ELM310 EFIS

Specification and Installation Instructions

Rev1.0

May 2025

Models

- EFIS **ELM310**

Note:

ELM310 EFIS is a non-TSO certified flight instrument.

Credits

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For inquiries regarding the contents of this manual or the products described herein, please contact us at info@360avionics.com.

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Revision History

Below is the document's revision hi story.

Revision #	Revision Date	Comments
Rev 1.0	May 15, 2025	Initial Release of this document

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1. Introduction

The **ELM310 Electronic Flight Instrument (EFIS)** is an advanced device engineered to provide critical flight information for pilots of experimental aircraft. Although not TSO-certified, the ELM310 EFIS delivers exceptional functionality and is designed to fit into standard aviation panel openings of **3 1/8"**.

This product manual outlines the **features**, **installation**, and **operation** of the ELM310 EFIS, providing essential guidance for its optimal use.

Please note: Throughout this document, the terms **"ELM310," "device," "unit,"** and **"instrument"** are used interchangeably to refer to the ELM310 EFIS.

2. General Description

The **ELM310 EFIS** is an advanced electronic flight instrument consisting of a **microcontroller**, **LCD display**, durable **housing**, and various integrated sensors. These sensors include a **gyroscope**, **accelerometer**, **static and dynamic pressure sensors**, and a **GPS receiver**. Additionally, two external sensors— a **GPS antenna** and an **Outside Air Temperature (OAT) sensor**— complement the system. The built-in LCD display provides a clear interface for presenting all flight-related data.

The **ELM310 EFIS** is composed of two distinct modules:

1. **Graphics Processing Unit (GPU)**: Responsible for controlling the LCD display and managing all output data.
2. **Sensors Processing Unit**, also known as the **Attitude and Heading Reference System (AHRS)**: Handles data from all integrated sensors, including the gyroscope, accelerometer, and pressure sensors.

Each processing unit operates with its own independent firmware, ensuring seamless and efficient functionality. These units communicate through high-speed, dedicated protocols to synchronize data processing and display.

For user control, the front panel is equipped with **dual rotating push knob**, enabling intuitive operation. The device also features a **MicroSD card slot**, located on top of the display, for map storage, software updates and other essential data.

3. Technical Specifications

Description	ELM310
Input voltage	+10 to +28 Volts
Power consumption	2.0W
Current	0.6A at 12V
Unit size	95mm x 95mm x 100mm (with knobs)
Weight	150 g
Operation humidity	25% to 90%
GPU processor	ARM Multicore
Sensors processor	ARM
System startup time	26 sec
Display	3.5” ultra-bright 640x480px
SD Card slot	Standard MicroSD 64Gb max FAT32
Panel opening	3.125” (79mm)
External communication	CAN bus (proprietary protocol) and RS232
Pitch/Roll range	360 degrees
Altitude range	-1000ft to 32000ft
Vertical speed range	10000ft/min up/down
Receiver	GPS receiver high sensitive Ublox
Antenna	Mag mount GPS with male SMA connector
Pitot/Static lines	¼” Quick connect
Manufacturer	360 Avionics Company

4. AHRS (sensors processing unit)

The **Attitude and Heading Reference System (AHRS)** utilizes data from multiple sensors, including an **accelerometer**, **gyroscope**, **dynamic pressure sensor**, and **GPS**. These sensors enable accurate calculations of attitude and heading, including **roll**, **pitch**, **yaw**, and **heading** information. In some versions of the unit, additional sensors such as an **Outside Air Temperature (OAT) sensor** or **magnetometer** may be integrated to further enhance AHRS calculations.

The AHRS continuously processes data from these sensors using advanced mathematical algorithms and digital filtering to estimate the current **Roll**, **Pitch**, and **Yaw (RPY)**. These parameters are then visually displayed via the artificial horizon. While the AHRS performs highly accurate calculations, it is important to note that, depending on sensor inputs and various external factors, some **RPY errors** may occur. To minimize such errors, **GPS data** and **True Airspeed (TAS) or Calibrated Airspeed (CAS)** are required, particularly during banked turns. It is highly recommended to keep the **GPS antenna** connected at all times, as **GPS course** and other critical parameters significantly improve the accuracy of attitude estimations.

Reminder for Pilots: Maintaining **coordinated flight** is crucial for accurate RPY estimation. While short periods of uncoordinated flight may not cause significant errors, extended uncoordinated flight will lead to considerable inaccuracies in RPY calculations.

In the event of uncoordinated flight, RPY parameters may display incorrect values, meaning the artificial horizon may not reflect the actual flight attitude. Once coordinated flight is resumed, it typically takes **20-35 seconds** for the system to recalibrate and return to accurate RPY indications.

Steep banking turns (greater than 50-55^{o}) may also introduce errors in RPY output, as certain parameters may exceed the operational thresholds of the sensors. Following the return to coordinated flight, the system will require **20-35 seconds** to realign the artificial horizon and provide accurate RPY data.

During **aerobatic maneuvers**, the system may experience substantial errors in attitude and horizon indications due to the physical limitations of the sensors. After normal flight is reestablished, it may take **more than 1 minute** for the AHRS to stabilize and present accurate attitude information on the display.

5. Pitot and Static systems

The **ELM310** is equipped with highly accurate **dynamic** and **static pressure sensors**, featuring dedicated **Pitot** and **Static ports** located on the back of the unit. The **Pitot sensor** serves as the primary source for airspeed data, ensuring precise airspeed readings during flight. In situations where the Pitot sensor's airspeed information is deemed unreliable—due to internal error thresholds defined by the manufacturer—the system automatically switches to **ground speed** derived from the **GPS sensor**. An appropriate alert will be displayed when this occurs to notify the pilot of the sensor switch.

For models equipped with an **Outside Air Temperature (OAT) probe**, **True Airspeed (TAS)** functionality is available. The OAT sensor enables advanced calculations and additional enhanced features in this version of the unit, providing a more comprehensive suite of flight data.

The **Pitot** and **Static ports** are designed with **¼" quick-connect fittings** to facilitate easy and secure installation.

Important Note: After connecting the Pitot and Static lines to the unit, it is crucial to perform a **Pitot/Static leak test** on the aircraft. This ensures that all connections are properly sealed and plumbed, minimizing the risk of inaccurate readings.

Both the **airspeed** and **altitude sensors** are factory-calibrated, requiring no further calibration after installation.

6. LCD Display

The **ELM310** is equipped with a **3.5" TFT LCD display** featuring a resolution of **640 x 480 pixels**, ensuring excellent **color accuracy** and **contrast**. The display is designed with **high-brightness technology** to remain fully readable in **direct sunlight**, making it ideal for cockpit environments exposed to varying light conditions. This display is a touch enabled means you can control with some functions with the finger.

Additionally, the **ELM310** incorporates built-in **ambient light sensor** on the front panel. That sensor enable the **auto-brightness** functionality, which can be controlled through the **Settings Menu** under **General Config > Display Brightness (Disp Brg)**. When the auto-brightness feature is activated, the display will automatically adjust its brightness in response to ambient light conditions—**increasing brightness** in sunlight and **dimming** in low-light or night environments.

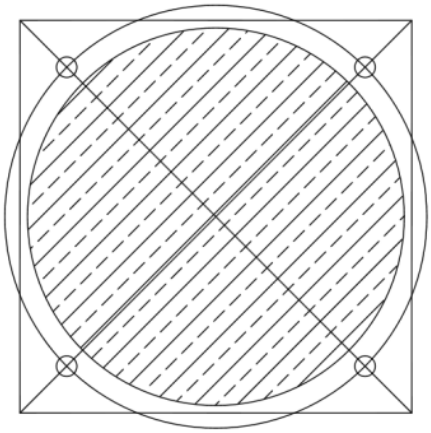
⚠ Display is touch enabled. Avoid pushing hard on the display with finger or other objects and avoid cleaning the displays with abrasive chemicals not designed for cleaning of LCD displays. To utilize the touch functionality it is enough just a slight touch of the position on display.

7. Product installation

7.1 Space requirements

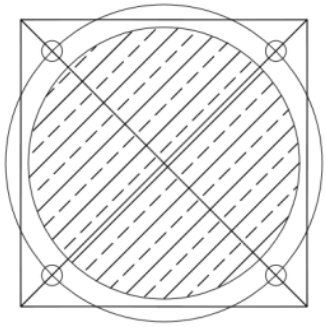
The **ELM310** is designed to fit seamlessly into a **3.125-inch opening** in the aircraft instrument panel. The mounting bracket features **four threaded #6-32 holes** for secure attachment. While using **three mounting points** is generally sufficient to firmly hold the instrument in place, it is recommended to utilize **all four** mounting points whenever possible for optimal stability and security.

⚠ Important installation warning: Excessive length of mounting screws may damage the LCD display. Carefully read section below to see what kind of screws are required for installation.



3 1/8 (80mm) Instrument Hole

1. Draw a 3.25" X 3.25" Square
2. Scribe 2 diagonal lines corner to corner
3. Using the center of the lines, scribe a 3.5" diameter circle.
4. At the intersection of the diagonals and the 3.5" dia circle drill 4 holes to clear #8 screw (.170" dia.)
5. Using the center of the diagonal lines cut a hole with a hole saw 3.125" dia.



2 1/4 (57mm) Instrument Hole

1. Draw a 2.375" X 2.375" Square
2. Scribe 2 diagonal line corner to corner
3. Using the center of the lines, scribe a 2.625" diameter circle.
4. At the intersection of the diagonals and the 2.625 dia circle drill 4 holes to clear #8 screw (.170" dia.)
5. Using the center of the diagonal lines cut a hole with a hole saw 2.250" dia.

7.2 EFIS Installation

⚠ Important installation warning: Excessive length of mounting screws may damage the LCD display or internal board. Carefully read the section below to see what kind of screws are required for installation.

Mounting Screw Length Notice for ELM310

Due to the design of the ELM310, special attention must be paid to the length of the #6-32 machine screws used for mounting the instrument.

- For the **ELM310**, the screw should not extend more than **5 mm (3/16" to 7/32")** into the EFIS front panel.

Example:
For a front panel with a thickness of **2 mm**, use:

- A **#6-32 machine screw no longer than 7 mm** for the ELM310

The use of longer machine screws for the mounting holes in ELM310 will likely cause the machine screw to reach the surface of the LCD display or internal board, and damage it.

Please note that such damage is not covered by warranty for the product!

7.3 Proper alignment of the instrument

For optimal performance of the **ELM310**, it is essential that the instrument panel is aligned **perpendicular** to the aircraft's flight path. To ensure accurate functionality of the AHRS sensors (accelerometer and gyroscope), the **X-axis** of the device must be oriented in the direction of the flight path, the **Y-axis** perpendicular to the flight path, and the **Z-axis** perpendicular to the ground.

If the instrument panel is **not perpendicular** to the flight path, the AHRS sensor axes will be misaligned, leading to incorrect operation. In such cases, the device will require calibration or leveling. For detailed instructions on the AHRS sensor leveling procedure, please refer to the relevant section of this manual.

7.4 Connections

The **ELM310** features various connectors located on the backside of the unit, including plumbing connectors (¼"), a GPS antenna port, and the main power/interface connection. For all electrical connections, the device employs a **26-pin D-SUB male connector** positioned centrally. A **female D-SUB connector** is included in the kit for all necessary wiring. For optimal performance and reliability, it is recommended to use wire gauges between **22 AWG** and **24 AWG**.

Quick connect ¼" Pitot line is marked as **'P'** and Static line is marked as **'S'** on the back of the unit (or on the connector's body). It is recommended that the installer labels the tubing connected to the two ports. This will ensure that correct connections will be made, should unit be removed / reinstalled.

GPS Antenna:

The GPS port uses SMA type female connector. Any type of GPS antenna with SMA male connector and 3.3V-5V voltage level can be used. Magnetic mount GPS antenna is included with the kit. The best location for the GPS antenna would be on top of the instrument panel under the windshield window where best and unobscured sky visibility is achieved. GPS antenna should never be mounted underneath the panel or behind the panel.

In case when antenna is installed outside of the airplane on the roof, it must be secured to the surface using a very strong adhesive, to ensure that the antenna will withstand strong winds. If planning to install the GPS antenna on the roof of the airplane, please seek advice from an experienced aviation maintenance specialist.

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

26-pin Main connector pinout:

1 – A/C Power **+V** (positive)	14 – RS-232 Tx2 (not in use)
2 - A/C Power **+V** (positive)	15 – RS-232 Rx2 (not in use)
3 – CAN bus Low	17 – GND (OAT-, RS232)
4 – CAN bus High	19 – OAT sensor signal input
7 – RS-232 Tx1 (not in use)	25 – A/C Power **GND** (negative)
8 – RS-232 Rx1 (not in use)	26 – A/C Power **GND** (negative)
10 – OAT sensor Power+	
13 – Audio OUT+ (not in use)	

For optimal performance, it is recommended to use **22 AWG** wire for all power connections (pins **1, 2, 25, and 26**). For all other connections, **24 AWG** wire is acceptable. It is advisable to use military specification (milspec) wires for all connections to ensure high quality and robustness of the wiring.

The kit includes a **female D-SUB 26-pin connector header** with options for soldering or crimping the pins. A plastic enclosure for the connector header is also provided. If soldering wires, please ensure that they are securely attached without any cold solder joints.

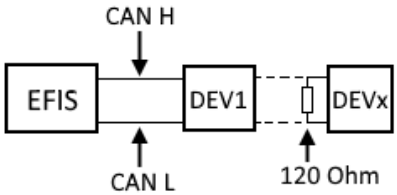
CAN Bus termination:

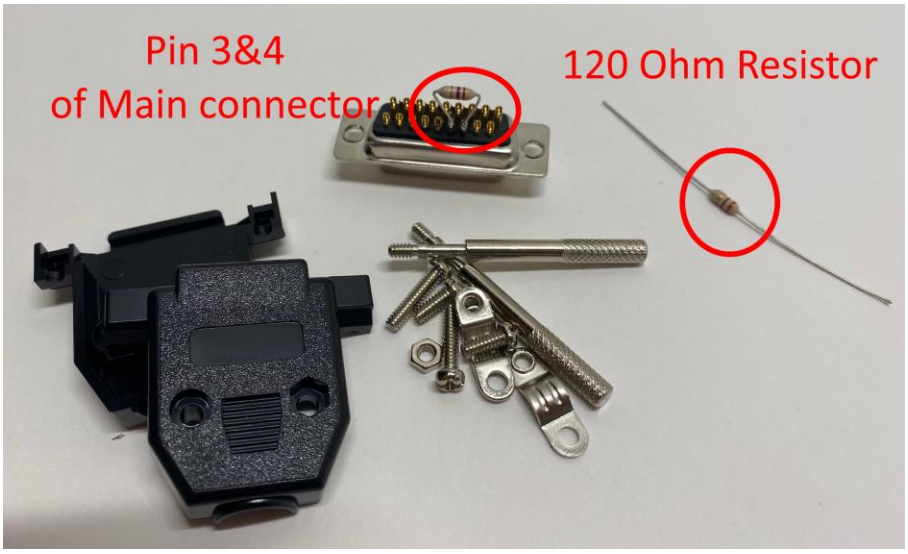
The **ELM310** can be installed in the aircraft in conjunction with compatible **360 Avionics** external magnetometers and/or engine monitors, connecting them to a single **CAN** line.

When the **ELM310** is installed independently (without an external magnetometer, **VICS** voice module, or engine monitor module), it is necessary to install a **120 Ohm termination resistor** (included with the kit) between **pin 3** and **pin 4** of the CAN line. This resistor must be securely installed on the connector and left within the enclosure.

If ELM310 comes with pre-assembled power cable do NOT add 120 Ohm resistor.

When an external module (DEV) such as the **EnGood engine monitor**, **VICS voice information system**, or external magnetometer is connected, a CAN bus termination resistor must be installed to properly terminate the CAN bus at the end of the line. Please refer to the diagram below for proper configuration.





Power bus:

Use AWG22 or less gauge of wires to connect power to the unit (pins 1,2,25,26). It is required to have 3A circuit breaker on power line for the ELM310. 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.

Power line with circuit breaker is usually connected via Avionics master switch or via Main master switch depending on the airplane configuration.

OAT Sensor (probe):

The **Outside Air Temperature (OAT)** sensor is an optional component that can be connected to the **ELM310**. When the OAT sensor is installed, additional data such as **True Air Speed (TAS)** and OAT will be displayed.

The OAT sensor consists of a digital probe housed in a threaded aluminum casing. The standard cable length is **59 inches (150 cm)**, which is typically sufficient for installation on the same side as the **ELM310** unit. While the OAT cable can be extended to your desired length, it should not exceed **14.76 feet (4.5 meters)**.

If an extension is necessary, ensure that all wire connections are properly extended and insulated to avoid electrical short circuits and potential damage to the unit.

<u>OAT sensor is connected to main 26pin connector pins:</u>

10 – OAT sensor power
17 – GND
19 – 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.

<u>OAT pinout:</u>

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 OAT sensor is installed in a position where it cannot measure real outside temperature (installation inside of the cabin, near heat source, etc) the OAT, TAS, Density Altitude and certain other information will be inaccurately calculated and displayed by **ELM310**. It is possible to Disable OAT sensor from "Settings" menu > "External devices > Use OAT" submenu.*

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 **ELM310** and connect the wires to the appropriate pins in the **26-pin connector**. Details regarding the sensor pinout and the 26-pin main connector are provided above.

RS-232 Ports:

Pins used for the ports

7 – RS-232 Tx1
8 – RS-232 Rx1
14 – RS-232 Tx2
15 – RS-232 Rx2
17 – GND (RS232)

RS232 ports are not active and not functional in current software version.

EFIS Menu and functions controls via the rotating knob.

The **ELM310 EFIS** is equipped with a dual concentric rotary control system, consisting of an **outer knob**, an **inner knob**, and an integrated **push-button** function on the inner knob. These provide intuitive access to all EFIS modes, menus, and page-specific features.

1. Outer Knob (Large Ring)

- Used primarily to **switch between EFIS display modes**
- **Rotate clockwise (CW)** or **counterclockwise (CCW)** to cycle through available operating modes (e.g., PFD, Map, Engine, etc.)
- Changes take effect immediately and are shown on the main display

2. Inner Knob (Small Center Knob)

- Used for **page-specific adjustments and menu navigation**
- Functions vary depending on the active page and context

3. Push-Button (Inner Knob Press)

- **Short Press:** Opens the **Page Function Menu**, which appears as a small overlay at the bottom of the screen.
    - Rotate the inner knob to scroll through available options
    - Press the knob to select a highlighted function
    - To exit the menu, scroll to **"Back"** and press the knob again
- **Long Press (3 seconds):** Opens the **Main Menu**, providing access to global settings and system functions.

This control system is designed to offer maximum flexibility with minimal complexity, ensuring that critical functions are accessible even in turbulent conditions or when wearing gloves.

EFIS functionality modes change using touch display.

The **ELM310 EFIS** features a responsive touchscreen interface that allows pilots to quickly switch between display modes using simple swipe gestures.

Mode Switching via Horizontal Swipes

- **Swipe left or right** across the screen to cycle through the main functional modes of the EFIS.
    - For example:
      While in **Artificial Horizon mode**, swiping **right to left** will switch to **HSI mode**.
      Swiping again will transition to **Time mode**, followed by additional available modes.
    - **Swiping left to right** navigates in the reverse direction, returning to previously viewed modes.

Mode-Specific Swipe Actions

- In **HSI mode**, swiping **upward** (from bottom to top) toggles between:
    - **ARC display mode**
    - **Compass rose display mode**

These intuitive gestures are designed to enhance situational awareness and minimize workload by allowing fast, hands-on access to essential information—without the need to use rotary knobs or press buttons.

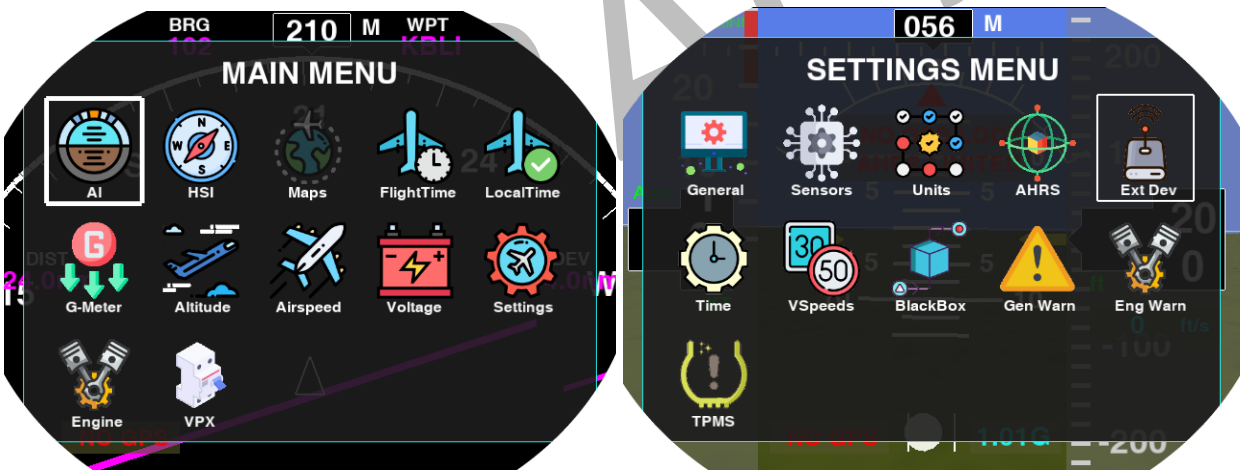
1. AHRS sensors leveling procedure and Pitch Adjust

1.1 AHRS sensors leveling procedure

In most airplanes, the instrument panel is perpendicular to both the flight path and the ground when the aircraft is leveled, such as during normal cruise flight. During production, each **ELM310** is calibrated for this installation, and the appropriate offset values are recorded in the device's memory. Each time the device is powered on, these offset values are automatically applied for calibration. However, there may be instances when re-calibration of the sensors is necessary.

If re-calibration is required, please follow the steps below:

1. **Level the Airplane:** Ensure that the aircraft's position is aligned with straight and level flight (cruise attitude). The airplane must be leveled in both the pitch and roll axes. Consult with your aircraft maintenance engineer if needed, and use jacks to level the airplane when applicable.
2. **Power On the ELM310:** Turn on the **ELM310** and wait for it to boot up until the **AHRS** is ready.
3. **Access the Main Menu:** Once the device has booted, if the artificial horizon indicator is not displayed on the screen, open the Main Menu by pushing and holding the knob for 3 seconds and then selecting "**Settings Menu**" by rotating the inner knob and pressing on it.



1. Rotate the 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.*

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

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

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

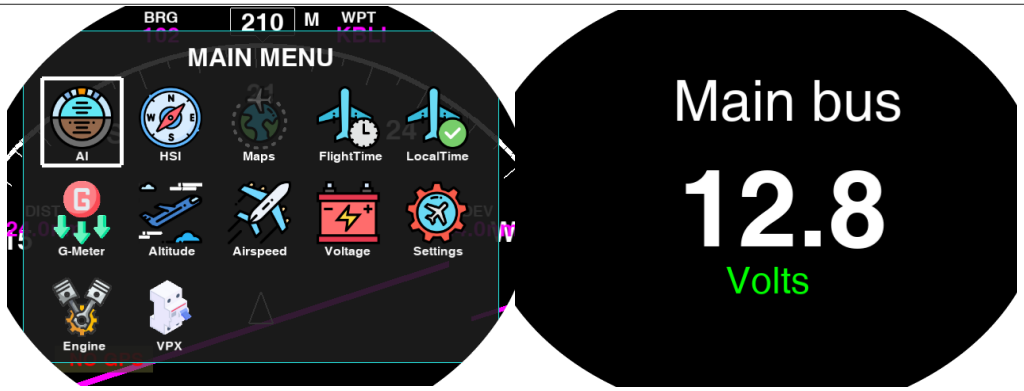
5. After 3-4 seconds the following message ***‘Updating Please Wait’*** will show up on the display.

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

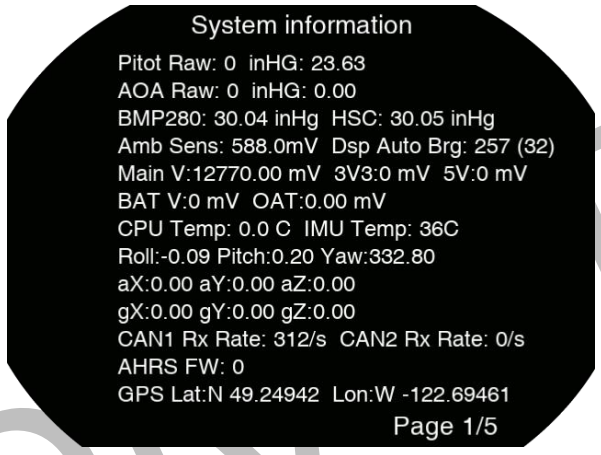
7. Push and hold the knob to return back to the “Artificial Horizon” mode.

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

9. To verify that calibration was completed successfully, open ‘Info Page’. To do so, switch to Voltmeter mode by first pushing the knob and then selecting Voltage from menu, then press the knob to access functions menu and select “Info” from there.



10. Ensure that Roll and Pitch are at “zero” or near it. Yaw does not need to be at “zero”.



11. Calibration is completed and verified.

12. Exit the “Info Page” by pressing the knob to access the functions menu and then ‘Volt”.

1.2 Pitch Adjust

In some cases, you may only need to adjust the pitch for a single flight. In this case, you may want to use “Pitch Adjust” option instead of “AHRS sensors leveling procedure”.

1. In the “Settings Menu” select “General Config”, then “Pitch Adjust”
2. Chose the correct number of “degrees” to compensate for the pitch. If on the ‘artificial horizon indicator” the nose is pointing downward, select a number below “0”; if on the artificial horizon indicator, the nose is pointing “upward”, select a number above “0”.

Pitch adjust will reset to “0” when the device is powered “OFF”.

2. 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 ELM310 EFIS. In case of any malfunction, the unit should be returned to the manufacturer for test and repair.

3. Firmware Update Procedure

The **ELM310 EFIS** operates using two separate internal firmware systems: one for the **GPU (graphics processing unit)** and one for the **AHRS (attitude and heading reference system)**. Each unit is preloaded with the latest available firmware at the time of manufacturing.

To maintain optimal performance and take advantage of the latest features and stability improvements, **firmware updates can be performed via the front USB port** or microSD card slot located **above the display**.

⚠ *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:

Step 1: Download the Firmware

- Obtain the latest firmware update from www.360avionics.com
  or by contacting **360 Avionics technical support**.

Step 2: Prepare the SD Card

- Format a **microSD card** (FAT32, recommended size: **8–16 GB**).
- Create a folder named Updates in the root directory of the SD card.
- Copy the firmware file (usually with a **.360** extension) into the x:/Updates/ folder.
- Ensure **no other files** are present in the Updates folder.
- **Power OFF** the ELM310 before inserting the SD card into the upper slot.

Step 3: Power On the ELM310

- Switch on the ELM310 EFIS.
- Ensure your battery has sufficient charge or is connected to a **trickle charger** capable of sustaining at least **30 minutes** of operation.

Step 4: Access the Update Menu

- Navigate to:
  Main Menu → Settings → Black Box → Software Update

- Press the control knob, rotate to **Activate**, then press again.

Step 5: Search for Updates

- Press the knob to open the function menu, select **Search**, then press again.
- The system will first search the SD card for update files.
  If connected to Wi-Fi, it will also check for available **online updates**.

Step 6: Select the Update

- Rotate the knob to highlight the desired update (e.g., **Main EFIS Software**, typically listed at the top).
- Press the knob to open the function menu and select **Select**.
  A green checkbox will appear next to the selected item.
- You may select **multiple update files** at once if instructed by support.

Step 7: Start the Update

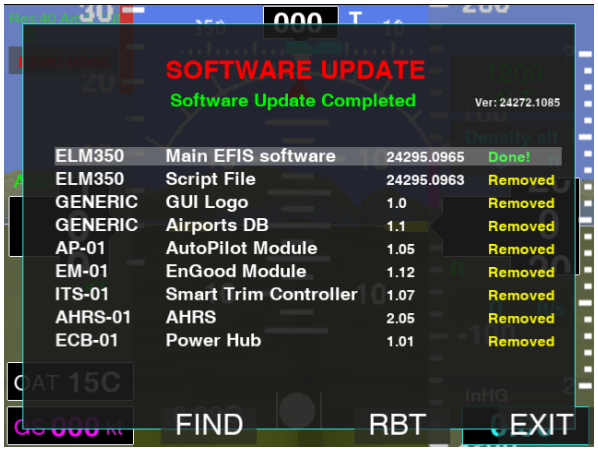
- With the update(s) selected, press the knob and choose **Update** from the function menu.
- Press the knob again to begin the installation process.

Step 8: Reboot After Update

- Once the update is complete, press the knob again, select **Reboot**, and press once more.
- The ELM310 will restart and apply the new software.

 Please note: The reboot may take up to **3 minutes** to fully initialize after a firmware update.

Following these steps ensures your ELM310 EFIS remains up-to-date with the latest features, stability improvements, and system enhancements.



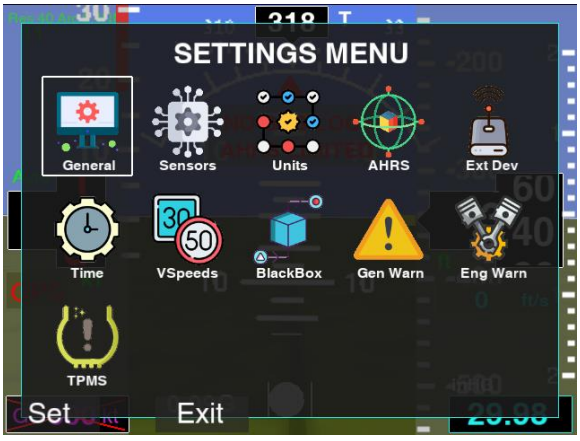
4. Operations

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 regardless of '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:*

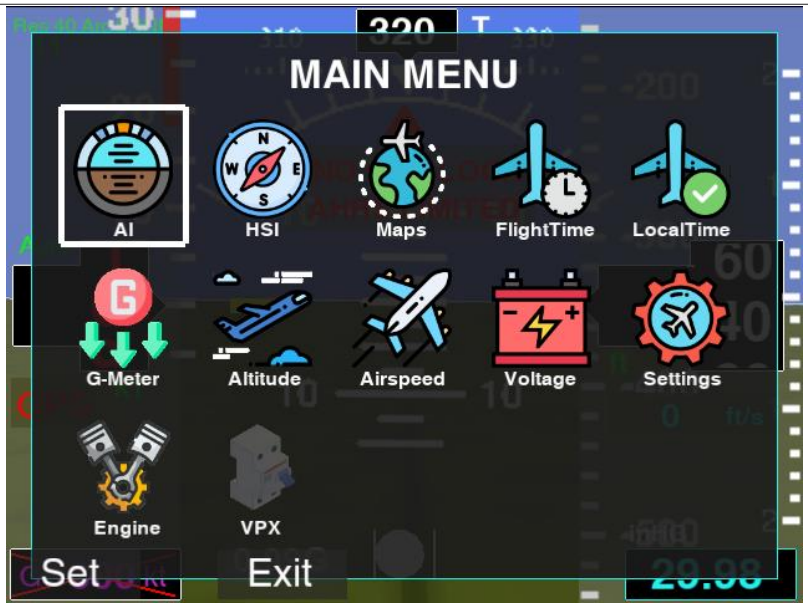
1. *Access the “Settings Menu” by pressing and holding the knob then opening a Settings menu*
2. *Open Submenu V-Speeds by rotating the knob and then pushing on it*
3. *Navigate to “Speed Vr” menu option and select it by pushing the knob once*
4. *The selector will turn blue*
5. *Rotate the knob clockwise 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 and holding the knob down.

11.2 EFIS Operation Modes

ELM310 has the following modes of operation:

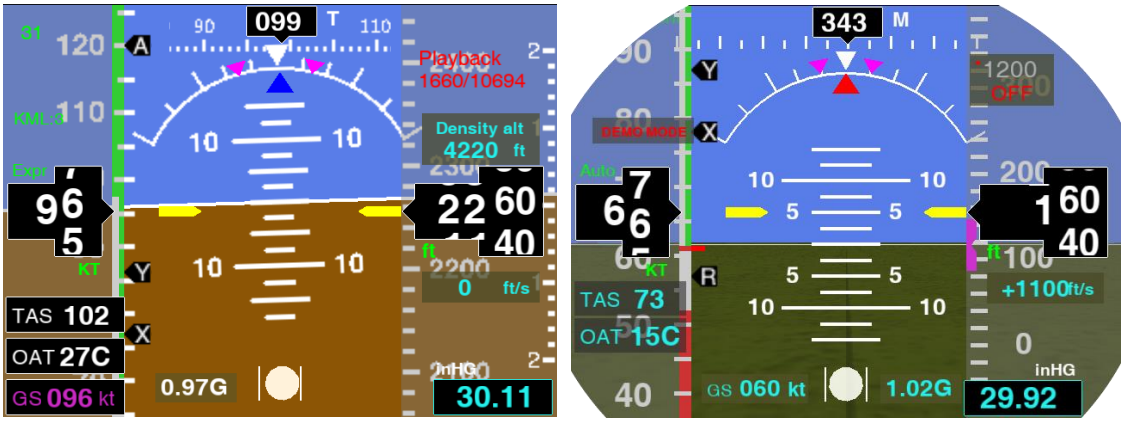
- Artificial horizon indicator
- Compass/HSI (arc mode)
- Map (Sectional/Global) ***only available for model ELM312***
- Flight Time
- Local Time
- G-meter
- Altimeter
- AirSpeed
- Voltmeter
- Oil life
- EnGood Engine Monitoring (*limited to monitoring functionality)
- VPX Integrated Circuit breakers support



By default, the ELM310 EFIS powers up displaying the **Artificial Horizon** screen. However, this behavior can be customized by navigating to:
Settings Menu → General Config → Start Mode,
where you can select a different default startup display according to your preferences.

Artificial horizon indicator

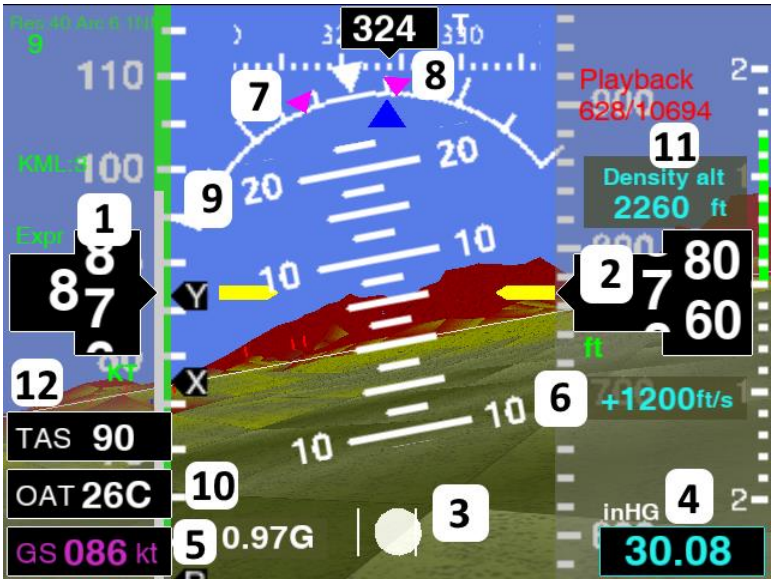
Artificial horizon in ELM310 has two modes of operations: Normal and Experimental 3D with synthetic view. Please note that Synthetic view mode is currently experimental only. ***Runway view is only available for ELM312 model.***



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 in ELM312 model.

Terrain and obstacles databases are required for your region to properly operate artificial horizon in 3D Synthetic vision mode. These databases can be updated using "***Software Update***" menu using a procedure similar to a firmware update. Refer to section *10* for Firmware Update Procedure.



The **Artificial Horizon Indicator** on the ELM310 EFIS—available in both **Normal** and **3D Synthetic View** modes—provides real-time visualization of critical flight data. Below is an overview of each parameter displayed on the screen:

1. Current Speed

- Displays either **Ground Speed** (in red) or **Air Speed** (in white), depending on the configured airspeed source.
- Speed units (e.g., knots, km/h, mph) are shown **below the speed tape** in green text.

2. Current Altitude

- Located on the **right side** of the screen.
- Displays the aircraft's current altitude; units are shown below the tape in green.
- If an OAT (Outside Air Temperature) sensor is connected and enabled, **Density Altitude** is shown **above the altitude tape**.

3. Slip/Skid Indicator

- Found at the **bottom center** of the display.
- The ball shows whether the aircraft is flying **coordinated**; when the ball is centered inside the gate, the aircraft is properly balanced.

4. Ground Pressure (Barometric Setting)

- Displayed at the **bottom right** of the screen.
- Units are shown **above** the pressure value.
- Adjust the setting using the rotary knob (CW/CCW) to match barometric pressure from ATIS or METAR.

5. Ground Speed

- Located at the **bottom left** of the screen.
- Displays ground speed with a **"GS"** label.
- If no GPS signal is available, "**NO GPS**" is shown instead.

6. Vertical Speed

- Displayed on the **right side**, below the altitude indicator.
- Shows climb or descent rate in **feet per minute (fpm)** or other configured units:
  - **White** text = level or descending (– sign)
  - **Green** text = climbing (+ sign)

7. Turn Bank Arc

- Positioned at the **top center** of the screen.
- Indicates the aircraft's current bank angle.
- Blue triangles appear beside the central white triangle to mark **standard-rate turns** (2-minute turns).

8. Current Track

- Located at the **top of the display**.
- Displays either:
  - **(M)** for Magnetic track
  - **(T)** for True track
- Toggle between modes via:
  Settings Menu → External Devices → Mag Decl Corr.

9. Airspeed Color Strip

- Displayed on the **left side** of the screen.
- Shows key **V-speeds** (e.g., **Vfe, Vy, Vx, Vr**) dynamically based on current airspeed.
- This strip provides at-a-glance performance envelope awareness.

10. Outside Air Temperature (OAT)

- Located **above the ground speed** indicator.
- Displays current OAT value with appropriate units (°C or °F).

- Requires a connected and enabled OAT sensor.

11. Density Altitude

- Automatically calculated when the OAT sensor is active.
- Appears **above the altitude tape**.
- Toggle via:
  Settings Menu → External Devices → Use OAT

12. True Airspeed (TAS)

- Calculated and displayed when both **Pitot input** and **OAT sensor** are available and enabled.
- Can be enabled via:
  Settings Menu → External Devices → Use OAT

This data-rich display allows pilots to maintain superior situational awareness with minimal head movement, offering all essential parameters in a single glance.

Compass mode

You can change Compass to Arc mode by swiping with finger from bottom to top of display.

The **Directional Indicator / Compass Mode** is available in both Ring and Arc modes. The functionality and information provided are similar in each mode. Switching between modes can be easily done by pressing the knob and use of functions menu.

In **Compass Mode**, the ELM310 EFIS presents a simplified navigational display focused on heading, track, and basic situational awareness. This mode is especially useful for enroute navigation and basic orientation.

1. Current Track

- The current track is displayed prominently at the top of the screen.
- By default, the system shows **Magnetic Track** (labeled as **(M)**).
- You can switch to **True Track** (labeled as **(T)**) via:
  Settings Menu → External Devices → Mag Decl Corr.
- The current reference (M or T) is indicated to the right of the track value.

2. Heading Bug Setting

- The current heading bug value is displayed at the **bottom right** of the screen.
- A **triangle symbol** represents the **Heading Bug Indicator**.
- Rotate the knob **clockwise or counterclockwise** to adjust the heading bug.

3. Heading Bug Display

- The heading bug is visually shown on the **compass dial**, allowing the pilot to easily track the selected heading relative to the aircraft's current orientation.

4. Ground Speed

- The current **ground speed** is shown at the **bottom left** of the display.
- Ground speed is derived from GPS and displayed in the configured units (e.g., knots, km/h, mph).
- If GPS signal is lost, the system will display **"NO GPS"** in place of speed.

Navigation Coupling

When connected to a **NAV receiver** (e.g., GPS or VOR), Compass Mode can also display:

- **Horizontal guidance** (lateral deviation to track)
- **Vertical guidance** (if supported by the NAV source)

This makes Compass Mode a practical option even for basic navigation tasks.

Technical Note:

By default, compass data is based on the **GPS Course Over Ground (COG)**, which provides accurate directional information **only when the aircraft is moving** and GPS signal is available.

- COG is initially displayed as **True direction**
- When **Magnetic Declination Correction** is enabled (Settings Menu → External Devices → Mag Decl Corr.), the system will convert and display the COG in **Magnetic direction**

Enhanced Flight Time mode

Extended Flight Time mode provides current:

1. UTC time
2. Local time
3. Flight time
4. Timer

Local time and UTC time are set via the “Settings Menu” > ‘Time submenu”. Flight time counter is automatically started as soon as airplane is airborne and stopped upon landing. Timer can be used for fuel tanks switch or other purposes and can be manually started/stopped and reset by pressing the knob via functions menu.

Note that the timer will continue counting the time, even if the screen is switched to a different mode (Compass, Artificial Horizon, etc).

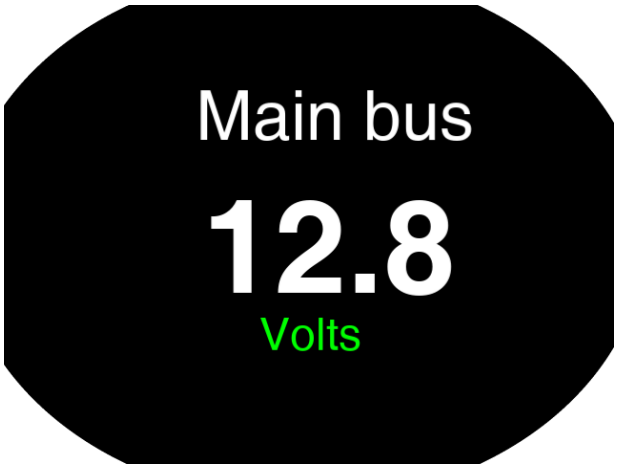
Time/Flight Time mode

Time/Flight Time mode is similar to Enhanced Flight time mode with two main differences:

- Only *Current Local Time* and *Flight Time* are indicated on the display
- Flight time is shown in decimals (aviation standard)

From this page it is possible to access 'Oil Life' page by pressing on the knob and selecting from functions menu "Oil Life".

Voltmeter mode



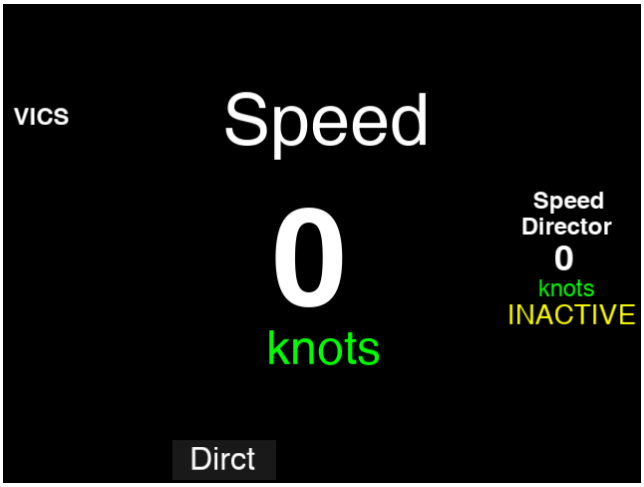
Voltmeter mode shows current voltage information as read on ELM310 power bus V+.
You can open **an 'Info' page** with additional technical details which can be used for calibration and other purposes by accessing the function menu while in Voltmeter mode.

Altitude Mode

Altitude mode provides:

- current altitude information in the center of the display
- density altitude on the left of the current altitude (only if OAT is installed and enabled)
- vertical speed information on the bottom left of the display
- current ground pressure setting (with respective units shown above it) on the bottom right of the display. You can change the current ground pressure setting by turning the knob clockwise or counter clockwise.
- altitude director information on the right of the current altitude (if external VICS is connected)

Speed Mode



Speed mode provides:

- current speed information in the center of the display
- speed director information on the left of the current speed (if external VICS is connected)
- speed units

G-Meter mode

G-Meter can display the following information:

1. current G force (needle)
2. highest registered G reached during current flight
3. lowest G reached during the same flight

To reset current values press on the knob and from functions menu select “Reset”

Oil Life Timer mode

The Oil Life Timer displays the cumulative flight time since the last oil change in decimal hours and minutes. It is recommended to reset this timer during each oil change by pressing the knob and selecting from functions menu the “Oil reset”

The timer operates as follows:

- **Activation**: The Oil Life Timer starts when the airplane becomes airborne (once Vr is reached).
- **Deactivation**: The timer stops upon landing (when speed is below Vs).

The Oil Life Timer enables pilots to conveniently track the total flight time since the last oil change, allowing for effective scheduling of maintenance.

Fuel Alarm

The Fuel Alarm feature can be enabled or disabled in the **Settings** > **Time** menu. This option allows the user to activate a repetitive alarm that reminds them to switch fuel tanks at a predefined interval (between 0 and 240 minutes).

- **Disabled**: When the alarm is set to ‘0’, it is disabled.
- **Enabled**: When a value between 1 and 240 is set, the unit will display the on-screen reminder message “Switch Fuel Tanks” at the specified intervals.

To dismiss the warning and return to the previous screen, press the knob.

If external VICS module is connected the audio reminder ‘Switch fuel tanks’ will also annunciate. More details about how to set this function read below under Settings->Time menu description.

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, ELM1000, ELM350 or ELM310 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 (ELM800/1000, ELM310, ELM350 and 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, ELM310 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 ELM800/1000, ELM310 or ELM350 EFIS systems. Additionally, a separate circuit breaker (3A) must be installed and labeled as “Compass” or “MAG-01” in the panel.

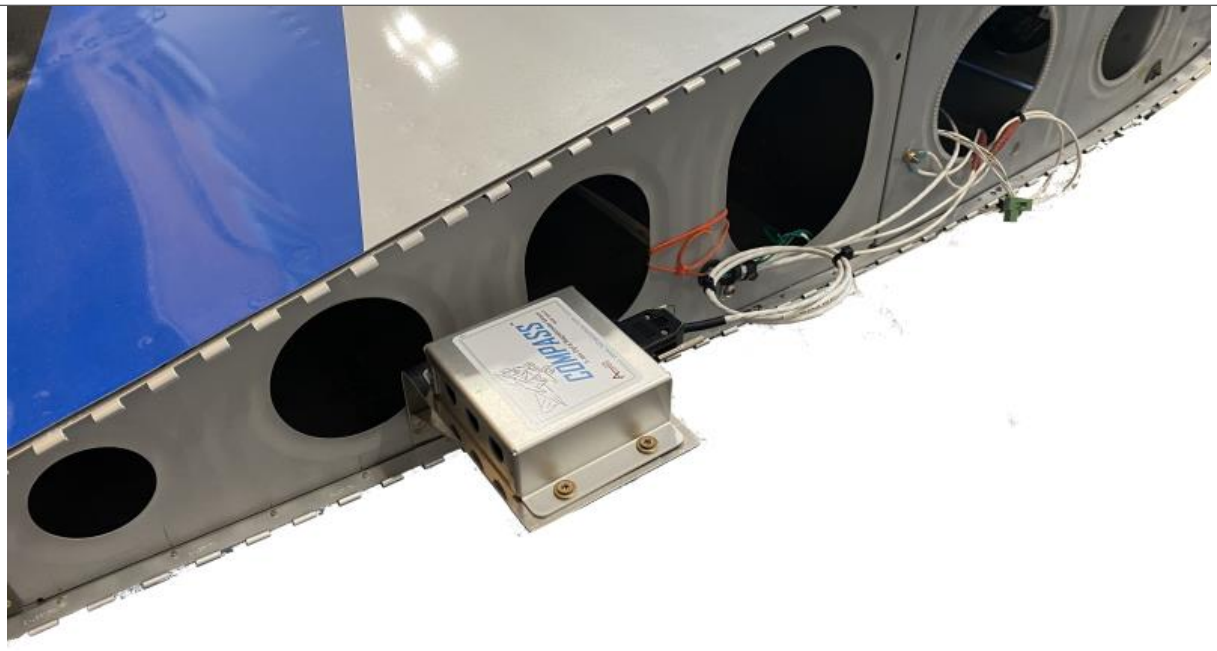
For detailed pin-out diagrams and connection methods, please refer to the “Hardware Installation” section.

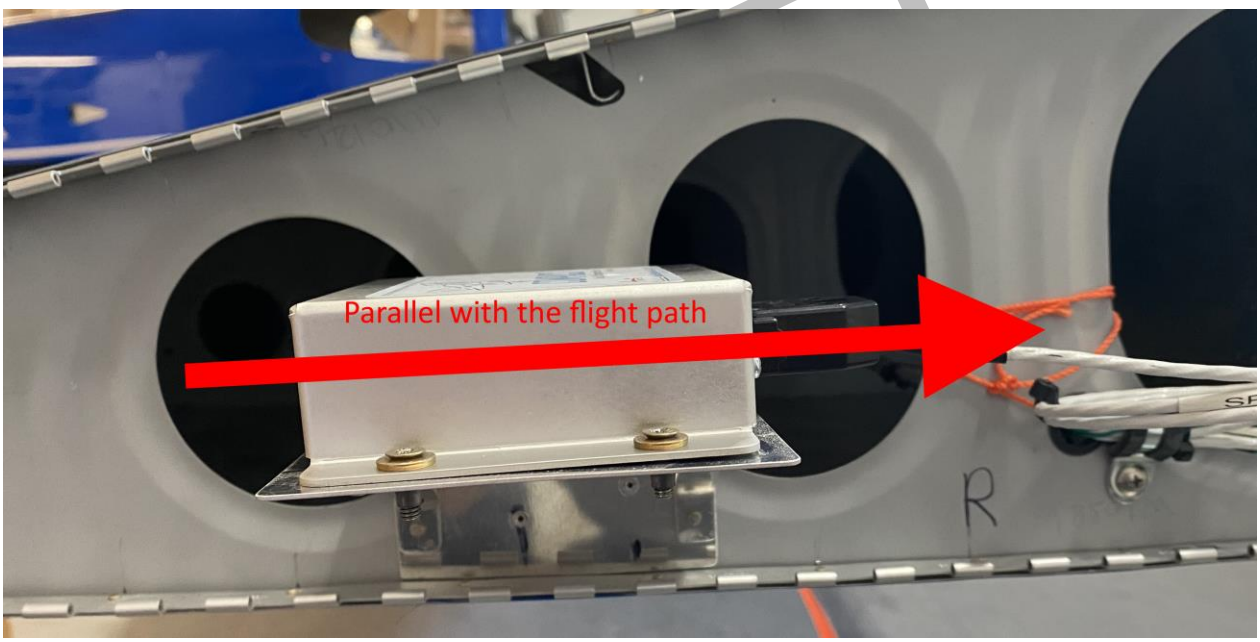
Magnetometer connector pinout:

Pin 1 – Power Input +
Pin 15 – Ground
Pin 10 – CAN Bus Low (should be connected to pin 3 of ELM310 Main Connector)
Pin 11 – CAN Bus High (should be connected to pin 4 of ELM310 Main Connector)

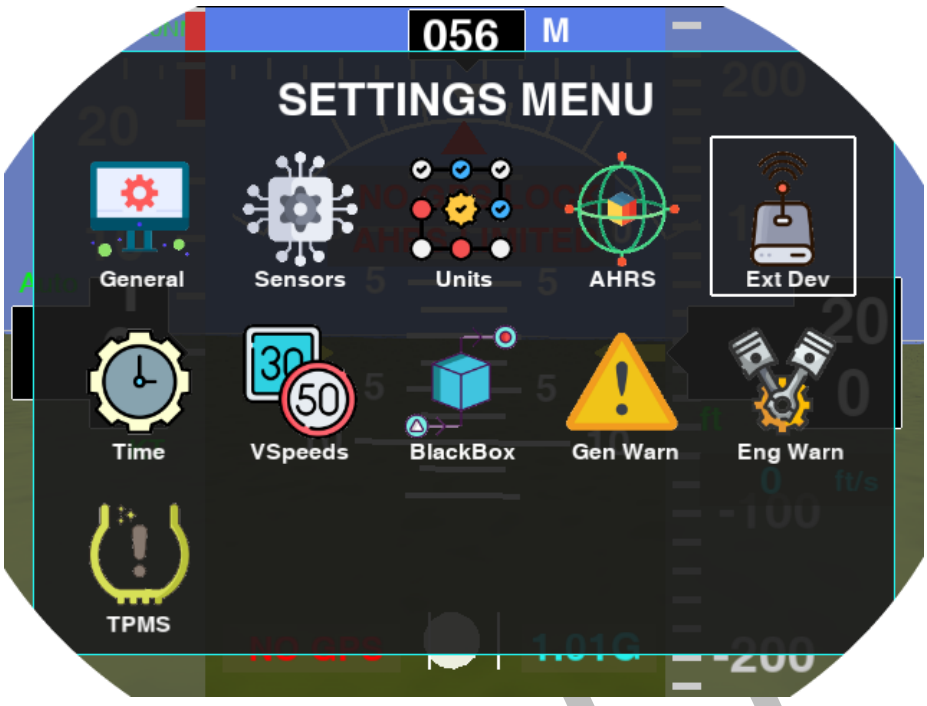
Physical Installation

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:





12. Settings Menu



The **Settings Menu** in the ELM310 EFIS allows users to configure and adjust a wide range of system parameters to suit their aircraft, preferences, and installation requirements.

Accessing the Settings Menu

1. **Press and hold** the control knob for approximately **3 seconds** to open the **Main Menu**.
2. Rotate the knob to highlight **Settings**, then **press** the knob to enter the Settings menu.

Navigating the Settings Menu

- **Rotate the knob** clockwise or counterclockwise to scroll through available menus and submenus.
- **Press the knob** to select and open a highlighted menu item.
- When a menu item is **highlighted in blue**, it indicates that you are in **selection mode**—ready to choose a category or option.
- When an item is **highlighted in orange**, you are in **adjustment mode**, ready to change the value.

Adjusting Settings

- With the item selected (orange background), **rotate the knob** to change its value or toggle through available options.
- **Press the knob** once again to confirm and apply the new setting. The selection highlight will return to **blue**, indicating the system is back in navigation mode.

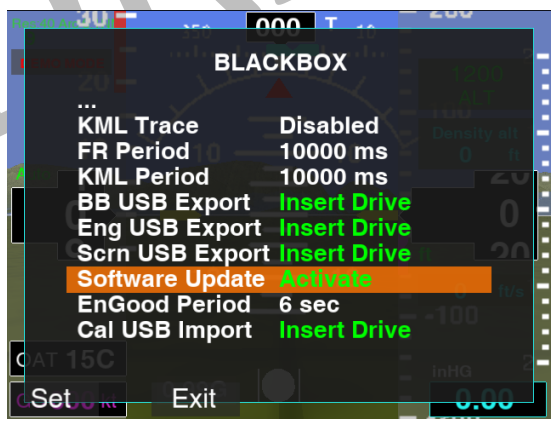
Exiting the Menu

- To exit a submenu, scroll to the top and select the **"..." (dot-dot-dot)** option, then press the knob to return to the previous menu level.
- To exit the Settings menu entirely, **press and hold the knob for 3 seconds**.

Note: Some settings may require a moment to apply. In these cases, the screen will briefly display **"Updating. Please Wait..."**. Once complete, you will be returned automatically to the Settings menu.

13. Black Box functionality

The **ELM310** is equipped with a built-in "**black box" recorder** that captures all flight parameters from various sensors at pre-set time intervals.



Recording Intervals:

- By default, the recording interval is set to 10**,000 ms (10 seconds)**.
- Users can select a different time interval in the **Settings menu** under **Black Box submenu** > **'FR Period'** and **'KML Period'**.

Data Recording Process:

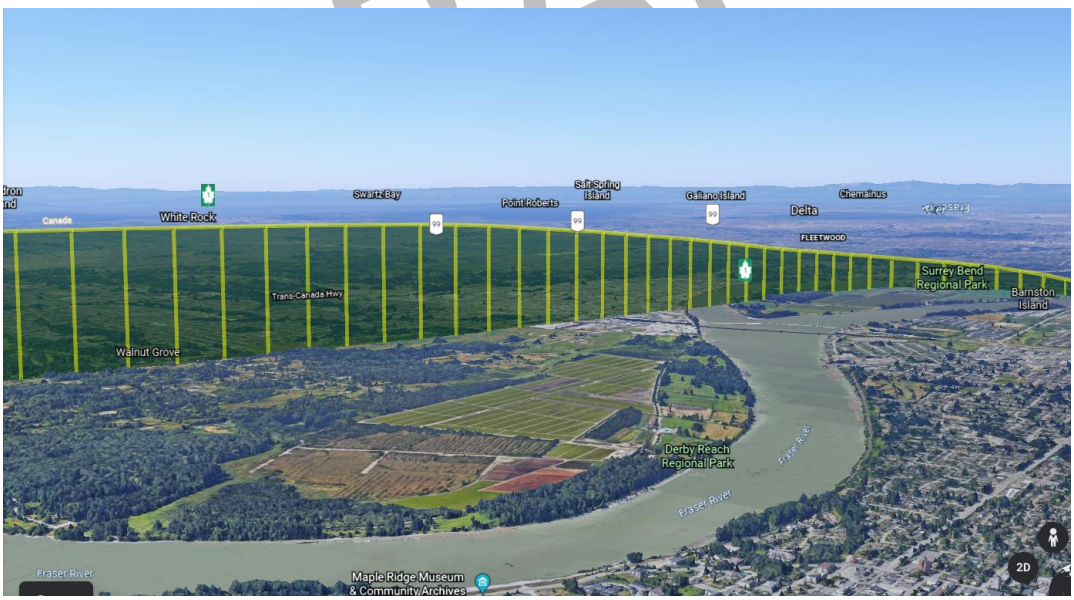
- The black box recorder begins data recording upon takeoff, once the speed reaches **Vr** (rotation speed).
- Recording ceases when the airplane lands, specifically when the speed falls below **Vs** (stalling speed).
- All recorded parameters are stored in the internal flash memory.

Data Export:

- Recorded data can be exported from the flash memory to a SD Card in two formats:
  - **Internal ELM310 format** (designed for future compatibility with specialized software).
  - **.KML format** for Google Earth.

Using KML Files:

- The exported **.KML file** can be opened using Google Earth software installed on a computer or accessed online via earth.google.com.
- This format allows users to visualize the flight path and altitude of the recorded flight, which can be valuable 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. Open Main Menu and then Settings menu
2. Select **BlackBox Func** in the “Settings menu” > “Black Box submenu” by pushing the knob
3. Choose ‘BB SD Export’ sub setting
4. Push the knob to start export. Display will indicate current export status.
   Once completed you will be prompted.
5. Remove SD Card 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.

14. Settings menu items and their respective settings:

Submenu: **General Config**

Int Compass

Enables or disables the use of the **internal compass** (feature not yet available).

Note: This setting must remain **Disabled** at all times.

Pitch Adjust

Allows manual **adjustment of the horizon pitch line** to compensate for installation angle or user preference.
Adjust the pitch line **up or down** by a few degrees.

Ki Gain

Controls the **integral gain** in internal AHRS control logic.

Default: 50
Do **not modify** unless instructed by 360 Avionics technical support.

Kp Gain

Controls the **proportional gain** in internal AHRS control logic.

Default: 2500
Do **not modify** unless instructed by 360 Avionics technical support.

Set Defaults

Resets the system to factory default settings:

- **EFIS + AHRS**: Resets all settings to full factory defaults
- **EFIS**: Resets only the graphical processor settings
- **AHRS**: Resets only the attitude and heading reference system

Disp Brg (Display Brightness)

Controls the **display brightness**:

- **1 to 32**: Manual brightness levels
- **33**: Enables **Auto Brightness** mode using the built-in ambient light sensor

Recommended setting: **Auto (33)**

Unit Config

Specifies the data input configuration used by the EFIS.

For ELM310, this should be set to **Pitot + GPS** unless otherwise instructed.

Start Mode

Defines the **default screen** shown at startup:

- **AI** – Artificial Horizon (default)
- **Compass** – Compass mode
- **Time** – Flight time and clock display
- **GMeter** – G-load display
- **Altimeter** – Altitude tape mode

- **Time (L)** – Time/Flight Time with log

Show Wind Data

Enables or disables wind speed/direction display on the Artificial Horizon.

Currently non-functional – will be available with a future external compass module.

Maps Source

Determines where **terrain and map databases** are stored:

- **Internal**: Uses internal memory
- **SD Card**: Uses SD card storage (default in newer models)

Do not change unless directed by technical support.

Horizon Mode

Selects the visual style of the Artificial Horizon:

- **Classic 2D**: Traditional, non-synthetic display
- **Test 3D**: Enables **synthetic vision** with terrain and obstacle awareness

Recommended for systems equipped with obstacle databases

Demo Mode

Should be **Disabled** during normal use.
Enabled only for dealer use in ground demonstration environments.

Dev Ctrl (Device Control)

Used for enabling configuration modes on connected modules such as **AHRS**, **EnGood engine monitors**, and others.

Modify only if instructed by 360 Avionics support.

GPS Source

Selects the GPS data source:

- **Auto**: Automatically selects the available GPS source

Default and recommended setting.

Charts Source

Specifies the format of map charts:

- **MBTiles**: Most commonly used format
- **Pure**: Alternative format

Use the format that matches your chart data type.

Charts Scheme

Defines the tile indexing scheme used for chart rendering:

- If using **Pure**, set to **XYZ**
- If using **MBTiles**, set to **TMS**

Touch Calibrate

Initiates touchscreen calibration routine.
Follow on-screen prompts to align touch inputs accurately.

Debug Info

Displays internal debug and diagnostic information.

Not required for normal operation.

⚠ **Caution:**
Incorrect changes to system-critical parameters (such as Ki, Kp, or Unit Config) may affect system stability. Always consult 360 Avionics technical support before modifying advanced settings.

Submenu: **Sensors**

The following parameters under the **Sensor Configuration** section allow for calibration and selection of pressure and motion sensors within the ELM310 system. These settings are critical for accurate altitude, airspeed, and attitude calculations.

⚠ **Important:** These values are normally calibrated during manufacturing or during 24-month pitot/static system inspections. Changes should only be made by qualified personnel or when specifically instructed by 360 Avionics support.

Alt Sensor

Selects the **active pressure sensor** used for static altitude data:

- **HSCMRN** (default): High-accuracy primary pressure sensor (used with pitot-static system)
- **BMP280**: Backup internal pressure sensor

Use **BMP280 only** if the external static system is blocked or unavailable.

IMU Type

Specifies the type of **Inertial Measurement Unit** (IMU) installed:

- Must always be set to **MPU9250**

Do not modify unless instructed by 360 Avionics.

BMP280 Offset

Applies an offset (positive or negative) to the **BMP280 internal backup pressure sensor** to calibrate its static pressure readings.

- Pre-set at factory calibration
- May be adjusted during pitot/static system checks (typically every 24 months)

HSCMRN Offset

Applies an offset (positive or negative) to the **HSCMRN primary pressure sensor** for fine calibration.

- Available only on units equipped with **GPS + Pitot** configuration
- Typically adjusted during formal pitot/static recalibration

Pitot Offset

Applies an offset (positive or negative) to the **pitot pressure sensor**, affecting indicated airspeed readings.

- Pre-configured at the factory
- May be adjusted as part of regular system maintenance

VICs LiDAR

Used to enable the **VICs module** when equipped with an integrated **LiDAR altimeter**.

- Set to **Enabled** when the LiDAR-equipped VICs module is installed and active.

LiDAR Calibrate

Allows for entering a **height offset** to compensate for the physical installation position of the LiDAR sensor relative to the aircraft reference point (e.g., sensor mounted below the fuselage).

These sensor settings are part of the core input processing configuration of the ELM310. Accurate calibration ensures reliable altitude and airspeed readings across all flight modes and conditions.

Submenu: **Units**

The ELM310 EFIS allows pilots and installers to customize the unit of measurement for various flight and engine parameters. These preferences can be configured in the **Settings Menu** to match regional standards or personal preference.

Speed Units

Sets the display units for:

- **GPS Speed**
- **True Airspeed (TAS)**
- **Indicated Airspeed (IAS)**

Available options:

- **Knots** *(default)*
- **Miles per hour (MPH)**
- **Kilometers per hour (KPH)**

Altitude Units

Sets the unit for altitude displays throughout the EFIS.
Available options:

- **Feet** *(default)*
- **Meters**

Pressure Units

Sets the barometric pressure units used in altimeter and ground pressure displays.
Available options:

- **inHg** *(default for North America)*
- **Bar**

Temperature Units

Applies to outside air temperature (OAT) and environmental data.
Available options:

- **Celsius (°C)**
- **Fahrenheit (°F)**

Fuel Units

Determines the displayed unit for fuel quantity.
Available options:

- **Liters**
- **Gallons**

Engine Temperature Units

Used for displaying engine temperature data (e.g., CHT, EGT).
Available options:

- **Celsius (°C)** *(default)*
- **Fahrenheit (°F)**

These settings provide flexibility for pilots operating in different regions and ensure consistency across all displayed flight data.

Submenu: **AHRS Config**

The following settings are intended for advanced configuration and calibration of the **AHRS** (Attitude and Heading Reference System), **airspeed sensors**, and system correction parameters. These functions are typically pre-set at the factory and should only be accessed by qualified personnel or under the guidance of 360 Avionics technical support.

*Trace **

Internal diagnostic trace functions.

⚠ **For engineering use only.** Not intended for customer access or configuration.

AHRS Reset

Manually reboots the **internal AHRS subsystem**, functioning as a soft reset (equivalent to cycling power to the AHRS module only).

Useful if attitude display behaves abnormally or after an AHRS configuration change.

Corr Force (Correction Force)

Controls attitude correction behavior during coordinated turns:

- **Auto** *(default)* – Automatically manages compensation based on flight dynamics
- **Legacy** – Uses earlier-generation correction method

Recommended setting: **Auto**

Accl Cal Ovrd (Accelerometer Calibration Override)

Determines how **attitude calibration (pitch and roll)** is applied during system startup:

- **Enabled** *(default)* – Uses factory or previously saved calibration at every startup
- **Disabled** – Recalibrates pitch and roll based on aircraft orientation at every power-up
- **Re-Cal (Recalibrate)** – Performs a new calibration and stores it in memory when in *Enabled* mode

Use "Enabled" to retain precise factory-calibrated alignment. Use *Re-Cal* only during setup or after structural changes.

Accel Limit

Sets the threshold for applying pitch compensation during **rapid acceleration or deceleration**, such as takeoff or braking:

- **Default value:** 1.2 kt/sec
- **Range:** 0.1 to 8.0 kt/sec
- This helps maintain stable pitch indication under dynamic load changes
- Can be **disabled** if compensation is not desired

AHRS Mode

Selects the source of **attitude data**:

- **Primary** *(default)* – Uses internal AHRS
- **Off / Backup** – Switches to an external AHRS source (if connected)

Use *Primary* in standard installations

ASI Calibrate (Airspeed Calibration)

Used for **recalibrating the pitot tube sensor bias**:

- Typically done **at the factory** or during **24-month pitot/static certification**
- Procedure:
  - EFIS must be powered ON
  - Engine **must be OFF**
  - No wind pressure (>5 kt) should be applied to the pitot tube
  - Pitot port must be **open to ambient pressure**

Mag Correct

Reserved for **future use** – intended for magnetometer-based correction of magnetic vs. true track.

Currently **not in use** and should remain unchanged.

These advanced functions are critical for ensuring reliable operation and accurate flight data. Improper adjustments may impact safety and should only be made when required and fully understood.

Submenu: **External Devices**

This section provides configuration options for external sensors, compass modules, communication interfaces, and integrated warning systems such as the VICS module. These settings allow for greater integration with other avionics and accessories.

Ext Compass (External Compass)

Enables integration with an **external magnetometer** or a **compass built into an external AHRS** module.

- Options:
  - **Disabled** *(default)*
  - **Compass** – Uses external compass only
  - **Compass + AHRS** – Uses both external compass and AHRS

Select the appropriate mode when connecting an external heading source.

Mag Decl Corr (Magnetic Declination Correction)

When GPS-based track is used, heading is displayed as **True direction** by default.
Enabling this option automatically converts the display to **Magnetic direction** using GPS-derived position and track data.

Mag Controls (Magnetometer Configuration)

⚠ **Most of the following options are intended for factory use only.**

- **Mag Auto Cal** – Default mode for automatic compass calibration
- **Mag Re-Cal/En** – Recalibrate and enable magnetometer *(factory use only)*
- **Acc Re-Cal/En** – Recalibrate magnetometer's accelerometer *(factory use only)*
- **Mag Algo (0/1)** – Select magnetometer algorithm; **default is 0**
- **Set N, NE, E, SE, S, SW, W, NW** – Compass rose directional calibration steps
- **Reset NESW Calibration** – Resets directional compass rose calibration
- **Deviation Cal (OFF)** – Controls deviation compensation (default is OFF)
- **Reset Deviation Cal** – Resets magnetic deviation calibration
- **Compass Defaults** – Resets all compass settings to factory default *(factory use only)*
- **Set Bias X, Y, Z** – Magnetometer axis bias values *(factory only)*
- **Set Scale X, Y, Z** – Magnetometer scaling *(factory only)*
- **Mag Cal Idle** – Diagnostic status for calibration *(factory only)*

Use OAT (Outside Air Temperature)

Enables or disables the OAT sensor.

When **disabled**, temperature-dependent features such as **True Airspeed (TAS)** and **Density Altitude** will be unavailable.
Default setting: Enabled

VICS Module Settings *(External Audio Warning System)*

🔧 For full configuration details, refer to the **VICS Module Manual**.

- **VICS Warn*** – Enable/disable external warning messages; allows selecting specific alert types
- **VICS Voice*** – Choose between **male** or **female** voice output
- **VICS Volume*** – Set volume level for voice alerts
- **Speed Director*** – Enable/disable speed-related voice alerts and set warning type
- **Altitude Director*** – Enable/disable altitude-related voice alerts and set warning type
- **Director Intrv*** – Sets voice alert repetition interval (in seconds)

Communication Port Settings

COM1 Speed / COM2 Speed

Sets the **baud rate** for RS-232 communication on COM1 and COM2 ports.

Select a speed compatible with connected devices (e.g., 9600, 19200, 38400 bps).

COM1 Mode / COM2 Mode

Defines the function of each COM port, such as:

- **EFIS Communication**
- **Altitude Encoder Output**
- **Engine Monitor Input**
- Other device-specific functions

Additional Communication & Output Settings

Alt Encoder Mode

When the ELM310 is used as an **altitude encoder** for a transponder, select the appropriate output protocol here.

Requires matching COM port to be set to **Altitude Encoder Output** mode.

NMEA Out Message

Selects the format of **NMEA output messages** sent to connected autopilot or GPS devices.

Default: Internal – use this unless otherwise specified.

uAvionix Mode

Sets the communication protocol for the **uAvionix tailBeaconX** transponder interface.

Default: Half Duplex

Submenu: **Time**

This section describes the configuration of **time settings**, **fuel management alerts**, and **airframe usage tracking** within the ELM310 EFIS. These tools help support safe operations, scheduled maintenance, and accurate record-keeping.

Time and Date Settings

Allows adjustment of the **current system time** and **date**.

- Time is displayed in **24-hour format**
- Set the **current local date** and time for logging and display

Time Zone

Selects the time zone for local display.

- The system uses this setting to automatically calculate **UTC time**
- UTC is used internally for **flight logs**, **track history**, and data export

Fuel Alarm

Provides a **recurring reminder** to switch fuel tanks:

- Value is set in **minutes** (e.g., 30 = reminder every 30 minutes)
- Setting to **0** disables the alarm
- When active:
  - An **on-screen message** will be displayed
  - If a **VICS module** is connected, an audio alert will announce: *"Switch fuel tanks"*

Total Oil Life / Hobbs Time / Air Time

Displays and allows adjustment of cumulative system timers:

- **Oil Life** – Tracks engine time since last oil change
- **Hobbs Time** – Total time the avionics system has been powered
- **Air Time** – Total in-flight time (based on airspeed or altitude movement)

These timers are editable to match existing aircraft records or maintenance logs.

Reset Air Time / Hobbs Time

Allows the pilot or technician to **reset flight timers** to zero or a known reference point:

- Use only when changing aircraft assignments or performing system resets
- Air Time and Hobbs Time can be reset independently

Submenu: **V Speeds**

The **Speed V*** menu allows you to define key **V-speeds** for your specific aircraft. These values are critical for displaying color-coded airspeed bands and reference markers on the airspeed tape. Each value must accurately reflect the aircraft's certified performance specifications.

⚠ **Warning:**
Incorrect V-speed settings may result in misleading airspeed indications. Always refer to your aircraft's **Pilot Operating Handbook (POH)** or **Aircraft Flight Manual (AFM)** when entering these values.

V-Speed Types Available for Configuration:

- **Vr** – Rotation Speed
- **Vx** – Best Angle of Climb Speed
- **Vy** – Best Rate of Climb Speed
- **Va** – Maneuvering Speed
- **Vs0** – Stall Speed in Landing Configuration (flaps down)
- **Vs1** – Stall Speed in Clean Configuration (flaps up)
- **Vfe** – Maximum Flap Extended Speed
- **Vno** – Maximum Structural Cruising Speed
- **Vne** – Never Exceed Speed

Each V-speed is entered in **knots (KIAS)**. After configuration, these values are used to generate the appropriate **color-coded airspeed arcs and markers** on the Artificial Horizon and Airspeed Indicator displays.

Submenu: **BlackBox**

The ELM310 EFIS includes advanced **flight data recording (Black Box)** and **engine monitoring** capabilities. These features support post-flight analysis, diagnostics, and record-keeping. Additionally, the system offers **USB export/import** functionality and firmware update support.

KML Trace (Black Box Logging)

Enables or disables the **Black Box recording** of flight data in **KML format** (Google Earth-compatible).

- **Enabled** – Automatically records all flight data **from takeoff to landing**
- **Disabled** – Disables Black Box logging; no flight data will be saved

Default: Enabled
Recommended for flight tracking, support, or incident review

FR Period (Flight Recorder Interval)

Sets the recording frequency for **internal flight data logs**:

- Range: **1,000 ms to 10,000 ms** (1 to 10 seconds)
- **Default:** 5,000 ms (5 seconds)

Recommended to leave this at the default unless directed otherwise

KML Period (Google Earth Logging Interval)

Controls how often data is written to the **KML Black Box log**:

- Range: **1,000 ms to 10,000 ms**
- **Default:** 6,000 ms (6 seconds)

Determines the resolution of the visual GPS trace when viewed in Google Earth

BB / ENG USB Export

Allows export of previously recorded **Flight Recorder (FR)** and **KML Black Box** data, as well as **engine monitoring logs**.

- A USB flash drive must be connected using the **provided adapter cable**
- Files can be viewed and analyzed on external devices for review, maintenance, or troubleshooting

Scrn USB Export (Screenshot Export)

Enables the export of saved **screen captures** in **.png format** to a USB flash drive.

- Requires a USB flash drive connected via adapter
- Screenshots are saved automatically when the procedure below is used

How to Capture a Screenshot

To save a snapshot of the current EFIS screen:

1. **Press and hold the control knob**
2. While holding, rotate the knob **left or right by 1 click**
3. Release the knob

This feature is useful for capturing important flight display information, tuning screenshots, or visual documentation for later analysis.

Software Update

Activates the firmware or database **update mode** for the ELM310 EFIS.

- Requires USB or SD card with appropriate update files
- Refer to the **firmware update procedure** for step-by-step instructions

EnGood Period (Engine Data Logging Interval)

Controls how frequently the **EM-01 EnGood Engine Monitor** stores engine parameters to internal memory:

- **Default:** 6 seconds

This interval is sufficient for long-duration recording and general review

Cal USB Import / Export (Engine Monitor Calibration)

Used to **import or export calibration data** specific to the aircraft and installed **EM-01 Engine Monitor module**:

- Calibration settings are unique to each installation
- Can be saved for backup, transferred between aircraft, or restored during service

Submenu: **Info/Warnings**

The ELM310 EFIS includes advanced **situational awareness features** when operating in **3D Artificial Horizon mode**. These settings help detect and alert the pilot of proximity to terrain, obstacles, and airborne traffic. Configuration parameters allow customization of sensitivity and alerting thresholds.

Terrain Warning

Enables or disables **terrain awareness alerts** when operating in **3D Synthetic Vision mode**.

When enabled, the system will visually and/or audibly warn the pilot of proximity to surrounding terrain.

Obstacle Warning

Enables or disables **obstacle proximity alerts** (e.g., towers, antennas) in **3D Synthetic Vision mode**.

Warnings are based on aircraft trajectory relative to known database obstacle positions.

Obstacle Min Dist

Sets the **minimum horizontal distance to an obstacle** (in nautical miles) before triggering a warning.

- **Default:** 3 NM
- Works in conjunction with **Obstacle Min Hdg**

Lower values increase sensitivity to nearby obstacles.

Obstacle Min Hdg

Defines the **minimum difference in heading angle** (in degrees) between the aircraft's current heading and the projected obstacle's bearing that must be met to trigger a warning.

- **Default:** 3 degrees

Helps avoid false warnings from obstacles outside the aircraft's direct path.

Terr Red Zone

Defines how high the aircraft must be above the terrain to **avoid red (critical)** terrain warnings on the 3D display.

- **Default:** 300 ft

Red zones indicate terrain dangerously close to the aircraft's current altitude.

Terr Yellow Zone

Sets the altitude buffer above terrain where the map will display **yellow (cautionary)** terrain coloring.

- **Default:** 700 ft

Yellow zones suggest a terrain proximity risk but not immediately hazardous.

Traffic Awareness Settings

Traffic Warning

Enables or disables **airborne traffic alerts** when an external **GDL90 ADS-B traffic receiver** is connected to the system.

Visual and/or audio alerts are provided when traffic proximity thresholds are exceeded.

Traff Min Dist / Alt

Sets the **minimum distance (horizontal)** and **altitude difference (vertical)** at which nearby aircraft will trigger a traffic alert.

Recommended values depend on airspace type and mission profile.

LiDAR Altimeter Integration

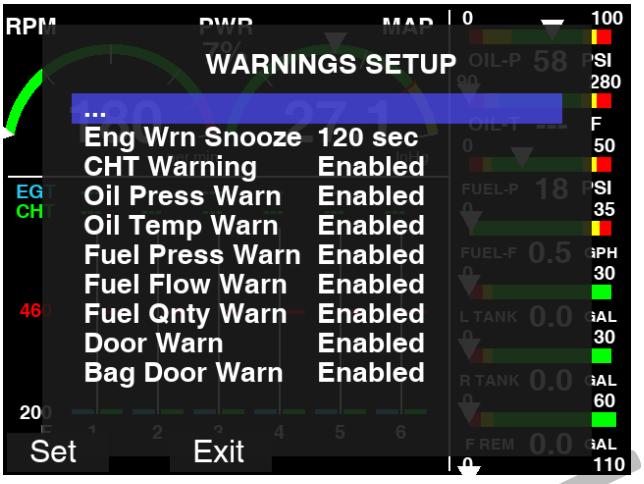
LiDAR Altimeter

Configures the operation mode for the **LiDAR altimeter** when connected via the **VICs system**.

- Enables precise low-altitude awareness based on laser distance measurements
- Use only with supported VICs LiDAR-equipped modules

These awareness features are intended to enhance pilot situational awareness in low-visibility conditions, mountainous terrain, or busy traffic environments. Always verify settings against your operational environment and aircraft profile.

Submenu: Warning Setup



This section outlines configurable options related to **engine monitoring alerts** and **fuel tank switch reminders**. These alerts help ensure pilot awareness of abnormal engine conditions and fuel management during flight.

Engine Warning Snooze

Specifies the **delay interval** (in seconds or minutes) between repeated **engine warning alerts** after the initial warning has been **snoozed** by the pilot.

- Once snoozed, the warning will be temporarily silenced.
- After the set interval, the system will reissue the warning if the condition persists.

This helps prevent persistent alarm fatigue while ensuring critical issues are not ignored.

Various Warnings

Enables or disables miscellaneous system warnings based on the user's configuration or installation preferences.

This includes alerts not tied to terrain, traffic, or engine limits (e.g., system status, low battery, OAT sensor failure).

Fuel Alarm

Sets the **recurring time interval** for the **"Switch Tanks"** fuel alarm message.

- The system will display a visual reminder at the set interval.
- If the **VICS module** is connected, an **audio voice alert** will also be triggered.
- To disable this feature, set the alarm interval to **0**.

For detailed instructions and configuration, refer to **Section 7.2 – Fuel Management and Reminders**.

These settings ensure that alerts are delivered in a timely and manageable way, helping pilots stay informed without distraction.

Submenu: TPMS SETUP

The **Tire Pressure Monitoring System (TPMS)** feature in the **EnGood EM-01 engine monitor module** allows for real-time monitoring of individual tire pressures. When enabled and properly configured, the system will display and alert the pilot of abnormal tire pressure readings for the aircraft's landing gear.

TPMS Mode

- **Enables or disables** the TPMS functionality within the EnGood EM-01 module.
- When **enabled**, the system will actively monitor tire pressure data from paired wireless TPMS sensors.

Default setting: Disabled
Enable only when TPMS sensors are installed and configured.

Sensor ABC (Sensor Code Assignment)

Each TPMS sensor must be assigned a unique **3-byte hexadecimal ID code** to link the correct sensor to the correct tire location.

- **Sensor 1** – Nose Wheel
- **Sensor 2** – Left Main Gear

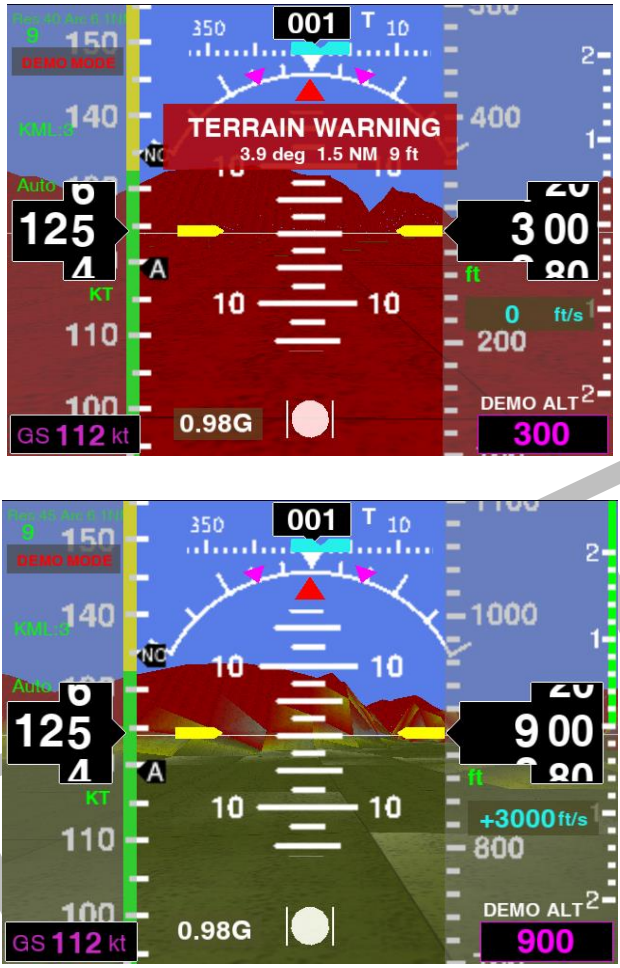
- **Sensor 3** – Right Main Gear

Enter each sensor's code in the appropriate field to establish communication with the respective tire position.

These codes are typically printed on the sensor or included in its documentation. Accurate assignment is essential for correct tire identification and alerting.

Once configured, the EFIS will provide **live pressure readings** and issue alerts in the case of **overpressure, underpressure, or sensor loss**. The TPMS display is typically accessible through the engine monitoring or system health pages.

Terrain and Obstacle Awareness Functionality



The ELM310 EFIS includes an advanced **Terrain Awareness and Warning System (TAWS)** designed to significantly enhance flight safety. By continuously analyzing terrain and obstacle data in the aircraft's path, the system provides **real-time visual and audio alerts** to help the pilot maintain safe clearance from terrain and man-made obstacles.

Color-Coded Terrain Alerts

The TAWS display uses intuitive **color zones** to indicate terrain clearance status relative to the aircraft's current altitude. These colors are dynamically generated in **3D Synthetic Vision mode**.

Red Zone – Critical Terrain Warning

- Triggered when the terrain ahead is **at or above the aircraft's altitude minus the configured Red Zone buffer**.
- Terrain is displayed in **red** on-screen.
- A **pop-up warning** is shown, providing:
  - The **track** and **distance** to the first point of potential impact
  - The **elevation** at that impact point

Yellow Zone – Cautionary Terrain Warning

- Activated when terrain is **below the Red Zone threshold but within the Yellow Zone buffer**.
- Terrain appears **yellow** on-screen.
- Indicates potential proximity risk, though not yet critical.

These buffer values can be customized via the **Terr Red Zone** and **Terr Yellow Zone** settings in the EFIS configuration menu.

Obstacle Alerts

- When the aircraft is projected to come within range of a known **obstacle** (e.g., tower, antenna, structure), a **visual alert** is triggered.
- Unlike terrain, the **map coloring does not change** for obstacles.
- The obstacle alert provides similar data to terrain warnings, including **bearing, distance, and height**.

Voice Alerts (with VICs Module)

If the optional **VICs voice alert system** is connected, TAWS events will also trigger **audible warnings**, such as:

- **"TERRAIN AHEAD"**
- **"OBSTACLE AHEAD"**

These voice alerts offer an additional safety layer by providing **hands-free awareness** of critical hazards.

This real-time alert system is a key feature for maintaining terrain and obstacle clearance in low-visibility, night, or high-workload conditions. It is especially valuable for **VFR pilots** operating near rising terrain or in unfamiliar areas.

The ELM310 EFIS includes a **screenshot capture feature** that allows users to save the current screen image at any time during operation. This function is especially useful for documenting system behavior, recording flight parameters, or providing reference material for technical support and troubleshooting.

How to Capture a Screenshot

To take a screenshot of the currently displayed screen:

1. **Briefly press the control knob**, then immediately
2. **Rotate the knob left or right by one click**
3. **Release the knob**

⚠ This entire sequence must be completed within **1 to 1.5 seconds**.

Once captured:

- The image is automatically saved in **.png format**
- The filename will include the **current date and time** for easy reference
- Screenshots are stored in the system's **internal memory**

Exporting Screenshots

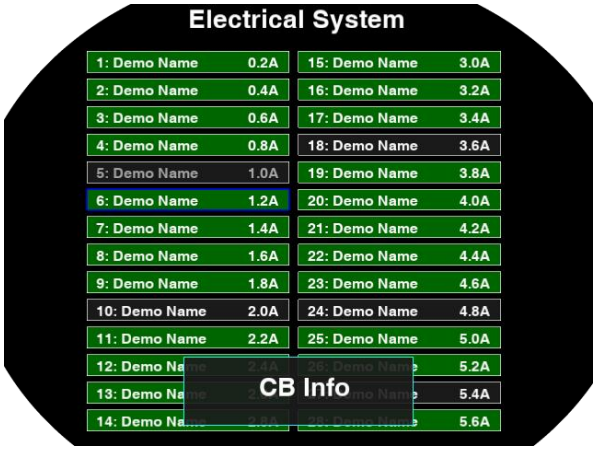
To export saved screenshots to an **SD card**:

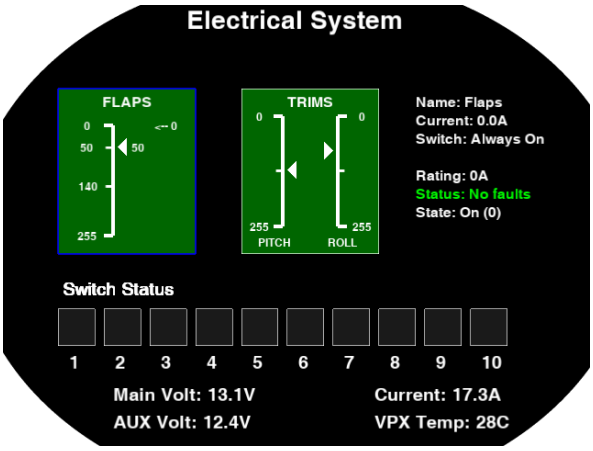
1. Insert an SD card into the EFIS
2. Navigate to:
   Main Menu → Settings → Black Box
3. Select the option to **export screenshots**

The selected images will be copied to the SD card and can be viewed or shared using any standard computer or compatible device.

This feature is ideal for capturing system states during flight testing, monitoring, or calibration, and can assist in technical support diagnostics.

VPX Solid State Circuit Breaker Module support





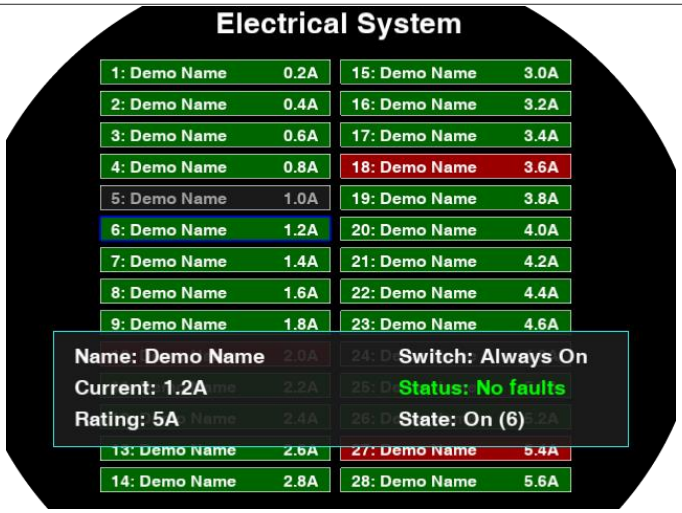
The **ELM310** features support for the **Vertical Power (VPX)** solid-state circuit breaker module, enabling the monitoring of live-time parameters, error clearing, and state switching for individual circuit breakers.

Communication:

- The ELM310 communicates with the VPX module via an **RS232 interface**.
- This communication can be selected through the **External Devices menu**.
- The default baud rate for this communication is set to **57600**.

Display Information:

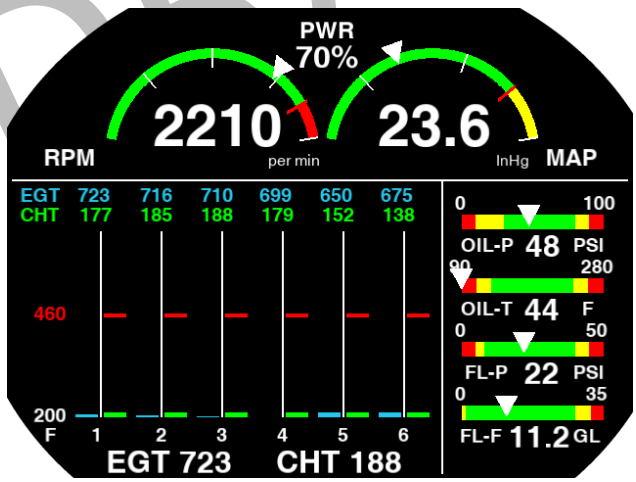
- When the VPX module is connected, its current state will be displayed on the main screen.
- The VPX menu consists of **two pages**:
  - **Page 1:** Displays circuit breaker information.
  - **Page 2:** Shows trims and switch information.
- By rotating the **knob**, you can select the desired circuit breaker, which will be highlighted by a blue rectangle.



Circuit Breaker Control:

- Use the functions menu by pressing the knob to select desired action for the selected circuit breaker.

EnGood engine monitor support



If connected with EM-01 engine monitor the ELM310 allows to monitor the engine live params. In future ELM310 software updates more EnGood functionality will be added.

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.

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