ELM800/1000 EFIS

Specification and Installation Instructions

Rev1.4

March 2026

Model

- EFIS **ELM800**

Note:

ELM800 EFIS is non-TSO certified flight instrument.

Model

- EFIS **ELM1000**

Note:

ELM1000 EFIS is non-TSO certified flight instrument.

Credits

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Revision History

Below is the document's revision story.

Revision #	Revision Date	Comments
Rev 1.0	May 20, 2023	Initial Release of this document
Rev 1.0.1	August 07, 2023	Additional information added
Rev 1.1	September 26, 2024	Additional features and info
Rev 1.2	May 11, 2025	ELM800 and features added
Rev 1.3	February 06, 2026	Additional features added
Rev1.4	March 14, 2026	Rotax 9xx iS series support

Contents

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1. Introduction

The ELM800/1000 Electronic Flight Instrument System (EFIS) is an advanced electronic device designed to provide various flight information to pilots of experimental airplanes. The ELM800/1000 are a non-TSO-certified flight instruments, available in a form factor compatible with most standard aviation panels. This product manual outlines the EFIS functionality, installation, and operation. The functionality, installation and operation of ELM800 and ELM1000 are almost identical.

Please note: In this document, the terms "EFIS", “ELM800”, "ELM1000", "device", "unit", and "instrument" are used interchangeably when referring to the ELM800 / ELM1000 EFIS.

2. General Description

The ELM800 / ELM1000 Electronic Flight Instrument System (EFIS) is an electronic device comprised of a microcontroller, an LCD display, a touch panel, a housing case, and various built-in sensors, including a gyroscope, accelerometer, static and dynamic pressure sensors, and a GPS receiver. Additionally, there are two external sensors: a GPS antenna and an Outside Air Temperature (OAT) sensor. The integrated LCD display is used to present all flight information.

The ELM800 / ELM1000 EFIS consists of two distinct modules: the Graphics Processing Unit (GPU) and the Sensors Processing Unit, also known as the Attitude and Heading Reference System (AHRS). The GPU is directly connected to the display, controlling the LCD and all output data. The AHRS is responsible for reading and processing sensor data. Both units have their own firmware and function independently, communicating with each other at high speeds via dedicated protocols.

For user control, the ELM800 / ELM1000 features two rotating knobs and six push buttons on the front panel. A built-in USB port is also located on the front for easy access. Additionally, the ELM800 / ELM1000 is equipped with an internal SATA drive for map and database storage.

3. Technical Specifications

Description	ELM800/1000
Input voltage	+10 to +28 Volts
Power consumption	25W
Current	1.8A at 14V
Unit size ELM800	220mm x 150mm x 75mm (with knobs)
Unit size ELM1000	280mm x 205mm x 75m (with knobs)
Weight	750 g
Operation humidity	25% to 90%
GPU processor	NVIDIA
Sensors processor	ARM
System startup time	26 sec
Display ELM800	8.0” ultra-bright 1280x720px
Display ELM1000	10.2” ultra-bright 1280x800px
USB Port	Standard USB 2.0
External communication	CAN bus (proprietary protocol) and RS232 (NMEA)
Pitch/Roll range	360 degrees
Altitude range	-1000ft to 32000ft
Vertical speed range	10000ft/min up/down
Receiver	u-Blox high-sensitivity GPS receiver with WAAS
Antenna	Mag mount GPS with male SMA connector
Pitot/Static/AOA lines	¼” Quick connect
Manufacturer	360Avionics

4. AHRS (sensors processing unit)

Please note that the ELM800 / ELM1000 EFIS may feature either an internal, built-in AHRS system or an external AHRS module.

The Attitude and Heading Reference System (AHRS) is based on a combination of accelerometers, gyroscopes, dynamic pressure sensors, and GPS data. These sensors are essential for accurately calculating attitude and heading, which include roll, pitch, yaw, and heading information. Depending on the version of the unit, additional sensors, such as an Outside Air Temperature (OAT) sensor or magnetometer, may also be used to enhance AHRS calculations.

The sensor data is processed in the AHRS module, where complex mathematical algorithms and digital filtering are applied to estimate the current Roll, Pitch, and Yaw (RPY) and display them on the screen via the artificial horizon. Depending on the sensor accuracy and environmental factors, some errors in the estimated RPY may occur. For best performance, GPS data and/or True Airspeed (TAS) or Calibrated Airspeed (CAS) are necessary to reduce errors, particularly during banked turns. It is highly recommended to keep the GPS antenna connected at all times, as GPS-based parameters help improve attitude estimation. Coordinated flight will further minimize errors in RPY calculations.

Reminder for Pilots: Maintaining coordinated flight is critical for accurate RPY estimation. Short periods of uncoordinated flight may not cause significant errors, but prolonged uncoordinated flight will lead to inaccuracies in RPY calculations.

In an uncoordinated flight, the RPY parameters displayed on the artificial horizon will likely show errors, meaning the horizon line on the display will not match the true horizon as perceived by the pilot. After resuming coordinated flight, it will take approximately 20–35 seconds for the RPY data to correct itself and return to accurate readings.

Steep banking turns, especially those exceeding 50–55 degrees, can also introduce errors in the RPY output, as sensor readings may reach their upper or lower thresholds. Once normal, coordinated flight resumes, the RPY data will typically correct itself within 20–35 seconds.

Aerobatic maneuvers will likely result in substantial errors in artificial horizon and attitude indications due to the limitations of the sensors. After returning to normal flight conditions, it may take over 1 minute for the RPY data to stabilize and show accurate attitude on the display.

5. Pitot and Static systems

Pitot/Static/AOA + GPS:
The ELM800 / ELM1000 EFIS is equipped with highly accurate built-in dynamic and static pressure sensors, with Pitot and Static ports located on the back of the unit or the external AHRS module (if applicable). The Pitot sensor is the primary source of airspeed data. However, in cases where the Pitot sensor's airspeed information is deemed unreliable (as determined by manufacturer-defined internal error thresholds), the system will automatically switch to displaying ground speed derived from the GPS sensor. When this occurs, an appropriate alert will be shown on the display.

True Airspeed (TAS) is available in this version of the EFIS when an Outside Air Temperature (OAT) probe is installed and connected. The installation of the OAT probe also enables additional enhanced functionality within the unit.

The Pitot, Static, and Angle of Attack (AOA) ports are designed for ¼" quick-connect fittings. **Note:** AOA is an optional feature and is not included in the standard configuration of the ELM800 / ELM1000.

When connecting the Pitot/Static/AOA lines to the EFIS, it is crucial to perform a pitot/static leak test on the aircraft to ensure that all connections are properly sealed and plumbed.

Airspeed and altitude sensors come factory-calibrated and do not require any additional calibration after installation.

6. LCD Display

The **ELM800** features a high-definition LCD display with a resolution of **1280 x 720 pixels**, offering excellent color reproduction and contrast. It utilizes **high-brightness, sunlight-readable technology** with a **8.0" diagonal**. This **TFT LCD** display, equipped with a bright backlight, is designed for use in environments with direct sunlight. A **capacitive touch panel** is mounted on top of the LCD, allowing for smooth and responsive touch interaction.

The **ELM1000** features a high-definition LCD display with a resolution of **1280 x 800 pixels**, offering excellent color reproduction and contrast. It utilizes **high-brightness, sunlight-readable technology** with a **10.2" diagonal**. This **TFT LCD** display, equipped with a bright backlight, is designed for use in environments with direct sunlight. A **special capacitive touch panel** is mounted on top of the LCD, allowing for smooth and responsive touch interaction.

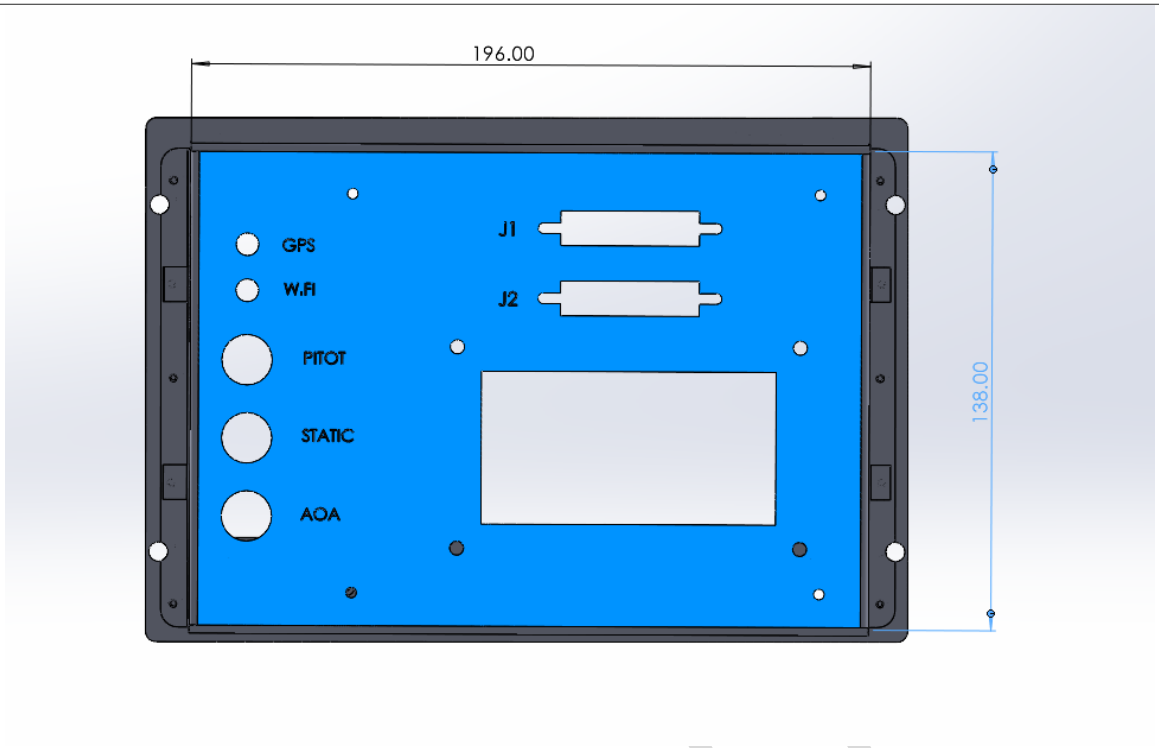
The ELM800 / ELM1000 also includes **built-in ambient light sensors** located on the front panel. The **auto-brightness** feature can be toggled in the **Settings menu** under **General Config > Disp Brg**.

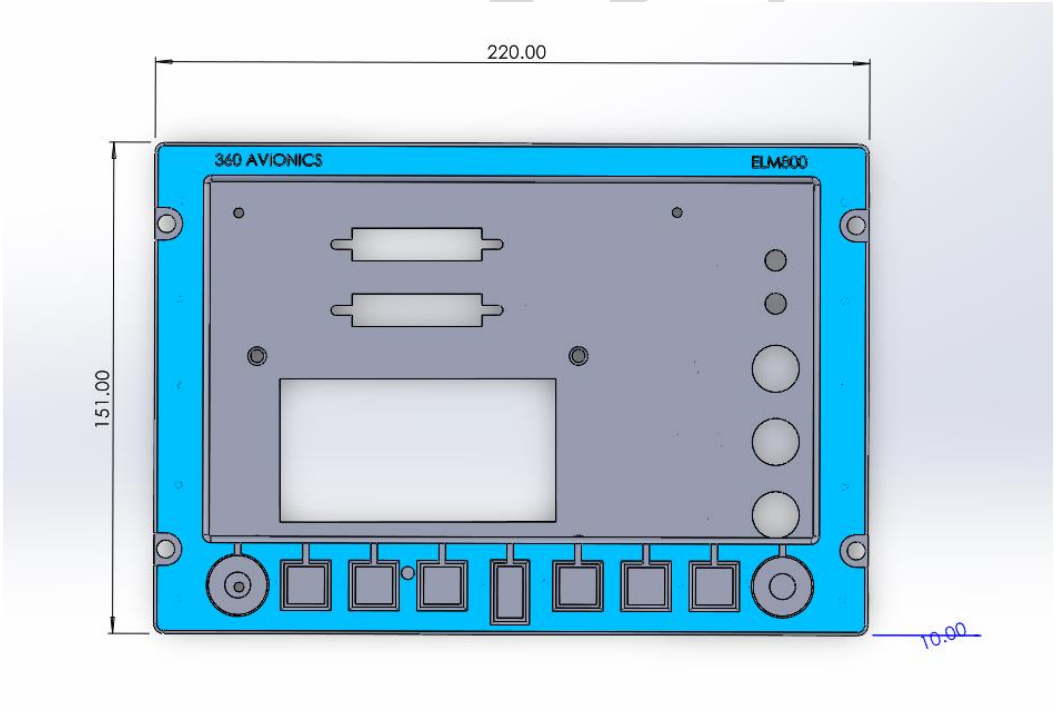
When the auto-brightness feature is enabled, the display brightness automatically adjusts to ambient light conditions, becoming brighter in direct sunlight and dimmer at night for optimal readability.

7. Product installation

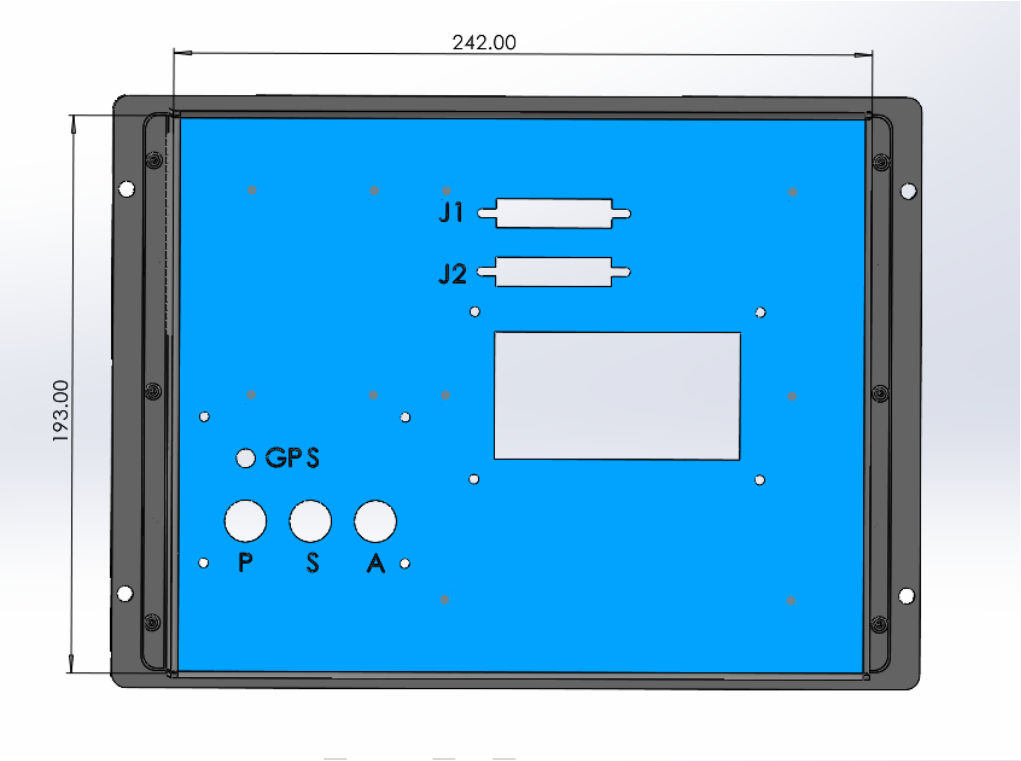
All dimensions are given in Millimeters (mm).

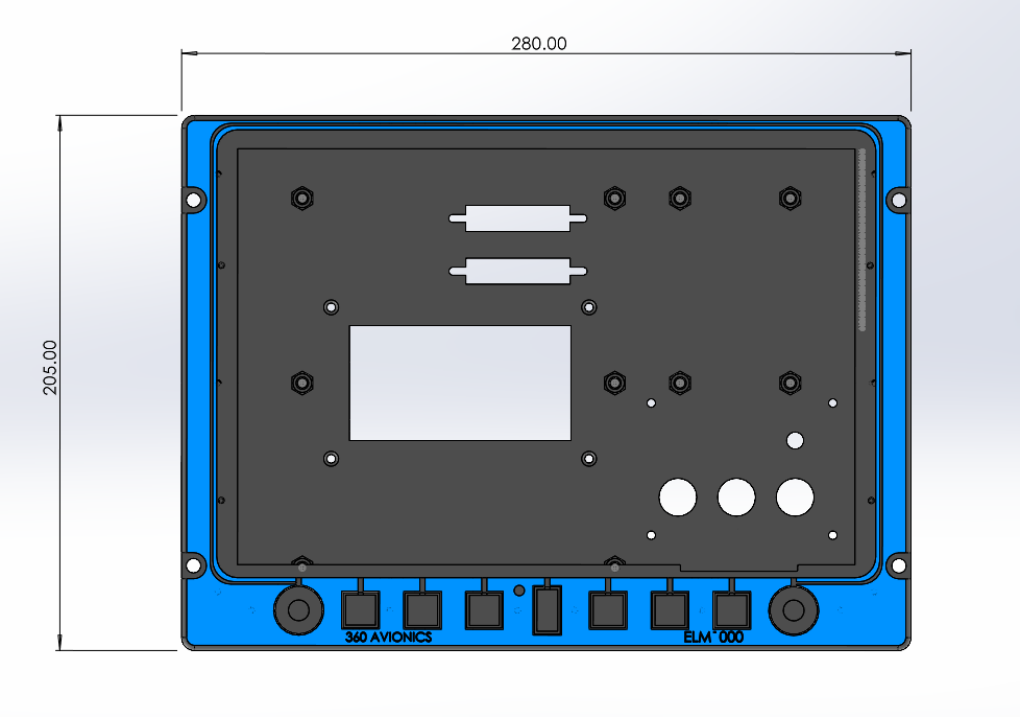
ELM800 EFIS requires rectangle cutout in airplane panel for installation.
The dimensions of the rectangle cutout are shown in the drawing below and they are respectively 196mm in width and 138mm in height.





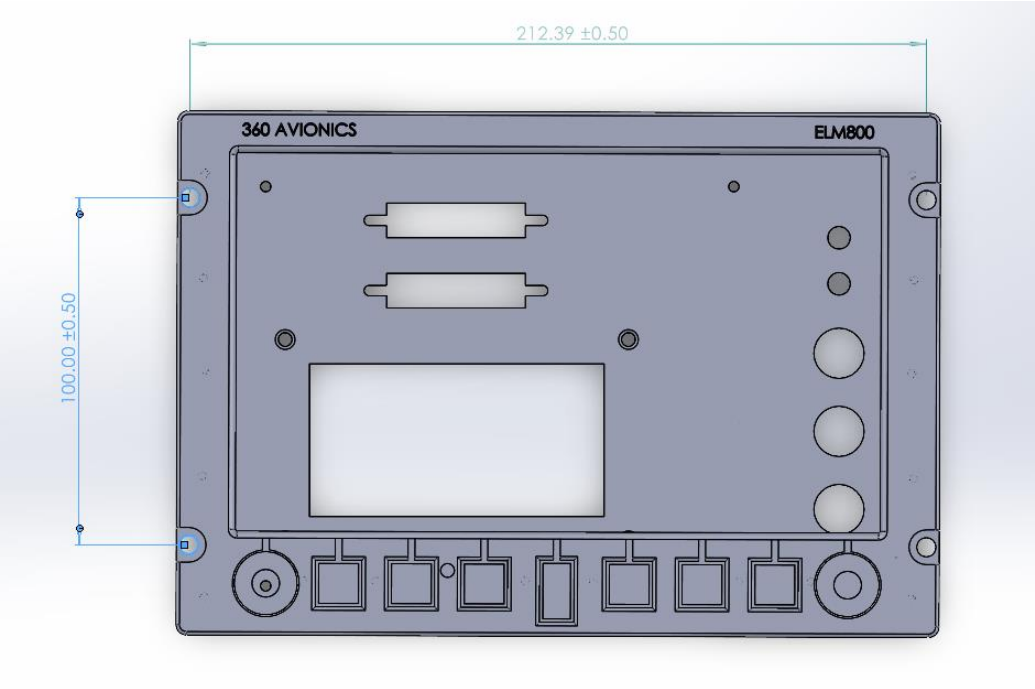
ELM1000 EFIS requires rectangle cutout in airplane panel for installation.
The dimensions of the rectangle cutout are shown in the drawing below and they are respectively 242mm in width and 193mm in height.



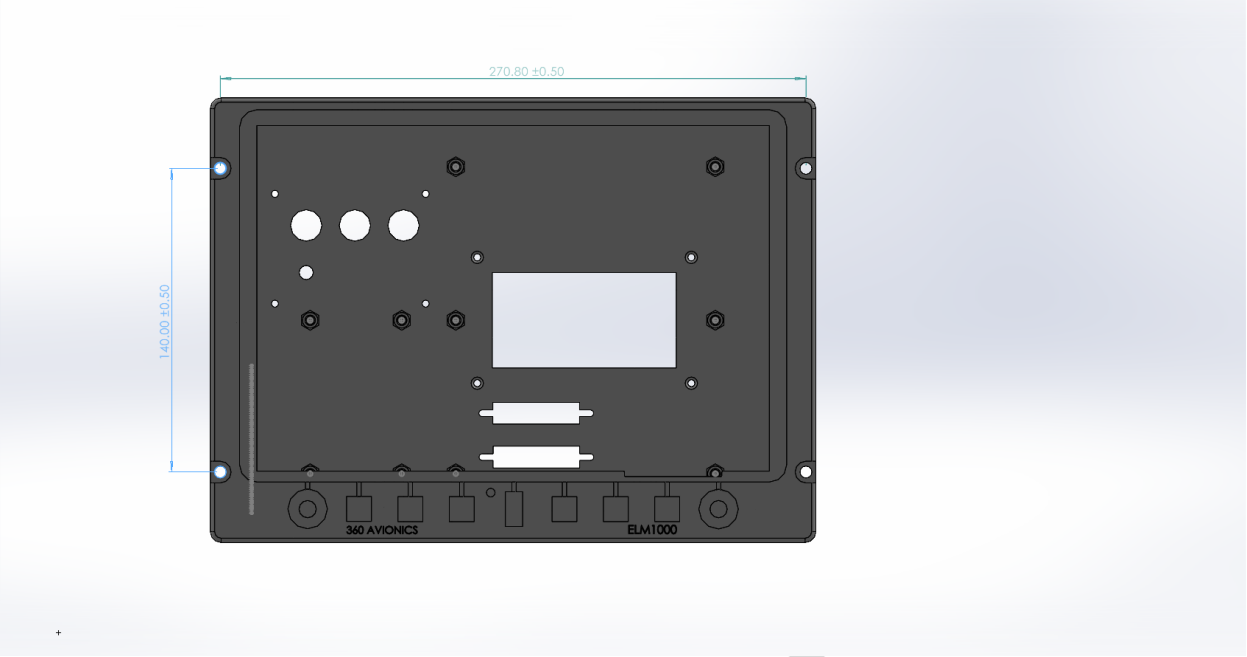


ELM800/1000 EFIS requires four (4) machine screws or bolts for panel installation. EFIS has four (4) holes in its front panel with a dimeter of 5.50mm each. It is recommended to use a mounting hardware of the size no less than #8-32

The vertical distance between holes (ELM800) is 100mm and the horizontal distance is 212mm as shown below.
It is recommended to use a nut plates for the panel to simplify EFIS installation/removal.



The vertical distance between holes (ELM1000) is 140mm and the horizontal distance is 270.8mm as shown below.
It is recommended to use a nut plates for the panel to simplify EFIS installation/removal.

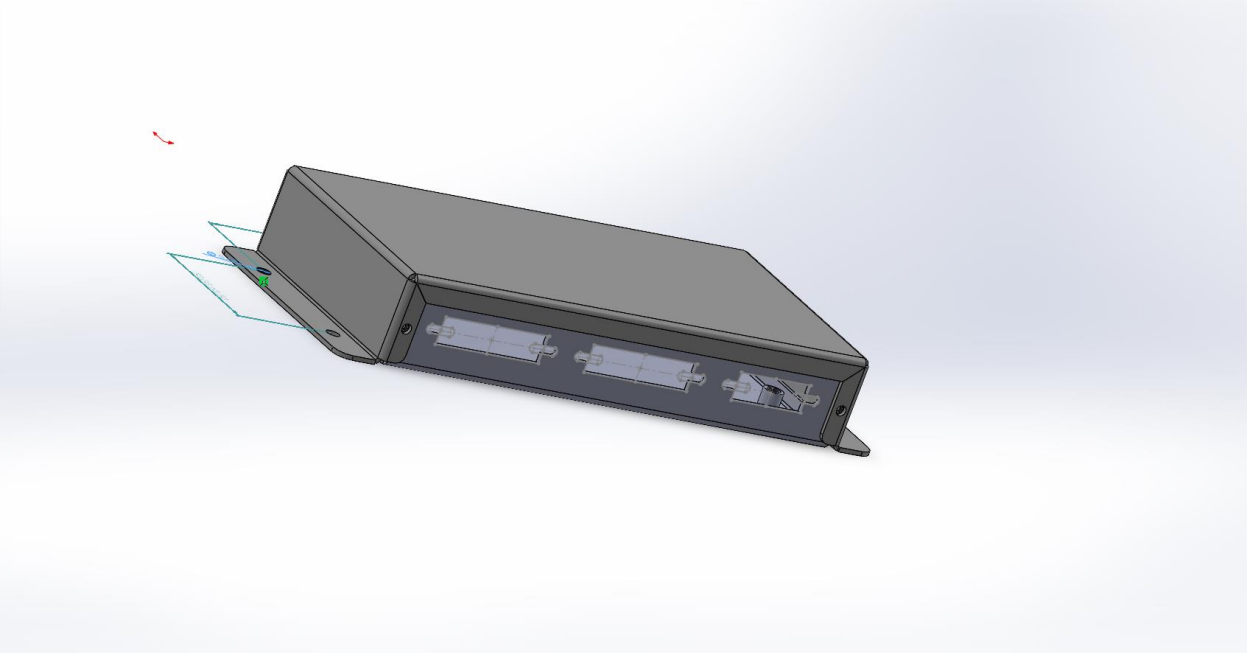


At the back side of the EFIS there are connectors so it is recommended to have a clearance with other parts of at least 120mm.

EnGood EM-01 sensor processing unit

It is recommended that EnGood EM-01 sensor processing unit is installed behind the instrument panel. There are 4 mounting holes. Each hole has a diameter of 5mm.
Horizontally, the distance between the mounting holes is 198mm; vertically, the distance between the vertical mounting holes is 50mm.

⚠ Important: Please allow at least 85mm of clearance between the front panel of Engood sensor processing unit and other parts for connectors and wires.



Recommended mounting hardware is #6-32 bolts. It is preferable to have a nut plates installed in the panel to simplify installation and removal of the EM-01 module.

7.1 Proper alignment of the instrument

It is assumed that the **instrument panel** is always perpendicular to the airplane's flight path. For proper operation of the **ELM800/1000**, the **AHRS sensors** (such as accelerometers and gyroscopes) must be correctly aligned. Specifically:

- The **X axis** of the sensors must point in the same direction as the flight path,
- The **Y axis** must be perpendicular to the flight path, and
- The **Z axis** must be perpendicular to the ground.

If the instrument panel is **not perpendicular** to the flight path, the **AHRS sensors' axes** will be misaligned, and the device will not function correctly. In such cases, the device will require calibration or leveling. For details on the **AHRS sensor leveling procedure**, please refer to the appropriate section of this manual.

7.2 Connections

On the backside of the **EFIS unit**, there are connectors for **pitot/static/AOA plumbing**, the **GPS antenna**, and two **main power connectors**. For all electrical connections, the **ELM800/1000** uses two **25-pin D-SUB male/female connectors** located at the top center of the unit. A male/female D-SUB connector is included in the kit for wiring purposes. The recommended wire gauge for connections is **22AWG–24AWG**.

The **quick-connect ¼" pitot line** is marked as **'P'**, and the **static line** is marked as **'S'** on the back of the unit. It is recommended that the installer labels the tubing connected to these ports to ensure correct reconnection if the unit needs to be removed and reinstalled. If applicable, the **AOA connector** is marked **'A'**.

GPS Antenna:

The **GPS port** uses an **SMA type female connector**. Any GPS antenna with an **SMA male connector** and a **3.3V–5V voltage level** can be used. A **magnetic-mount GPS antenna** is included with the kit. The ideal location for the GPS antenna is on top of the instrument panel under the windshield, where it has an unobstructed view of the sky. The GPS antenna should never be mounted underneath or behind the panel, as this may hinder signal reception.

If the antenna is installed outside the airplane, such as on the roof, it must be securely attached using a strong adhesive to ensure it withstands high wind speeds. For external installations, it is recommended to seek advice from an experienced aviation maintenance specialist to ensure proper placement and durability.

When tightening the GPS connector, hand-tightening is sufficient. Do not overtighten.

25-pin Main connector's pinout:

J1 Connector (Top)

1- **Power Ground Input**
2- **Power Ground Input**
3- GND
4- GND
5- GND
6- RS232 TX4
7- RS232 RX4
8- RS232 TX3
9- RS232 RX3
10- Reserved
11- Reserved
12- CAN bus Low
13- CAN bus High
14- AUDIO L
15- RS232 TX1
16- RS232 RX1
17- RS232 TX2
18- RS232 RX2
19- Reserved
20- Reserved
21- Reserved
22- Reserved
23- Reserved
24- **Power +V Positive Input**
25- **Power +V Positive Input**

J2 Connector (Bottom)

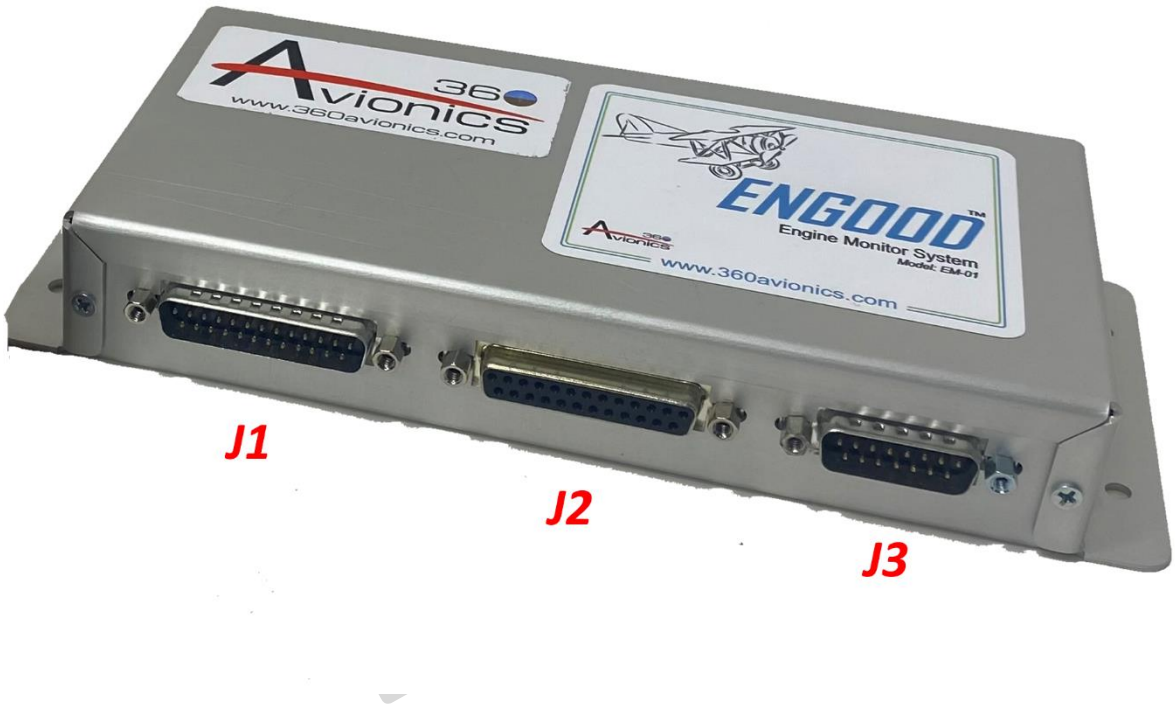
1- GND
2- GND
3- RS485-1 A
4- RS485-1 B
5- RS485-2 A (ELM1000 only)
6- RS485-2 B (ELM1000 only)
7- Unused
8- ARINC429 A Rx (ELM1000x only)
9- ARINC429 B Rx (ELM1000x only)
10- Reserved
11- Reserved
12- Reserved
13- Reserved
14- GND
15- Reserved
16- NC
17- Video1 Input (ELM1000x only)
18- Video2 Input (ELM1000x only)
19- GND
20- OAT Sensor Signal
21- OAT Sensor Power+ Out
22- Reserved
23- Reserved
24- +12V Cam (ELM1000x only)
25- Reserved

It is recommended to use **22 AWG** wire for all power connections (pins 1, 2, 24, and 25 of J1). For all other connections, **24 AWG** wire is acceptable. Use **milspec wires** for all connections to ensure high quality and robustness. The kit includes male and female **D-SUB 25-pin connector headers** for either soldering or crimping pins, along with a plastic enclosure for the connector header.

When soldering wires, ensure that they are securely attached to avoid cold solder joints.

EM-01 and EM-02 Engine Sensor Processing Units

Please note that models EM-01 and EM-02 have some pin differences!



Connector J1 (DB25) Match for both models

1- CHT1+	11- CHT6+	21- EGT4-
2- CHT1-	12- CHT6-	22- EGT5+
3- CHT2+	13- GND	23- EGT5-
4- CHT2-	14- EGT1+	24- EGT6+
5- CHT3+	15- EGT1-	25- EGT6-
6- CHT3-	16- EGT2+	
7- CHT4+	17- EGT2-	
8- CHT4-	18- EGT3+	
9- CHT5+	19- EGT3-	
10- CHT5-	20- EGT4+	

Connector J2 (DB25) (EM-01)

1- Oil Temp+
2- Oil Temp-
3- Aux Temp+
4- Aux Temp-
5- RPM Sens Input
6- Fuel Flow Sens1 Input
7- Fuel Flow Sens2 Input
8- Oil Press Sens Input
9- Fuel Press Sens Input
10- MAP Sens Input
11- Current Sens Input
12- Flaps Pos Sens Input
13- Rudder Trim Sens Input
14- Left Door Sens In
15- Fuel Meter Right Sens Input
16- GND
17- GND
18- GND
19- Reserved
20- Fuel Meter Left Sens Input
21- Elevator Trim Sens
22- 5V for Sens
23- 5V for Sens
24- 5V for Sens
25- Right Door Sens In

Connector J2 (DB25) (EM-02)

1- Oil Temp+
2- Oil Temp-
3- Aux Temp+
4- Aux Temp-
5- RPM Sens Input
6- Fuel Flow Sens1 Input
7- Fuel Flow Sens2 Input
8- Oil Press Sens Input
9- Fuel Press Sens Input
10- MAP Sens Input
11- Current Sens Input
12- Flaps Pos Sens Input
13- Rudder Trim Sens Input
14- Left Door Sens In
15- Fuel Meter Right Sens Input
16- Analog Input 15
17- CO Sensor Input
18- Battery Voltage Input
19- AUX5 Input
20- Fuel Meter Left Sens Input
21- Elevator Trim Sens
22- 5V for Sens
23- 5V for Sens
24- 5V for Sens
25- Right Door Sens In

Connector J3 (DB15) (EM-01)

1- Power IN (12V)
2- Reserved
3- Reserved
4- Reserved
5- Unused Input
6- Roll Trim Sens Input
7- Reserved
8- GND
9- Warn Lamp Output2 (Master Warning)
10- CAN bus Low
11- CAN bus High
12- Warn Lamp Output1 (Low Oil pressure)
13- Reserved
14- Baggage Door Sens In
15- Power Ground Input

Connector J3 (DB15) (EM-02)

1- Power IN (12V)
2- Reserved
3- Reserved
4- Reserved
5- Engine CAN Low
6- Roll Trim Sens Input
7- Reserved
8- GND
9- Warn Lamp Output2
10- CAN bus Low
11- CAN bus High
12- Warn Lamp Output1
13- Engine CAN High
14- Baggage Door Sens In
15- Power Ground Input

6.4 Power bus:

EM-01 Sensor Processing Unit
Use AWG20 or less gauge of wires to connect power to the sensors unit (pins 1 and 15 of J3 connector). It is required to have 5A circuit breaker on power line for this module. This circuit breaker should be accessible from pilot's seat. Ground wire can be connected to chassis ground or directly to the battery negative terminal.

6.5 Data communication bus:

EM-01 Sensor Processing Unit must be connected to *ELM800/1000 EFIS* using CAN bus for all data exchange between devices.

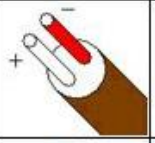
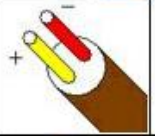
Use only twisted pair of milspec wire AWG22-24 for this connection.

Connect pins as follows:

Signal	***EM-01***	***ELM800/1000***
CAN Low	10 (J3)	12 (J1)
CAN High	11 (J3)	13 (J1)

6.6 Sensors

CHT, EGT, Oil Temperature, GearBox, Coolant and under Cowling Sensors:

Type	Material		Color Code	Range (°C)	
Thermocouple Grade	Positive Wire	Negative Wire		Minimum	Maximum
J	Iron	Constantan		0	750
K	Chromel	Alumel		-200	1250

Compatible Sensors

The **CHT** (Cylinder Head Temperature) and **EGT** (Exhaust Gas Temperature) sensors compatible with the **EM-01 Sensor Processing Unit** are **K-type thermocouple sensors**. It is also possible to use **J-type thermocouple sensors**; however, this must be specified during production (please inform us when placing your order).

By default, the kit includes **ungrounded K-type thermocouple** CHT and EGT sensors. Each sensor features two wires:

- **"+" positive** (yellow wire)
- **"-" negative** (red wire)

Temperature Sensor Connections

- For **Gearbox**, **Under Cowling**, and **Coolant Temperatures**, the **K-type thermocouple (ungrounded)** is used.
    - **Under Cowling Sensor**: This sensor cannot be used simultaneously with the gearbox temperature sensor. Connect either the gearbox or the cowling temperature sensor to the **AUX temperature input** of the EM-01 (Connector J2, pins **3 and 4**).
    - **Coolant Temperature Sensor**: This sensor should be connected instead of the CHT sensor 5 (Connector J1, pins **9 and 10**). Note that this setup makes it impossible to use both the CHT5 and the coolant sensor at the same time.

⚠ Important: Please note that the sensor wires cannot be extended or replaced using any wires made of material other than specified in the table above. If extension of K-type thermocouple wires is required you, must source specific K-type extension wires.

It is recommended to use **crimp-on terminals** for the sensor wires and to join them using **bolts and nuts** with washers. Ensure that such connections are well insulated after the connection is made to prevent any electrical issues.

Important Considerations:

- Pay attention to **heat sources** such as exhaust pipes. Avoid routing sensor wires close to these sources to prevent melting or shorting of the wires.

The supplied **DB25 pin connector** and pins will require the avionics installer to perform appropriate crimping of the wires into the connectors. A description of this procedure is outside the scope of this manual and should be performed based on the installer's experience.

EGT Sensor Installation

1. **Drilling the Hole**:
   - Drill a hole of **5 mm (1/5”)** in your exhaust pipe.
   - Position the hole **2” to 4”** from the cylinder exhaust port.
   - Ensure that the hole in each exhaust pipe is drilled at the same distance from the cylinder exhaust port to maintain equal temperature readings across the cylinders.
2. **Installing the Probe**:
   - Install a clamp over the pipe, then insert the probe and tighten the clamp.
   - Adjust the probe’s end depth inside the exhaust pipe to be approximately in the middle.
   - Tighten the probe’s nut on top.
3. **Final Checks**:
   - Ensure that after installation, the probe will not interfere with your cowling or other components of the engine.

CHT spring loaded sensor for Lycoming engines comes with special fitment adapter. Sensor is installed in the special port available in each cylinder head using the adapter. Sensor can be adjusted using the spring for correct depth.

Depends on engine model various CHT sensors can be used including ring type (under spark plug) sensors.

Pressure Sensors:

Pressure sensors for Oil and Fuel pressure used with EM-01 Sensor Processing Unit are 5 Volt analog sensors.

Sensors threaded: ***1/8"-27 NPT / 1/8" NPT***
Each sensor has three (3) wires:

Red – Positive Power +5V
Black – Negative GND
Green – Signal Output

Pressure sensors connections:

GND (black) should be connected to any of pins: 16,17 or 18 of J2 (EM-01).

Power (red) should be connected to any of pins 22,23 or 24 of J2 (EM-01)

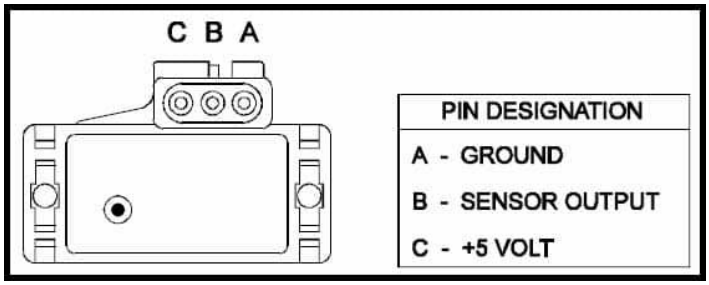
Signal output of the sensor (green) should be connected to appropriate pin of J2 depending on sensor function:

(J2)
8 – Oil pressure
9- Fuel pressure

Both Oil and Fuel pressure sensors should have correct pressure limit spec for planned pressure. We provide sensors of 100PSI but may also provide higher or lower limit sensors upon request.

MAP Sensor:

MAP sensor used with EM-01 Sensor Processing Unit is a 5V analog sensor.



Sensor connector may have the following colors:

(shown in the left picture)
Red – Power+5V should be connected to any of pins 22,23 or 24 of J2 (EM-01)
Black – Negative GND should be connected to any of pins: 16,17 or 18 of J2 (EM-01)
Blue – Signal Output should be connected to pin 10 of J2

(shown in the right picture)
Red – Power+5V should be connected to any of pins 22,23 or 24 of J2 (EM-01)
Yellow – Negative GND should be connected to any of pins: 16,17 or 18 of J2 (EM-01)
Blue – Signal Output should be connected to pin 10 of J2

Fuel Flow Sensor

Fuel flow sensor is not included with the kit but can be ordered separately. We recommend using a Floscan 201 but any other fuel flow sensor which uses PWM as an output can be used.

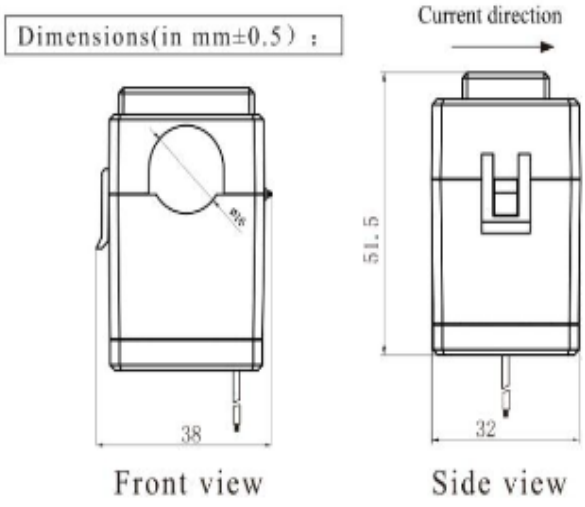
EM-01 Sensor Processing Unit can support single or dual fuel flow sensors configuration.

Floscan 201 has the following wire colors:

Red – Connect to +12V. It can be connected to pin1 of J3 (EM-01) or to separate 12V power source via 1A circuit breaker.
Black – *GND* (recommended to ground it near the sensor location)
White – *Signal output* connect to pin6 of J2 if this is a single Fuel flow sensor installation
*Connect White output of second Fuel Flow sensor to pin7 of J2 *(dual Fuel Flow install)*

Current Flow Sensor

EM-01 Sensor Processing Unit supports analog current flow Hall split core sensors connection. We successfully tested the following Hall split core sensor: **HSTS016L** 100Amp sensor



Sensor has the following wire colors:

Red – Power+5V should be connected to any of pins 22,23 or 24 of J2 (EM-01)
Black – Negative GND should be connected to any of pins: 16,17 or 18 of J2 (EM-01)
Yellow – Signal output should be connected to pin11 of J2
White – (not connected)

Current sensor should be installed around the main battery positive wire and secured. The best location for the sensor can be determined by installer, depending on the location of the battery.

Flaps Position, Rudder Trim and Elevator Trim Sensors

Sensors for Flaps, Rudder, Roll and Elevator trim are simple analog sensors with voltage output of 0V to 5V. We have successfully tested the following types of sensors and servo/sensor combos:

- Ray Allen POS-12
- Ray Allen T2-10A
- Other Ray Allen servo/sensor combos

Most of Ray Allen sensors or servo/sensor combos will have three (3) wires for sensing purposes:

Orange – Usually connected to +5V, so unless this wire is already connected in your setup to servo you may safely connect it to any of pins 22,23 or 24 of J2 (EM-01 Sensor Processing Unit).
WARNING! Do not connect this wire to EM-01 module if it is already connected with your servo.

Green – Signal position output wire. Connect it to appropriate input of EM-01 (flaps, rudder, roll or elevator).

Blue - Usually connected to GND, so unless this wire already connected in your setup to servo you may safely connect it to any of pins: 16,17 or 18 of J2 (EM-01)
WARNING! Do not connect this wire to EM-01 module if it is already connected with your servo.

Fuel Tank Level Sensors

EM-01 Sensor Processing Unit is capable of reading the data from standard resistor type fuel level sensors with range of resistance from 30 Ohm to 240 Ohm.

Simply connect the wire from fuel level sensor installed in your fuel tank to appropriate input in J2 connector of EM-01.

Use pins:
15 (J2) – Right fuel tank
20 (J2) – Left fuel tank

Main and Baggage Door Sensors

You can use any sort of a trigger sensor for your doors. It can be a simple push button type sensor which has two contacts and acts as a simple button.

Connect one contact of sensor to chassis GND of airplane. Connect second contact of the sensor to appropriate input of J2 and J3 connectors of EM-01 Sensor Processing Unit.

Use pins:
25 (J2) – Right door
14 (J2) – Left door
14 (J3) – Baggage door

Warning Lamp Outputs

EM-01 Sensor Processing Unit has two warning lamp outputs. These can be used to drive small 12V lamps in panel.

Pins to connect are:
12 (J3) – Lamp1 Low Oil Pressure
9 (J3) – Lamp2 Master Warning

When triggered, warning lamp output will become internally grounded via transistor and allow up to 250mA of current to flow.

Connect one contact of lamp to +12V in airplane and connect another contact of lamp to warning lamp output on EM-01 Sensor Processing Unit.

Lamp1 should be labeled on panel as “Oil Pressure”. This lamp will turn on if oil pressure is below the pre-set limit. Also this lamp will turn on upon powering of the EnGood Engine Monitor System and will immediately turn off during engine start as soon as engine’s oil pressure reaches the minimum trigger limit.

Lamp2 is unused at this time.

Rotax 91x iS series engine connection:

Rotax 91x iS series engines feature a modern, fully electronic engine management system with a dual-lane ECU architecture and integrated CAN bus communication designed specifically for aircraft avionics integration. Each ECU lane operates independently and continuously transmits engine data to the pilot display over a dedicated CAN bus interface. The system provides a comprehensive set of real-time parameters derived from engine-mounted sensors, including engine speed, fuel flow, manifold air pressure, oil pressure, oil temperature, coolant temperature, exhaust gas temperature for all cylinders, manifold air temperature, ambient air temperature and pressure, throttle position, ECU supply voltage, and additional parameters such as boost pressure, airflow, and wastegate position for turbocharged variants . The ECU also transmits system status, sensor status, and device health information, allowing full monitoring of engine condition and redundancy status. It should be noted that cylinder head temperature sensors are not part of the standard Rotax iS CAN interface and must be implemented externally if required.

The CAN bus interface for Rotax 91x iS engines is available through the HIC (Hybrid Ignition Circuit) connectors located in the engine bay, with separate connectors assigned to Lane A and Lane B of the dual ECU system. Each lane provides its own independent CAN interface to ensure redundancy, and both lanes should be connected to the avionics system for full functionality and fault tolerance. The CAN lines (Engine CAN High and Engine CAN Low) are routed through these HIC connectors and are internally terminated within the ECU, while the connected display system must provide proper bus termination as required by CAN standards . The exact physical location of HIC A and HIC B connectors is on the engine assembly near the ECU modules in the engine compartment, typically mounted on or adjacent to the ignition system housing. Pin assignments for CAN communication are defined per connector, with dedicated pins for CAN High and CAN Low on each lane, and care must be taken to maintain proper separation between Lane A and Lane B wiring to preserve system redundancy.

Rotax Engine Side

HIC Connector A (12 pin)
19428-0015 or 19428-0031

Pin 5 – CAN BUS LOW 1A
Pin 6 – CAN BUS HIGH 1A

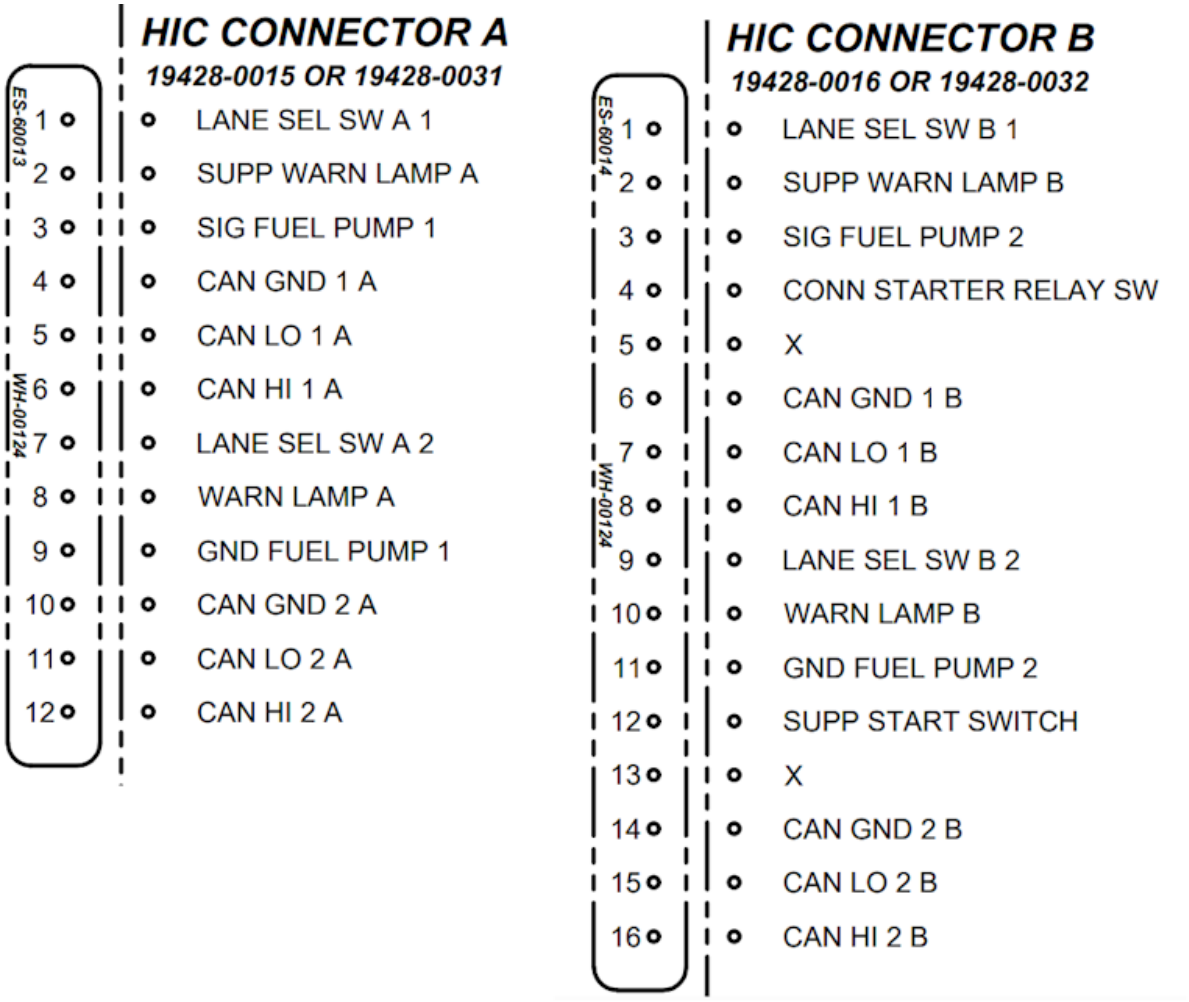
HIC Connector B (16 pin)
19428-0016 or 19428-0032

Pin 7 – CAN BUS LOW 1B
Pin 8 – CAN BUS HIGH 1B

***CAN BUS LOW 1A** and **CAN BUS LOW 1B** are connected together and routed to EM-02 connector **J3 pin 5 (Engine CAN Low)**.*

***CAN BUS HIGH 1A** and **CAN BUS HIGH 1B** are connected **together** and routed to EM-02 connector **J3 pin 13 (Engine CAN High)**.*

Rotax 91xiS series HIC connector's pinout



When a Rotax 91x iS series engine is interfaced with the EM-02 via CAN bus, optional CHT sensors may be installed and connected to the EM-02 inputs CHT1 through CHT4.

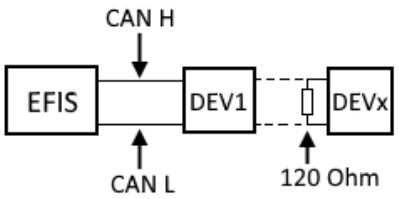
To configure the EFIS for Rotax communication, set Settings → EnGood → Engine Model to Rotax 91x iS.

CAN Bus termination:

The ELM800/1000 can be installed in the aircraft alongside compatible 360 Avionics external modules such as magnetometers, engine monitors (e.g., ENGOOD), or the VICS voice information system, all connected via a single CAN bus line.

When the ELM1000 is installed *without* any external CAN modules, a **120 Ohm termination resistor** (included in the kit) **must be installed between pin 12 and pin 13 of connector J1**. This resistor should be placed inside the connector and left within the enclosure to ensure proper CAN bus operation.

If one or more external CAN modules (e.g., ENGOOD engine monitor, VICS, or magnetometer) are used, the **termination resistor must be placed at the end of the CAN bus line**, as shown in the diagram below, to ensure correct signal termination and prevent communication errors.



Once the system is fully assembled and all CAN bus wires are connected to the devices, measure the resistance between the CAN H and CAN L wires at the device that is farthest from the EFIS. If the measured resistance is between 115 and 125 Ohms, install a 120 Ohm termination resistor at the farthest device to properly terminate the CAN bus. If the measured resistance is between 55 and 65 Ohms, no additional termination resistors are required.

Power bus:

Use **AWG 22** or a lower gauge wire to connect power to the unit (pins 1, 2, 24, and 25 of **J1**). A **5A circuit breaker** is required on the power line for the **ELM800/1000**. This circuit breaker should be easily accessible from the pilot's seat.

The ground wire can be connected either to the chassis ground or directly to the battery's negative terminal.

The power line with the circuit breaker is typically connected via the **Avionics Master Switch** or the **Main Master Switch**, depending on the airplane's configuration.

OAT Sensor (probe):

The **Outside Air Temperature (OAT)** sensor is optional and can be connected to the **ELM800/1000**. When the OAT sensor is installed, additional information such as **True Air Speed (TAS)** and OAT will be displayed. We strongly recommend having this sensor installed.

The OAT sensor is a digital probe enclosed in a threaded aluminum housing. The standard cable length is **59 inches (150 cm)**, which should be sufficient for installation on the same side as the EFIS unit. You may extend the OAT cable length to your desired length, but it should not exceed **14.76 feet (4.5 meters)**. If cable extension is necessary, ensure that wire connections are properly extended and isolated to avoid electrical shorts and potential damage to the unit.

OAT sensor is connected to **J2** main connector pins:

21 – OAT sensor power
19 – GND
20 – OAT sensor input signal

OAT sensor should be installed in a way that exposes its sensing surface to the outside air. It is important to avoid installation of the sensor in close proximity to engine heat, exhaust pipes and exhaust heat.

OAT pinout:

Note: Wire colors of the sensors may vary depending on the model.

Version 1	Version 2	Function
Orange strip	Red	OAT sensor power (+3V3)
White	Black	GND
Blue strip	Yellow	OAT sensor output signal

Please note that if the OAT (Outside Air Temperature) sensor is installed in a location where it cannot accurately measure true outside air temperature (e.g., inside the cabin or near a heat source), the EFIS will display incorrect values for OAT, True Airspeed (TAS), Density Altitude, and other temperature-dependent data.

If accurate OAT readings are not possible due to installation constraints, the OAT sensor can be disabled by navigating to:
Settings > External Devices > Use OAT

OAT Sensor (probe) installation:

Carefully assess the optimal location for the **OAT sensor**, taking into account the aforementioned limitations, such as the maximum cable length and proximity to heat sources. Additionally, ensure the airplane's structural integrity when selecting a safe location for the probe; avoid drilling through critical structural components like spars.

Once the location is determined, proceed to drill a hole through the aircraft's skin.

For Probes with a Threaded Bottom:

1. Install the probe into the drilled hole and secure it by tightening the nut.
2. Apply **Loctite (Blue)** to the threads to prevent the probe from loosening due to chassis vibrations.

For Probes without a Threaded Bottom:

1. Use a small rubber grommet (approximately **0.187 inches in diameter** or similar) installed in the skin surface.

2. Insert the temperature probe into the grommet and secure it using a silicone gasket maker to lock the sensor in place.

Next, route the wire from the sensor to the back of the **ELM800/1000** and connect the wires to the appropriate pins in the **J2 connector**. Details regarding the sensor pinout and the J2 main connector are provided above.

RS-232 Ports:

Pin numbers used for the ports

Port1 (Conn. J1)
TX - 15
RX - 16

Port2 (Conn. J1)
TX - 17
RX - 18

Port3 (Conn. J1)
TX - 8
RX - 9

Port4 (Conn. J1)
TX - 6
RX - 7

For each port the settings and functionality is configured via ‘Settings” -> “External Devices” menu.

ARINC429 Port: *(available only in model ELM1000x)*

Pin numbers used for the port J2 (bottom)

Pin 8 - ARINC429 A Rx (ELM1000x only)

Pin 9 - ARINC429 B Rx (ELM1000x only)

Can be connected to ARINC429 Tx A and B lines of Garmin GPS175 or similar

Video Inputs: *(available only in model ELM1000x)*

Pin numbers used for the port J2 (bottom)

Pin 17 – Video Input1 (ELM1000x only)

Pin 18 – Video Input2 (ELM1000x only)

Pin 24 - +12V power for Camera (limited to 250mA)

Video input1 accepts composite video signal from NTSC standard analog camera or NTSC thermal camera.

Trig Avionics COMM and Transponder connection

ELM800/1000 series EFIS supports connection of single TRIG TY91/92 series COMM radio and TRIG TT21/22 transponder.
ELM1000 model has two dedicated RS485 channels while ELM800 has only single dedicated RS485 channel for this connection.

ELM1000 J2 connector

3 – RS485-1 A	5 - RS485-2 A
4 – RS485-1 B	6 - RS485-2 B

ELM800 J2 connector

3 – RS485-1 A
4 – RS485-1 B

ELM1000 Connections

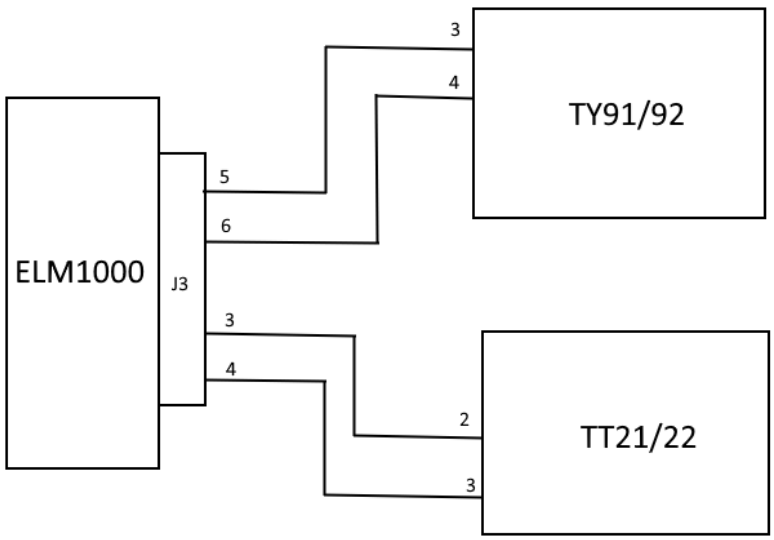
- If connecting single TY91/92 or TT21/22 only, use J2 connector pins 5 and 6 (port2).

At the TY91/92 use its pins 3 - TMAP1A and 4 - TMAP-1B to connect with EFIS.
At the TT21/22 use its pins 2 – TMAP1A and 3 – TMAP1B to connect with EFIS

Set in Settings -> External Devices:
COM2 Mode: Trig COMM1 (for TY91/92) or Trig XPonder (for TT21/22)
COM2 Speed: 38400

- If connecting both TY91/92 and TT21/22 use J2 connector pins 5 and 6 (port2) for TY91/92 and pins 3 and 4 (port1) for TT21/22 connection.
  At the TY91/92 use its pins 3 - TMAP1A and 4 - TMAP-1B to connect with EFIS.
  At the TT21/22 use its pins 2 – TMAP1A and 3 – TMAP1B to connect with EFIS

  Set in Settings -> External Devices:
  COM1 Mode: Trig XPonder (for TT21/22)
  COM1 Speed: 38400
  COM2 Mode: Trig COMM1 (for TY91/92)
  COM2 Speed: 38400



ELM800 Connections

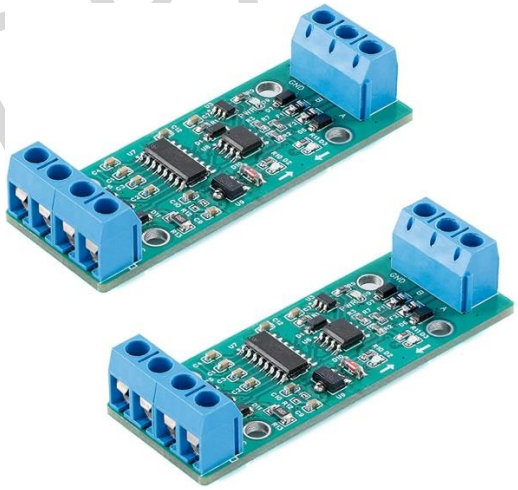
If connecting single TY91/92 or TT21/22 only, use J2 connector pins 3 and 4 (port1).
At the TY91/92, use its pins 3 - TMAP1A and 4 - TMAP-1B to connect with EFIS.
At the TT21/22, use its pins 2 – TMAP1A and 3 – TMAP1B to connect with EFIS

Set in Settings -> External Devices:
COM1 Mode: Trig COMM1 (for TY91/92) or Trig XPonder (for TT21/22)
COM1 Speed: 38400

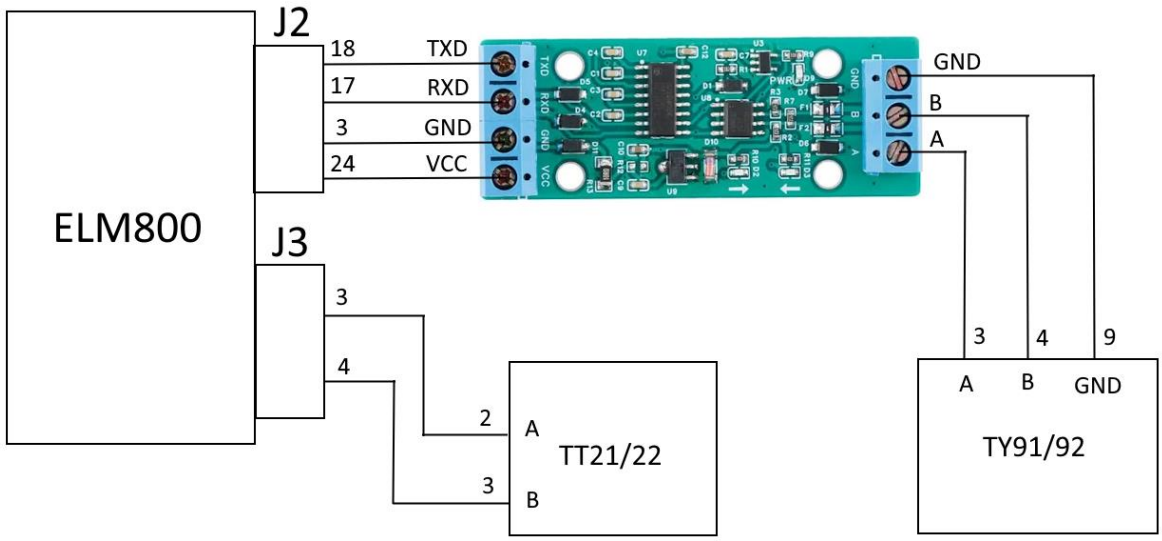
If connecting both TY91/92 and TT21/22 use J2 connector pins 3 and 4 (port1) for TT21/22 connection.
At the TT21/22, use its pins 2 – TMAP1A and 3 – TMAP1B to connect with EFIS

Set in Settings -> External Devices:
COM1 Mode: Trig XPonder (for TT21/22)
COM1 Speed: 38400
COM2 Mode: Trig COMM1 (for TY91/92)
COM2 Speed: 38400

For TY91/92 connection, use RS232 to RS485 Converter adapter:



Connect adapter to EFIS ELM800, TT21/22 and TY91/92 as follows:



For control head connection at Trig unit use second pair of TMAP A/B pins. Do not connect control head in parallel with EFIS on the same TMAP pins.
If you connect TT21/22 control head please set in EFIS menu:
Set in Settings -> External Devices:
Trig XPonder: Ctrl Head
When not control head is in use for TT21/22 set
Trig XPonder: Headless

8. Settings Menu Lock / Unlock

To prevent accidental changes to critical configurations, the EFIS includes an extra layer of protection for the *Settings* menu. By default, the *Settings* menu is grayed out and inaccessible when the EFIS is powered on.

To unlock the *Settings* menu:

1. Rotate the **left knob** to highlight the *Settings* menu.
2. Press and **hold the left knob for 3 seconds**.

The *Settings* menu will then unlock and become accessible.

9. AHRS sensors leveling procedure and Pitch Adjust

9.1 AHRS sensors leveling procedure

In most airplanes, the instrument panel is perpendicular to the flight path and the ground when the airplane is leveled (such as in normal cruise flight). During production, each **ELM800/1000** is calibrated for this installation, and the corresponding offset values are recorded in the device's memory. Each time the device is turned **ON**, these offset values are automatically used for calibration. However, there may be instances when re-calibration of the sensors is required.

If re-calibration is required, the following procedure should be followed:

1. Level airplane, ensure its position is the same as in a straight and leveled flight (cruise attitude). Airplane should be leveled in both pitch and roll axis. Consult with your aircraft maintenance engineer if required. Use jacks to level airplane when applicable.

2. Turn on ELM800/1000 and wait until it boots up and AHRS is ready.

3. Once the device is booted, if artificial horizon indicator is not displayed on the screen, you will need to open Main Menu by pushing left Knob and then select “Settings Menu”

4. Rotate the left knob and select “AHRS config” submenu, then select ***‘Accl Cal Ovrd’.*** *If this option is not visible, continue rotating the knob until you find it.*

5. To select menu option (***‘Accl Cal Ovrd’)*** push the knob. The selector background will change from blue to orange.

6. Rotate the left knob to select ***‘Re-Cal’***

7. Push the left knob to start recalibration process. The note will change to “Disabled”. This means that re-calibration process has started.

8. After 3-4 seconds the following message ***‘Updating Please Wait’*** will show up on the display.

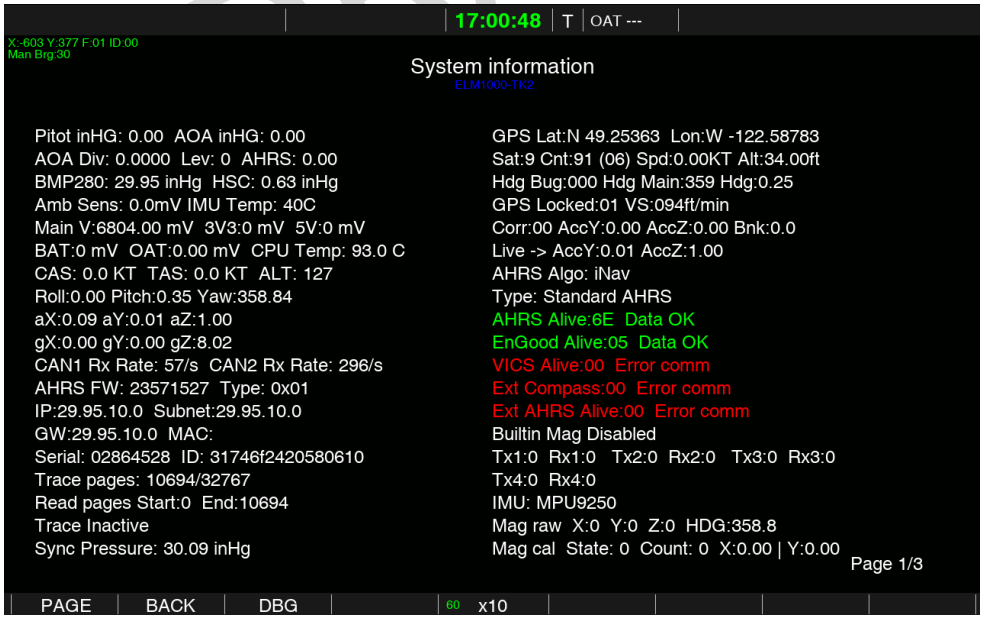
9. Once the calibration is completed, you will return to the “AHRS Config” submenu and the setting option will automatically change back to “Enabled”.

10. Push the left button to return back to the “Artificial Horizon” mode.

11. Calibration of AHRS is completed at this time. Make sure that you have horizon calibrated properly.

12. To verify that calibration was completed successfully, open ‘Info Page’. To do so open Settings menu mode by first pushing the left knob and then selecting Settings from menu, then press second from the left button (label “Info” should be shown)

13. Ensure that Roll and Pitch are at “zero”. Yaw does not need to be at “zero”.



14. Calibration is completed and verified.

15. Exit the “Info Page” by pressing ‘Back” (left button).

9.2 Pitch Adjust

In some cases, you may only need to adjust the pitch for a single flight. In this situation, you can use the **"Pitch Adjust"** option instead of performing the **"AHRS sensors leveling procedure."**

To adjust the pitch:

1. In the **Settings Menu**, select **General Config**, then **Pitch Adjust**.
2. Choose the appropriate number of **degrees** to compensate for the pitch. If the nose is pointing downward on the **artificial horizon indicator**, select a number below **0**. If the nose is pointing upward, select a number above **0**.

Note: The pitch adjust will reset to **0** when the device is powered **OFF**.

10. Maintenance and Repair

AHRS leveling procedure should be performed annually (every 12 months). Pitot/static systems leak test should be performed every 24 months to ensure proper operation of the device.

There are no field repairable parts inside of the ELM800/1000 EFIS. In case of any malfunction, the unit should be returned to manufacturer for test and repair.

11. Firmware Update Procedure

GPU and AHRS modules within the ELM800/1000 operate using two distinct firmware.
Each unit comes preloaded with the latest available firmware at time of production, however future firmware updates are possible via USB port located on the front panel of the EFIS.

Note: It is strongly recommended to have airplane battery connected to external trickle charger for the duration of the firmware update. This is needed to avoid unexpected power outage and unsuccessful firmware update.

To perform a firmware update for your unit, please follow these simple steps:

If Updating from a USB Device:

1. **Download the Firmware:** Obtain the firmware from www.360avionics.com or receive it via email from a 360 Avionics technical support agent.
2. **Prepare the USB Drive:**
   - Copy the firmware update file to a USB flash drive formatted as FAT32.
   - The drive should be under 16GB in size.
   - Place the firmware in the **x:/Updates** folder at the root of the USB flash drive.
   - Use the USB port on the front panel of the EFIS for all updates.
3. **Check the Updates Folder:** Ensure that nothing else is saved in the **Updates** folder except for the firmware files. The update typically consists of a single file with a **.360** extension, and the file name usually includes the model of the device being updated.

Next Steps (for Both USB and Online Updates):

4. **Power On the ELM800/1000:**
   - Start the ELM800/1000.
   - Ensure that your battery has sufficient power to keep the ELM800/1000 running for at least 30 minutes. It is recommended to use a trickle charger connected to your airplane's battery.
5. **Access the Update Menu:**
   - Navigate to **Main Menu** → **Settings** → **General** and select **Software Update**.

If Updating from USB:

6. **Insert the USB Drive:**
   - Insert the USB flash drive containing the firmware update into the USB port on the front panel of the EFIS using the adapter cable.
   - Wait at least 20 seconds before proceeding to the next step.

If Updating Online via Internet:

Ensure your EFIS is connected via WiFi to your local internet router.

7. **Search for Updates:**
   - Press the **FIND** button to search for updates online and then on the USB drive.
   - The ELM800/1000 will search for available updates and display them on the screen. If connected to the internet via WiFi, the ELM800/1000 will first search for the online update and, if found, will use it as an update source.
8. **Select the Update:**
   - Click on the small square to the left of the update to choose the desired update.
   - A green checkmark will appear in the small square next to the selected update.
   - To initiate the firmware update, press the **UPDATE** button once.
   - The update process may take anywhere from a few seconds to 15 minutes, depending on the updates selected.
9. **Complete the Update:**
   - Once the firmware update is complete, a **"Software Update Completed"** message will be displayed.
   - At this point, reboot the unit by pressing the **REBOOT** button.

12. Operations

11.1 Configuring your device

⚠ For proper operation of the device, the device must be configured with the airplane's V speeds: Vr, Vx, Vy, Va, Vs0, Vs1, Vfe, Vno, Vne. Refer to your plane's Pilot Operating Handbook ("POH") for the specific speeds that apply to your airplane.

⚠ Please note that ALL of the V Speeds set in this sub section should be entered in Knots independent from 'Speed units' setting.

The speeds can be configured in the "Settings" menu > "V speeds" submenu.

Starting with Vr, set all of the speeds for your airplane. Navigate to the speed that you would like to change in "V speeds Menu", and *follow the following steps:*

1. *Access the "Settings Menu" by pressing the left knob*
2. *Open Submenu V-Speeds by rotating the left knob and then pushing on it*
3. *Navigate to "Speed Vr" menu option and select it by pushing the knob once*
4. *The selector will turn blue*
5. *Rotate the knob clockwise or counter clock-wise to select the speed value that matches Speed Vr for your airplane*
6. *Push the knob once*
7. *The selector will turn orange*

Performs steps 3 to 7 for all of the other Speed Types. Once all of the speeds have been set for your airplane exit the menu by pressing left button 'Exit'

11.2 EFIS Operation Modes

ELM800/1000 has the following modes of operation:

- Artificial horizon indicator
- Compass/HIS
- Map (Sectional/Global)
- Airplane Overview
- Weight and Balance
- Checklists
- Artificial horizon split with one of [map, HSI, Time, Engine monitor, VPX]
- Map split with engine monitor (MFD only)

By default, whenever the unit is powered up it starts with the Artificial horizon indicator, however this can be changed via the “Settings Menu” > ‘General Config” > “Start mode” if desired.

During operation of ELM800/1000 the top and bottom info lines are always contains important information such as time, radio frequencies, warnings and button/knob help/function.

Pay attention to labels on top of buttons for its basic functionality.

Artificial horizon indicator

Artificial horizon in ELM800/1000 has two modes of operations: Standard 2D or Full 3D with synthetic view. It also can be set in day or night mode of operation (automatically by surise/sunset)

Artificial horizon mode of operation can be selected via ‘Settings’ menu under ‘General Config’ -> ‘Horizon Mode’

All placement of the labels is identical for both modes. Please note that terrain awareness is only available when 3D artificial horizon mode is in use.

Terrain and obstacles databases are required for your region to properly operate artificial horizon in 3D Synthetic view mode. These databases can be updated via Software Update menu in the similar to firmware update manner.

Flight Parameters Displayed by the Artificial Horizon Indicator

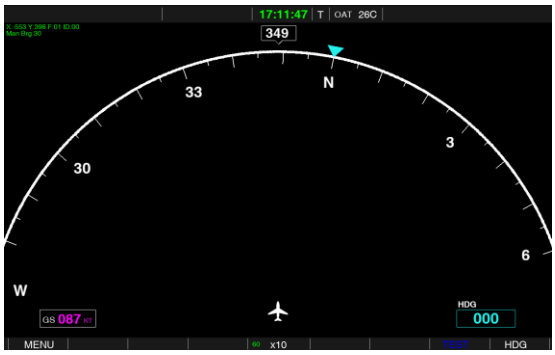
The artificial horizon indicator in both Normal and 3D Synthetic view shows the following flight parameters:

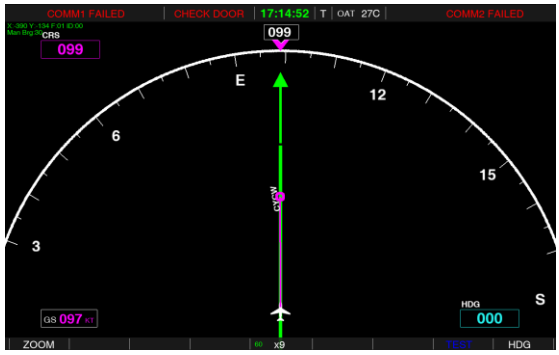
1. **Current Speed:** Displays either ground speed (in red) or airspeed (in white) depending on the source used by the ELM800/1000. The units for current speed are always displayed below the speed indicator in green.
2. **Current Altitude Indicator:** The current altitude value appears on the right side of the display, with the units shown below the altitude indicator in green. When the OAT sensor is connected and enabled, density altitude is shown above the current altitude indicator.
3. **Slip/Skid Ball Indicator:** Located at the bottom of the screen, the slip/skid ball indicates airplane coordination; the airplane is coordinated when the ball is inside the gate.

4. **Ground Pressure Indicator:** Found at the bottom right of the screen, this indicator shows the ground pressure with units displayed above it. To adjust the ground pressure based on ATIS, rotate the knob clockwise or counterclockwise.
5. **Ground Speed Indicator:** Positioned at the bottom left of the screen, it displays current ground speed when GPS signal is available. If GPS signal is lost, the message "NO GPS" will appear. Units are shown to the right of the ground speed value, with "GS" indicating ground speed.
6. **Vertical Speed Indicator:** Located on the right side of the screen beneath the altitude indicator, it shows altitude change per minute in the same units as altitude. A white vertical speed indicates the airplane is steady or descending (with a "-" sign for descending), while green indicates climbing (with a "+" sign).
7. **Turn Bank Arc:** This arc is displayed at the top center of the screen, indicating the current bank angle. During flight, two small blue triangles (▼) appear on either side of the center white triangle to represent a standard turn bank (2 minutes per turn).
8. **Current Track Indicator:** Located at the very top of the display, it defaults to (M) Magnetic track but can be switched to (T) True track in the "Settings Menu" > "External Devices" > "Mag Decl Corr." The current mode (M or T) is shown to the right of the indicator.
9. **Vertical Color Speed Strip:** Found on the left side of the screen, this strip displays V speed markers (Vfe, Vy, Vx, Vr, etc.), moving in accordance with the current speed of the airplane.
10. **Outdoor Air Temperature (OAT):** OAT information is displayed at the bottom left of the screen, above the ground speed indicator, with units shown next to the value.
11. **Density Altitude:** Automatically calculated when the OAT sensor is connected and enabled in the "Settings Menu" > "External Devices" > "Use OAT."
12. **True Air Speed (TAS):** Calculated when the OAT sensor is connected and enabled in the "Settings Menu" > "External Devices" > "Use OAT." This requires a Pitot airspeed enabled version of the unit.
13. **Angle of Attack (AOA) Indicator:** Designed to indicate the current angle of attack; this option is not included with the standard ELM800/1000 and must be ordered separately. A special pitot sensor is required for operation.
14. **Engine Monitor CHT/EGT Temperatures:** When connected to the EM-01 EnGood sensor module, it provides current engine temperatures (CHT and EGT) for all cylinders.
15. **G-Force Sensor:** Registers the current G-force, as well as the top and bottom limits reached during flight.
16. **Wind Direction Indicator:** Shows current wind speed and direction, functioning only in conjunction with an external magnetometer.
17. **Engine Monitor Sensors and Other Information:** When connected to the EM-01 EnGood sensor module, it provides current engine sensor parameters, including RPMs and MAP.

Compass mode

Directional indicator / Compass mode is also available in Arc mode.





Compass Mode Display Information

In compass mode, the ELM800/1000 displays the following information:

1. **Current Track:** The display defaults to showing the (M) Magnetic track. This can be changed to (T) True north in the "Settings Menu" > "External Devices" > "Mag Decl Corr." The current mode (M or T) is indicated to the right of the track indicator.
2. **Current Heading Bug Setting:** Located at the bottom right of the display, the current heading bug setting is represented by a triangle icon. To adjust the heading bug setting, rotate the knob clockwise or counterclockwise.
3. **Heading Bug Indicator:** The heading bug indicator is located on the compass dial, allowing pilots to easily reference the desired heading.
4. **Ground Speed Indicator:** Found at the bottom left of the display, this indicator shows the current ground speed.

Directional Information Sources:

- When the MAG-01 is not installed, the compass information is derived from the GPS Course Over Ground (COG), which provides precise directional information while the airplane is in motion and GPS signal is available. The COG represents the True direction.
- If enabled in the "Settings Menu" > "External Devices" > "Mag Decl Corr," the COG will be converted from True to Magnetic direction for display on the compass.
- When the MAG-01 is installed and enabled in the settings menu, the ELM800/1000 utilizes directional information received from the MAG-01 instead of GPS COG. The MAG-01 provides accurate and stabilized directional information during flight.

Use of external MAG-01 Digital 3-axis Magnetometer and Heading Sensor

MAG-01 Magnetometer Overview

The **MAG-01** is a small, lightweight, and cost-effective source of stabilized magnetic heading information. It accurately senses the Earth's magnetic field in three axes, providing essential data for Air Data and AHRS (Attitude and Heading Reference System) to determine the aircraft's heading. The MAG-01 easily integrates with the ELM800/1000 or ELM350 systems, though it is important to note that the MAG-01 is currently non-TSO certified and intended for installation in experimental (home-built) airplanes only.

Key Features

- **Microprocessor-Based:** The MAG-01 utilizes advanced microprocessor technology to sense the Earth's magnetic field alignment and relay this information to compatible AHRS systems (ELM1000, ELM800, ELM350, ELM200/300) for referencing magnetic heading.
- **3-Axis Measurement:** The magnetometer provides full three-axis measurements, ensuring precise and stabilized digital indications of magnetic field strength and direction.
- **Gyroscopic Stabilization:** Built into the magnetometer is a gyroscopic sensor that provides stabilized information across all axes, accommodating the full range of pitch and roll limits.
- **Enhanced Flight Reference:** The ELM800/1000 and ELM350 AHRS utilize comparative inputs from GPS, the MAG-01 magnetometer, and air data computer information to achieve high integrity and precision in digital flight reference. This system combines the functionalities of a Vertical Gyro and a Directional Gyro to measure Roll, Pitch, and Heading angles.
- **Solid-State Technology:** Replacing traditional rotating mass instruments, the MAG-01 employs long-life solid-state sensing technology to provide electronically stabilized AHRS.

Installation Considerations

When installing the MAG-01, ensure it is positioned away from the AHRS and other electronic components to minimize external magnetic interference. Recommended installation locations include:

- Outboard of the wing at the wingtip
- Tail section
- Inside the vertical stabilizer

Connectivity

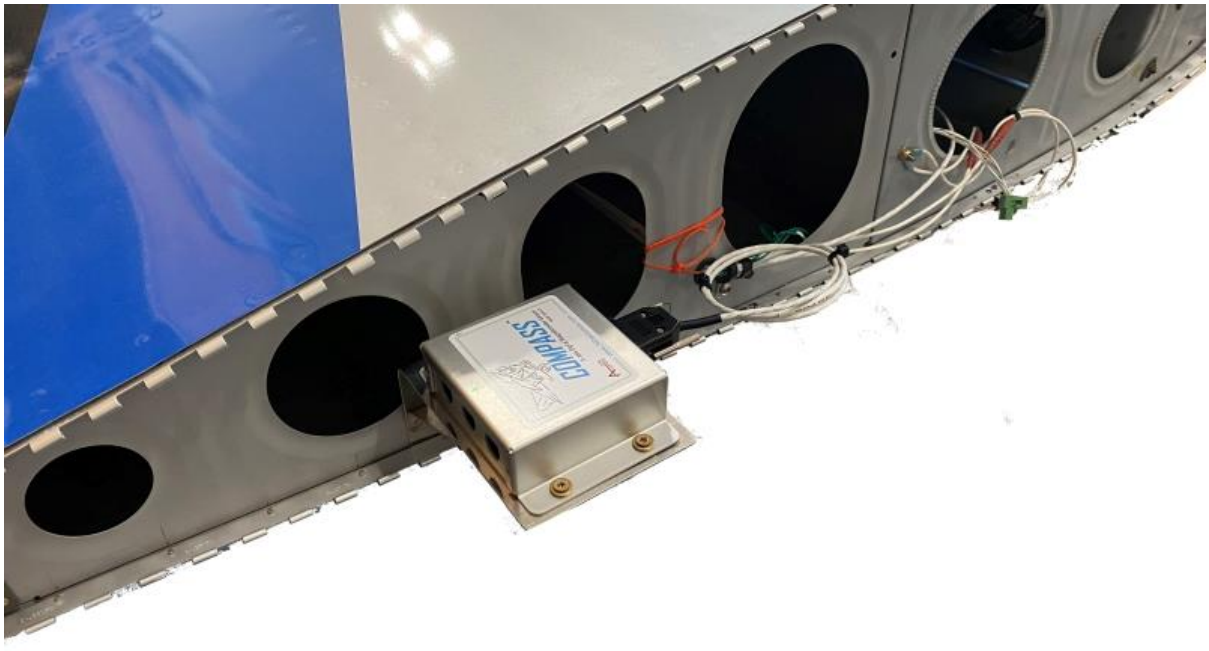
The MAG-01 features a DB15 connector on its front wall, requiring only four wires to interconnect with ELM1000 or ELM350 EFIS systems. Additionally, a separate circuit breaker (3A) must be installed and labeled as “Compass” or “MAG-01” in the panel.

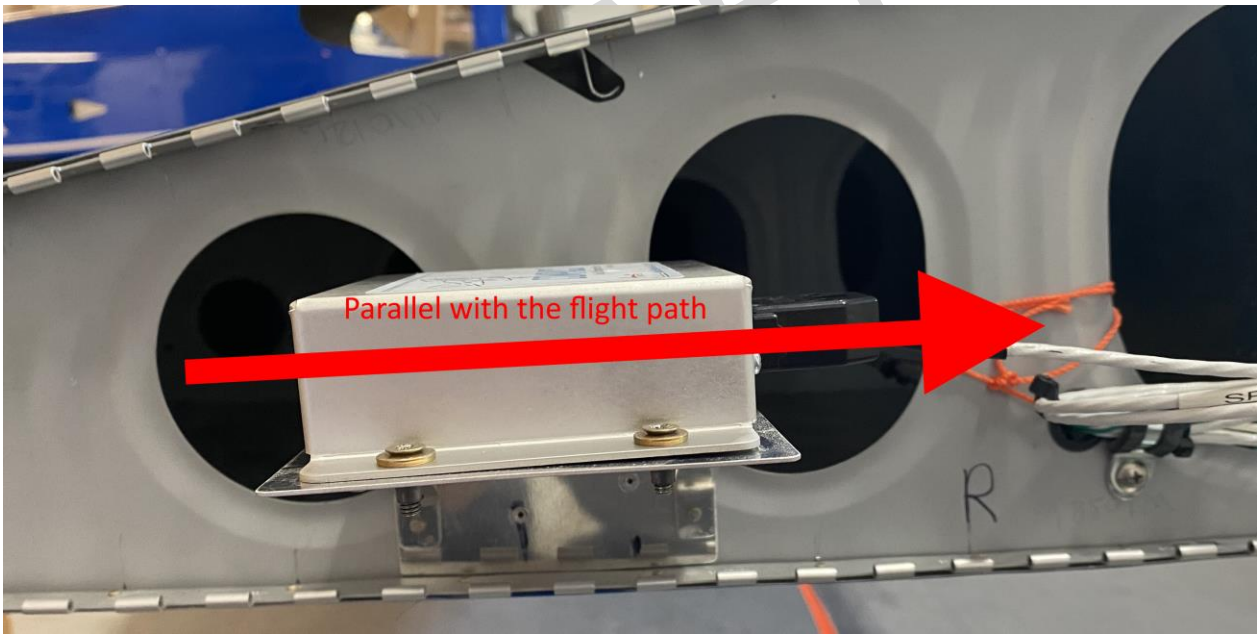
Magnetometer connector pinout:

Pin 1 – Power Input +
Pin 15 – Ground
Pin 10 – CAN Bus Low (should be connected to pin 3 of ELM350 Main Connector)
Pin 11 – CAN Bus High (should be connected to pin 4 of ELM350 Main Connector)

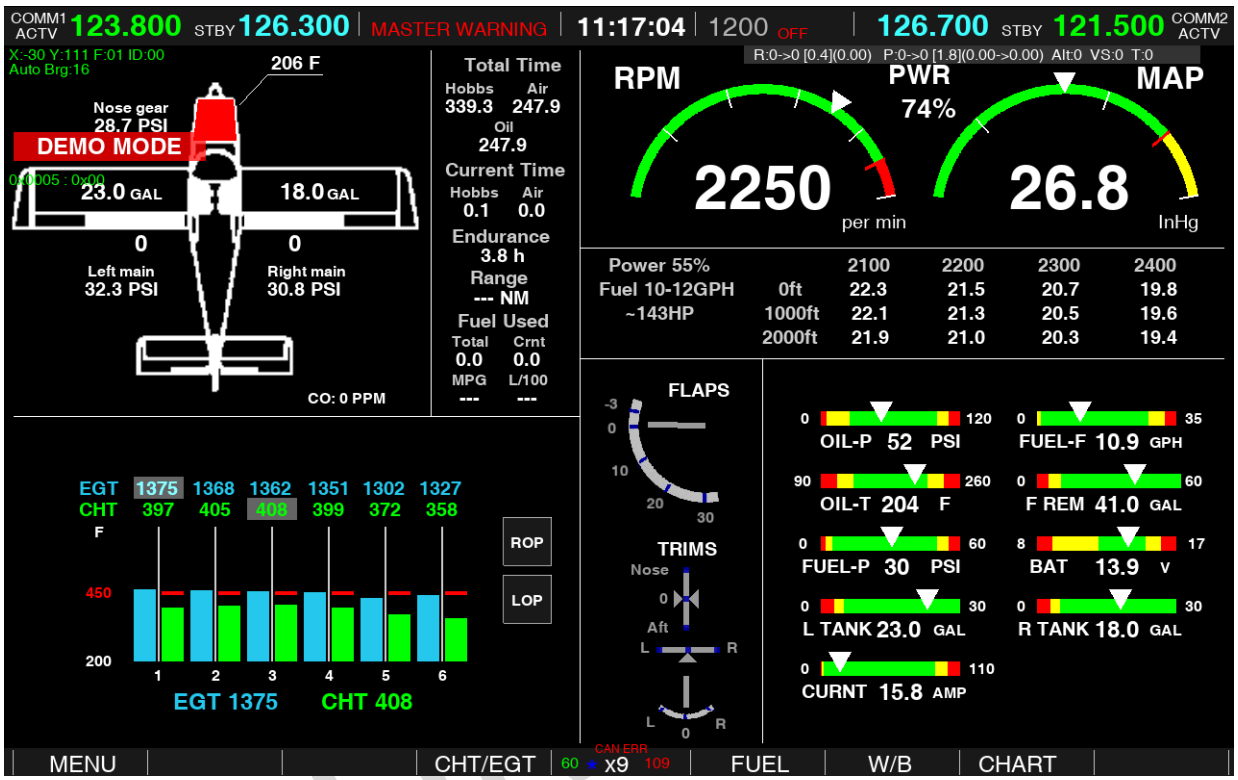
Physical Installation

Magnetometer should be installed with the connector forward and matching the airplane nose direction. Enclosure should be installed in the way so the magnetometer body will be in a parallel with the flight path.
Please see the images provided below for the reference:





Enhanced Aircraft Flight Information Mode



Enhanced Aircraft Flight Information Mode

The **Enhanced Aircraft Flight Information Mode** consolidates crucial aircraft data into a single display screen, providing pilots with real-time insights into their aircraft's status and performance. The following information is available:

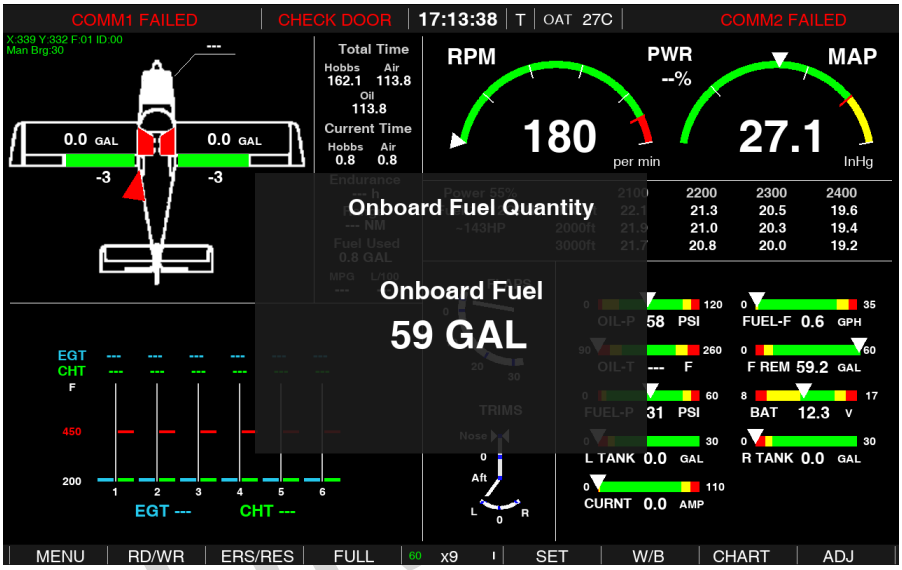
- **Airplane Doors and Flaps Status:** Current status and position of airplane doors and flaps.
- **Current Airplane Times:** Displays Hobbs, Air, and Oil times.
- **Endurance and Range:** Information on endurance, range, and fuel used.
- **Fuel Efficiency Metrics:** Displays MPG and L/100 km information for comparison with vehicle travel only.
- **Engine Power Charts:** Power charts specific to your engine, which can be uploaded for any engine model.
- **Flaps and Trims Position:** Current positions of flaps and trims.
- **Engine Monitoring Information:** Real-time data on EGT (Exhaust Gas Temperature), CHT (Cylinder Head Temperature), pressures, RPMs (Revolutions Per Minute), MAP (Manifold Absolute Pressure), and more.
- **CHT Live Graphs:** Live graphs of CHT data displaying the last 3 minutes of information.

- **ROP and LOP Assistant:** Assistance for Lean of Peak (LOP) and Rich of Peak (ROP) operations.
- **CO Level in cabin (if special CO sensor is installed)**

Navigating Power Charts

To switch between engine power charts for different power levels, press button 6 labeled **"CHART."** The chart will display three altitudes, with the current altitude always positioned in the middle.

Total amount of fuel on board can be set from this mode. Press button 4 from the left "FUEL". New menu appear on the screen.



Rotate right knob to set fuel quantity on board then press button 4 "SET" again to store the fuel quantity.

Fuel Alarm Feature

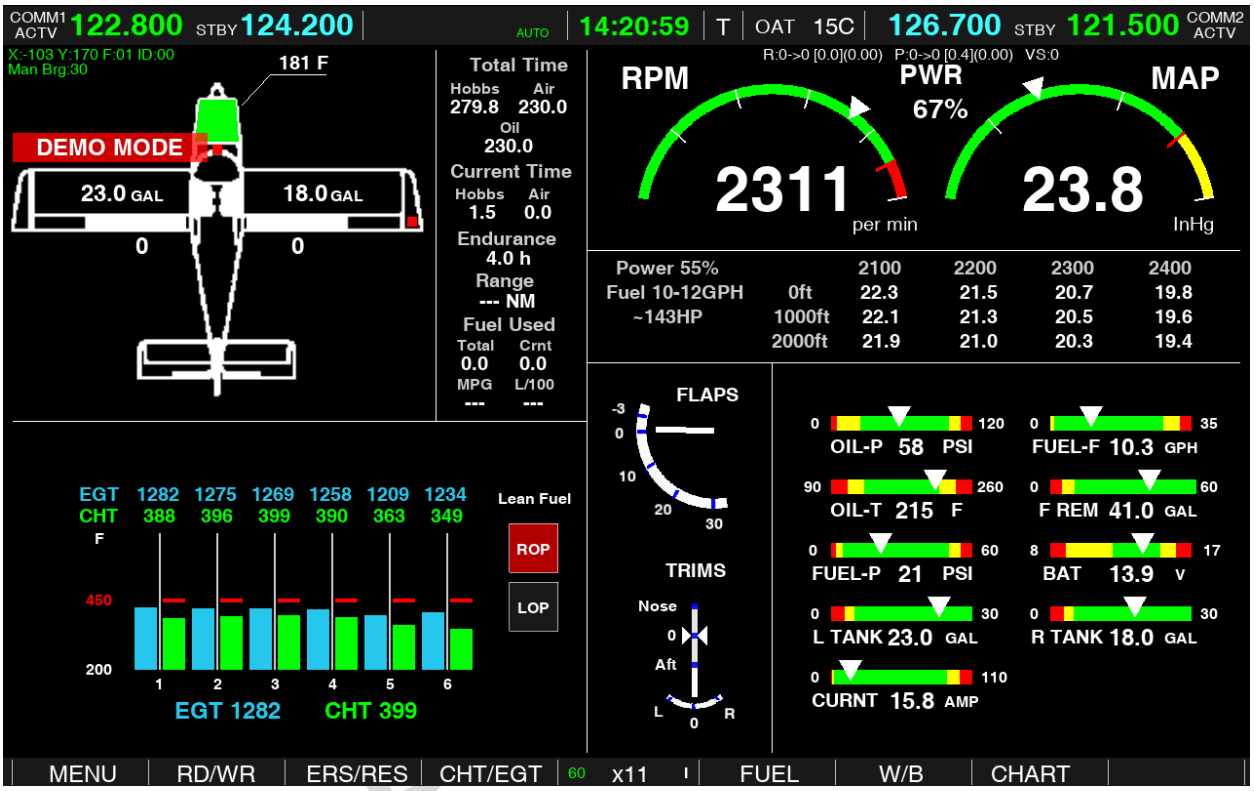
The **Fuel Alarm** can be easily enabled or disabled in the **Settings Menu** under **Time**. This feature allows the user to set a repetitive alarm that reminds them to switch the fuel tanks at predefined intervals, ranging from **0 to 240 minutes**.

- **Alarm Settings:**
  - Setting the alarm to **0** disables the feature.
  - When enabled (setting between **1 and 240 minutes**), the unit will display a reminder message on the screen: **"Switch Fuel Tanks"** at the specified intervals.
- **Acknowledging the Alarm:**
  - To dismiss the warning and return to the previous screen, simply press the **left button**.

If an external **VICS** module is connected, an **audio reminder** stating **"Switch Fuel Tanks"** will also be triggered.

For detailed instructions on setting this function, please refer to the **Settings Menu** under **Time**.

Lean of Peak / Reach of Peak Assistant



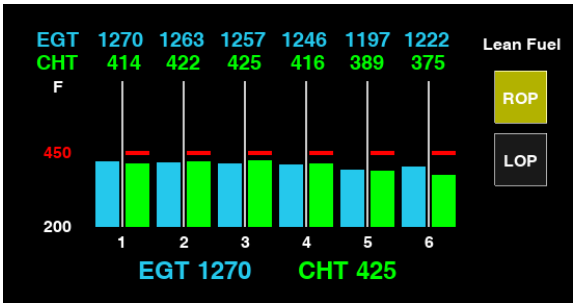
Leaning Assistant Feature

The **Leaning Assistant** is designed to simplify the leaning process for pilots. It offers two primary modes based on **Exhaust Gas Temperature (EGT)**: **ROP (Reach of Peak)** and **LOP (Lean of Peak)**.

Steps for Using the Leaning Assistant:

1. **Climb and Level Off:**
   - After takeoff, climb to your desired cruise altitude and level off.
   - Set your appropriate power settings (Throttle/MAP and Prop/RPM).
   - Allow the EGTs to stabilize for about **30 seconds to 1 minute**.
2. **Select Leaning Mode:**
   - Tap the **ROP** or **LOP** button on the screen, depending on your desired leaning method.
   - The selected button will turn **red**, indicating it is armed and ready for use.
3. **Begin Leaning:**

- Gradually lean your fuel while closely monitoring the selected button's color and the information displayed.

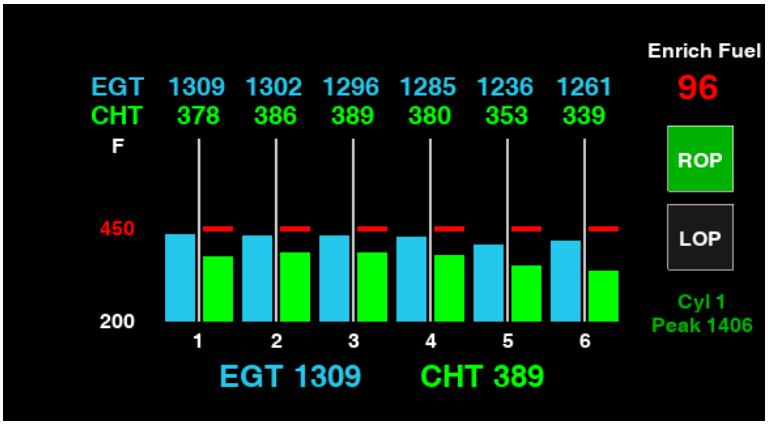


ROP (Reach of Peak) Mode:

- In **ROP Assistant mode**, the engine monitor waits for the first cylinder's EGT to reach its peak and flatten.
- As soon as the temperature of the first cylinder reaches its peak and stabilizes, the button will turn **green**, and the temperature difference between the peak EGT and the current EGT for that cylinder will be displayed.

LOP (Lean of Peak) Mode:

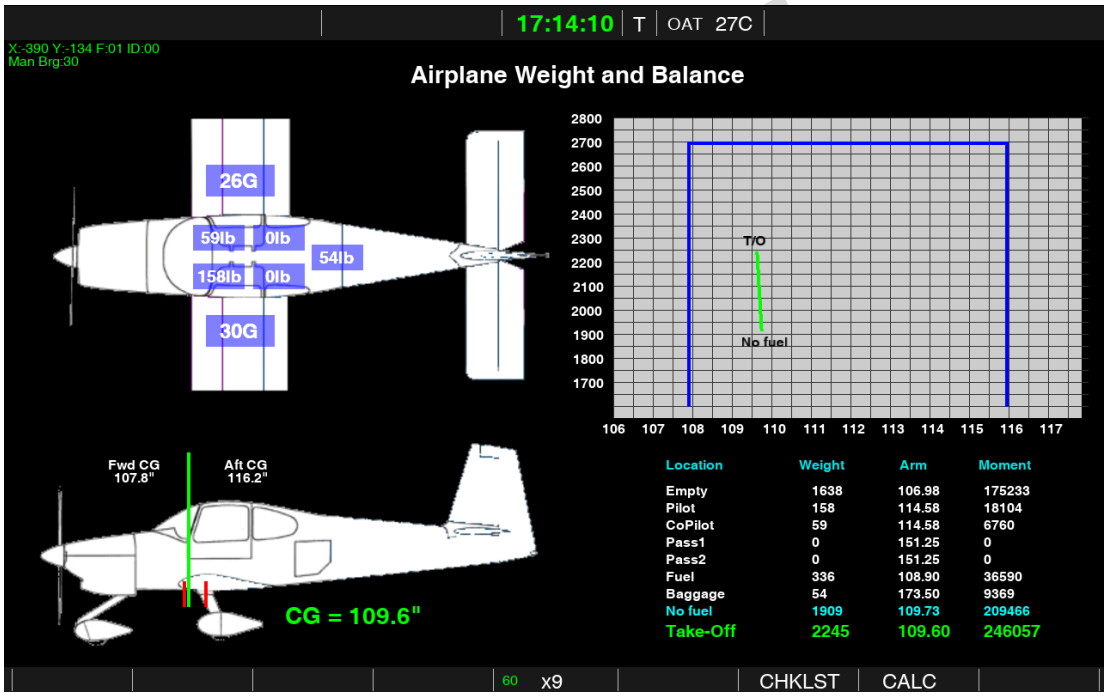
- In **LOP Assistant mode**, the engine monitor waits for all cylinders' EGTs to reach their peak and flatten.
- Once the temperature of the last cylinder (the last in sequence) reaches its peak and stabilizes, the button will turn **green**, and the temperature difference between the peak EGT and the current EGT for that cylinder will be shown.



If you use **ROP** mode, after button became green start slowly enrichening fuel and monitor EGT temperature difference shown on top of the button. Stop enrichening as soon as you reach your desired temperature difference (normal is 80-100F but can be different depends on your engine).

If you use **LOP** mode, after button became green continue slowly leaning fuel and monitor EGT temperature difference shown on top of the button. Stop leaning as soon as you reach your desired temperature difference (normal is 20-50F but can be different depends on your engine).

Weight and Balance Mode



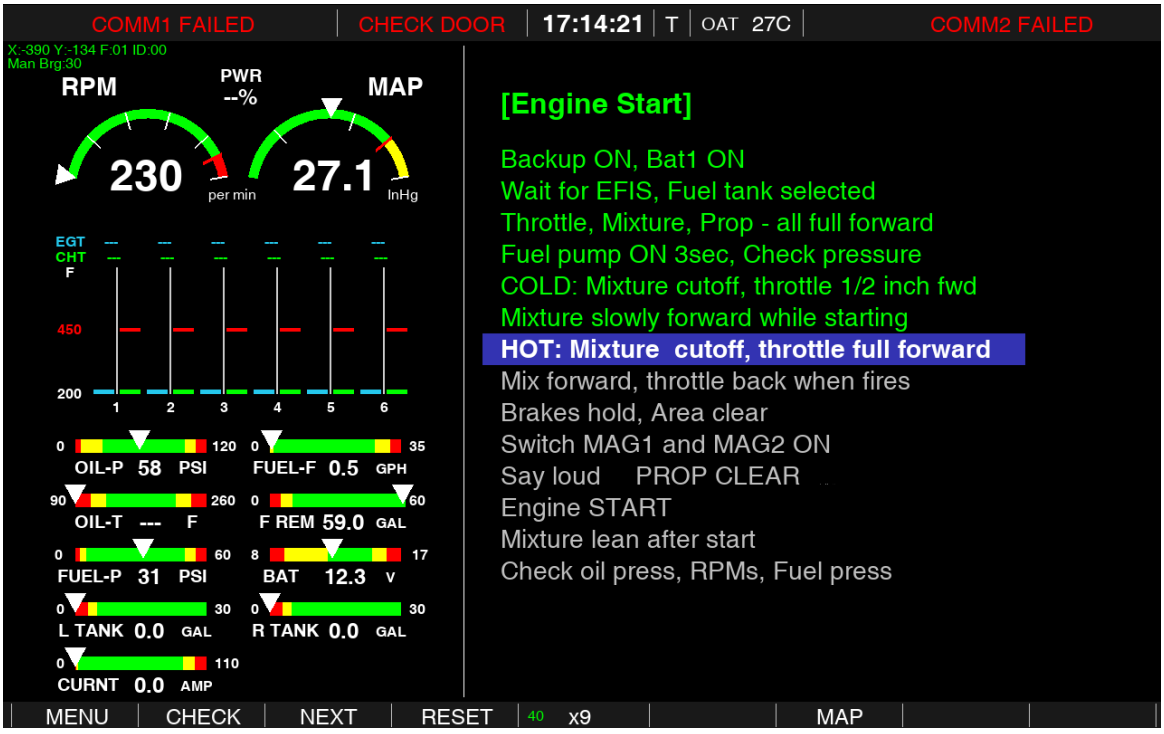
This mode allows to calculate current weight and balance based on pre-defined airplane parameters (can be updated/set for any airplane).

1. Simply touch blue rectangle on the airplane top view and set the weight for pilot/pax, as well as amount of fuel in gallons on board. When specific field is touched it becomes red. Rotate left knob to adjust the number. Once adjusted press button 1 “SET” to set the value.

2. Press button 6 “CALC” to calculate weight and balance for the airplane. Image is self intuitive and shows both graph and CG on the airplane side.

   All settings including arms, default pax/pilot/baggage weights can be adjusted via appropriate settings menu: “Settings” -> “W/B Checks”

Checklists Mode



Checklists mode allows pilot to quickly and efficiently proceed with all required checklists before/during/after flight.

Checklists can be easily customized and uploaded to the EFIS.

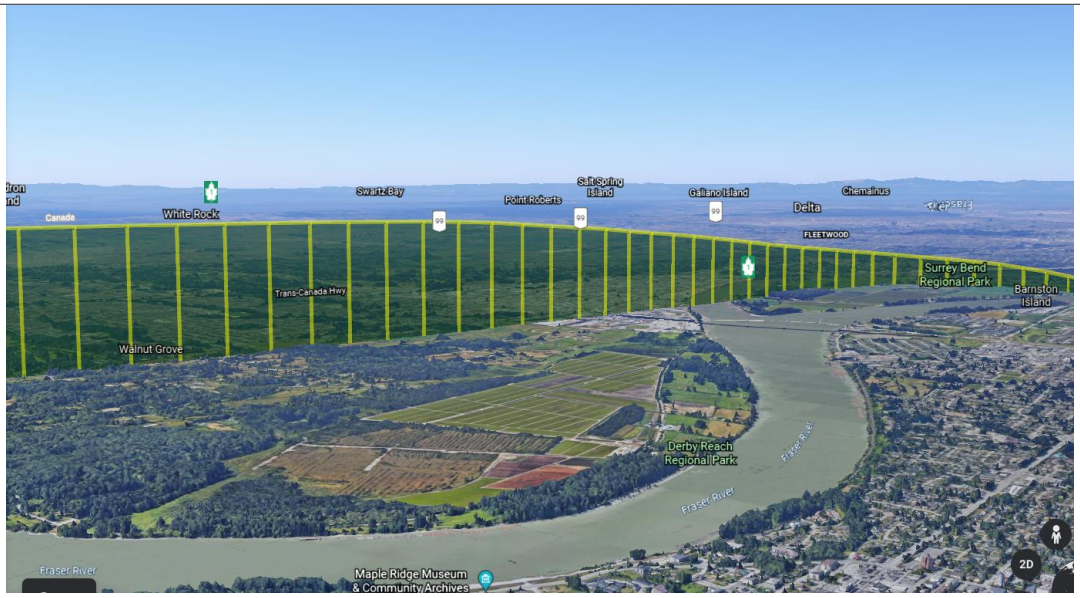
Press button 1 “CHECK” to check the item (mark it green) and press button 2 “NEXT” to move to next check list.
Button 3 “RESET” starts everything over by unchecking all checked items of all lists.

12. Black Box functionality

ELM800/1000 has built-in black box recorder functionality. Black box recorder takes all flight parameters from all sensors on every pre-set time interval. By default, the time interval is set to 5,000ms (5 seconds), but a different time interval can be selected in the “Settings menu” > “Black Box submenu” > **‘FR Period’** and **‘KML Period’**.

All parameters are recorded to the internal flash memory. Data record starts on takeoff when speed has reached Vr and stops when airplane has landed (when speed falls below Vs). Recorded data can be exported from flash memory to USB flash in two formats – internal ELM1000 format (for future expansion to read with special software) and also in .KML Google Earth format.

Exported .KML file can be opened using Google Earth software installed on computer or online via **earth.google.com** This format will allow one to see the flight path and altitude of the recorded flight that can be useful for flight analysis.



To export past flights from the black box memory on to SD card select from the “Settings menu” > “Black Box submenu” > ***BlackBox Func***.

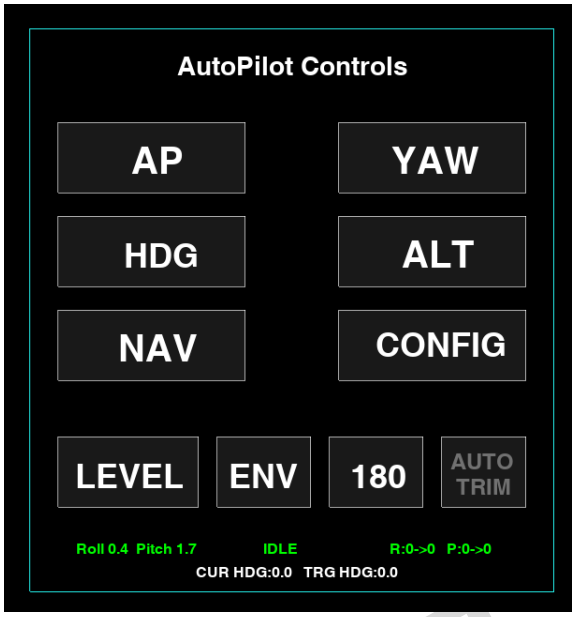
1. Ensure that USB Flash drive via adapter cable is connected to USB port.
2. Select **BlackBox Func** in the “Settings menu” > “Black Box submenu” by pushing the left knob
3. Choose ‘BB USB Export’ sub setting
4. Push the knob to start export. Display will indicate current export status.
   Once completed you will be prompted.
5. Remove USB flash from the unit and insert to PC. Copy exported files (KML) and open them with Google Earth.
6. Each flight will be exported in individual file with name of file matching the date and time of the flight.

13. AutoPilot functionality

ELM800/1000 EFIS supports autopilot controls for compatible AP modules (AP-01, etc).
Refer to autopilot manual for all installation and configuration steps.

If Autopilot connected to ELM800/1000 network and activated in the Settings menu the ‘AP’ button will appear in the bottom left corner (artificial horizon mode). If Yaw damper also installed and connected its control button will show on top of the ‘AP’ button.

By touching ‘AP’ button Autopilot menu will appear on display. This menu let pilot to engage/disengage various autopilot modes.



'AP' button will engage/disengage autopilot in both altitude and lateral modes. When autopilot activates button's background becomes green.

'HDG' button will engage/disengage autopilot in heading (lateral) mode while altitude mode will not be engaged.

'NAV' button will engage/disengage autopilot in navigation mode if flight plan is loaded and activated. This mode can only be engaged when flight plan is active in EFIS. In case if 'NAV' mode is active and flight plan gets cancelled autopilot will automatically switch to HDG mode instead.

'YAW' button will engage/disengage yaw damper.

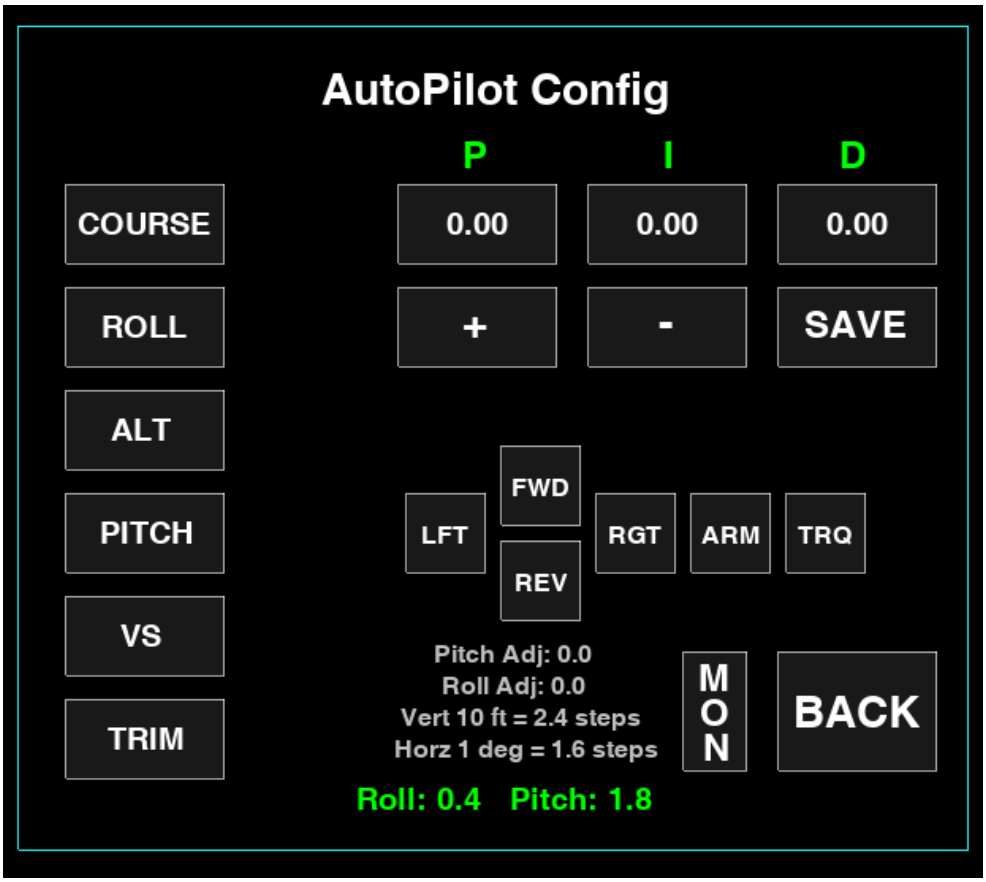
'ALT' button will engage/disengage altitude hold/vertical control mode.

'LEVEL' button will immediately bring airplane in 'straight and leveled' position and then will engage autopilot (if not engaged) in both HDG and ALT modes.

'ENV' button will activate/deactivate attitude-envelope protection mode. This mode will limit airplane in both pitch and roll angles depends on preset values.

'180' button will perform 180 degrees turn of the airplane and then will engage autopilot (if not engaged) in both HDG and ALT modes.

'CONFIG' button allows pilot to configure his autopilot's sensitivity and speed of reaction depends on airplane/airframe type.



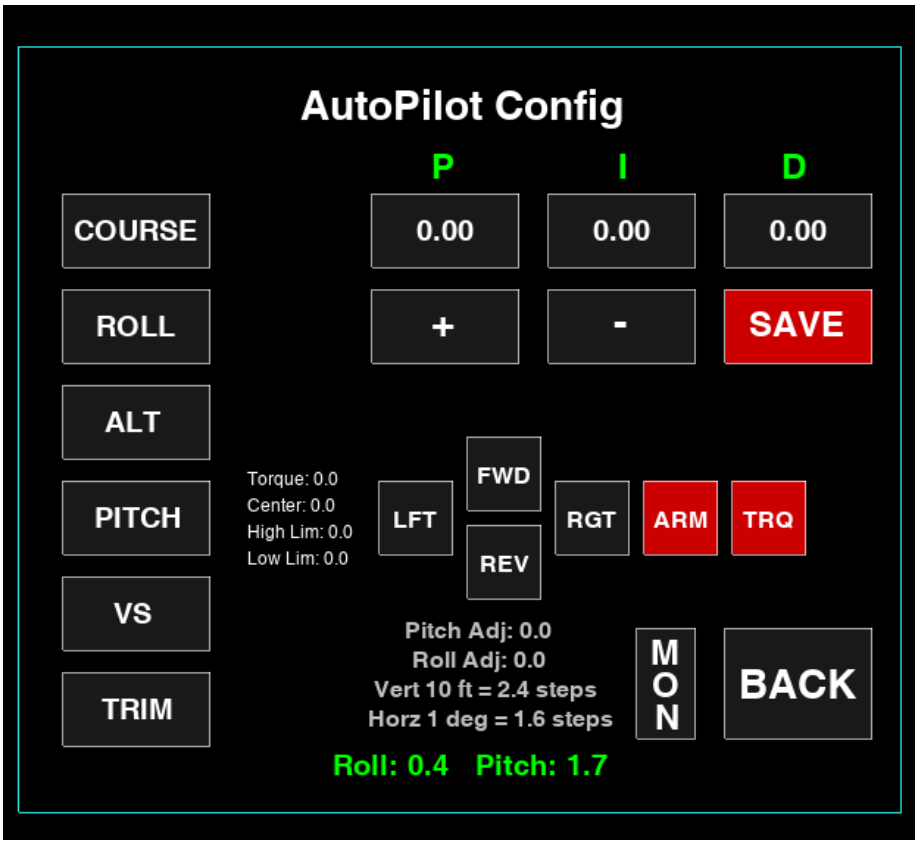
WARNING! 'CONFIG' mode should be used only while airplane is on the ground.

While in autopilot configuration mode:

'ARM' button allows to arm and test autopilot's direction of operation for both pitch and roll. Press on ARM button and once it becomes red your pitch and roll servos will both be engaged. Press on 'FWD' button should move stick (yoke) forward (nose down), button 'REV' should move stick (yoke) backwards (nose up), button 'LFT' should move stick (yoke) left (bank to the left) and button 'RGT' should move stick (yoke) right (bank to the right).

Set desired pitch servo torque level (0…255) via main ‘Settings -> Autopilot menu’. Now configure pitch up/down warning limit, which will show warning to pilot on display during normal operations.

This limit needed to warn pilot when pitch servo operates at its maximum torque level and airplane should be trimmed manually.

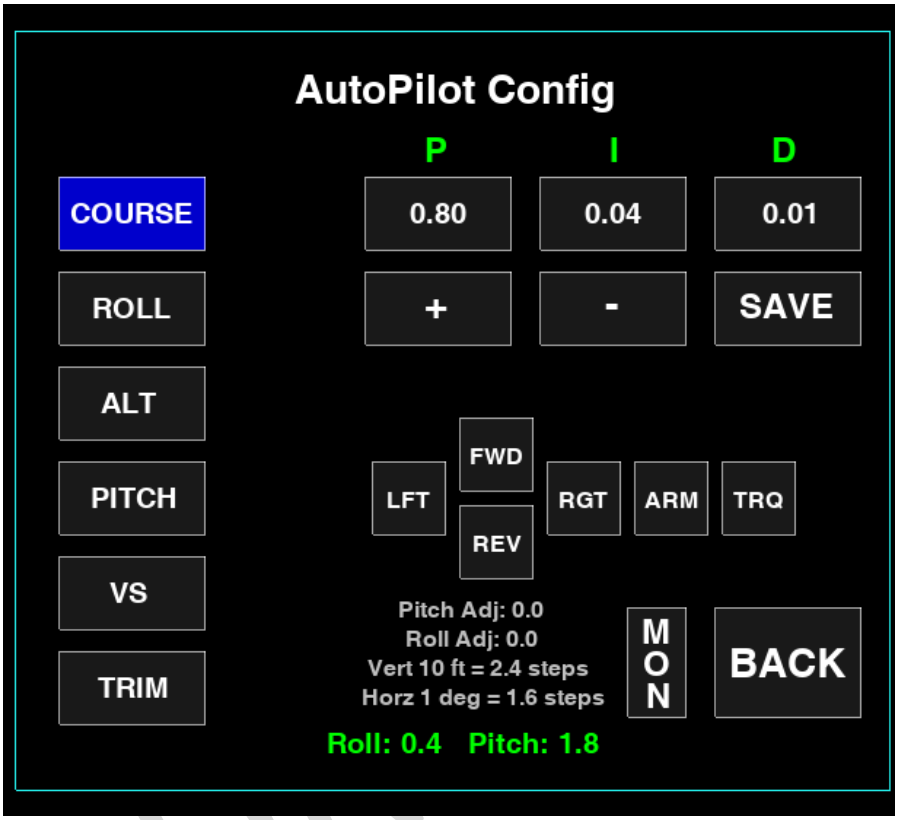


Make sure that ARM button is red, now press TRQ button so it also becomes red.

Slowly pull the stick (yoke) as if you climbing. Pull the stick/yoke until pitch servo slips. This will set the maximum pitch up force which servo can withhold.

Slowly push the stick (yoke) forward until pitch servo slips. This will set the maximum pitch down force which servo can withhold.

Press ‘SAVE’ button to save these new presets in to memory. Now your pitch servo’s torque alarm configured.



Special fine tune mode for the autopilot can be accessed via top left column of buttons.

Please refer to autopilot manual for information on how to adjust and tune autopilot's sensitivity in pitch and roll axis.

14.Settings Menu

ELM800/1000 has a built in ***Settings menu*** where various parameters can be adjusted and configured.

To enter '*Settings menu*' press the left knob or touch display on top of the knob position 'SET'. Main menu will open up. Select with left knob 'Settings' menu and push the left knob or touch desired menu with finger.

Settings menu has submenus under each menu option.

It is easy to navigate through the "Setting menu" by turning the left knob clockwise or counter clockwise and by pressing the left knob to select/open. Alternatively touch desired item to set.

- You can rotate the knob to move the selector up and down to scroll through the menus
- By pressing the knob, you can enter a desired menu or submenu

- When the menu selector's background is blue, you can rotate the knob to move the selector up and down to scroll through the menu or submenu options. Alternatively you can swipe finger up/down at the right side of the menu inside of the menu box.

- When a desired menu or submenu option is found, you can select it by pressing the knob or touching the selection. Selector's background color will change from blue to orange.

- When the selector's background color is orange, the option was selected and the settings for the selected option can now be changed. Turn the knob clockwise or counterclockwise to scroll through the settings.

- Once the desired setting is found, press the knob once to apply the selected setting for the given option. Menu selector's background will turn back to blue. Alternatively touch the selection with finger.

- To exit a submenu, mover selector to '…' option (always most upper in any submenu) and push the knob, this will return back to root of settings menu. You may also touch display on top of the button 1 in 'BACK' position.

- To exit a Settings menu at any time press left button labeled 'Exit'

Please note: when certain settings are selected, the changes are not applied instantaneously, instead a message 'Updating. Please Wait' will be displayed. Once the changes are applied, the message will disappear and the "Setting menu" will be displayed.

14. Settings menu items and their respective settings:

Submenu: **General Config**

Compass – Enables or Disables the use of internal compass (not available yet as an option, planned for future). Must be 'Disabled' at all times.

Pitch Adjust – Allows to adjust pitch horizon position up or down by some degrees.

Ki Gain – Should be set to 50. Do no adjust unless advised by manufacturer

Kp Gain – Should be set to 2500. Do no adjust unless advised by manufacturer

Set Defaults – '*EFIS + AHRS*' will completely reset of the settings to default values (factory specified settings), '*EFIS*' will set graphical processing unit to defaults and '*AHRS*' will set the AHRS processing unit to defaults.

Disp Brg – '*Auto*' setting will use auto brightness mode based on the ambient sensor light. Range of *1 to 32* will allow to manually set display brightness. Adj Min allows to set min bright ambient conditions, Adj Max allows to set max bright ambient conditions, Reset Adj will reset these to defaults.

Unit config – This setting is normally set by manufacturer. For ELM800/1000 model unless otherwise stated it should be set to Pitot+GPS by default.

Start Mode – By default, the unit powers on to the "artificial horizon" mode. The mode upon power "ON" can be set any other mode, such as: *AI* – artificial horizon, *Compass* – compass mode, *Time* – extended flight time mode, *GMeter* – g-meter display mode, *Altimeter* – altimeter display mode, *Time(L)* – time/flight time mode

Show wind data – Enables/Disables wind speed and direction on AI display. Currently this mode is not functional. Option should become available with external compass addon.

Debug Target – This setting is only for debug use and does not need to be changed

EFIS Mode – If ELM800/1000 is the only EFIS installed in your airplane set it to PFD Single. Otherwise, if more than single ELM800/1000 is installed set appropriate mode for this EFIS (PFD, MFD, etc). This will influence functionality of the EFIS.

Sync Pressure – If more than single ELM800/1000 is in use then this setting allows to use pilots PFD to autoset ground pressure on all connected ELM800/1000 EFISes simultaneously

Maps Source – Choose where maps and other terrain databases are stored. By default it set to internal SATA drive however it may also be set to USB or internal FLASH. Do not change unless directed by manufacturer.

Dev Ctrl – *Special functionality. Not for use unless directed by tech support.*

Horizon Mode – Artificial Horizon mode can be selected either Classic 2D with no synthetic view and obstacles or Synthetic 3D mode with synthetic vision and terrain/obstacle awareness mode ON.

Demo Mode – Must always be set to Disabled unless used by dealer for ground stand demonstrations.

Heading Source - Must always be set to Auto

GPS Source – Set where ELM800/1000 will take its GPS data. Normally set to Auto

Debug Info – Normally set to disabled

Charts Source – Should be set to Pure or MBTiles depends on the type of chart maps is in use. Normally set to MBTiles.

Charts Scheme – For Charts Source: Pure set to XYZ and for Charts Source MBTiles set to TMS.

Internet Weather – In case if you have an active internet connection to your EFIS you may obtain METARs for surrounding airports in the Airport Information Menu

Software Update – Activate software update functionality

Touch Calibration – Allows touch screen calibration

Airplane visual – Change visual airplane appearance in some menus

Telemetry – Enable Telemetry data transfer in flight (see. Telemetry description below)

Telemetry Time – Rate of telemetry data send during the flight

WiFi AP Mode – For versions with built in WiFi for flight plan transfer only! (ForeFlight, etc)

Submenu: **Sensors**

Alt Sensor – Allows to select internal pressure sensor to be BMP280 or HSCMRN. By default it always should be set to **HSCMRN**. In case if static system is blocked and unusable the BMP280 internal pressure sensor can be used as a backup.

IMU Type – Should always be set to MPU9250.

BMP280 Offset – Allows to offset (positive or negative) the static pressure coming from backup pressure sensor to calibrate it. Normally this offset is pre-set at production but can be changed if needed during 24-month pitot/static calibration.

HSCMRN Offset – Allows to offset (positive or negative) the static pressure coming from primary pressure sensor (only for GPS + Pitot version of the unit) to calibrate it. Normally this offset is pre-set at production but can be changed if needed during 24-month pitot/static calibration.

Pitot Offset – Allows to offset (positive or negative) the pressure value coming from pitot sensor to calibrate it. Normally this offset is pre-set at production but can be changed if needed during 24-month pitot/static calibration.

Oil and Fuel pressure sensors – Set here the maximum pressure value for respective sensor installed. We normally set it to 100PSI and use appropriate spec sensors.

Current Sensor – Set here current sensor max spec current

A Sensor Midpoint – Mid point for current sensor. Normally should be set to 2.5V

RPM Pulse Length – For all modern ignition systems which provide a RPM signal it should be set to Standard. For noisy old type ignition systems where RPM signal comes with additional noise it can be set to other specific value.

Analog and Main V dividers – Do not change these values. Factory predefined.

Flaps Calibration – Option to calibrate flaps voltage from sensor for various flaps positions. Set flaps with sensor connected to desired position then select the position from the calibration setting and press knob to save new voltage

Rudder Calibration – Designed to calibrate rudder trimmer voltage from sensor for various rudder trimmer positions (center, full left, full right). Set rudder trimmer with sensor connected to desired position then select the position from the calibration setting and press knob to save new voltage

Elevator Calibration – Designed to calibrate elevator trimmer voltage from sensor for various elevator trimmer positions (center, nose up, nose down). Set elevator trimmer with sensor connected to desired position then select the position from the calibration setting and press knob to save new voltage

L and R Tank Calibration – Designed to calibrate fuel tank levels for every 5 gallons. Calibrate first on empty tank, and then add by 5 gallons until full and calibrate every 5 gallon position via the calibration setting. You may calibrate each tank separate or just calibrate one and then copy values to another one (assume identical sensors and tanks are in use)

AOA Calibrate – Angle of Attack calibration. Currently not used.

Kalman Speed – Speed of filter reaction. Preset at manufacturer.

VICs LiDar – Laser altimeter functionality built in VICs module activation/deactivation

LiDar Calibrate – Allows to set airplane height while on the ground.

Roll Calibration – Designed to calibrate roll trimmer voltage from sensor for various rudder trimmer positions (center, full left, full right). Set roll trimmer with sensor connected to desired position then select the position from the calibration setting and press knob to save new voltage

Flaps, Pitch, Roll, Yaw Position Source – set where position information is taken from (EM01 [EnGood], PowerHub, Smart Trim)

Submenu: **Units**

Speed Units – Display speed units for GPS, TAS and Airspeed in *Knots*, *MPH* or *KPH*

Alt Units – Display altitude units in '*Feet'* or '*Meters'*

Press Units – Display pressure units in '*inHg'* or '*Bar'*

Temp Units – Display temperature units in *'Celsius'* or *'Fahrenheit'*

Submenu: **AHRS Config**

***Trace** ** - Trace related options are intent for engineering use only and not described nor recommended for use by customer.

AHRS Reset – Forces AHRS part to restart, similar to “power ON/OFF” for internal AHRS only.

Corr Force – Correction force for banking turns. Should be always set to ‘Auto’ or ‘Legacy’ modes. Normally never requires to be changed.

Accl Cal Ovrd – When the device comes from factory, this option is set to “Enabled”. On each power ON calibration settings from memory will be used. ‘*Re-Cal*’ setting will force re-calibration of the roll and pitch when in ‘Enable’ mode. When set to ‘*Disabled*’, the device will recalibrate attitude (roll, pitch) on each power ON for current unit position. Set to ‘*Enable*’ will lock current calibration and write it to memory.

Accel Limit –This value represents the acceleration or deceleration threshold after which compensation for the attitude pitch indication is added to ensure proper attitude indication during rapid acceleration or deceleration (such as during take-off or landing). By default, acceleration limit is set to 1.2 kt/s. This value should be suitable for most airplanes, but for some airplanes, a different value can be chosen between 0.1 kt/s to 8 kt/s. Acceleration limit can also be disabled, if desired.

AHRS Mode – Source for AHRS data. Normally set to 'Primary' which refers to internal AHRS. Under certain circumstances may be set to 'Off/BackUp' mode which will use external AHRS source of attitude information.

ASI Calibrate – Airspeed sensor calibration mode. This normally done during production and does not require user to change the setting. However on some occasion (24-month pitot/static calibration) etc this function can be used. Function will recalibrate pitot sensor bias. It should be calibrated when avionics is ON but engine is off and no winds over 4-5 knots blowing to pitot tube sensor. Pitot tube sensor should be opened to ambient pressure at the time of calibration.

Mag Correct – Magnetometer correction of magnetic/true direction. Currently not in use.

Slip/Skid Sensitivity – Should always be set to Normal

Submenu: **External Devices**

Ext Compass – External Compass. EFIS can work in conjunction with an external compass or External comas built in to external AHRS. Should an external compass be connected to EFIS, it can be activated in this menu option by selecting “Compass” or “Compass + AHRS”. By default, external compass is “Disabled”.

Mag Decl Corr – Declination correction – when GPS source for heading is in use, it is always ‘True’ direction. Enabling this option will automatically recalculate to ‘Magnetic’ direction based on magnetic declination in current location (based on GPS track and coordinates).

Mag Cal Ovrd – External Magnetometer (compass) Calibration Override – when external compass requires recalibration, it can be done using this setting.

Use OAT – Enables/Disables OAT sensor readings. Please note that if OAT is disabled some other information such as TAS will become unavailable. Default set to Enabled.

VICS Warn* – Enables/Disables VICS external module warnings and allows to choose specific warnings only.

VICS Voice* – Allows to choose between Male and Female voices for external VICS module.

VICS Volume* – Sets the output volume for external VICS module.

Speed Director* – Enables/Disables Speed Director mode and allows to choose warning type

Director Intrv* – Sets the interval in seconds for Altitude and Speed Directors voice warnings

Altitude Director* – Enables/Disables Altitude Director mode and allows to choose warning type

COMx Speed – Speed of the RS232 port x

COMx Mode – Mode of operation for RS232 port x

COMM1/2 Mode – Type and protocol of COMM radio connected to EFIS

Lasar Logging – Should be always disabled

NMEA Out Message - Set the type of NMEA Out message for autopilot. By default always should set to Internal.

Alt Encoder Mode – Whenever xPlane Mini also used as a altitude encoder for various types of transponders specific output protocol can be set here. Works in conjunction with appropriate COM Mode port settings (Altitude Encoder Out).

Ping ValCOMM – Support for older firmware versions of VAL Avionics COMM 2000

Sync COMM – If only single ELM800/1000 is installed set to Disabled. In case if more than one ELM1000 is installed set to Master on the unit which is connected to COMM radios and set to Slave on other units to sync display information from COMM radios.

uAvionix Mode – Sets the communication mode with uAvionix tailBeaconX. Default is HalfDuplex

Trig Xponder – When Trig device is set as COMM1/XPonder this sets either COMM1 only or XPonder mode (headless or with Control head)

**Details about VICS functionality and menu settings can be found in dedicated VICS Module Manual.*

Submenu: **Time**

Time and Date settings – Current time in 24h format and Date settings.

Time Zone – Setting for current time zone. UTC time is calculated based on this setting and current time. Ex. Los Angeles is GMT -8, New York is GMT -5

Fuel Alarm – Sets repetitive alarm for fuel tanks switching. When set to 0 alarm is off. Every pre-set period of time unit will show on-screen alarm message. If external VICS module is connected the voice message 'Switch fuel tanks' will be given. To disable function set it to 0.

Total Oil Life, Hobbs and Air time – You can adjust Total Hobbs, Air time and Oil Life times from here.

Reset Oil, Hobbs, Air times – Times can be reset to 0.0 here

Sync Time - If only single ELM800/1000 is installed set to Disabled. In case if more than one ELM1000 is installed set to Master on the unit which is PFD and Slave on other ELM1000 units to sync the current time between.

Submenu: **V Speeds**

Speed V* – Sets *V speed* values for airplane in **Knots**.

WARNING! It is important to have these speeds set to match your airplane specific speeds. Please refer to airplane's Pilot Operating Handbook("POH"). A separate menu option is available for each speed type: Vr, Vx, Vy, Va, Vs0, Vs1, Vfe, Vno, Vne.

Submenu: **BlackBox**

KML Trace – Black Box KML Trace functionality option can be set to 'Enabled' for normal black box mode when all flight information is recorded for each flight (once the airplane is airborne and until it lands). Option can be set to '*Disabled*' - Black Box functionality will be turned off and no flight information will be recorded.

FR Period – Basic Flight Data trace period can set the time interval between black box readings. All flight parameters can be recorded into internal flash memory every 1,000ms to 10,000ms (1 sec to 10 sec). By default, the interval is set to 5,000ms (5 sec). It is recommended to keep this setting.

KML Period – KML Flight Data trace period can set the time interval between black box readings. All flight parameters can be recorded into internal flash memory every 1,000ms to 10,000ms (1 sec to 10 sec). By default, the interval is set to 6,000ms (6 sec). It is recommended to keep this setting.

BB, Eng USB Export – allows exporting previously stored FR or KML flight data logs for further use and review. USB flash drive should be connected via adapter cable.

Cal USB Import and Export – All calibration information (sensors values, etc) can be exported to external USB flash and then reimported should you require to replace your Engine Monitor display for some reason.

Lasar Export – Not in use

AOA Trace – Not in use

Scrn USB Export – allows exporting screen shorts in .png format. USB flash drive should be connected via adapter cable.

Maps USB Import – Import and Update Maps from USB source

Data Offload – Allows offloading data via internet to secure server for future use. See “Data offload ” below.

Screenshot of the currently displayed information can be taken at any time by simultaneous press of both buttons for short time. This is useful feature for the case when you want to store your display information for further review.

Submenu: **Display/Config**

COMM/NAV Info – Set the position of COMM and NAV radio's information in top info line.

G-Meter – Enables/Disables G-Meter in AI mode display

Engine Monitor – Set position where engine monitor information is shown during split/screen operation

AI Split Mode – Default right side mode for split screen on startup

Show AOA – Enables/Disables AOA indication on display. In case if this is a second ELM800/1000 in the system set to slave so it will take AOA information from the PFD master ELM800/1000 unit

AI Full Engine Monitor – Configures what engine monitor info is shown in AI mode of display

Map Rad Vec – Show distance radiuses and heading vector around airplane in the map mode

Synthetic Vision Sun – Enable synthetic vision to change colors depends on time of the date in your location (based on GMT setting and GPS coordinates)

HITS (Highway in the skies) – Activates virtual tunnel when flying to destination waypoint for easy navigation

Map Trail – Enables the green trail on the map which shows airplane path for past 90 minutes of flight

Water Bodies – For supported regions shows water bodies on 3D synthetic vision

Submenu: **EnGood**

Engine Type – Set either 4 or 6 cylinder engine here to properly format display and show specific to individual cylinders temperature information.

MAP Sensor – MAP sensor presence in the system

Fuel Quantity Sensors – Set to "Installed" if fuel level sensors are connected

Fuel on Board – Set total fuel on board in all tanks

FF1 and FF2 K-Factors – Fuel Flow K-Factor number for sensor 1 and optional sensor 2. Normally each fuel flow sensor has its K-factor written on it. For example Floscan 201 with standard K-Factor 29.50 is set as: 29500 in this setting
K-Factor is a fine adjustment value for any fuel flow sensor

RPM Factor – This parameter describes how many pulses from RPM sensor are actual 1 RPM of engine. For 6 cylinder it is normally 1.5 while for 4 cylinder engine it is 2. However it may differ for your particular RPM output type so adjust accordingly.

ECU Defaults – Forces EM-01 engine monitor module to its default settings

Fuel Flow1 and 2 – Set if Fuel Flow sensor(s) are in use and installed

MAP Offset – You can offset MAP pressure in case if readings from the MAP sensor for some reason are different from actual.

Fuel Units – Units used for fuel information indication: Liters or Gallons

Eng Temp Units – Units used for engine temperature indication

****Various Limits*** **-** allows setting all minimum and maximum limits for various engine parameters. Consult with your engine documentation to set correct values. By default values are set for Lycoming IO-360 and Lycoming IO-540 engines.

Door Sensors – Set if door sensors are connected

Baggage Door Sensor - Set if baggage door sensor is installed

Cowling Temperature Sensor – Set if AUX1 sensor is installed

Fuel Pressure Sensor – Set if Fuel pressure sensor is installed

Current Sensor – Set if current sensor is installed

CHT, EGT, Oil and Cowl Temp Type sensors – Should be set to Standard at all times

Engine Model – Set convenient Continental/Lycoming, or Rotax (CAN bus) or ULPower (CAN Bus) engine type installed

Submenu: **Info/Warnings**

Engine Warning Snooze – When engine warning is raised and then snoozed how long to wait before repetitive warning is issued.

Various warnings – Enable/Disable various warnings depends on desired configuration

Terrain Warning – Enables/Disables terrain awareness warning when in 3D artificial horizon mode only.

Obstacle Warning – Enables/Disables obstacle awareness warning when in 3D artificial horizon mode only.

Obstacle Min Dist – minimal distance to obstacle in NM to trigger warning. Works in conjunction with 'Obst Min Hdg'. Default set to 3NM.

Obstacle Min Hdg – minimal heading difference (current vs track to obstacle) in deg to trigger warning. Works in conjunction with 'Obst Min Dist'. Default set to 3 degrees.

Terr Red Zone – This set how high airplane should be over terrain to avoid triggering Red color (alarm) map. When airplane altitude is more than pre-set value over the terrain it will not trigger the Red color (alarm) map. Default set to 300ft.

Terr Yellow Zone – This set how high airplane should be over terrain to avoid triggering Yellow color (warning) map. When airplane altitude is more than pre-set value over the terrain it will not trigger the Yellow color (warning) map. Default set to 700ft.

Fuel Lean Warning – This function requires MAP, RPM and fuel flow sensors as well as engine charts loaded to function properly. Function will monitor the fuel flow and pop-up warning in case if fuel flow exceeds current power settings pre-set fuel flow limits.

LiDar Altimeter – This function activates LiDar altimeter information on display during landing/final approach. Please refer to VICs module manual for all details about this feature.

Traffic Warning – This function enables ADS-B traffic warnings on the screen

Traf Min Distance and Altitude – This sets minimal ADS-B traffic vertical and horizontal distances when warning message get triggered.

Stall Audio Warning – This enables stall audio warnings via VICs module. Refer to VICs manual for details on this feature.

VPX Warning – This enabled the warnings from Vertical Power solid state circuit breaker system

TPMS Warning – This enables warnings from EM-01 module with TPMS system connected

Airspace Warning – This enables airspace warnings on display

Submenu: **WB/Checks**

Various Weight and Balance settings specific to airplane.

Submenu: **Autopilot**

AP Mode – This enables/disables autopilot feature.
Yaw Damper – This enables/disables yaw damper feature.
Pitch and Roll Torque – This set's maximum torque for both pitch and roll servos in range of 1…255. Higher the number, higher the torque. Default value is 200 for both pitch and roll.
Pitch and Roll Coef – Sets the sensitivity coefficient for pitch and roll. Number higher than 20 makes sensitivity higher and numbers below 20 makes sensitivity lower. Default values are 25 for roll and 22 for pitch. Refer to autopilot manual for details on this setting
Reverse Pitch and Roll – this setting will reverse pitch/roll servo direction. *Warning Set these two parameters once on the ground and never change them unless required.*
Roll and Pitch angle Limits – sets the limits for pitch/roll during autopilot normal operations.

Pitch Trim – sets the mode for the trim. Default is Manual.
Set Defaults – sets default parameters in autopilot module.
Yaw Center and Activity – this is to control TruTrak Yaw damper parameters only
Envelope Protection – this set envelope protection mode ON or OFF at startup by default. This mode can be also activated/deactivated via AutoPilot touch menu.
Envelope Protection Pitch and Roll limits – sets the limits for autopilot while envelope protection mode is active.
AutoTrim Speed – When autotrim is in use it sets the trim speed.

AutoTrim Direction – Sets autotrim direction (Normal or Reversed)
P Torque Limit H – Sets the high torque limit (do not change unless directed)
P Torque Limit L – Sets the low torque limit (do not change unless directed)

Submenu: **PowerHub**

This product is under development and this part will be updated in the future

Submenu: **SmartTrim**

Set defaults – Resets the auto trim module to defaults
Analog and Main V dividers – do not change
Pitch, Roll, Yaw and Flaps direction – Normal or reversed
Low and High ASI limits – set the speed limits between which the autotrim will adjust the speed. When set both to 0 the auto trim speed functionality is disabled.
Smart Trim – set if smart trim is installed

Submenu: **Remote**

Joystick – set type of joystick in use. Type1 is a BMW iDrive controller (2014-2018 models)
Button1 – 4 – sets function for buttons

Submenu: **TPMS**

This product is under development and this part will be updated in the future

Submenu: **ADSB**

Set Defaults – Reset ADSB-01 module to factory defaults
1090TL set – Normal 250mV (offset in mV for ADSB 1090 sensitivity)
Controls – Activates various functions (for field test use only)
Use CAN bus – Allows to transfer all data to EFIS via CAN bus instead of Wifi or RS232
AHRS Feed – Enabled full AHRS data feed via WiFi to compatible FB (ForeFlight, etc)
WiFi Mode – Normal set to Broadcast, unless required Unicast (ForeFlight)

Print Screen Functionality

During EFIS operation at any time screenshot of the currently displayed image can be taken and stored internally in **.png** format. This is useful feature when during normal operation is may become required to store some parameters shown on display or for some sort of troubleshooting with manufacturer at later or just sharing with others.
To take a snap shot of the display at any time shortly press and release two buttons around USB port simultaneously. Screen shot with name of current time and date in **.png** format gets stored in to internal memory. It can be exported using online connection or USB drive then. Please refer to submenu '***BlackBox***' and appropriate function.

Data Offload functionality (online)

When EFIS is connected to internet (WiFi/Cable) it is possible to offload engine data, flight data, KML data, screenshots and make a backup of all configs to the secured server (see Telemetry chapter). Also it is possible to restore your earlier stored configs from the remote server. Select Data offload from BlackBox menu and then select the item you want to offload by pressing the respective button on display. Status of the transfer will be shown in the bottom of the menu.

Terrain and Obstacle Awareness Functionality

Terrain Awareness Warning System

The **Terrain Awareness Warning System** enhances pilot safety by providing real-time alerts regarding potential terrain hazards ahead.

Warning Levels:

1. **Warning Level:**
   - When the terrain ahead is at or below the preset altitude (defined in the **Red Zone Setting**), the dangerous terrain will be highlighted in **red** on the display.
   - A **Terrain Awareness Warning** popup will appear, showing:
     - Track and distance to the first impact point.
     - Elevation of that point.
   - In this level, the warning message will have a **black background** and will not trigger additional warnings via the VICS (Voice Information and Control System).
2. **Alarm Level:**
   - If the warning escalates to an **alarm level**, the background of the warning message will change to **red**.
   - If the VICS is connected, an additional voice warning will be provided.

Mute Feature:

- By touching the warning message on the display, the alert will be muted for **180 seconds**.

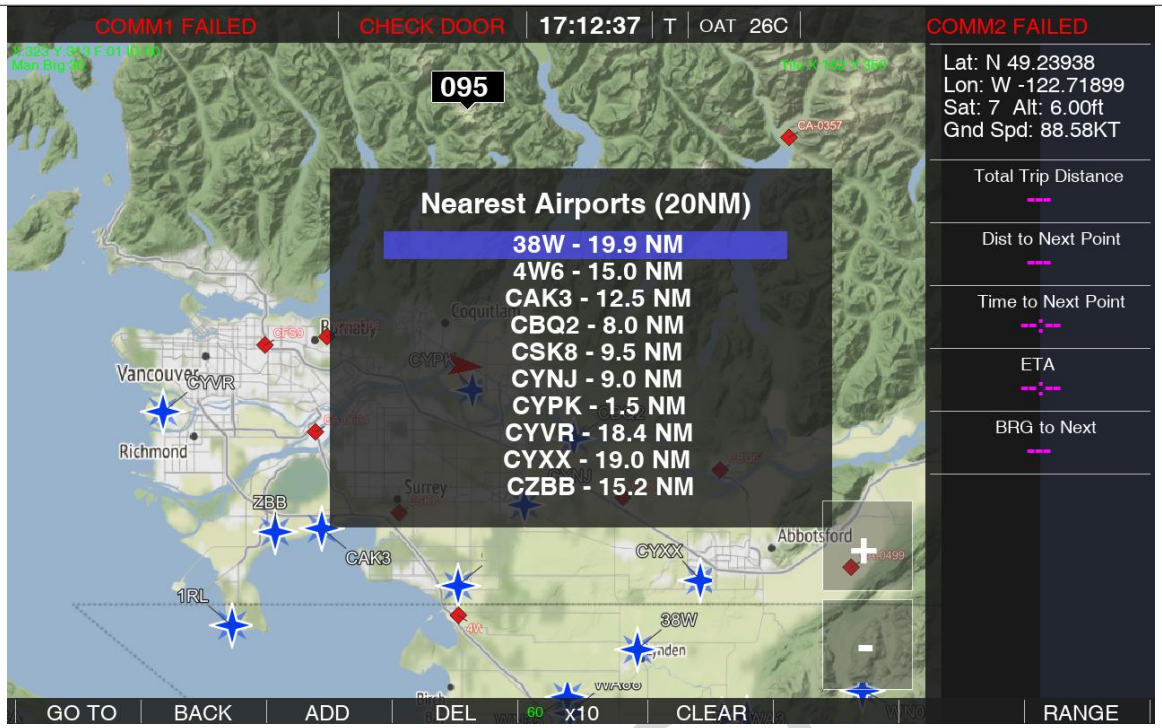
Yellow Zone:

- If the terrain ahead is displayed in **yellow**, it indicates that the altitude between the airplane and the terrain is more than the Red Zone setting but less than the Yellow Zone setting (warning zone).

Obstacle Awareness:

- The same awareness warning will apply for obstacles, although the terrain color will not change.
- If the VICS voice system is connected, voice alarm messages such as "**TERRAIN AHEAD**" or "**OBSTACLE AHEAD**" will sound to alert the pilot.

Maps Mode and Flight Planing Functionality



Map Mode

In **Map Mode**, users can navigate and interact with the displayed map, which includes various functionalities for zooming and flight planning.

Map Zooming:

- **Knob Control:** Rotating the **left knob** will change the zoom level of the currently displayed map.
- **Button Control:** Zoom can also be adjusted by pressing the **"+"** or **"–"** buttons located at the bottom right corner of the map.
- **Gesture Control:** A **two-finger swipe** over the map allows for changing the zoom level intuitively.

Flight Planning Modes

There are two primary flight planning modes: **NEAR** and **GO TO**.

NEAR Mode:

- To activate **NEAR Mode**, press the button labeled **1 "NEAR"**. This mode displays the nearest airports surrounding the airplane's position.
- **Range Adjustment:** The **right knob** can be used to change the search range for nearest airports, with a default setting showing airports within **20 NM**.
- **Airport Selection:**

- Use the **left knob** to select the desired airport for a direct route.
- Press the **left knob** to activate **"Direct TO"** mode.

Additional Information Display:

- On the right side of the screen, you will see information about:
  - Current GPS position
  - Satellite reception
  - Ground speed
- When in **"Direct TO"** or **Flight Plan Mode**, the right side of the screen will also display:
  - **Total trip distance**
  - **Distance to next point**
  - **Estimated Arrival Time**
  - **Bearing to the next point**
- Flight plan route points will be indicated in the bottom right of the screen.

GO TO Mode:

GO TO Mode

When in **Map Mode**, pressing the **second button "GO TO"** opens a flight plan entry window, allowing users to create and manage flight plans efficiently.

Airport by Name Flight Planning:

1. **Entering Airport Code:**
    - Users can enter a four-letter airport code using the **right knob**.
    - Rotate the **right knob** to select the first letter of the airport code.
    - Press the **right knob** to switch to the next letter, and repeat this process until all four letters are entered.
    - Upon entering the last letter, the cursor will return to the first letter for any necessary adjustments.
2. **Adding Waypoints:**
    - After entering the desired airport code, press **button number 6 "ADD"** to add the entry to the flight plan.
    - All added waypoints will be displayed on the right side of the screen and in the **Flight Plan** menu above the airport code entry field.
3. **Loading the Flight Plan:**
    - Once all desired waypoints are entered, press **button 1 "LOAD"** to load and activate the flight plan.

Loading Flight Plans from Internal Drive or USB:

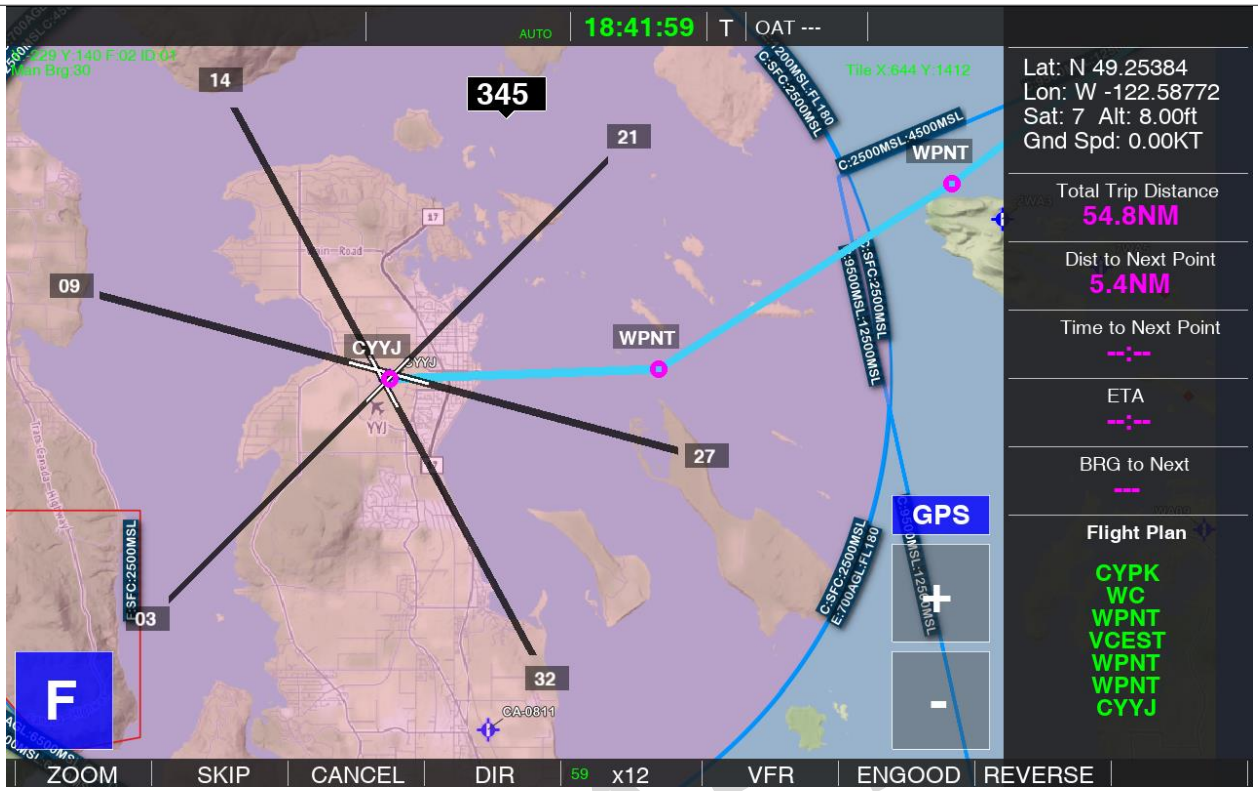
- Users can load flight plans created on external devices (such as ForeFlight, Garmin, etc.) in **.fpl format**.
- Example Workflow:
    1. Create a flight plan on an iPad using the **ForeFlight** app.
    2. Email the flight plan to yourself in **.fpl format**.
    3. Copy the flight plan file to a USB drive in the folder named **'FlightPlan'**.
    4. Insert the USB drive into the ELM1000.
    5. While in **"GO TO" mode**, press **button 5 'FPL'**.
        - If no USB drive is inserted, this button will allow access to the local flight plans database stored on the ELM1000.

Flight Plan Menu:

- A new menu will appear, displaying all flight plans stored either on the ELM1000 (Local) or in the **'FlightPlan'** folder on the USB drive (USB).

Select desired flight plan by rotating left knob and press on it to activate.

If you want to store flight plan to local database press ‘STORE’ button. This will create a copy of this flight plan on local ELM1000 EFIS.



Runway extension lines:

If available in local database for each airport in flight plan, runway extension lines will show with their respective numbering.

Moving map around:

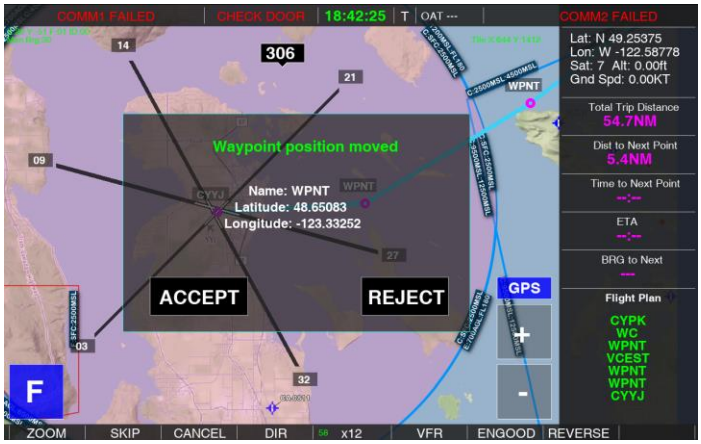
To move map around and look for the location, which is outside of current view, touch with your finger button ‘GPS’ in the lower left corner of the map. It will lit blue (Active).
Now you can move map with your finger to any direction. Please note that you will not be able to see your current position on the map when in this mode. This mode is useful when planning or editing a flight plan. Touch ‘GPS’ button once again to return to normal view mode.

Flight plan live editing:

While flight plan is loaded and activated you may add or delete waypoints or move their position on the map. To do that push on 'F' (Function) button at the lower left corner of the map. Button will lit blue (active).

To delete waypoint – set zoom level of the map so you can see desired waypoint and its label on the screen. Touch with your finger waypoint and watch the waypoint label. As soon as background of waypoint label becomes red – release finger. Confirmation dialog will pop-up. Push on 'Delete' or 'Close' to either delete or keep waypoint.

To move waypoint – Touch with your finger waypoint and watch the waypoint label. As soon as background of waypoint label becomes blue – it is in live move mode. Keep finger over the waypoint and move it across the map to new desired location. Release the finger when set to desired location on the map. Confirmation dialog will pop up. Push on 'Accept' to keep new position of waypoint or 'Reject' to return waypoint to original position.



To add new waypoint – touch and hold with your finger on any flight plan leg at the location where you want to insert waypoint. In short moment new waypoint show up under your finger – keep holding your finger and now move it to the desired location on the map. Flight plan lines will move and follow your finger. Release when set to desired location on the map. Confirmation dialog will pop up. Push on 'Accept' to add waypoint or 'Reject' to delete newly created waypoint.

<u>To create new flight plan by selecting desired waypoints on the map</u>:

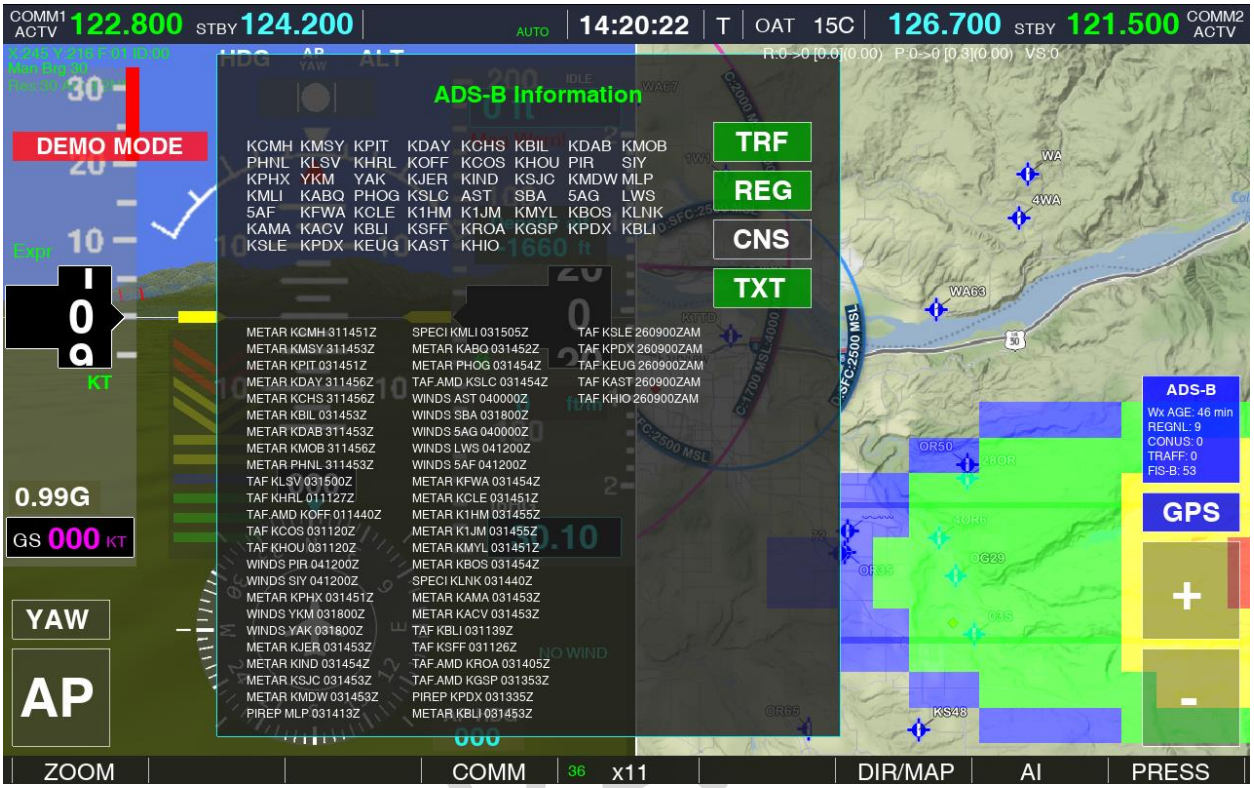
While in Map mode, press on second button "GO TO" will open a flight plan entry window. Now touch the 'F' (Function) button in the lower left corner of the map. It will lit blue when active.

Touch desired waypoints on the map to create a flight plan. Each new waypoint will show on a map together with a flight leg line. To delete last waypoint press on button 3 ‘DEL’. To clear flight plan press on button 4 ‘CLEAR’.
To activate a flight plan press on button 1 ‘LOAD’.

When one of the RS232 ports of ELM800/1000 is set to ‘NMEA Out’ it will be used to send a flight plan to another device such as Garmin AERA 660 or Garmin GPS 296/396/296 and others which support NMEA sentences format as input. You may configure desired speed for the port depends on the settings in your host device.

‘NMEA Out’ mode can drive an autopilot for point-to-point navigation.

ADS-B Data Details:



If ADS-B receiver is connected with ELM1000 EFIS it is possible to monitor what data is received from the receiver. While in artificial horizon split map or full map modes the ADS-B label at the middle right of the display will show: the age of the latest NEXRAD weather update, counters for received regional and CONUS weather updates, ADS-B traffic messages and Flight Information data (FIS-B) received.

By touching the ADS-B label at the middle, right of the display the ADS-B Information window will open. This window will show airport codes (at the top) and type of reports (at the bottom) received.

Buttons at the top right allow to set what types of data is desired to receive:
TRF – Traffic information
REG – Regional NexRad weather
CNS – CONUS NexRad weather
TXT – Textual information (TAF, PIREP, METAR, WINDS, etc)

Airport Information and IFR approach plates:

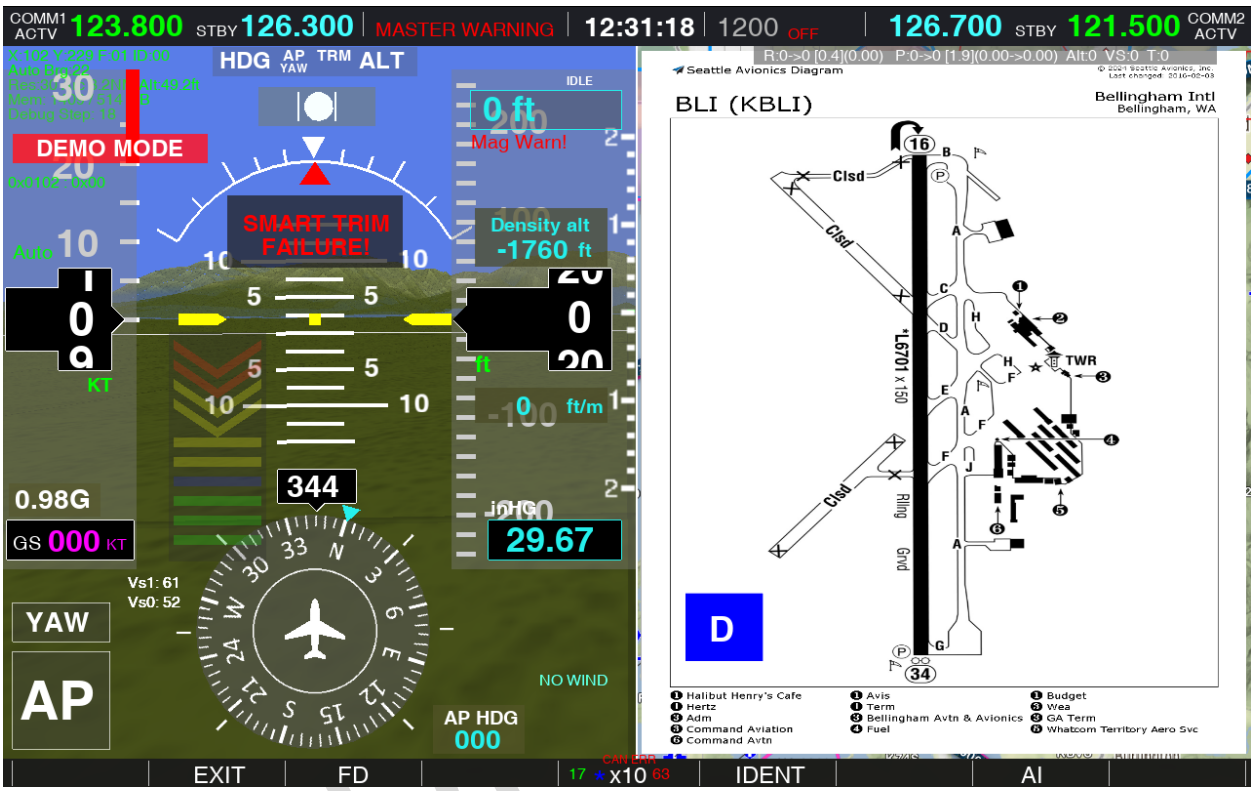
While in map split mode or full screen map mode by touching desired airport on the map the airport information window will pop-up.

Please note that while in full screen map mode it is required first to activate 'F' function mode by touching 'F' button in the bottom left of the screen.

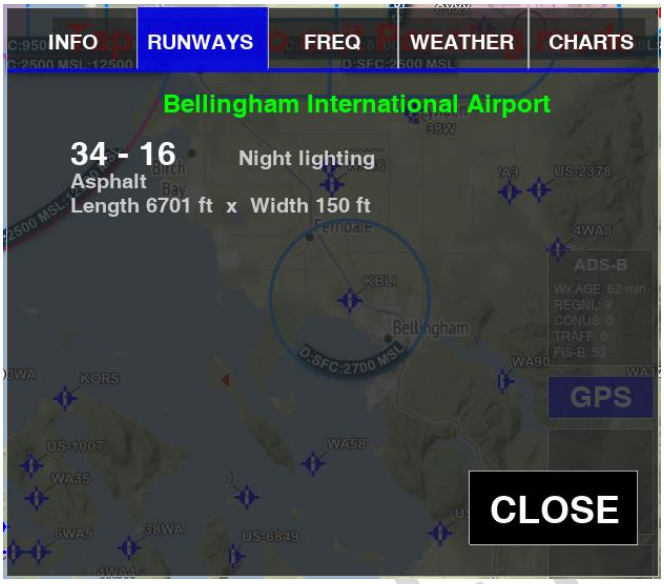
Airport information window divided by tabs which can be open/switched by finger touch.

Info tab shows general airport information including ICAO code, GPS position and elevation.
Runways tab shows information about airport's runways, its length, width and lighting equipment.
Frequency tab shows airport's radio frequencies information
Weather tab shows airport's weather or nearby airport's weather if available from ADS-B
Charts tab shows all available airport charts (IFR approach plates)

Whenever in the bottom left corner of the INFO tab the button with letter “D” is available press on it to see/hide airport taxi diagram.

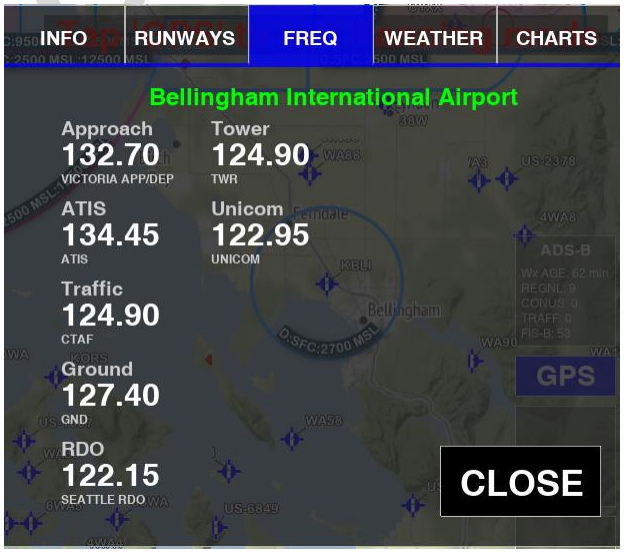


Runways tab



This tab includes details about airport's runways, their length, width and surface.
For each runway, if it is equipped for night landing, appropriate message will be shown.

Frequencies tab



This tab shows information about all radio frequencies available for selected airport. If EFIS connected with compatible COMM radio, by

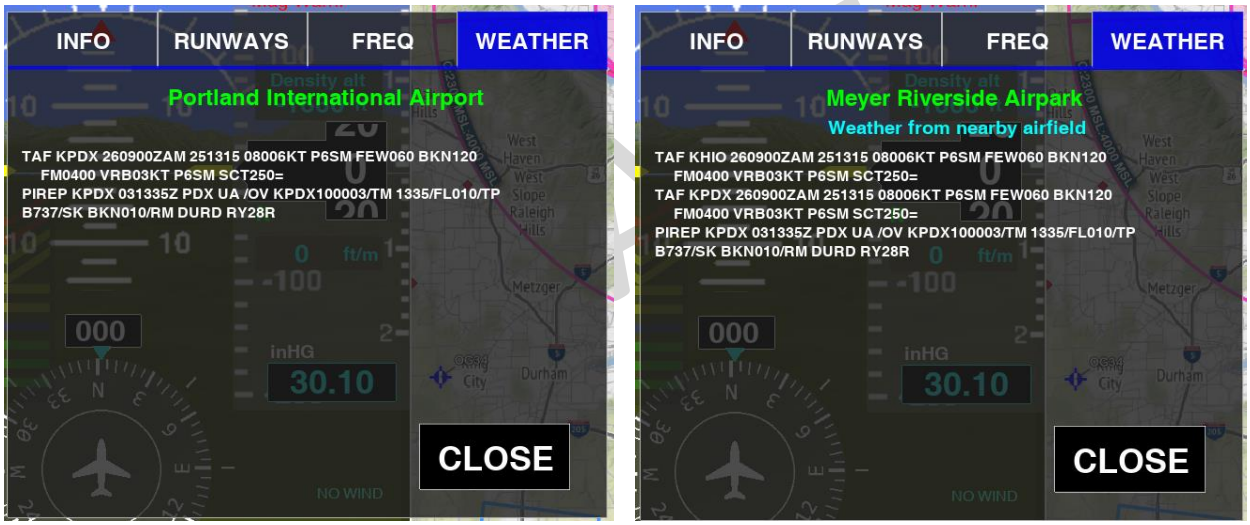
touching the frequency with finger pilot can send desired selected frequency as a stand-by frequency to COMM radio.

While *Frequencies tab* is selected button 3 'COMM' in EFIS will cross switch standby and active frequencies in COMM radio.

The normal usage flow would be:

1. Touch desired frequency in the tab, so it gets send to COMM radio as a standby freq.
2. Push (or touch) button 3 'COMM' in EFIS to switch between active and standby freqs.

Airport Weather Tab



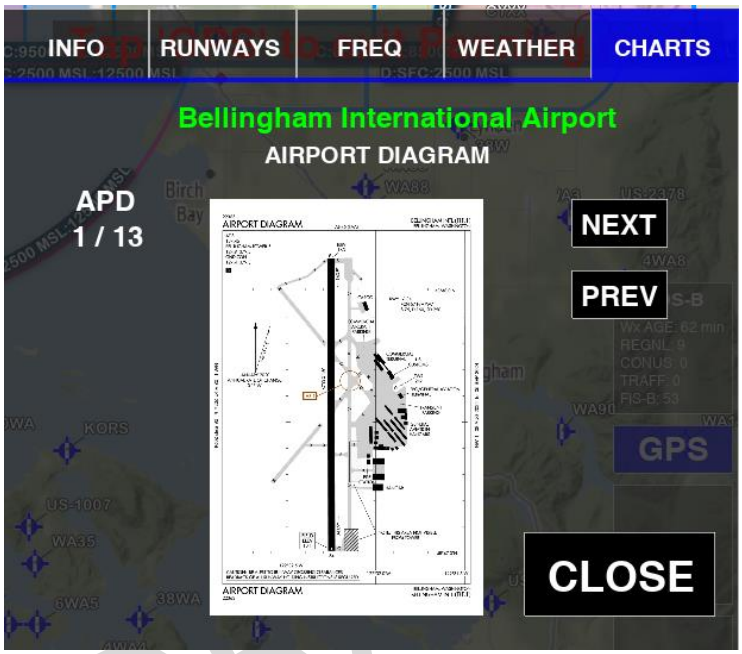
When weather information for selected airport is available from ADS-B it will popup under *Weather tab*.

Information may include METAR, TAF, PIREP, WINDS and other data received from ADS-B receiver.

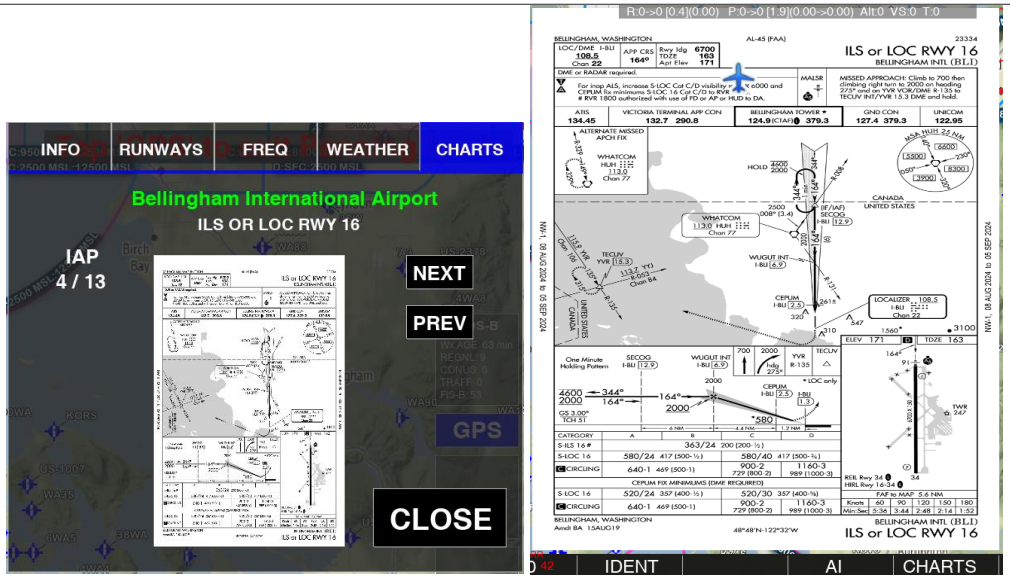
In case if ADS-B weather is not available for selected airport it will search for weather from airports in the area around selected airport and in case if found it will show it as well.

If Internet weather option set to Enabled in settings menu and EFIS has a live connection with internet you should be able to see the METARs from the airport (subject to availability and reporting)

Airport Charts Tab

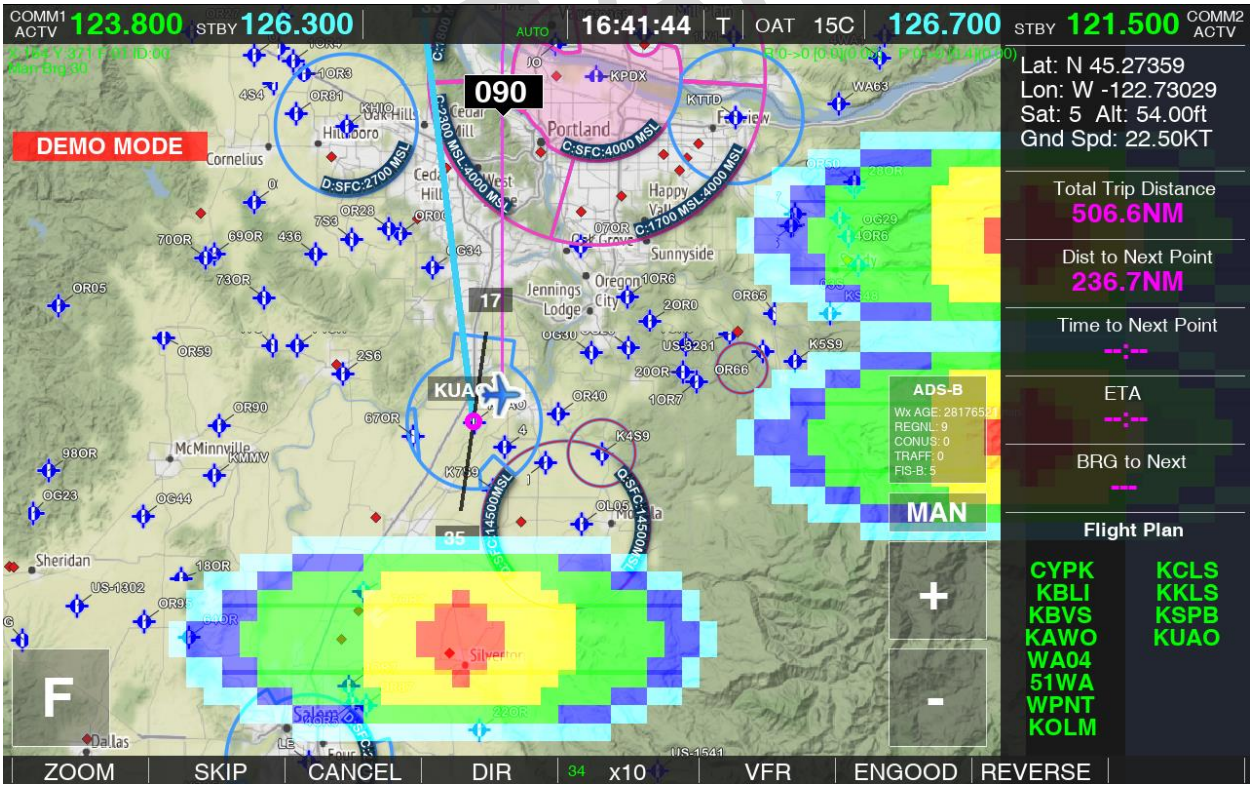


This tab allows seeing all charts available for the airport in EFIS database. Use buttons NEXT and PREV to scroll through available charts. Touch the chart in the middle of display to show it in full screen.



Use fingers to move the chart on display and zoom-in/zoom-out (two finger swipe)

ADS-B Weather on the map



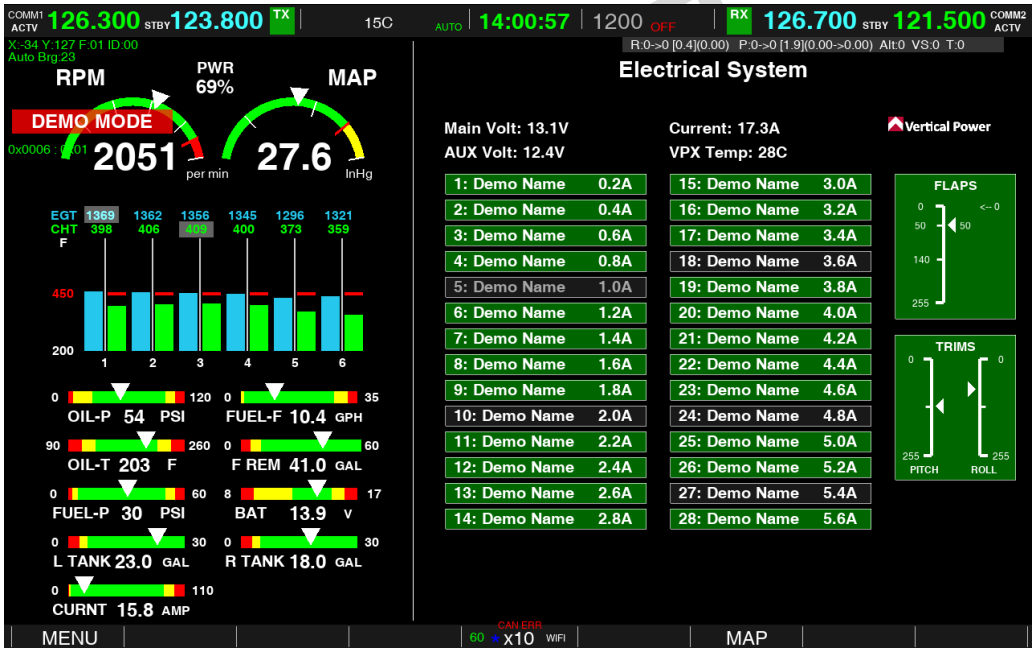
Whenever weather from ADS-B (NexRad CONUS or Regional) is received it will become visible on the map. The composite reflectivity of NexRad product is coded using standard color philosophy.

For information about color-coding refer to section 3.8.2 (Table 3-2) of RTCA DO-267A.

Intensity values 0 and 1 are ignored as considered to be a background (no precipitation).

Vertical Power VP-X Electronic circuit breaker support (VPX Sport and Pro models)

EFIS supports a connection to VP-X ECB models Sport and Pro using RS232 port.
Set under Settings -> External Devices -> COMx port mode to Vert Power VP-X and speed for this port to 57600. Recommended ports are Port2, 3 or 4.



By touching desired circuit breaker, you should be able to see more details about it such are current, status and other.

From the Warnings menu, you should be able to enable the warning for VPX system in case of digital circuit breaker failure. This warning will pop-up as a message on all screens while EFIS is in use.

Audio Panel functionality support

EFIS also supports an audio panels from PS Engineering using RS232 port.
Set under Settings -> External Devices -> COMx port mode to PS Eng Audio Panel and speed for this port to 9600. Recommended ports are Port2, 3 or 4.

New button under “pressure preset” box will appear: “AUDIO”. Pressing this button will activate the audio panel menu on display. In top info line green boxes next to COMM1 and 2 frequencies will show the TX/RX state of each audio channel in panel.

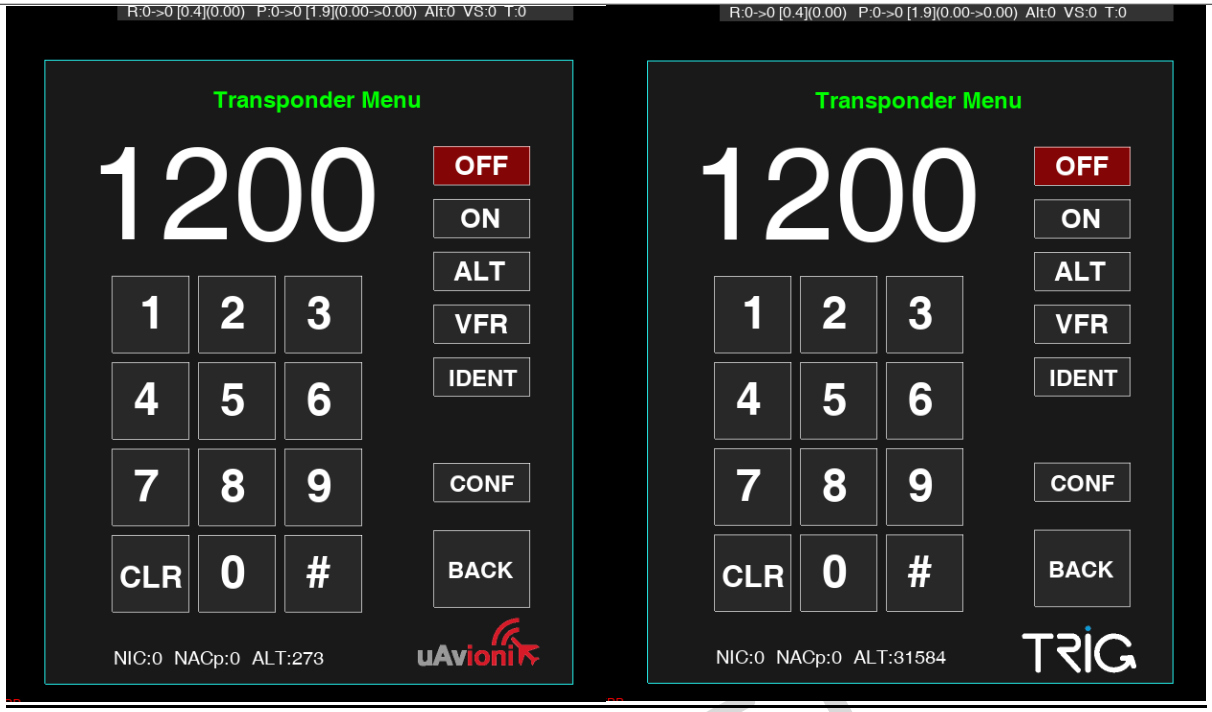
Supported audio panel models are: PMA450 series both remote and panel mount models

Transponder support

EFIS supports remote control for uAvionix TailBeaconX and Trig TT21/22 transponders.

uAvionix TailBeaconX – Set under Settings -> External Devices -> COMx port mode to uAvionix BeaconX and speed for this port to 2400. Recommended ports are Port2, 3 or 4.

Trig TT21/22 - Set under Settings -> External Devices -> COMx port mode to Trig XPonder and speed for this port to 38400. You can only choose port 1 (ELM800) or port 1,2 (ELM1000). Connect transponder to RS485 A and B lines (J2 connector in the back of EFIS).



Please see appropriate section of this document for detailed connection diagrams.

WiFi functionality

When compatible WiFi USB dongle is connected to the EFIS via the front USB port the WiFi menu will become accessible. Also the label “WIFI” will appear in the bottom info line near center.

WiFi menu will allow you to connect to local WiFi access point or compatible ADSB source.

Press Search button to show all available networks.

Select the WiFi network name from the menu by touching it. For password protected network enter the password using on-screen keyboard. Once connected you will see a message on the screen and connection details in the top left corner of the WiFi menu.

Green WiFi sign will appear in the bottom info line near center.

Telemetry functionality

When internet connection is available to EFIS it is capable of sending live data to the ground server via specific time periods. This allows storing all flight parameters including engine data on the ground and review these live while flight is conducted or after landing. This feature can be useful for flight school units where timely access to the airplane engine information, airplane current position and others is important.

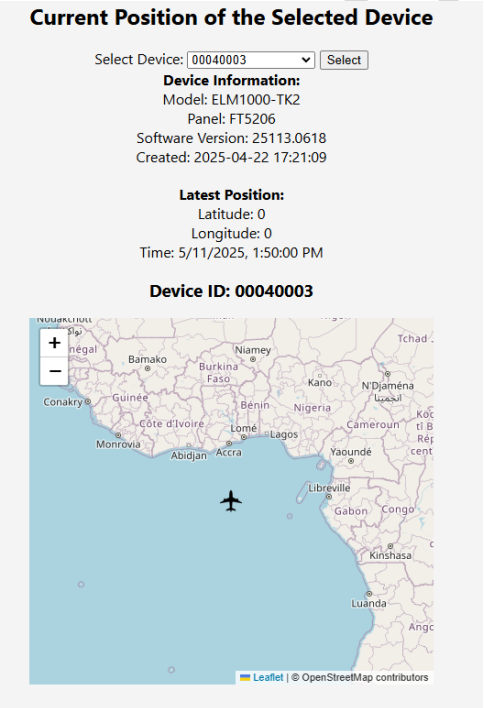
As an example of the internet source in the air can be a Starlink Mini with specific plan which allows to use data while in motion at high speeds. Alternatively, WiFi internet source (phone) can be used.

In the Settings menu, under General set Telemetry to In-flight (sends data only when airplane is airborne) or Engine Running (sends data as engine is started). Set the Telemetry Time to desired time frames when data gets send.

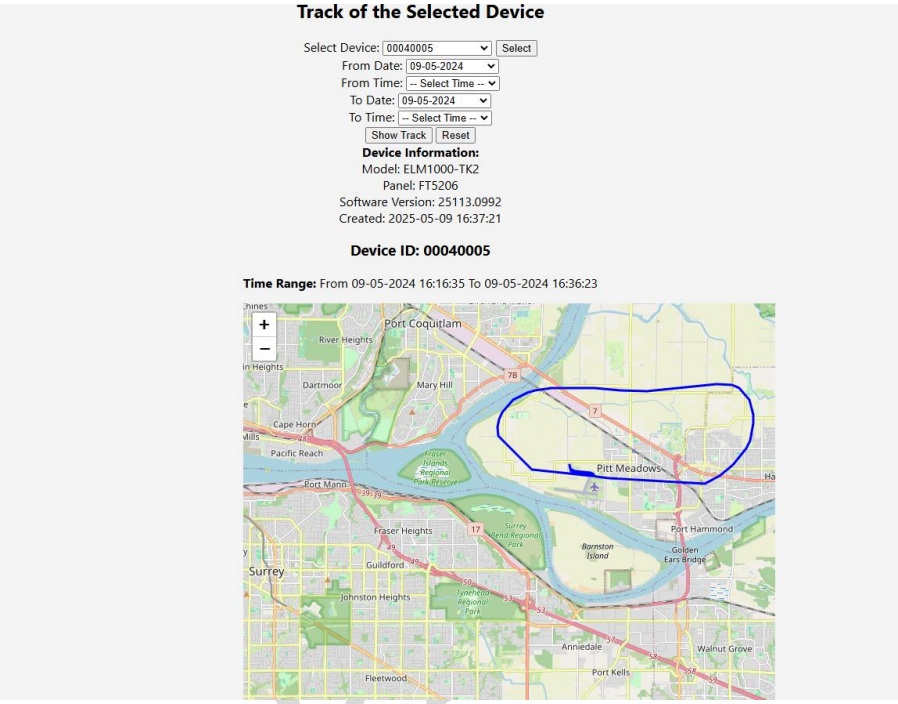
Open: https://www.360avionics.com/telemetry and register an account. Send us an email and request to add your EFIS unit to your account. Once this is done you should be able to use your online Telemetry access.

When logged you will see a menu:

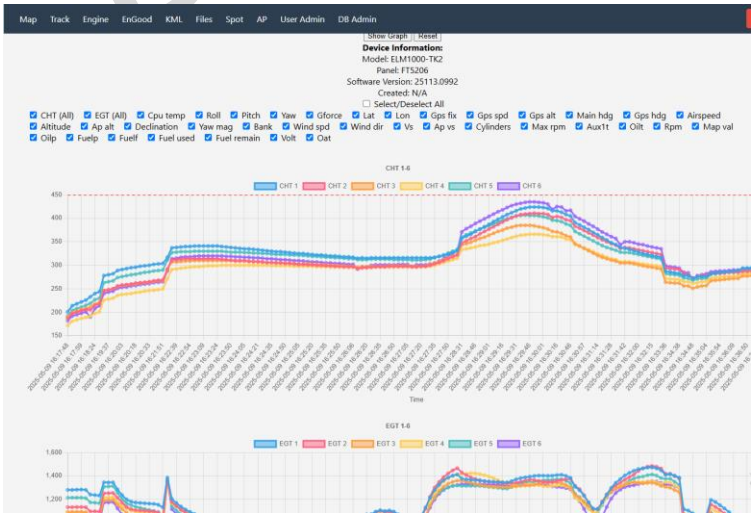
Map – this will show you live position of your aircraft with EFIS



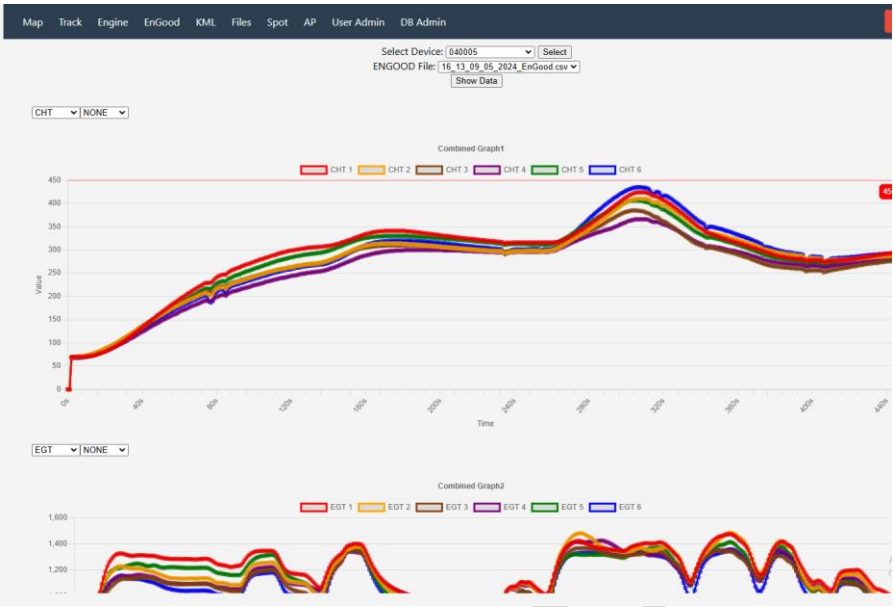
Track – this will show you current position and will draw a track of your trip



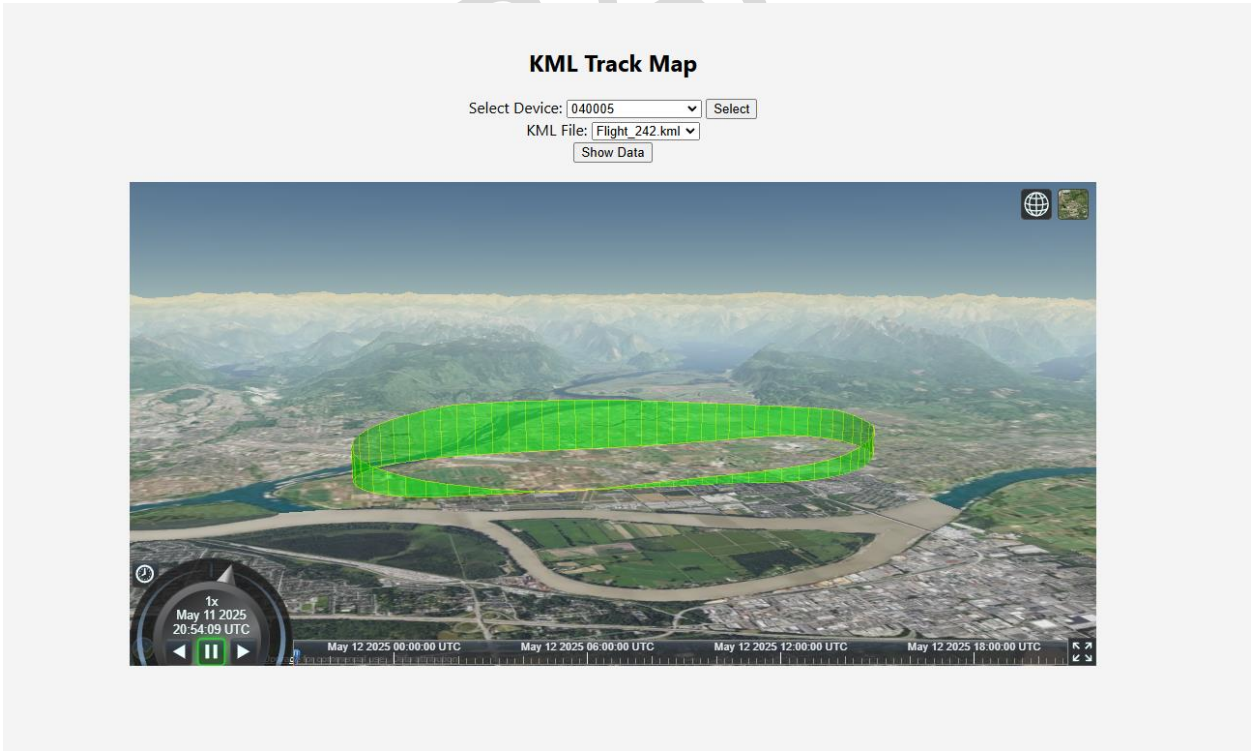
Engine – this will show you all current engine parameters



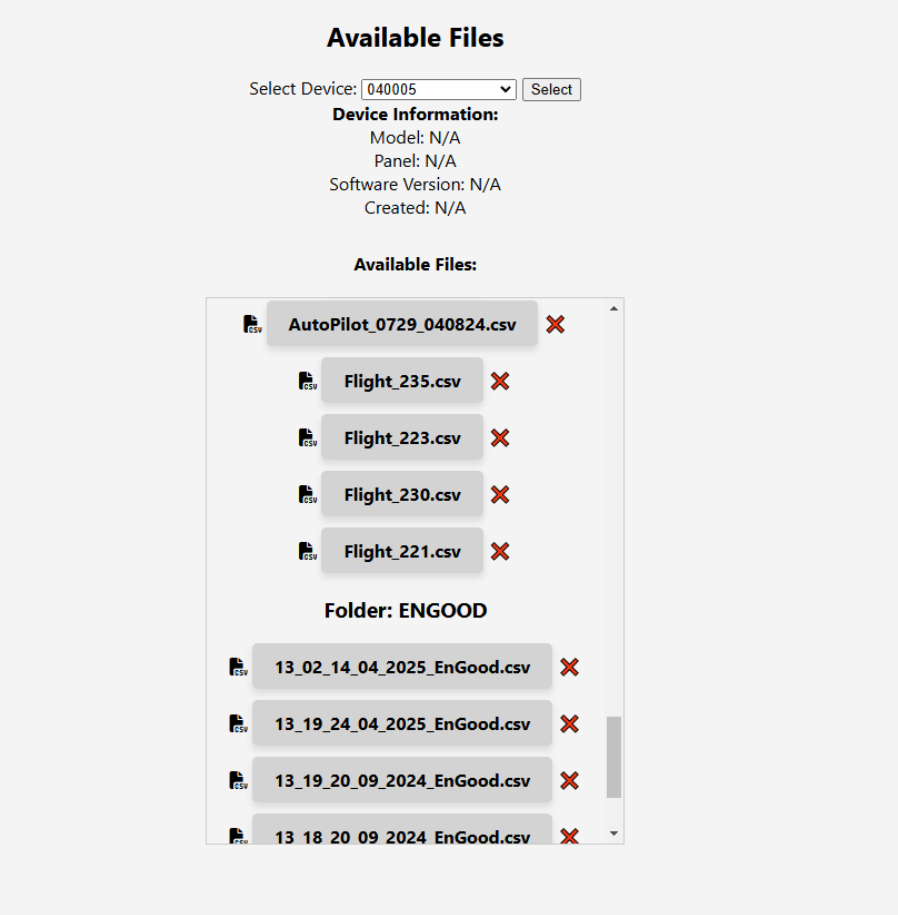
EnGood – this allows you to review your offloaded (via Blackbox-Offload Data menu) engine data from previous flights



KML – this allows you to review your flight path in 3D

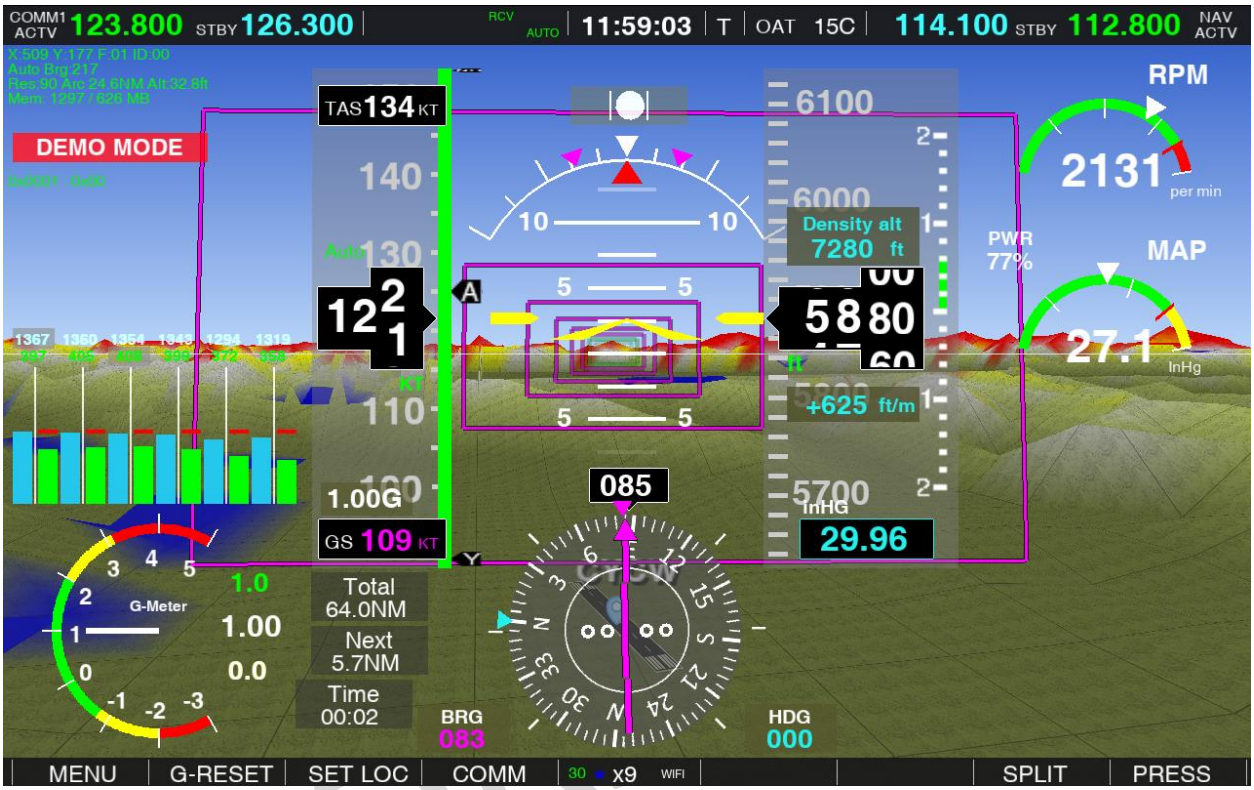


Files – this allows you to access to all your offloaded files. Files can be deleted or downloaded to your local PC.



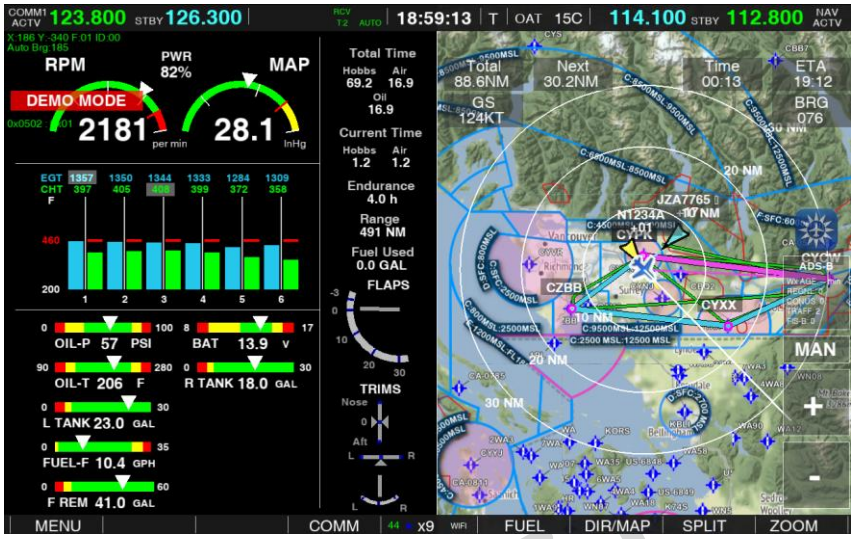
Telematics is a newly developed feature, which will be supported in all upcoming EFIS models.

HITS Highway In the Skies Functionality



When flying toward the destination waypoint with HITS enabled, a virtual tunnel is displayed in synthetic vision, providing a clear and intuitive path that is easy to follow by keeping the aircraft within the tunnel. It can be enabled under Settings -> Display -> HITS

MAP with Engine Monitor Split Functionality

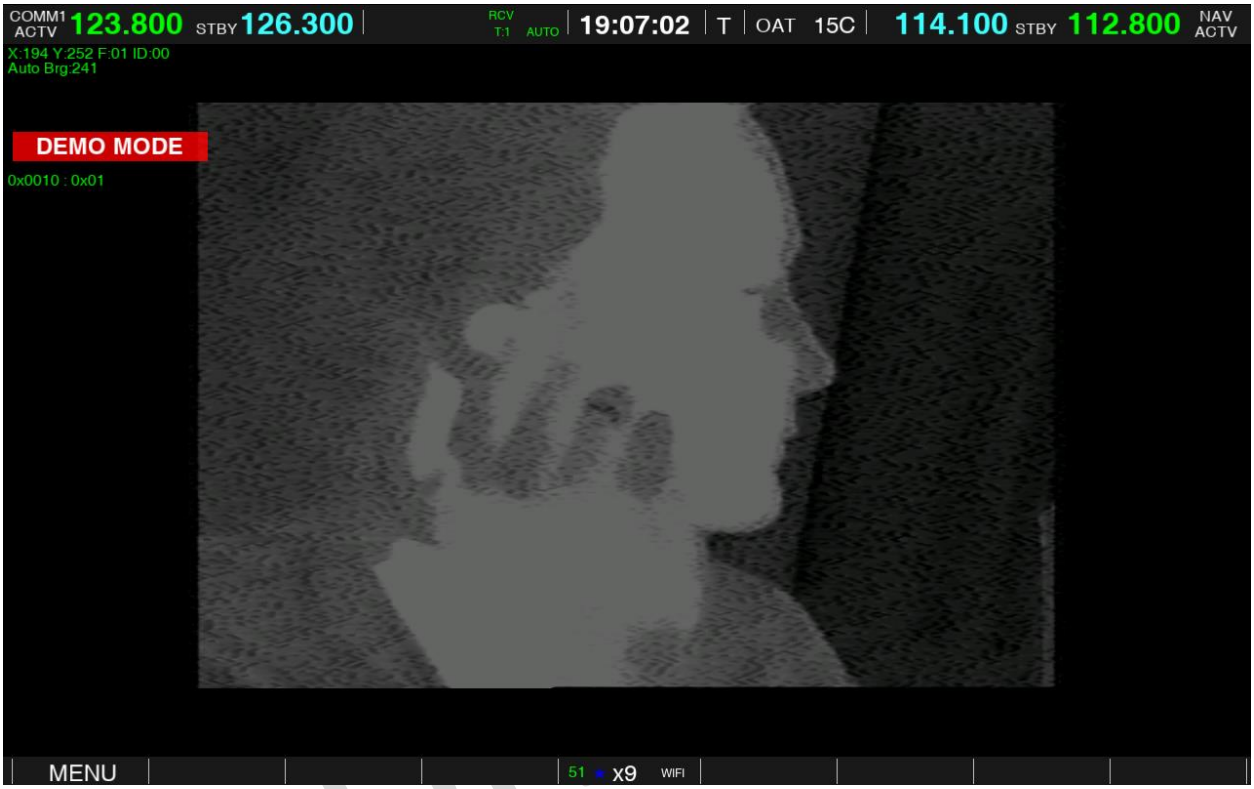


When the EFIS is used as an MFD or PFD, the display can be switched to engine monitor and map split mode. This allows navigation and engine monitoring at the same time, while on the PFD the pilot can focus on all other critical flight parameters.

Day/Night Artificial horizont simulation functionality

When enabled under Display then Synth Visual Sun, the synthetic vision background automatically changes based on day or night time, creating a more realistic three dimensional perspective view.

Analog Camera functionality



This mode allows a standard NTSC camera feed to be displayed on the screen. This function is available only on ELM1000x models.

Airspace Alerts

When the Airspace Warnings feature is enabled in Settings under Warnings Airspace Warnings, the system continuously monitors the aircraft position relative to nearby controlled or restricted airspace. A popup message will be displayed whenever an airspace is detected ahead of the aircraft's current track, or when the aircraft is approaching the airspace vertically from above or below. For airspace located ahead, the alert is triggered approximately five minutes prior to the predicted entry based on current groundspeed and track. For vertical proximity, the alert will activate when the aircraft is within 500 feet above or below the airspace boundaries. This provides the pilot with timely awareness to take appropriate action before entering controlled or restricted airspace.

15. Operation Limitations

- Information from airplane's POH is always supersedes information provided in this manual
- This unit is non-TSO certified and cannot be installed on the certified airplane unless special permission is obtained from regulatory agency/airplane manufacturer.

16. Warranty coverage and limitations

360 Avionics company provides the warranty for this product against defects in materials and workmanship for the duration of 24-month (2 calendar years) from the date of retail purchase of this product by end user ('Warranty Period"). If a hardware defect arises and a valid claim is received within the Warranty Period, at its option and as the sole and exclusive remedy available to Purchaser, 360 Avionics company will either (1) repair the hardware defect at no charge, using new or refurbished replacement parts, or (2) exchange the product with a product that is new or which has been manufactured from new or serviceable used parts and is at least functionally equivalent to the original product, or, at its option, if (1) or (2) is not possible (as determined by 360 Avionics company in its sole discretion), (3) refund the purchase price of the product. Prior a refund is given, the product for which the refund should be provided must be returned to 360 Avionics and becomes 360 Avionics's property.

This Limited Warranty applies only to hardware products manufactured by 360 Avionics company that have the "360 Avionics" trademark, tradename, or logo attached to them at the time of manufacture by 360 Avionics company. The Limited Warranty does not apply to any non 360 Avionics hardware products or any software, even if packaged or sold with 360 Avionics hardware. Manufacturers, suppliers, or publishers, other than 360 Avionics company, may provide their own warranties to the Purchaser, but 360 Avionics and its distributors provide their products AS IS, without warranty of any kind. Software distributed by 360 Avionics company (with or without the 360 Avionics's brand name including, but not limited to system software) is not covered under this Limited Warranty. Refer to the licensing agreement accompanying such software for details of your rights with respect to its use. This warranty does not apply: (a) to damage caused by use with non 360 Avionics company products; (b) to damage caused by accident, abuse, misuse, flood, fire, earthquake or other external causes; (c) to damage caused by operating the product outside the permitted or intended uses described by 360 Avionics; (d) to damage caused by service (including upgrades and expansions) performed by anyone who is not a representative of 360 Avionics or an 360 Avionics Authorized Reseller; (e) to a product or part that has been modified to significantly alter functionality or capability without the written permission of 360 Avionics company; (f)to consumable parts,

such as batteries, unless damage has occurred due to a defect in materials or workmanship; or (g) if any 360 Avionics serial number has been removed, altered or defaced.
To the extent permitted by applicable law, this warranty and remedies set forth above are exclusive and in lieu of all other warranties, remedies and conditions, whether oral or written, statutory, express or implied, including, without limitation, warranties of merchantability, fitness for a particular purpose, non-infringement, and any warranties against hidden or latent defects. If 360 Avionics cannot lawfully disclaim statutory or implied warranties then to the extent permitted by law, all such warranties shall be limited in duration to the duration of this express warranty and to repair or replacement service as determined by 360 Avionics in its sole discretion. 360 Avionics does not warrant that the operation of the product will be uninterrupted or error-free. 360 Avionics is not responsible for damage arising from failure to follow instructions relating to the product's use. No 360 Avionics reseller, agent, or employee is authorized to make any modification, extension, or addition to this warranty, and if any of the foregoing are made, they are void with respect to 360 Avionics company.

17. TSO approval and Liability limitations

This product does not yet have any TSO approvals as a flight instrument. 360 Avionics company as a manufacturer of this product will not help and responsibility for any sort of damage or destruction which can be caused by use of this product to any part of airplane caused by operation of this product.

To the extent permitted by applicable law, 360 Avionics company is not responsible for indirect, special, incidental or consequential damages resulting from any breach of warranty or condition, or under any other legal theory, including but not limited to loss of use; loss of revenue; loss of actual or anticipated profits (including loss of profits on contracts); loss of the use of money; loss of anticipated savings; loss of business; loss of opportunity; loss of goodwill; loss of reputation; loss of, damage to or corruption of data; or any other loss or damage howsoever caused including the replacement of equipment and property, any costs of recovering, programming, or reproducing any program or data stored or used with 360 Avionics company products and any failure to maintain the confidentiality of data stored on the product. Under no circumstances will 360 Avionics company be liable for the provision of substitute goods or services. 360 Avionics company disclaims any representation that it will be able to repair any product under this warranty or make a product exchange without risk to or loss of the programs or data. Some jurisdictions do not allow for the limitation of liability for personal injury, or of incidental or consequential damages, so this limitation may not apply to you.

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