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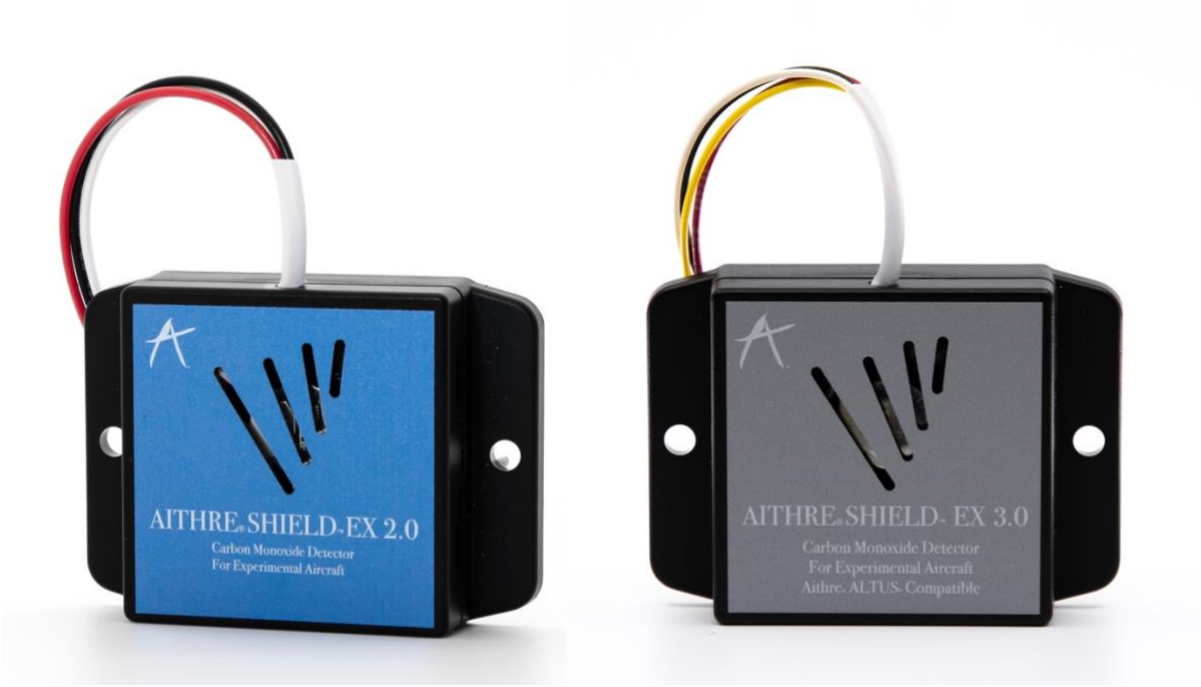
Aithre Shield EX Series

INSTALLATION MANUAL



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INTRODUCTION

GENERAL INFORMATION

The Aithre Shield EX 2.0 and 3.0 integrate behind-the-panel with your avionics using a simple analog voltage output(s) that works with all avionics (e.g. Garmin, Dynon, Advanced). The EX 3.0-S model outputs a serial RS-232 output that is currently accepted only by Advanced Flight Systems avionics. The EX 2.0 and 3.0 and 3.0-S 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 outputs only CO information whereas the EX 3.0 and EX 3.0-S 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; it then outputs the tank PSI and the SPO2 as a simple analog voltage output or RS-232 feed.

INSTALLATION

WIRING INSTRUCTIONS

- Red – **12V-18V**
  - Do NOT connect 24V power supplies
  - Total current draw is very low at around 5 mA
- 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
- Green (EX 3.0-S only) – RS-232 output of CO, Cabin Temp, SPO2, and Tank PSI

- Requires the Aithre Altus and Aithre Illyrian for full functionality
- RS-232 protocol published on the aithreaviation.com website under resources.

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 and 3.0-S: Download the Aithre Connect App on the APPLE store and verify automatic pairing with the EX 2.0 and 3.0 and 3.0-S on startup of the app. Verify CO values are presented in the Carbon Monoxide tab of the iOS app.
- EX 3.0 and 3.0-S: 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 1st 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 and 3.0-S. If the iOS is connected then the Illyrian in the 1st position on the oximeter tab controls the SPO2 output via the EX 3.0 and 3.0-S to the avionics.

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 and 3.0-S 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 and 3.0-S, 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 1-3 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 and 3.0-S, after initial setup, run the iOS application in the foreground or the background to reinforce and boost the strength of the wireless signal between the Aithre Altus and Illyrian and the EX 3.0 and 3.0-S. The iOS device acts as a relay for the Altus and Illyrian when used and will significantly improve the signal strength.

RECOMMENDED RANGES

For the EX 2.0 and 3.0, the voltage outputs correspond linearly to parameter values. However, for the EX 3.0-S, the serial output includes the actual parameter value as a digital number and no voltage mapping is necessary.

- 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)

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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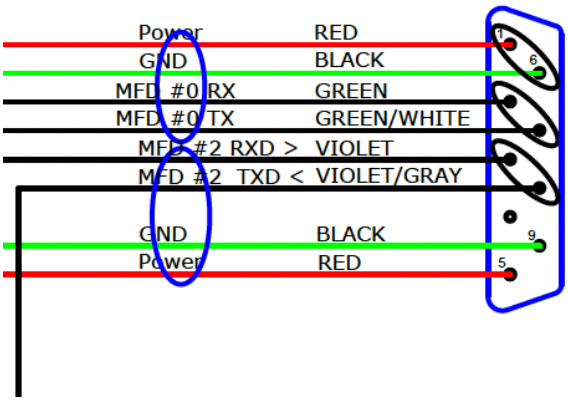
ADDENDUM A: ADVANCED FLIGHT SYSTEMS

Note: Advanced Flight Systems has limited to no support for the EX 2.0 or 3.0; Advanced is moving to supporting only the EX 3.0-S due to the increased number of data fields available. Aithre recommends only using the EX 3.0-S with Advanced Flight Systems avionics.

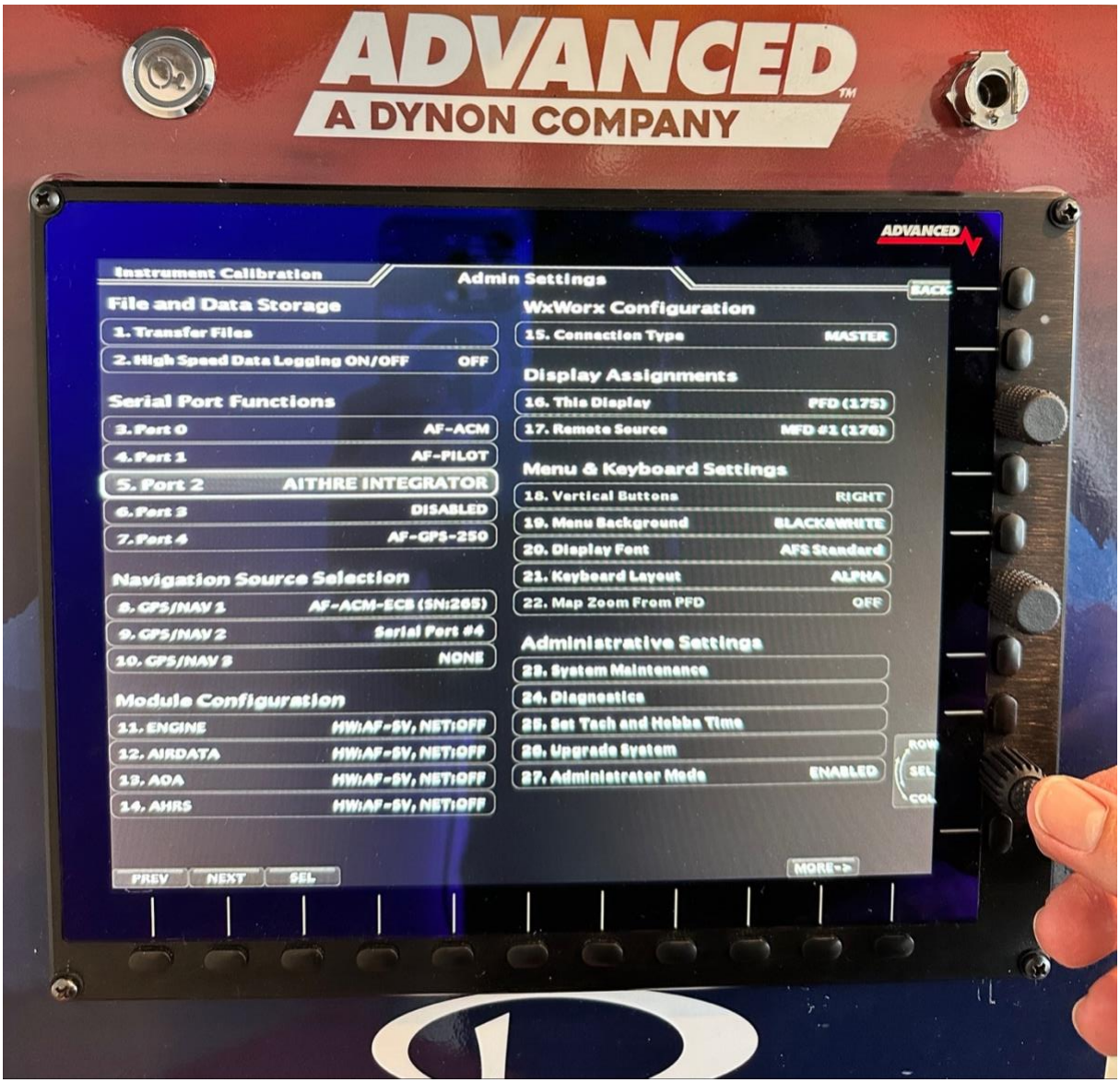
Contact Ken Chard at Dynon/Advanced support if using the EX 2.0 or 3.0 for current guidance.

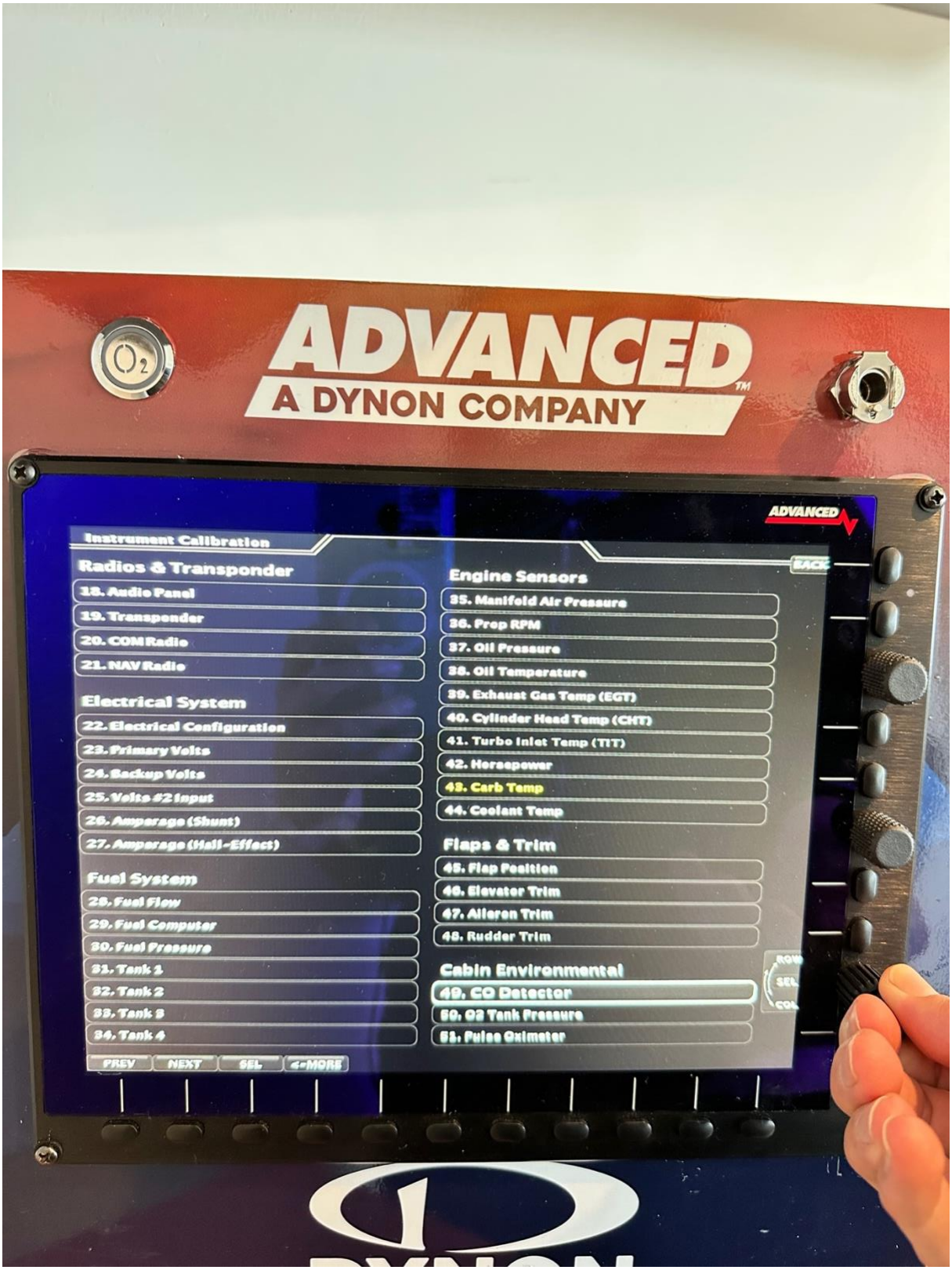
For the EX 3.0-S, hookup the red power, black ground, and green data wire to the Backup EFIS plug. Pins 1 and 5 are available as power. Pins 6 and 9 are available as ground. Use MFD #2 on pin 3, if available, for serial port 2.



P/N: 57317 Harness
BACKUP EFIS - CO

After wiring, ON THE MFD and NOT PFD, go to CAL → ADMIN and assign serial port 2 to the AITHRE INTEGRATOR. The serial ports for the backup EFIS are accessed only on the MFD. Save this setting. Then on the MFD, go to CAL → ENVIRO/CABIN and assign the CO, SPO2, and PSI sensors to the AITHRE INTEGRATOR input type. Save these settings and exit calibration.


ADVANCED
A DYNON COMPANY
ADVANCED
Instrument Calibration
Admin Settings
BACK
File and Data Storage
1. Transfer Files
2. High Speed Data Logging ON/OFF OFF
Serial Port Functions
3. Port 0 AF-ACM
4. Port 1 AF-PILOT
5. Port 2 AITHRE INTEGRATOR
6. Port 3 DISABLED
7. Port 4 AF-GPS-250
Navigation Source Selection
8. GPS/NAV 1 AF-ACM-ECB (SN:265)
9. GPS/NAV 2 Serial Port #4
10. GPS/NAV 3 NONE
Module Configuration
11. ENGINE HW:AF-SV, NET:OFF
12. AIRDATA HW:AF-SV, NET:OFF
13. ADA HW:AF-SV, NET:OFF
14. AHRS HW:AF-SV, NET:OFF
WxWorx Configuration
15. Connection Type MASTER
Display Assignments
16. This Display PFD (175)
17. Remote Source MFD #1 (176)
Menu & Keyboard Settings
18. Vertical Buttons RIGHT
19. Menu Background BLACK&WHITE
20. Display Font AFS Standard
21. Keyboard Layout ALPHA
22. Map Zoom From PFD OFF
Administrative Settings
23. System Maintenance
24. Diagnostics
25. Set Tach and Hobbs Time
26. Upgrade System
27. Administrator Mode ENABLED
PREV
NEXT
SEL
MORE->


ADVANCED
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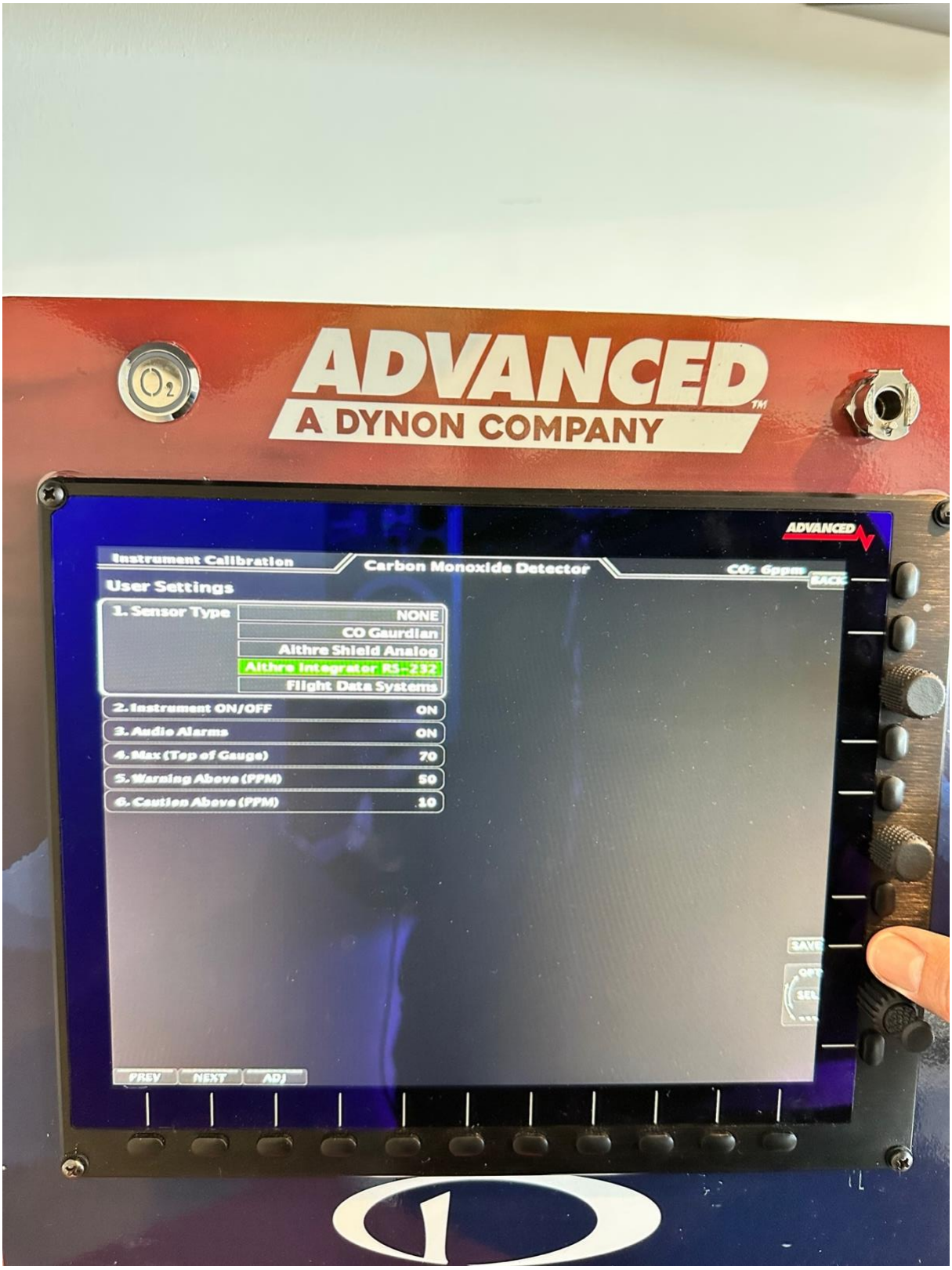
Instrument Calibration
Radios & Transponder
18. Audio Panel
19. Transponder
20. COM Radio
21. NAV Radio
Electrical System
22. Electrical Configuration
23. Primary Volts
24. Backup Volts
25. Volts #2 Input
26. Amperage (Shunt)
27. Amperage (Hall-Effect)
Fuel System
28. Fuel Flow
29. Fuel Computer
30. Fuel Pressure
31. Tank 1
32. Tank 2
33. Tank 3
34. Tank 4
Engine Sensors
35. Manifold Air Pressure
36. Prop RPM
37. Oil Pressure
38. Oil Temperature
39. Exhaust Gas Temp (EGT)
40. Cylinder Head Temp (CHT)
41. Turbo Inlet Temp (TIT)
42. Horsepower
43. Carb Temp
44. Coolant Temp
Flaps & Trim
45. Flap Position
46. Elevator Trim
47. Aileron Trim
48. Rudder Trim
Cabin Environmental
49. CO Detector
50. O2 Tank Pressure
51. Pulse Oximeter
PREV
NEXT
SEL
<-MORE


ADVANCED
A DYNON COMPANY
Instrument Calibration
Carbon Monoxide Detector
User Settings
1. Sensor Type
NONE
CO Gaurdian
Aithre Shield Analog
Aithre Integrator RS-232
Flight Data Systems
2. Instrument ON/OFF
ON
3. Audio Alarms
ON
4. Max (Top of Gauge)
70
5. Warning Above (PPM)
50
6. Caution Above (PPM)
10
PREV
NEXT
ADJ

Then access the Aithre suite of sensors in the Advanced Flight Systems avionics via CHECK -> CABIN.

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ADDENDUM B: DYNON SKYVIEW

Hook up the red 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 5-12V 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: 8, 22, 23, or 31. If there are no enhanced general purpose pins, then it is possible to use any of the other input pins, including 4, 6-12, 20-23, and 31.

Download to thumb drive the Dynon sensor file from our resources page on our website – www.aithreaviation.com -> Instructions & Resources under AithreShield EX Experimental Installed CO Detectors.

> Note: Download the file specific to the date of manufacture of you unit. There is a file for units produced prior to Mar 1st, 2023 and a different file for units produced after that date. The date of manufacture may be found on the back of the unit.

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

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

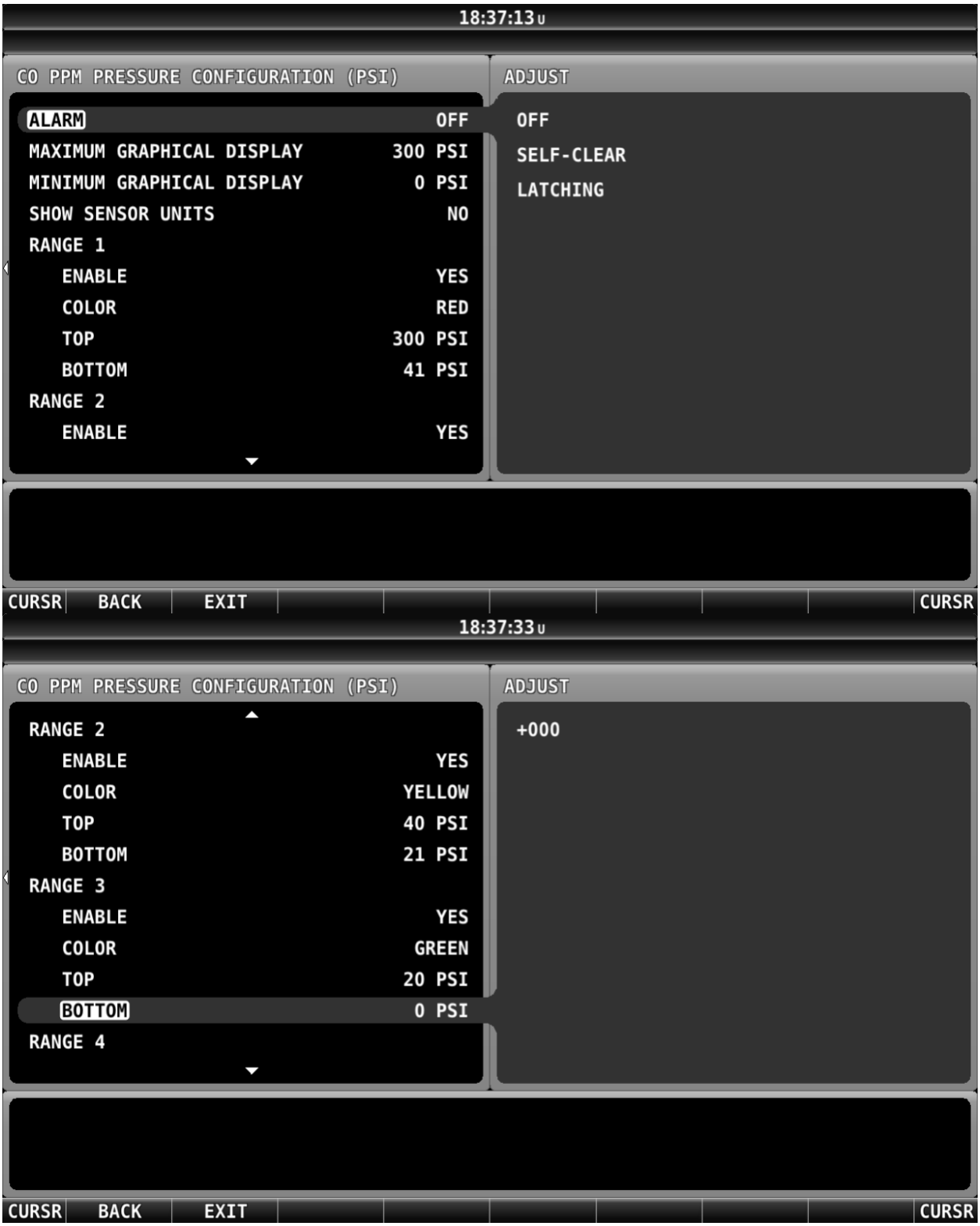
In the EMS setup page, enter the sensor mapping menu. Navigate to the sensor pin you connected to the Aithre Shield, select pressure sensor. The Aithre family of sensors will be options in the drop down sensor menu.

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.

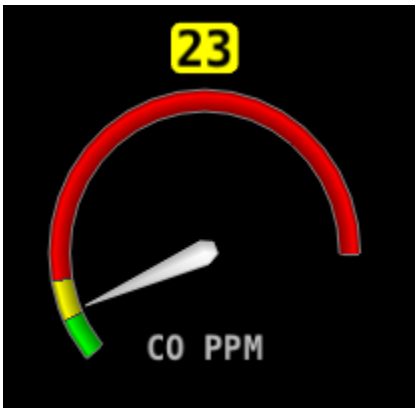
Note that you have to use the PSI choice, which basically sets up the input as a 0-5v Analogue Input. So do that. Then if you want to have a round gauge widget, you can just not have PSI displayed. You may find just setting the widget up as instructed except selecting a numerical display is actually neat and tidy. Also, you can easily choose to have just the dot as a widget on the screens. When you go to create the widget, if you press the STYLE button, you can scroll through the various widget shapes and styles and select the one you want. The SIZE button will also make it larger or smaller. It is pretty much the same process as setting up the bar graph widget in the SENSOR setup menu. You just have to define the ranges exactly as you would for the bar graph widget. See screenshots below.

Recommended ranges are as follows:

- Carbon Monoxide: 0-10 PPM normal; 11-50 PPM caution; 51-255 PPM warning
- Oxygen Tank Pressure: 0-100 PSI warning, 101-500 PSI caution, 501-2500 PSI normal
- Oximeter: 0-89% SPO2 warning, 90-92% SPO2 caution, 93%-100% normal

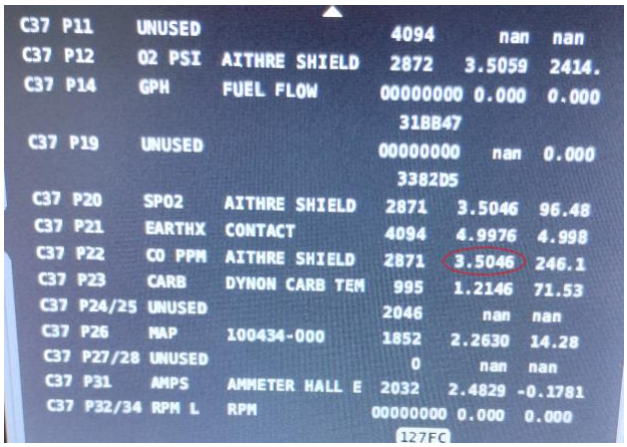

18:37:13
CO PPM PRESSURE CONFIGURATION (PSI)
ALARM OFF
MAXIMUM GRAPHICAL DISPLAY 300 PSI
MINIMUM GRAPHICAL DISPLAY 0 PSI
SHOW SENSOR UNITS NO
RANGE 1
ENABLE YES
COLOR RED
TOP 300 PSI
BOTTOM 41 PSI
RANGE 2
ENABLE YES
ADJUST
OFF
SELF-CLEAR
LATCHING
CURSR BACK EXIT CURSR
18:37:33
CO PPM PRESSURE CONFIGURATION (PSI)
RANGE 2
ENABLE YES
COLOR YELLOW
TOP 40 PSI
BOTTOM 21 PSI
RANGE 3
ENABLE YES
COLOR GREEN
TOP 20 PSI
BOTTOM 0 PSI
RANGE 4
ADJUST
+000
CURSR BACK EXIT CURSR


18:37:45
CO PPM PRESSURE CONFIGURATION (PSI)
BOTTOM 0 PSI
RANGE 4
ENABLE NO
COLOR YELLOW
TOP 10 PSI
BOTTOM 5 PSI
RANGE 5
ENABLE NO
COLOR RED
TOP 5 PSI
BOTTOM 0 PSI
ADJUST
+000
CURSR
BACK
EXIT
CURSR


23
CO PPM

In most cases, the Sheld EX data will display correctly after completing this procedure. However, due to manufacturer tolerances on some of the EX components, additional steps may be required. During start-up, the EX3 outputs 3.3 volts for 1 minute and then 0 volts for one minute to facilitate calibration. Individual adjustments may be required for CO, SPO2, and Tank Pressure. The process is the same for all three parameters. We will outline the process to calibrate the CO which may be mimicked for the other two parameter.

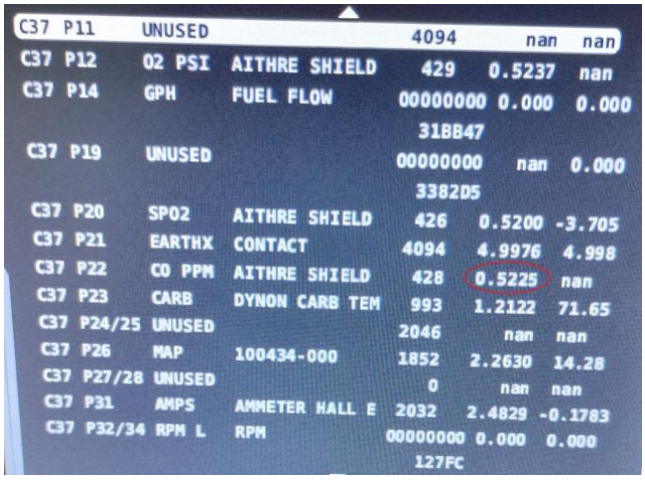
When the unit is turned on, CO should read 255 ppm for one minute and then 0 ppm for one minute. If the readings are correct, no further action is required. If values are not correct follow the procedure outlined below:



Navigate to the Dynon Debug Data page: Setup Menus/EMS Setup/Sensor Debug Data/C37_Pxx

Note that are different lines for each of the three sets of Aithre Data which may be presented on Dynon. The pin numbers may vary depending which ports to which you connected the EX3 analog wires. In this example the CO analog wire was connected to Pin 22.

For the first minute the CO ppm is artificially set to 3.3 volts which should present as 255ppm on Dynon. If this value is off, record the number circled in red. In this case 3.5046.



After one minute, the CO ppm is artificially set to 0 volts which should present as 0 ppm on Dynon. If this value is off, record the number circled in red. In this case, .5225.

Repeat this procedure for SPO2 and Tank Pressure. Email all data to support@aithreaviation.com. We will send you a new Dynon sensor file. Load the file and you should see the correct values during initial start-up. At that point the Dynon presentation should accurately reflect EX3 sensed data during flight.

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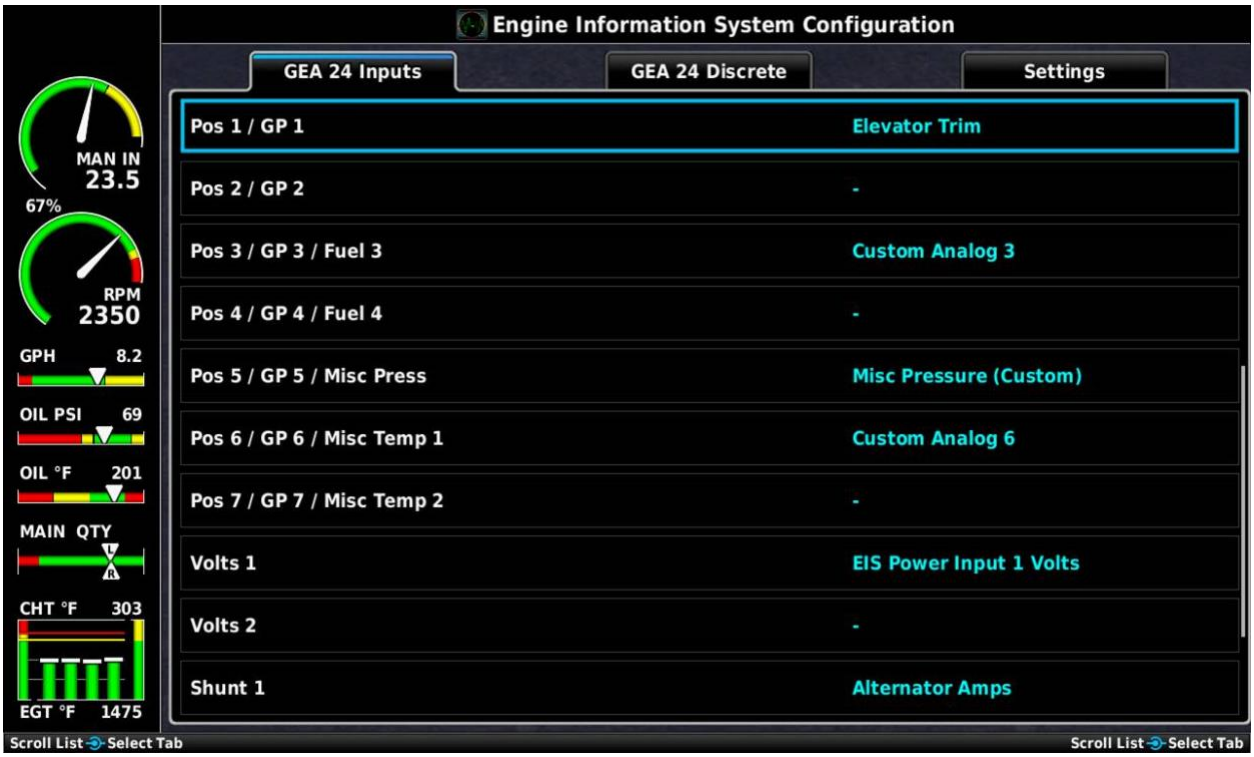
ADDENDUM C: GARMIN G3X ADDENDUM

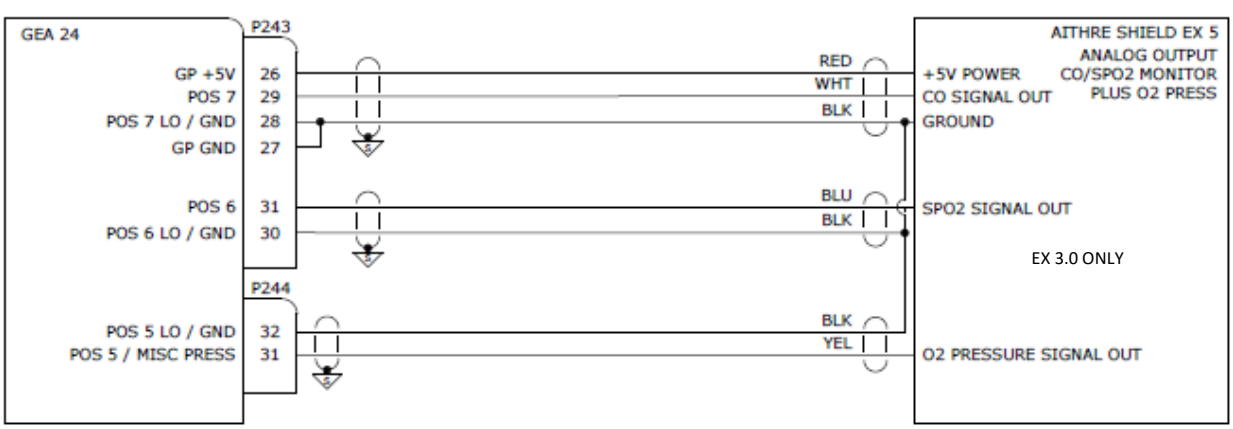
Hook up the red power, black ground, white (CO) analog output wire, yellow (tank psi – EX 3.0 only) analog output, and blue analog output (pilot SPO2 – EX 3.0 only) to the GEA 24. **Make sure the black ground wire is grounded to aircraft ground.** The following pinout from the G3x manual shows which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


Engine Information System Configuration
GEA 24 Inputs
GEA 24 Discrete
Settings
MAN IN
23.5
67%
RPM
2350
GPH
8.2
OIL PSI
69
OIL °F
201
MAIN QTY
CHT °F
303
EGT °F
1475
Pos 1 / GP 1
Elevator Trim
Pos 2 / GP 2
-
Pos 3 / GP 3 / Fuel 3
Custom Analog 3
Pos 4 / GP 4 / Fuel 4
-
Pos 5 / GP 5 / Misc Press
Misc Pressure (Custom)
Pos 6 / GP 6 / Misc Temp 1
Custom Analog 6
Pos 7 / GP 7 / Misc Temp 2
-
Volts 1
EIS Power Input 1 Volts
Volts 2
-
Shunt 1
Alternator Amps
Scroll List
Select Tab
Scroll List
Select Tab

Below is an example wiring diagram.



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. THE DIAGRAM ABOVE SHOWS MULTIPLE GROUND PINS, BUT ONLY ONE IS REQUIRED SO LONG AS YOU CONFIRM IT IS 0 RESISTANCE TO GROUND.

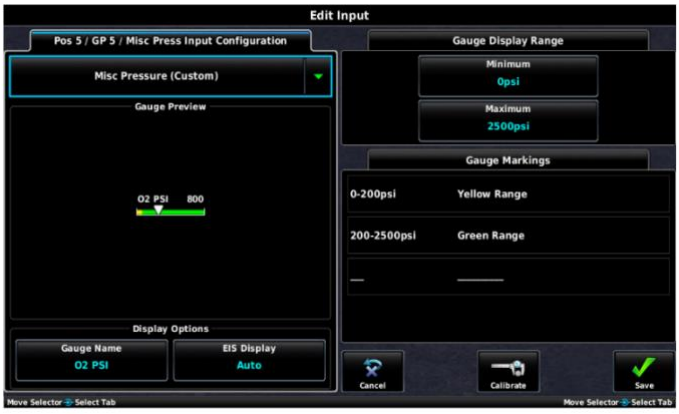
After wiring, set up the Aithre Shield EX detector as a GP (general purpose) input to the engine monitor and select Custom Analog as a gauge. Then calibrate the gauge for the corresponding voltage to value ranges as set forth above.

Recommended ranges are as follows:

- Carbon Monoxide: 0-10 PPM normal; 11-50 PPM caution; 51-255 PPM warning
- Oxygen Tank Pressure: 0-100 PSI warning, 101-500 PSI caution, 501-2500 PSI normal
- Oximeter: 0-89% SPO2 warning, 90-92% SPO2 caution, 93%-100% normal

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

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Support for Aithre products is available on our website www.aithreaviation.com, phone 208-481-8310, and email support@aithreaviation.com

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