ELM200/300

Specification and Installation Instructions

Rev1.6

May 2025

Models

- EFIS MiniUni 2 (ELM200)
- EFIS MiniUni 3 (ELM300)
- EFIS MiniUni 2P (ELM200P)
- EFIS MiniUni 3P (ELM300P)

Note: MiniUni EFIS is non-TSO certified as a flight instrument.

Credits

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Revision History

Below is the document's revision hi story.

Revision #	Revision Date	Comments
Rev 1.0	August 01, 2021	Initial Release of this document
Rev 1.1	October 09, 2021	Document update
Rev 1.2	May 22, 2023	Document update
Rev 1.3	November 19, 2023	Document update
Rev 1.4	August 10, 2024	Document update
Rev 1.5	September 22, 2024	Document update
Rev 1.6	May 01, 2025	Document update

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1. Introduction

MiniUni Electronic Flight Instrument (EFIS) is an advanced electronic device which is designed to provide various flight information to pilots of experimental airplanes. MiniUni EFIS is non-TSO certified as a flight instrument. This EFIS is available in two form factors and fits in standard aviation panel openings 2 ¼" (model: MiniUni2-P) and 3 1/8" (model: MiniUni3-P). Functionality of both units is very similar with very minor differences. This product manual is intended to describe EFIS functionality, installation and operation**.**

Please note: in this document "MiniUni", "device", "unit" and "instrument" are used interchangeably when reference is made to all models of MiniUni.

2. General Description

MiniUni EFIS is an electronic device which is comprised of a microcontroller, an LCD display, a housing case and various built-in sensors, including: gyroscope, accelerometer, static and dynamic pressure sensors and GPS receiver. In addition, there are two external sensors: GPS antenna and outside air temperature (OAT) sensor. LCD display built into EFIS is used to display all of the flight information.

MiniUni EFIS consists of two distinct modules: graphics processing unit (GPU) and sensors processing unit (also known as Attitude and Heading Reference System or simply "AHRS"). The first one is directly connected to the display and is used to control LCD display and all output data. The second processing unit is connected to all of the sensors and is intended to read and process all sensors' data. Both processing units have their own firmware and work independently of each other. They communicate with each other at a high speed using dedicated protocol.

For all user controls and inputs there is a rotating knob (in both models of MiniUni) and also two push buttons (in MiniUni3 only). Both models of MiniUni have built in SD card slot for MicroSD card. This card is used for all firmware updates as well as for logs and flight data export function. MicroSD card must be FAT formatted and should have a size of no more than 16Gb. There are two different versions of each unit which are GPS only based or GPS + Dynamic/Static based.

3. Technical Specifications

Description	MiniUni 2 and MiniUni3
Input voltage	+10 to +28 Volts
Power consumption	2.0W
Current	1.1A at 12V
Unit size (MiniUni2)	68mm x 68mm x 81mm (with knob)
Unit size (MiniUni3)	88mm x 88mm x 81mm (with knob)
Weight (MiniUni2)	150 g
Weight (MiniUni3)	195 g
Operation humidity	25% to 90%
GPU processor	ARM
Sensors processor	ARM
System startup time	26 sec
Display (MiniUni2)	2.25” sunlight readable transflective 320x240px
Display (MiniUni3)	3.5” ultra-bright 320x240px
SD Card slot	Standard MicroSD
Panel opening (MiniUni2)	2.25” (57.15mm)
Panel opening (MiniUni3)	3.125” (79mm)
External communication	CAN bus (proprietary protocol) and UART 115200
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
Communication ports	RS232 (2 ports)
Manufacturer	360Avionics

4. AHRS (sensors processing unit)

Attitude and Heading Reference System ("AHRS") is based on accelerometer, gyroscope, dynamic pressure and GPS sensors. These sensors are required for proper calculation of the attitude and heading which includes roll, pitch, yaw and heading information. In addition, depending on the unit version additional sensors may be used for AHRS calculations (such as outside air temperature sensor, magnetometer, etc).

Information from the sensors is taken and processed in the sensors processing unit (AHRS). Complex mathematical calculations are performed and digital filtering is applied to information provided by the sensors to estimate current Roll, Pitch and Yaw ("RPY") and show them on the display via artificial horizon indication. Depending on the sensors used in calculations, the output provided by the sensors and other factors, the estimated RPY may produce some errors. GPS data is required for MiniUni to minimize the errors in RPY calculations, especially when in banked turn. It is strongly recommended to always have GPS antenna connected to the unit because the GPS course as well as a few other parameters taken from the GPS sensor are crucial for correct attitude estimations. Coordinated flight will also minimize the errors in RPY calculations.

Reminder for pilots: It is very important to always remain in a coordinated flight. Coordinated flight is an essential requirement for precise RPY estimation. Uncoordinated flight for a short period of time will not produce enough errors for RPY to become invalid, however a prolonged uncoordinated flight will lead to significant amount of errors in RPY calculations.

When an uncoordinated flight is experienced, RPY parameters will likely be displayed with errors, in other words the artificial horizon position will not depict true horizon, as experienced by the pilot. After coordinated flight is resumed it will take approximately 20-35 seconds for RPY parameters to correct themselves and to return to their correct position.

Steep banking turns (over 50-55^{o}) may also produce some errors in RPY output because some parameters may exceed the upper or lower threshold of some sensors. After coordinated flight is resumed it will take approximately 20-35 seconds for RPY parameters to correct themselves and to return to their correct position.

Aerobatic exercises will likely produce significant errors in artificial horizon and attitude indications due to limitations of the sensors. After normal flight conditions are resumed it may take more than 1 minute for parameters to stabilize and correct attitude to show on the display.

5. Pitot and Static systems

MiniUni EFIS is available in two different configurations: (1) GPS based only version and (2) Pitot/Static + GPS version. The differences between these versions are described below.

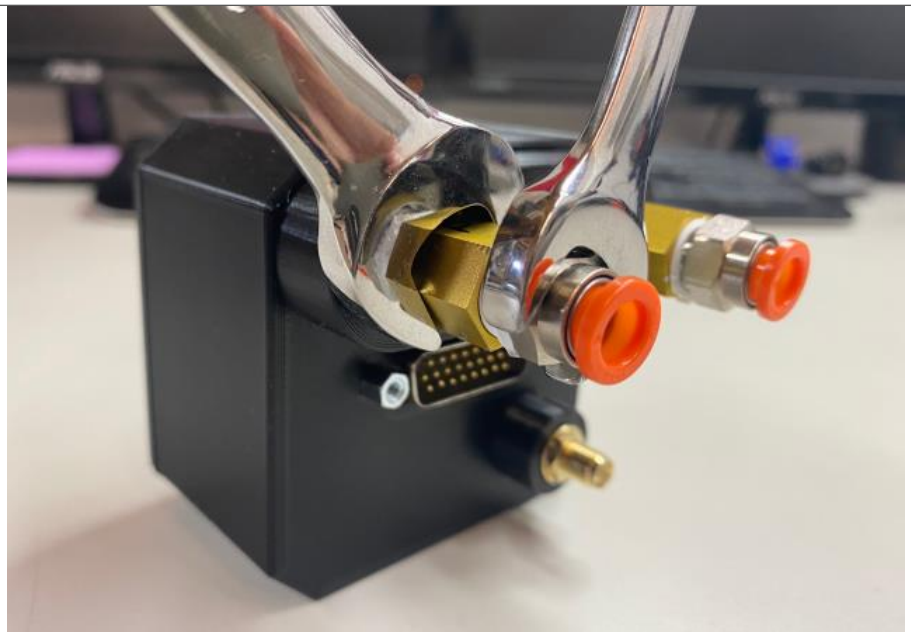
	AirSpeed	True AirSpeed	Ground speed
GPS based only			● (as air speed)
Pitot/Static + GPS	●	●	●

(1) GPS based only – This version has built-in backup pressure sensor for all precise altitude and vertical speed calculations. Ground speed is calculated based on the information provided by GPS sensor. The Pitot and Static ports are not available in this version. Airspeed and True Airspeed (TAS) indicators from pitot sensor are **NOT** available in this version. This version of MiniUni will likely be used as an additional backup instrument with enhanced functionality. Outside air temperature (OAT) probe is optional for this unit and is not included in package.

(2) Pitot/Static + GPS – This version has precise built-in dynamic and static pressure sensors with Pitot and Static ports on the back side of the unit. The Pitot sensor acts as the primary source for airspeed information, however in case when airspeed information from Pitot sensor is considered non-reliable (as determined by manufacturer-defined internal errors threshold), the ground speed will be shown instead and will be based on the GPS sensor with appropriate alert on the display.
True Airspeed (TAS) is available in this version when Outside Air Temperature (OAT) probe is installed and connected. All additional enhanced functionality is also available in this version of unit.

Pitot and Static ports are NPT 3/8”-27 threaded or quick release ¼”connectors. All recent (2023) manufactured units come with quick release ¼” ports.

⚠ Important installation tip: When plumbing connectors are installed it is important to use two wrenches to ensure that NPT 3/8”-27 female port on the unit is held by the wrench while respective male NPT connector is screwed in. Failure to do so will easily unscrew female NPT connector inside of the unit and may cause further functionality issues.



When pitot/static lines are connected to the unit it is very important to perform pitot/static leak test on the airplane to ensure that all connections are properly plumbed and sealed. Airspeed and altitude sensors are factory calibrated and do not require additional calibration after installation.

6. LCD Display

All models of MiniUni utilize LCD displays with 320 x 240px resolution with good color transmission and contrast.

MiniUni3 utilizes high brightness sunlight readable technology display 3.5” diagonal. This display is a TFT LCD with bright backlight which is intended for use in applications where direct sunlight is present.

MiniUni2 utilizes sunlight readable, transflective technology display 2.25” diagonal. This display, compared to the display utilized in MiniUni3, is slightly dimmer, but is easily readable under direct sunlight in all flight conditions. Transflective technology utilizes different layers that are activated depending on the level of illumination. In bright sunlight, the display acts mainly as reflective display. In dim ambient light or at night, the display works in transmissive mode.

Both units (MiniUni2 and MiniUni3) have built-in ambient light sensors on the front panel. Auto brightness feature can be enabled in the “Settings” menu > “General config” submenu.

MiniUni3: If auto brightness feature is turned “ON” in MiniUni3 the brightness of the display will automatically adjust based on the ambient light - display will be brighter in direct sunlight and will be dimmer at night.

MiniUni2: If auto brightness feature is turned “ON” in MiniUni2, the brightness of the display will automatically adjust based on the ambient light, however, compared to MiniUni3, the effect will be negligent due to transflective technology used in the display. Trasnflective technology does not require increased brightness of the display to stay readable in bright sunlight. In both direct sunlight and dim ambient light, the display will remain readable whether auto brightness feature is turned “ON” or “OFF”. It is recommended that user tries both modes to find optimal setting for the eye and particular setup.

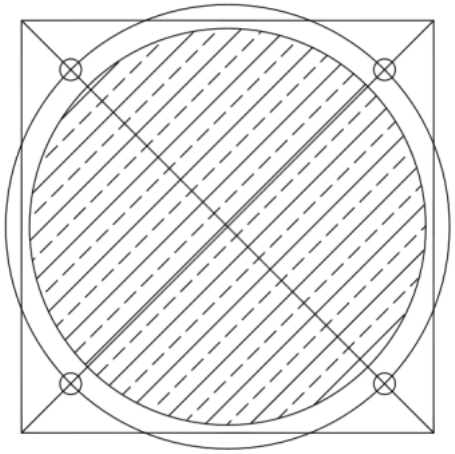
Displays in both models are non-touch. Avoid pushing on the display with finger or other objects and avoid cleaning the displays with abrasive chemicals not designed for cleaning of LCD displays...

⚠ Important installation warning: Excessive length of mounting screws may damage the LCD display. Carefully read section 7 below to see what kind of screws are required for installation.

7. Product installation

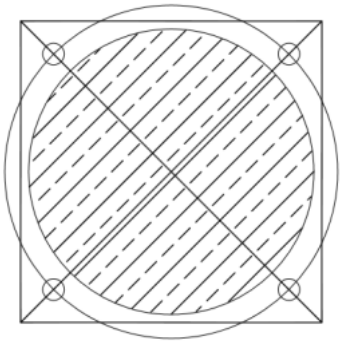
7.1 Space requirements

MiniUni2 (ELM200) and MiniUni3 (ELM300) are both easy to install. MiniUni2 fits into 2.25” opening in the instrument panel. MiniUni3 fits into 3.125” opening in the instrument panel. Each unit has four mounting holes on the front panel. It is sufficient to use only three (3) mounting points to firmly hold the instrument in place, however use of all four is recommended when possible.



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.

The installation depth of the unit for both MiniUni2 and MiniUni3 will require approximately 85mm (not including depth of the plumbing for Pitot and Static lines).

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 ELM200/ELM300

Due to the design of the ELM200 and ELM300, special attention must be paid to the length of the #6-32 machine screws used for mounting the instrument.

- For the **ELM300**, the screw should not extend more than **5 mm (3/16" to 7/32")** into the EFIS front panel.
- For the **ELM200**, the screw depth inside the front panel must not exceed **10 mm (25/64")**.

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

- A **#6-32 machine screw no longer than 7 mm** for the ELM300
- A **#6-32 screw no longer than 12 mm** for the ELM200
-

The use of longer machine screws for the mounting holes in ELM200/300 will likely cause the machine screw to reach the surface of the LCD display or internal board, and damage it.

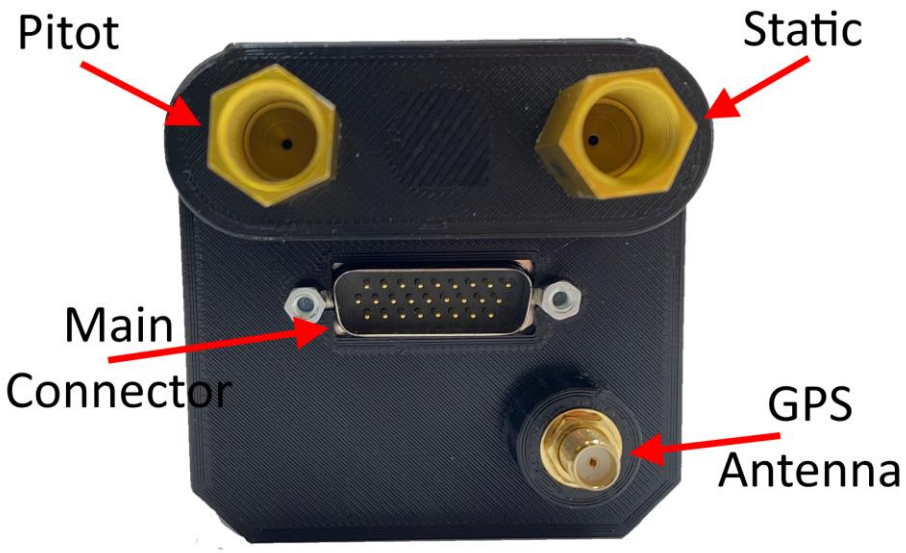
Please note that such damage is not covered by warranty for the product!

7.3 Proper alignment of the instrument

*It is assumed that the instrument panel is always perpendicular to the airplane's flightpath. For proper operation of MiniUni, AHRS sensors' (such as accelerometer and gyroscope) X axis must point in the same direction as the flight path, Y axis must be perpendicular to the flight path and Z axis must be perpendicular to the ground. If instrument panel is **NOT** perpendicular to the flight path, AHRS sensors' axis will be misaligned, and therefore the device will not operate correctly – in this case the device will need to be calibrated or leveled. For AHRS sensors leveling procedure please see appropriate section in this manual.*

7.4 Connections

On the back side of the unit there are two or more main connectors depending on the version of the product. For all electrical connections MiniUni utilizes a 26 pin D-SUB male pins connector located in the center. Female D-SUB connector is included with the kit for all wiring. Recommended wire gauge is 22AWG-24AWG.



Pitot line is marked as **'P'** and Static lines is marked as **'S'** on the back of the unit. 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. MiniUni units come with quickconnect ¼" connectors for Pitot and Static ports preinstalled.

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:

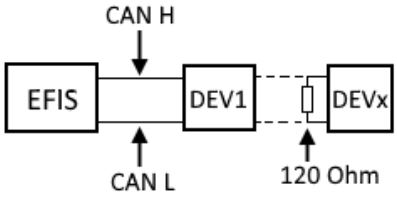
1 – Power +V (positive)
2 - Power +V (positive)
3 – CAN bus Low
4 – CAN bus High
7 – RS232 Tx (Port1)
8 – RS232 Rx (Port1)
10 – OAT sensor power (+3V3)
12 – RS232 Tx (Port2)
13 – RS232 Rx (Port2)
17 – GND (OAT-, Audio-, RS232)
19 – OAT sensor input
25 – GND (negative)
26 – GND (negative)

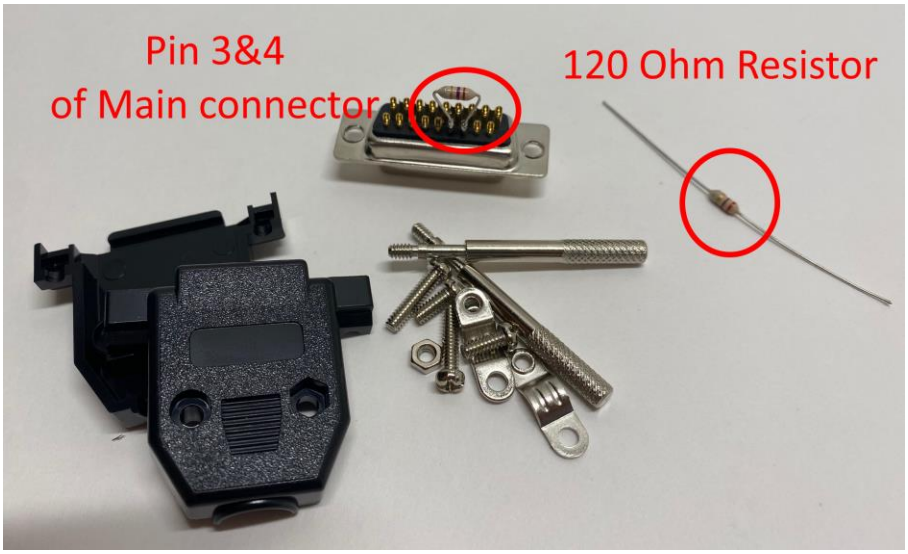
It is recommended to use 22AWG for all power connections (pins 1,2,25,26). For all other connections it is acceptable to use 24AWG. Use milspec wires for all connections to ensure high quality and robustness of the wiring. Kit includes female D-SUB 26pin connector header (soldering or crimp in pins option). Plastic enclosure for the connector header is also provided. In case of wires soldering ensure that they are properly attached without cold soldering.

CAN Bus termination:

MiniUni can be installed in the airplane together with compatible 360 Avionics external magnetometer and/or engine monitor, and connected to a single CAN line. When MiniUni is installed on its own (without an external magnetometer, VICS voice module and/or engine monitor module), it is required to install 120 Ohm termination resistor (included with the kit) between pin 3 and pin 4 for CAN line. The resistor must be installed on the connector and left inside of the enclosure.

When external module (DEV) such as ENGOOD engine monitor, VICS voice information system or external magnetometer is installed, CAN bus termination resistor must be installed to terminate the CAN bus at the end of the CAN bus line. See diagram below:





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 MiniUni. 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 depends on the airplane configuration.

OAT Sensor (probe):

Outside air temperature ("OAT") sensor is optional and can be connected to the MiniUni. Depending on the version of the unit, additional features will become available.

GPS based: When OAT sensor is installed in this version, OAT will become available on the display, but True Air Speed (TAS) will not be available.

Pitot/Static + GPS version: When OAT sensor is installed additional information such as True Air Speed (TAS) and OAT will become available on the display.

OAT sensor is a digital probe which is enclosed in a threaded aluminum housing. Standard cable length of 59" (150cm) should be sufficient to install OAT sensor on the same side where MiniUni unit is installed. You may always extend OAT cable length to desired length, but should not exceed 14.76' (4.5 m). If cable extension is necessary, always properly extend and isolate wires connections to avoid electrical shortage and possible unit damage.

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

10 – OAT sensor power (+3V3)
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.

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 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 MiniUni. It is possible to Disable OAT sensor from "Settings" menu > "External devices" 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 **ELM350** 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 Port:

Pins used for the port

7 – RS232 Tx (Port1) *MiniUni3 only*
8 – RS232 Rx (Port1) *MiniUni3 only*

12 – RS232 Tx (Port2) *MiniUni3 only*
13 – RS232 Rx (Port2) *MiniUni3 only*

17 – GND (RS232, OAT- and Audio-)

Port settings are selectable using EFIS menu.

*Please note that currently RS232 ports are **ONLY** available in MiniUni3 model.*

8. AHRS sensors leveling procedure and Pitch Adjust

8.1 AHRS sensors leveling procedure

In most airplanes the instrument panel is perpendicular to the flight path and perpendicular to the ground when airplane is leveled (such as in normal cruise flight). During production each MiniUni is calibrated for such installation, and proper offset values are recorded into the memory of the device. Each time the device is turned "ON", the offset values are automatically used to calibrate the device. However, there may be cases when re-calibration of 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 MiniUni 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 select it:
    - MiniUni3 – push the right button
    - MiniUni2 – push the main knob

4. When the artificial horizon indicator is displayed, push and hold the knob for 3 seconds to go into the 'Settings menu'.

5. 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.*

6. To select menu option (***'Accl Cal Ovrd')*** push the knob The selector background will change from white to blue.

7. Rotate the knob to select ***'Re-Cal'***

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

9. After 3-4 seconds the following message ***'Updating Please Wait'*** will show up on the display along with backward moving timer.

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

11. Select "…" from the menu to return to the "Setting" Menu.

12. Push the knob and hold it for 3 seconds to return back to the "Artificial Horizon" mode.

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

14. To verify that calibration was completed successfully, open 'Info Page'. To do so, switch to Voltmeter mode:
    - MiniUni3: push the right button

15. MiniUni2: push the knob Once in Voltmeter menu, open the "Info page":
    - MiniUni3: push the knob

16. MiniUni2: push the knob and hold it for 3 seconds Ensure that Roll and Pitch are at "zero". Yaw does not need to be at "zero".

17. Calibration is completed and verified.

18. Exit the "Info Page":
    - MiniUni3: push the right button

MiniUni2: push the knob

8.2 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".

9. 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 MiniUni. In case of any malfunction, the unit should be returned to the manufacturer for test and repair.

10. Firmware Update Procedure

GPU and AHRS modules within the MiniUni, operate using two distinct firmwares.
Each unit comes preloaded with the latest available firmware at time of production, however future firmware updates are possible via SD card.

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.

Should firmware update be available and required for your unit it can be performed in a few easy steps:

1. Download firmware from www.360avionics.com or receive by email from a 360 Avionics technical support agent.

2. Copy firmware update file to a microSD card. MiniUni usually comes with the SD card of 4Gb or bigger size. Make sure that the SD card is formatted to FAT file system. Firmware should be copied to the root of the microSD card.

3. Make sure that nothing else is saved on the SD card except these files. Firmware update file names start with '***FW_***' and have an extension '***.enc***' *or* '***.hex***'. Update may consist of one single file or two separate files.

For example:

FW_MiniUni35_main.enc
FW_MiniUni_ahrs.enc

4. Make sure that unit is OFF. Insert SD card into the unit. Push and hold the knob. While holding the knob, turn the unit "ON" using master/power switch. Release the knob as soon as Bootloader menu is displayed. This sequence will start up MiniUni in Bootloader mode for firmware update.

5.

a) MiniUni3: Push left button to verify contents of the SD card. *If you do not wish to proceed with the update you may turn the unit "OFF" by using master/power switch or press right button.*

b) MiniUni2: Push the knob to verify contents of the SD card. *If you do not wish to proceed with the update you may turn the unit "OFF" by using master/power or press and hold the knob for 3 seconds.*

6. If firmware update is found, the bootloader will indicate that on the display.
Start the firmware update process (Flash):

- MiniUni3: Press left button
- MiniUni2: Press the knob

The firmware update process may take up to 30 minutes depending on the size of the update files.

Keep the unit powered "ON" for the duration of the firmware update. Unexpected power outage may cause the unit to become unresponsive. If this happens the unit should be powered "OFF" and turned "ON" again. Then, firmware update procedure should be repeated.

7. When firmware update is completed successfully, "completed successfully" message will be shown on display. At this point the unit can be rebooted by pressing knob (on MiniUni2) or left button (on MiniUni3) as well as using the power OFF/ON cycle.

8. If for any reason the unit becomes unresponsive after firmware update is completed, it is recommended that you repeat the update again. There is a possibility that something went wrong during the update.

11. 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" from "artificial horizon" mode or "compass mode" by pressing the knob and holding it for 3 seconds*
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 white*

Performs steps 3 to 7 for all of the other Speed Types. Once all of the speeds have been set for your airplane, select "…" from the "V speeds" submenu to go to the "Setting menu", then push the knob and hold it for 3 seconds to return to "artificial horizon" mode. Note that you can exit the "Settings Menu" only when the selector is white.

11.2 MiniUni Operation Modes

MiniUni has the following modes of operation:

- Artificial horizon indicator
- Compass (course deviation indicator CDI)
- G-meter
- Time/Flight time
- Extended Time
- Altimeter
- Speedometer
- Voltmeter
- Oil life

- MiniUni3: You can switch between operation modes by pressing the right button.
- MiniUni2: You can switch between operation modes by pressing the knob

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 desitred.

Artificial horizon indicator

The artificial horizon indicator, shows the following flight parameters:

1. **Current speed:** Depending on the version of the MiniUni and other factors, the speed shown can either be ground speed or air speed, and the speed can either be shown in red or white color. The units for current speed are always shown below the speed indicator in green.

    - **MiniUni GPS based version**: In this version of the MiniUni, the speed is always obtained from the GPS sensor, and it is always shown in red color. 'GPS' label appears next to the speed indicator.

    - **MiniUni Pitot/Static + GPS based version**: In this version of the MiniUni, the speed is usually obtained from the dynamic pressure sensor (Pitot) and is considered an airspeed. When the airspeed is obtained from pitot, it is shown in white color. When current speed is shown in red color it is taken from the GPS sensor and is considered a ground speed. 'GPS' label is shown next to the ground speed information

2. **Current altitude indicator:** current altitude value appears on the right side of the display. The units for current altitude are always shown below the altitude indicator in green. **Density altitude:** shown above the current altitude indicator whenever OAT sensor is connected and enabled in the main menu.

3. **Slip/skid ball indicator:** The slip/skid ball indicator is located at the bottom of the screen. Airplane is coordinated when ball is inside of the gate.

4. **Ground pressure indicator:** Ground pressure indicator is located at the bottom right of the screen. it's units are shown above the ground pressure indicator. To adjust the ground pressure based on ATIS, rotate the knob clockwise or counter clockwise.

5. **Ground speed indicator:** Ground speed indicator is shown on the bottom left of the screen. When GPS signal is not available the message "NO GPS" is shown. When GPS signal is available current ground speed will be shown. The units are shown to the right of the ground speed value. "GS" stands for "ground speed".

6. **Vertical speed indicator:** Vertical speed is shown on the right side of the screen, underneath the altitude indicator. It shows altitude change per minute in same units as altitude is shown. When vertical speed is shown in white color, the airplane is steady or descending; "-"sign will appear before the number if airplane is descending. When

vertical speed is shown in green color, the airplane is climbing; “+” sign will appear before the number.

7. **Turn bank arc:** Turn bank arc is located at the top of display, in the center. This arc shows current bank angle of the turn. In addition, when in flight, two small blue triangles “▼)” are shown on both sides of the at center white triangle. They represent a standard turn bank (2min/turn). This indication will only be shown during flight.

8. **Current track indicator:** Current track indicator is located at the very top of the display. By default, it shows the (M) Magnetic track however it can be switched to (T) True track in the “Settings Menu” > “External devices” > “Mag Decl Corr”. Current mode (M) or (T) is shown to the right of the indicator.

9. **Vertical speed color strip:** Vertical speed color strip is located on the left hand side of the screen and shows the V speed markers (Vfe, Vy, Vx, Vr, etc). The strip and the markers move, according to the current speed of the airplane.

10. **Outdoor Air Temperature:** OAT information is located at the bottom left of the display, above the “ground speed” indicator. The units are shown next to the value.

11. **Density Altitude:** Automatically calculated by the unit whenever OAT sensor is connected and enabled in the “Settings menu” > “External devices” > “Use OAT”.

12. **True Air Speed (TAS):** Calculated by the unit whenever OAT sensor is connected and enabled in the “Settings menu” > “External devices” > “Use OAT”. This function requires Pitot airspeed enabled version of the unit.

Compass mode

In compass mode MiniUni displays the following information:

1. **Current track:** By default, the (M) Magnetic track is shown. The track can be changed to (T) True north in “Settings Menu” > “External devices” > “Mag Decl Corr”. Current mode (M) or (T) is shown to the right of the indicator.

2. **Current heading bug setting:** current heading bug setting is located on the bottom right of the display as well as shown by triangle ‘Heading bug indicator’. To change the heading bug setting, rotate the knob clockwise or counter clockwise.

3. **Heading bug indicator**: the heading bug indicator is located on the compass dial

4. Ground speed indicator: ground speed indicator is located on the bottom left of the display.
By default, compass information is taken from the GPS COG (course over the ground) which is a precise value when airplane is in motion and GPS signal is available. GPS provides a COG as a True direction. If enabled in “Settings Menu” > “External devices” > “Mag Decl Corr”, COG will be converted from True to Magnetic direction and shown on compass/display.

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:

- MiniUni3: timer can be manually started and stopped by pressing the left button. Timer can be reset by pressing knob.

- MiniUni2: timer can be manually started, stopped and reset by pressing the knob and holding it for 3 seconds.

Note that the timers in both MiniUni3 and MiniUni2 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 (described below).

Voltmeter mode

Voltmeter mode shows current voltage information as read on MiniUni power bus V+.
You can open an 'Info Page' with additional technical details which can be used for calibration and other purposes:
MiniUni3: press the knob once
MiniUni2: press and hold the knob for 3 seconds

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:

- on MiniUni3: press left button
- on MiniUni2: press and hold the knob for 3 seconds)

Oil Life Timer mode

Oil Life timer mode shows cumulative flight time since the last time oil was changed (in decimal hours/minutes). It is recommended that this timer is reset on every oil change by pressing the knob and holding it for 3 seconds until Oil Life timer reset to '0.0'. Every time when airplane gets airborne (Vr is reached) Oil Life Timer starts. Upon landing (speed is below Vs) Oil Life Timer stops.

Oil Life Timer allows the pilot to conveniently track the cumulative flight time since the last time oil was changed and schedule maintenance accordingly.

Fuel Alarm

Fuel Alarm can be enabled or disabled in the Settings>Time menu. This option allows user to turn on a repetitive alarm that would display a reminder to switch the fuel tanks at a predefined interval of time (between 0 and 240 minutes). When alarm is set to 0 it is disabled. When an alarm is turned on (value between 1 and 240 is set), the unit will show on-screen reminder message "Switch Fuel Tanks" every predefined interval of time. To return back to the main screen push the knob once.

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

CDI (Course Deviation Indication Mode)

When external GPS receiver is connected and 'NMEA In' mode is set for desired RS232 port in settings, the MiniUni EFIS (currently model MiniUni3 only) is capable of acting as CDI (course deviation indicator) while following the remote GPS flight plan.

During this mode at the left in the middle of the display *the name of the next waypoint* is shown. At the right from top to bottom: *bearing to next waypoint, distance to next waypoint and deviation from course* are shown. In the center of the display *the scale of deviation dots* is shown. It is standard 1NM per dot. If deviation is more than 3NM the scale dots will disappear.

When external NMEA source is connected, the main AI screen will show in the top left either message 'NMEA' – when no active flight plan is loaded in external GPS source, or 'WPT' and its name when active flight plan is loaded.

TailBeaconX controls

When tailBeaconX (uAvionix) is connected via RS232 port to MiniUni (currently only MiniUni3 model is supporting this feature) it is possible to control tailBeaconX functions such are operation mode and squawk code from the EFIS.

Current tailBeaconX operation status and current squawk code is shown at the right side of the screen above altitude window in the transponder status field. To change squawk code press left button on the EFIS. In the bottom of the screen menu with squawk code selection will appear.

Squawk code entry done digit by digit. Current digit is underlined. Rotate knob left or right to set first digit of the squawk code then press knob once to select the second digit. It will become underlined. Set the second, third and fourth squawk digits in the same way. Once squawk code is entered press and hold left button on EFIS until new squawk code appears at the middle right of the display in transponder status field.

To change current operation mode of the tailBeaconX transponder press the left button on EFIS twice. On first button press the squawk entry gets active, on second button press the mode change gets active.

Rotate knob to select operation mode for transponder (OFF, ON, ALT or IDENT). Once the desired mode name appears in the bottom of the display press and hold left button on EFIS until desired mode name appears at the middle right of the display in transponder status field.

Transponder status field may also indicate additional information related to the current transponder status such are: 'NO GPS FIX' or 'ERROR'.

When tailBeaconX is in OFF mode it is normal for 'NO FIX' message for GPS to appear. As soon as transponder is switched to 'ALT' mode the 'NO FIX' message will disappear.

The small blinking red dot at the left of squawk code indicates that transponder may have some problem and may require service.

When tailBeaconX is in 'IDENT' mode the appropriate status will show up in the status field.

12. Settings Menu

MiniUni has a built in ***Settings menu*** where various parameters can be adjusted and configured. To enter '*Settings menu*' the unit must be in "Artificial horizon" or "Compass mode". Press and hold knob for 3-4 seconds until Settings Menu is displayed. Settings menu has submenus under each menu option.

It is easy to navigate through the "Setting menu" by turning the knob clockwise or counter clockwise and by pressing the knob.

- 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 white, you can rotate the knob to move the selector up and down to scroll through the menu or submenu options
- When a desired menu or submenu option is found, you can select it by pressing the knob. Selector's background color will change from white to blue.
- When the selector's background color is blue, 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 white.

- To exit a submenu, move selector to '…' option (always located at the top of any submenu) and push the knob, this will return back to main menu.

- To return back to 'Artificial horizon mode' make sure the selector background is white, press the knob and hold it for 3-4 seconds. This can be done from main menu or any of submenus.

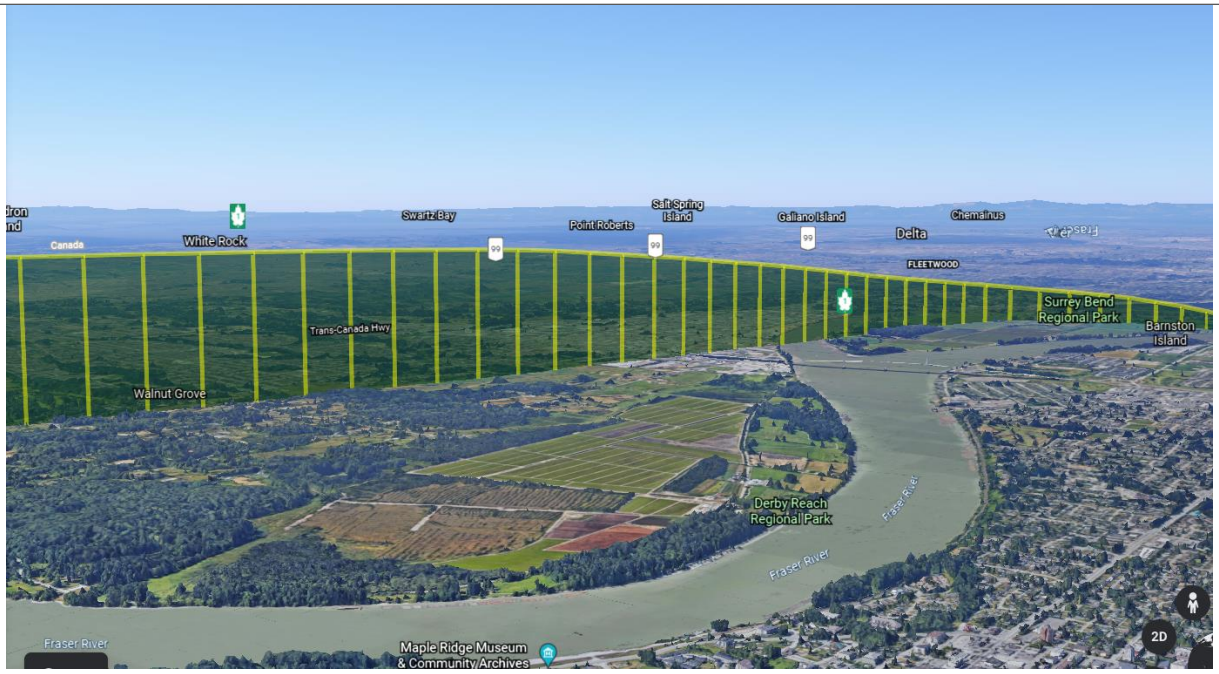
Please note: when certain settings are selected, the changes are not applied instantaneously, instead a message 'Updating. Please Wait' will be displayed. Once the changes are applied, the message will disappear and the "Setting menu" will be displayed.

13. Black Box functionality

MiniUni has a 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" > '***BB Trace Time***'.

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 SD Card in two formats – internal MiniUni 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.

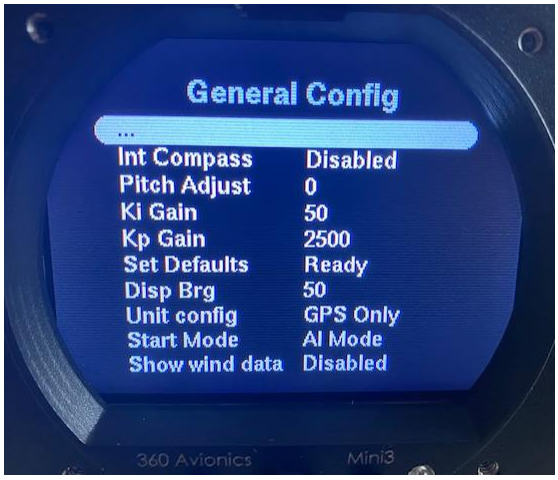


To export past flights from the black box memory on to SD card select from the “Settings menu” > “Black Box submenu” > ***BlackBox Func***.

1. Ensure that microSD card is inserted
2. Select **BlackBox Func** in the “Settings menu” > “Black Box submenu” by pushing the knob
3. Selector will become blue
4. Choose ‘Export to SD’ sub setting by rotating the knob
5. Push the knob to start export. Display will indicate current export status.
   Once completed you will be prompted.
6. Remove SD card from the unit and insert to PC. Copy exported files (KML) and open them with Google Earth. 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 internal compass (not available yet as an option, planned for future). Keep 'Disabled' at all times.

Pitch Adjust – Allows to adjust pitch horizon position up or down by few 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 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 85* will allow to manually set display brightness. For MiniUni3 it is recommended to use Auto mode if night flights are conducted, while for MiniUni2 it is recommended to set brightness to level between 55-65 because of the type of display used in this unit, unless the pilot prefers *"Auto"* setting. To select 'Auto' choose '0' value for setting.

Unit config – This setting is normally set by manufacturer, depending on the version purchased by the user. *GPS Only* – GPS based unit with no static/dynamic pressure sensors. *Pitot + GPS* – unit with built in dynamic and static pressure sensors, as well as GPS sensor. Pitot + GPS based unit can be used as GPS-based unit by setting this option to "GPS Only".

Start Mode – By default, the unit powers on with the "artificial horizon" mode displayed. The mode upon power "ON" can be set to 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 and provided wind information is not correct.

Dev Ctrl – This is special service function, which is not required for normal use.

Color Scheme – Allows you to choose various color scheme for main AI (Attitude Indicator) display mode.

Submenu: **Sensors**

Alt Sensor – Allows to select internal pressure sensor to be BMP280 or HSCMRN. Whenever unit model is GPS Based, sensor BMP280 must always be selected. For units with both GPS and Pitot/Static options sensor should be set to HSCMRN or BMP280 (as backup only).

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.

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.

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.

VICs LiDar – When connected with VICs module and LiDar altimeter sensor you may enable or disable LiDar altimeter mode via this setting. Mode1 will enable standard range LiDar sensor and Mode2 will enable extended range LiDar sensor.

LiDar Calibrate – Allows to calibrate the height of LiDar sensor installation on airplane to compensate for any additional height especially when installed under the wing of the high wing airplane.

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 intended for engineering use only and not described nor recommended for use.

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

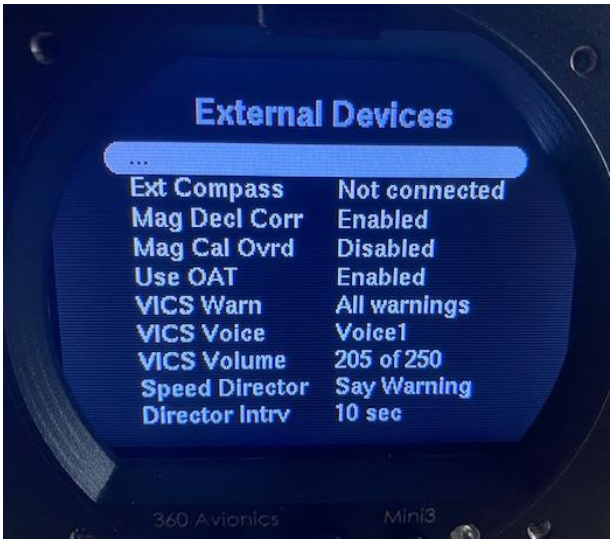
Corr Force – Correction force for banking turns. Should always be set to 'Auto' or 'Legacy' modes. Normally always set 'Auto'.

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.

ASI Calibrate – Calibrates ASI sensor to zero speed. This must be used ONLY when airplane engine is OFF and pitot sensor is not exposed to any air stream. Setting will 'zero' the airspeed indication based on current air pressure.

Submenu: **External Devices**



Ext Compass – External Compass. MiniUni can work in conjunction with an external compass. Should an external compass be connected to MiniUni, it can be activated in this menu option by selecting "enabled". 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 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.

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

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

Engine Monitor – This mode not supported at this time.

COM Port Speeds and Modes of operation – Allows to select the desired speed and mode of operation for each of two RS232 ports (currently is only available for MiniUni3)

Alt Encoder Mode – Sets the desired output format for transponder's altitude encoder.

uAvionix Mode – Communication mode for tailBeaconX. Default is Half Duplex.

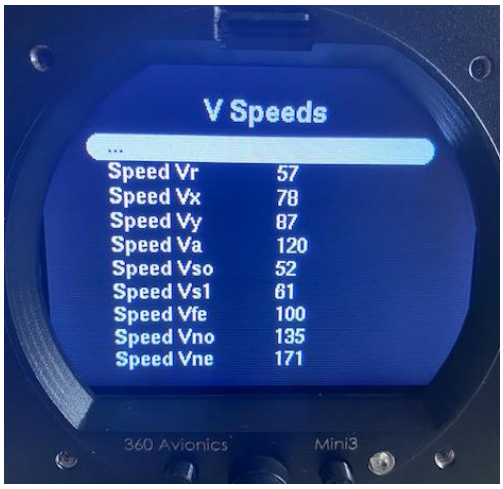
Submenu: **Time**

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.

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 audio reminder 'Switch fuel tanks' will also sound. To disable function set it to 0.

Submenu: **V Speeds**



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

BlackBox Func – Black Box functionality option can be set to '*Active*' 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 '*Stop*' - Black Box functionality will be turned off and no flight information will be recorded. Option can be set to, '*Erase Memory*' – this will clear up internal flash memory and all recorded flights will be erased. Option can be set to '*Export to SD*' – all flight information since last export will be exported to the SD card Export is done in two formats: internal MiniUni and '.KML' – Google Earth format. After Export all exported flights get erased from internal memory. Numbers at the right of setting value describes how many pages are used (first number) and how many flights are recorded (second number). It is recommended to export your flights to SD card whenever recorded flight number is below (50) to avoid memory overlap and flight information corruption.

BB Trace Time – Black Box trace time 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.

Submenu: **Info/Warnings**

Rudder Speed – when used with VICs module this sets the speed at which voice warning to check the rudder (amphibian planes) will annunciate.

Gear/Flaps Speed and Altitude – when used with VICs module this sets at what minimum speed and altitude audible warning to check Gears and Flaps will annunciate.

Landing Warning – when used with VICs module this enables/disables warning during landing for above mentioned parameters.

Lidar Warning/Info – when used with VICs module this enables/disables the altitude information in AI screen for current LiDar sensed altitude during the landing phase of flight.

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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