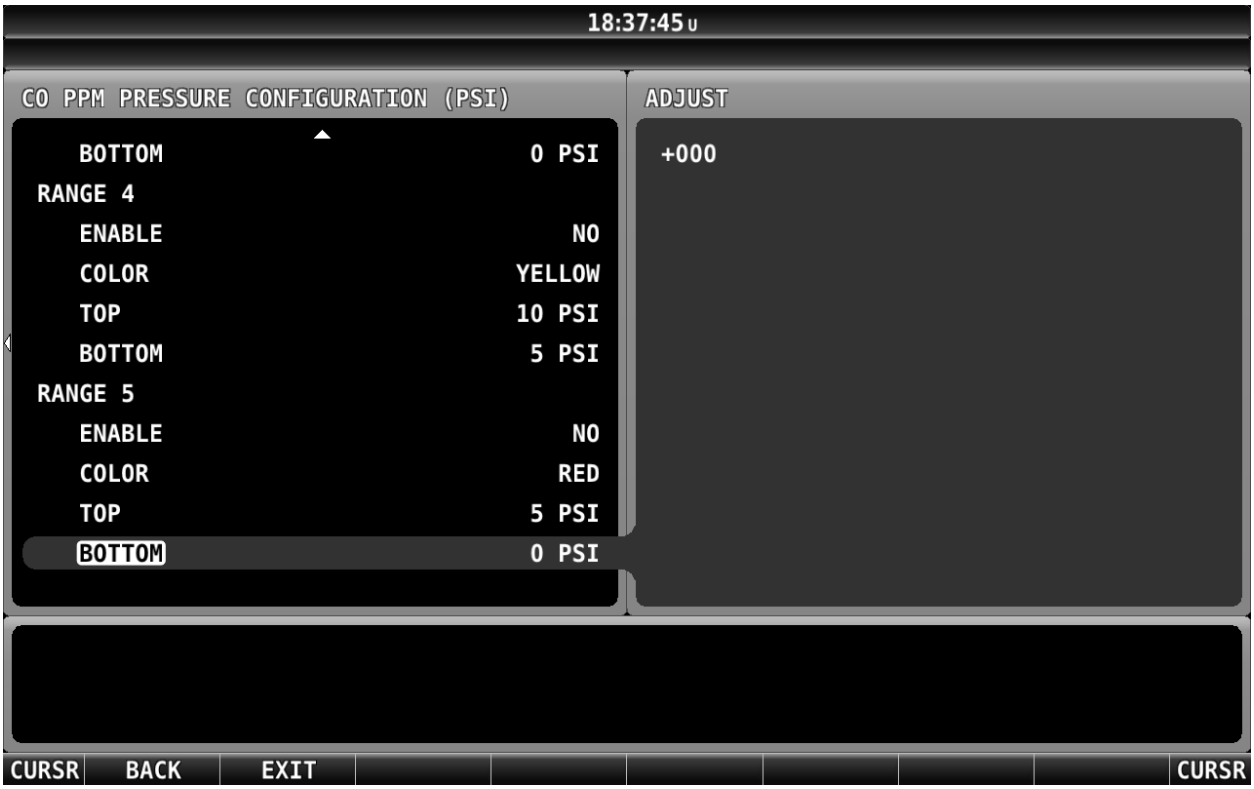

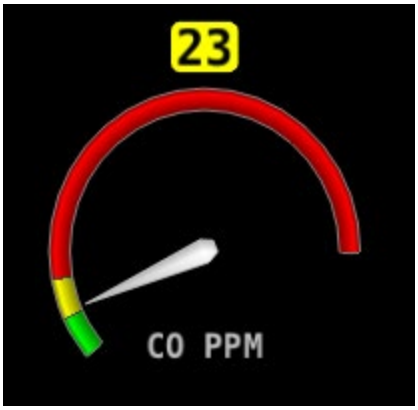

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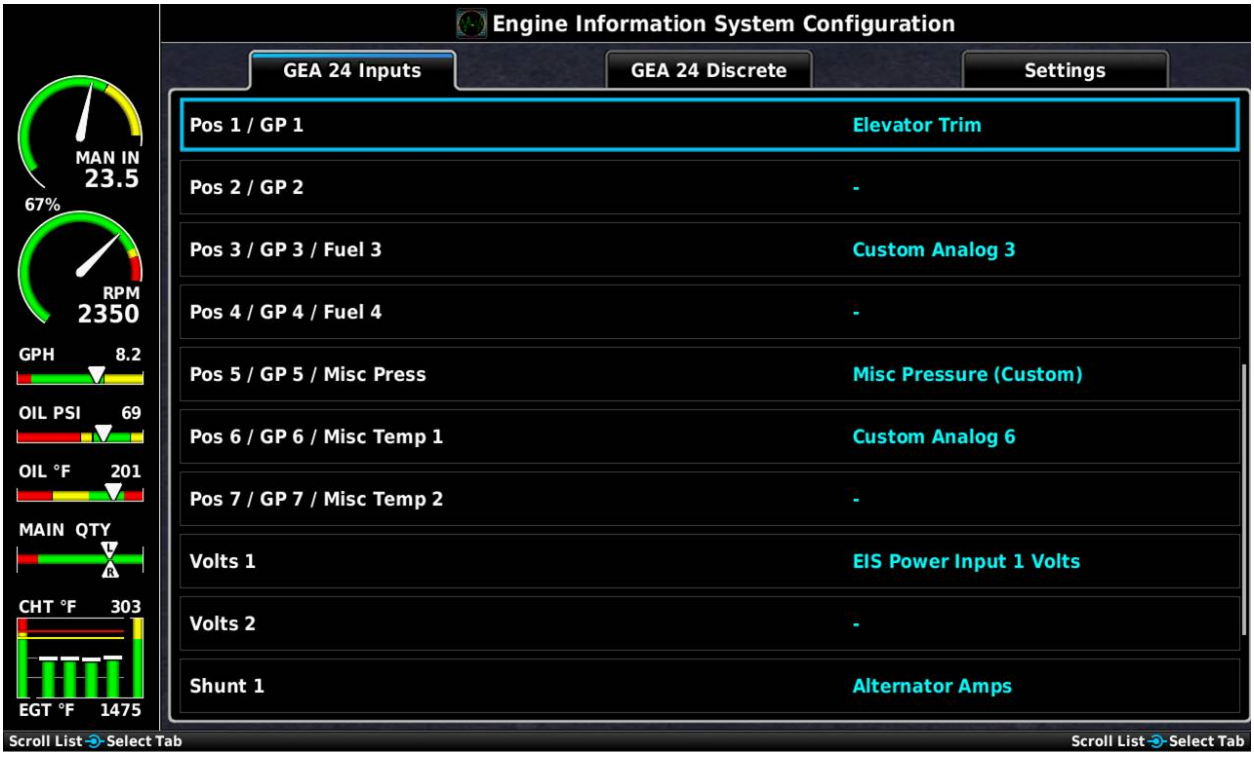
ADDENDUM C: GARMIN G3X ADDENDUM

Hook up the red 5V power, black ground, white (CO) analog output wire, yellow (tank psi – EX 3.0 only) analog output, and blue analog output (pilot SPO2 – EX 3.0 only) to the GEA 24. **Make sure the black ground wire is grounded to aircraft ground.** The following pinout from the G3x manual shows which pins are available for 5V and analog inputs.

Pin Name	Connector	Pin	I/O
GP1 HI / +5V	J244	18	Out
GP1 / POS 1	J244	19	In
GP1 LO / GND	J244	20	--
GP2 HI / +5V	J244	21	Out
GP2 / POS 2	J244	22	In
GP2 LO / GND	J244	23	--
GP +5V_2	J244	24	Out
GP GND_2	J244	26	--
GP +5V_3	J244	27	Out
GP GND_3	J244	29	--
POS 3 HI / +5V	J244	11	Out
POS 3 / GP 3 / FUEL QTY 3	J244	12	In
POS 4 HI / +5V	J244	14	Out
POS 4 / GP 4 / FUEL QTY 4	J244	15	In
POS 5 HI / +5V	J244	30	Out
POS 5 / GP 5 / MISC PRESS	J244	31	In
POS 5 LO / GP 5 / GND	J244	32	--
GP +12V	J244	50	Out
POS 6 / GP 6 / TIT 1/ MISC TEMP 1 HI	J243	31	In
POS 6 / GP 6 / TIT 1/ MISC TEMP 1 LO	J243	30	In
POS 7 / GP7 / TIT 2/ MISC TEMP 2 HI	J243	29	In
POS 7 / GP 7 / TIT 2/ MISC TEMP 2 LO	J243	28	In
GP +5V	J243	26	Out
GP GND	J243	27	--

One of the simplest ways of finding out which analog input pins are available is to look at the engine/airframe configuration page on your PFD (in config mode). In this example below, inputs 2,4, and 7 are not presently in use.



Below is an example wiring diagram.

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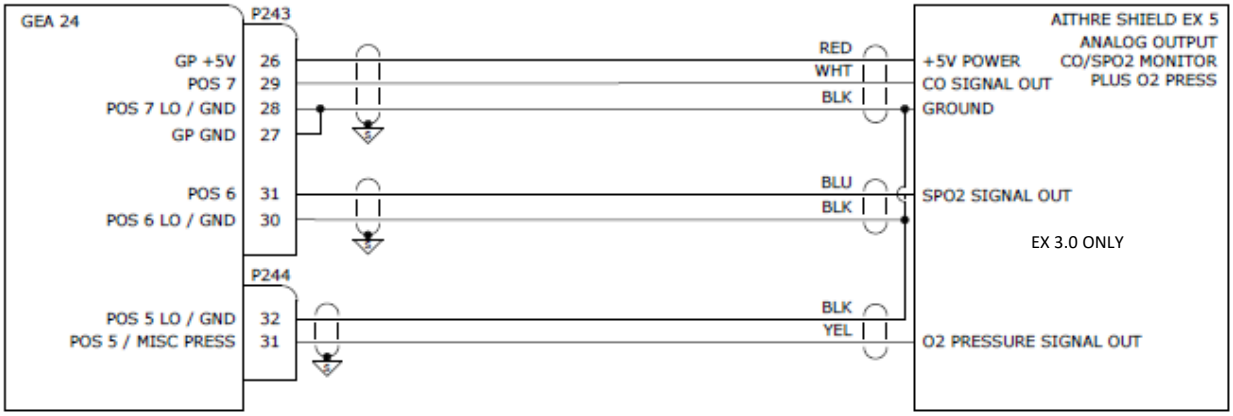

INSTALLATION AND CONFIGURATION NOTES

1. **TYPICAL +5V POWER REQUIREMENT IS 5 MILLIAMPS.**
2. **CO OUTPUT SIGNAL IS LINEAR, 0 TO 3.3V, CORRESPONDING TO 0 TO 255 PPM CO.**
3. **SP02 OUTPUT SIGNAL IS LINEAR, 0 TO 3.3V, CORRESPONDING TO 0% to 100%**
4. **O2 PRESSURE OUTPUT SIGNAL IS LINEAR, 0 TO 3.3V, CORRESPONDING TO 0 TO 2,500 PSI**
5. **ANY SPARE CUSTOM ANALOG INPUT CHANNEL MAY BE USED. EXAMPLES FOR POS 5, POS 6, AND POS 7 SHOWN ABOVE.**

MAKE SURE THE BLACK GROUND WIRE IS GROUNDED TO AIRCRAFT GROUND AS THE PIN GROUNDS (E.G. PIN 30 AND 28) ON THE GEA 24 MAY NOT ALWAYS BE CONNECTED TO AIRCRAFT GROUND.

After wiring, set up the Aithre Shield EX detector as a GP (general purpose) input to the engine monitor and selected Custom Analog as a gauge. Then calibrate the gauge for the corresponding voltage to value ranges as set forth above in the recommended ranges.

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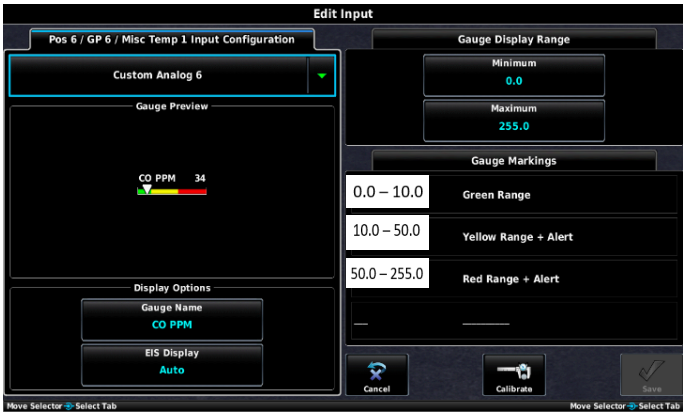
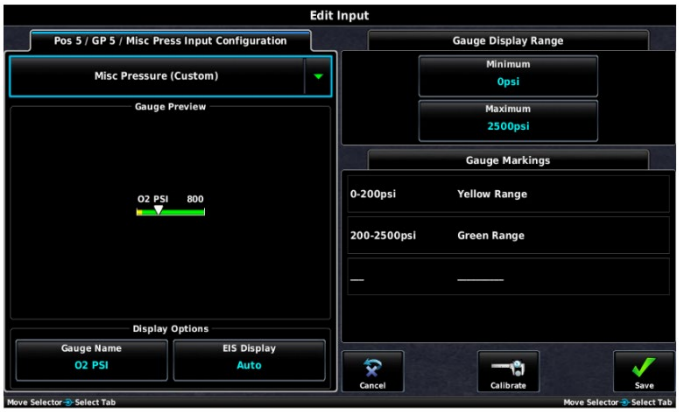
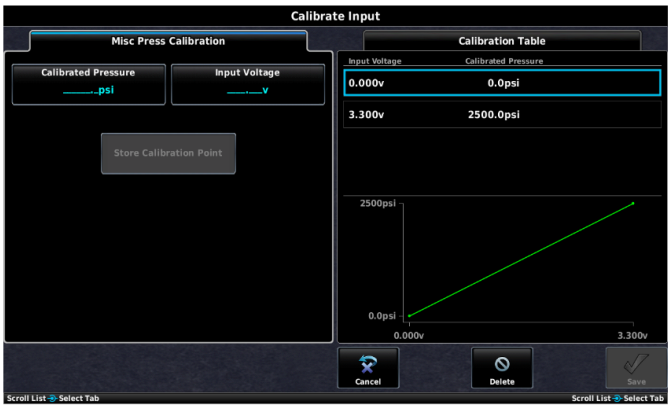
EXAMPLE G3x SETTINGS FOR CARBON MONOXIDE

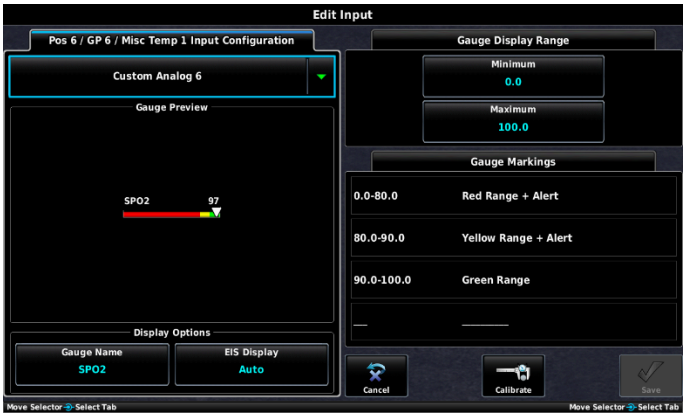


EXAMPLE G3x SETTINGS FOR OXYGEN TANK PSI (EX 3.0 only)





EXAMPLE G3x SETTINGS FOR PILOT SPO2 PERCENTAGE (EX 3.0 only)



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ADDITIONAL PRODUCT INFORMATION

USA

Contains Transmitter Module
FCC ID: A8TBM71S2
or
Contains FCC ID: A8TBM71S2

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CANADA

Contains transmitter module
IC: 12246A-BM71S2

ADDITIONAL USER MANUAL INFORMATION

USA

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CANADA

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

- This device may not cause interference; and
- This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:
(1) l'appareil ne doit pas produire de brouillage;
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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WARRANTY NOTICE: LIMITED ONE YEAR WARRANTY FROM DATE OF PURCHASE WITH PROOF OR PURCHASE WITH SOLE REMEDY BEING REPLACEMENT OR REPAIR OF PRODUCT AT SELLER'S OPTION. NO SPECIAL OR CONSEQUENTIAL DAMAGES. WARRANTY LIMITED TO DEFECTS IN MATERIAL AND WORKMANSHIP. WARRANTY LIMITED TO THE ORIGINAL PURCHASER AND THE ORIGINAL CUSTOMER OF THE PURCHASER AND CANNOT BE ASSIGNED OR TRANSFERRED. NO PERSON IS AUTHORIZED TO EXPAND THIS WARRANTY. THIS WARRANTY DOES NOT APPLY TO ANY PRODUCTS THAT HAVE BEEN SUBJECT TO ABUSE, MISUSE, OR IMPROPER INSTALLATION, STORAGE, MAINTENANCE, OPERATION OR WHICH HAS BEEN ALTERED, MODIFIED, OR INCORRECTLY REPAIRED. WARRANTY VOID IF HOUSING OPENED, OBJECT INSERTED, DEVICE INCORRECTLY POWERED, OR DEVICE EXPOSED TO LIQUID OR DUST. WARRANTY LIMITED TO THE FOREGOING AND OTHERWISE, AS IS WITH NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE EXPRESS OR IMPLIED.