innovative avionics

FLYBOX®

ECLIPSE

for **ROTAX 912iS**

Installation and operating manual

Document release 3.0, 02/04/2019

For software version: CORE 6.00MCA

INDEX Pag.

The  symbol used in this manual indicates important information regarding use of this device.

1. IMPORTANT NOTICES AND WARNINGS

- This device is intended for installation onto non type certified aircraft only, because it has no aviation certification. Refer to your local aviation authorities to check if this device may be installed in your aircraft.
- This instrument cannot be used under any circumstances to conduct flights in IMC conditions.
- Read entirely this manual before installing the instrument in your aircraft, and follow the installation and operating instructions described here.
- Keep this manual in the aircraft.
- This document must accompany the instrument in the event of change of ownership.
- The pilot must understand the operation of this instrument prior to flight, and must not allow anyone to use it without knowing the operation. Don't use this instrument in flight until you are sure of the correct operating of the same.
- When the installation is finished you must do a test, prior to flight, switching on all the possible source of electric noise and checking the properly operation of this instrument.
- Using this instrument over the maximum allowable ranges can cause malfunction or wrong indications.
- **Do not solely rely on this instrument to determine the primary flight and engine informations. Always compare the informations provided with other primary instruments to recognize eventual malfunction.**
- The software of this instrument can be subject to change, update, addition or removal of functions, so also the operating mode of the instrument can be subject to change. Always refer to the installation and operating manual updated with the software version used in your instrument. To obtain updated software and manuals, please visit www.flyboxavionics.it.
- Responsibility for installation lies entirely with the installer. Responsibility for operations lies entirely with the operator. Responsibility for any calibration, alarms thresholds and activations, every customizable instruments thresholds or any other settings lies with the person performing these modifications.
- Microel s.r.l. reserves the right to change or improve its products. Information in this document is subject to change without notice.

If you do not agree with the notices above do not install the Eclipse in your aircraft, but return the product for a refund.

1.1 Primary actions after installation

WARNING! Do not fly until you have performed at least the actions indicated below:

1- Airspeed bar thresholds setting: (for Eclipse PFD or IFIS). It's essential to set the airspeed thresholds (bar colors) according to the V-speeds of the aircraft on which you installed the instrument, as explained in chapter 6.1.2, section "ASI GAUGE SETUP". Flying without correctly set this thresholds may be very dangerous because the airspeed bar indicate the colors relative to the various V-speeds incorrectly. The default factory settings are all preset to zero.

2- Tank level sensors: (if connected, for Eclipse EIS or IFIS). It's indispensable to perform the calibration for all the tank level sensors connected to the Eclipse. Without performing calibration and settings no indication will be furnished.
It is responsibility of the user to check during the first flights and over time the goodness of the calibration and therefore the instrument indications.
The verification can be done in any moment, for example by simply checking the quantity put to fill the tank: if you know that the tank filled contain 40 liters and the Eclipse indicate as remaining quantity 10.0 liter, you know that to fill the tank you must put approximately 30 liters. Of course keeping in mind that in ground the indications will be different that in flight because of the flight's attitude. This problem is present also in the traditional analog gauge indicators, but is more difficult to detect because of the non-numeric indication.
Another verification is, in case of low remaining quantity (i.e. 4~5 liters), drain and measure it.

3- Magnetic calibration: (for Eclipse PFD or IFIS). The magnetic calibration after the installation of your Eclipse is an essential procedure that you must perform before you fly. Not only the heading, but also the attitude indicator depends on a correct magnetic calibration. Without it there is no data stored for the magnetic sensors and the attitude indicator, that use this data also, may not work correctly. The magnetic calibration it's a simple procedure that is explained in chapter 7.1.

4- Fuel computer: (if installed, for Eclipse EIS or IFIS). If it's installed the fuel flow transducer, BEFORE rely on informations provided by the fuel computer section you must:
- Verify that the K-factor set in the Eclipse is pertinent to the installed fuel flow transducer (for the Flybox® TFTHP is 416,400).
- Execute the fuel flow transducer calibration as explained in chapter 7.2. Without calibration the fuel computer informations may be wrong, even if the nominal K-factor is correct for the fuel flow transducer used.
After calibration, the K-factor should have been calculated automatically and at best for every single installation. You must still check for some time if the remaining quantity indicated are reliable compared to the refuelling performed. For example, if the instrument indicate a remaining quantity of 35 liters and you know that the tanks capacity is 80 liters, filling the tanks should require approximately 45 liters; in case of much difference redo the calibration.
Consider also that, during use, little errors accumulate and if you never fill the tanks you never "reset" all these errors.

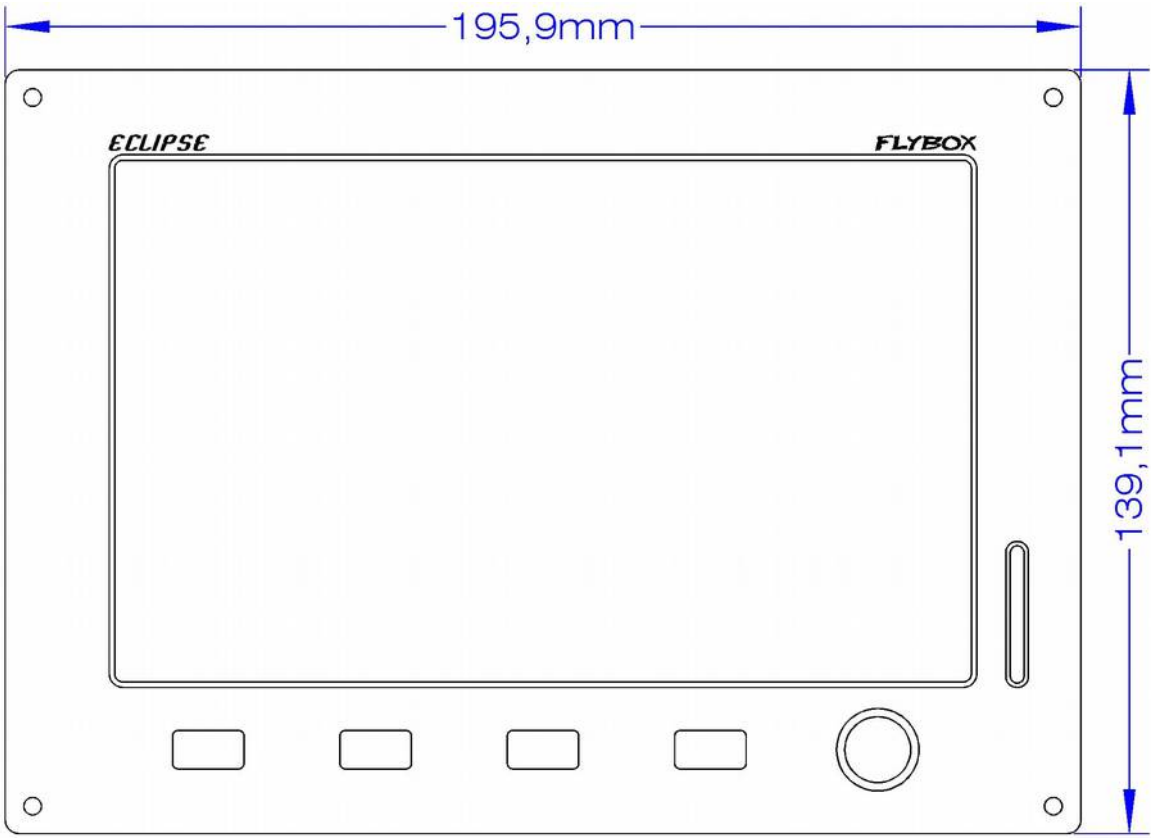
5- Instruments panel pitch adjust: For the proper operation of the attitude indicator it's necessary to compensate the inclination of the instruments panel regards the longitudinal axis of the aircraft, as explained in chap.6.1.9, "Pitch adjust" parameter.

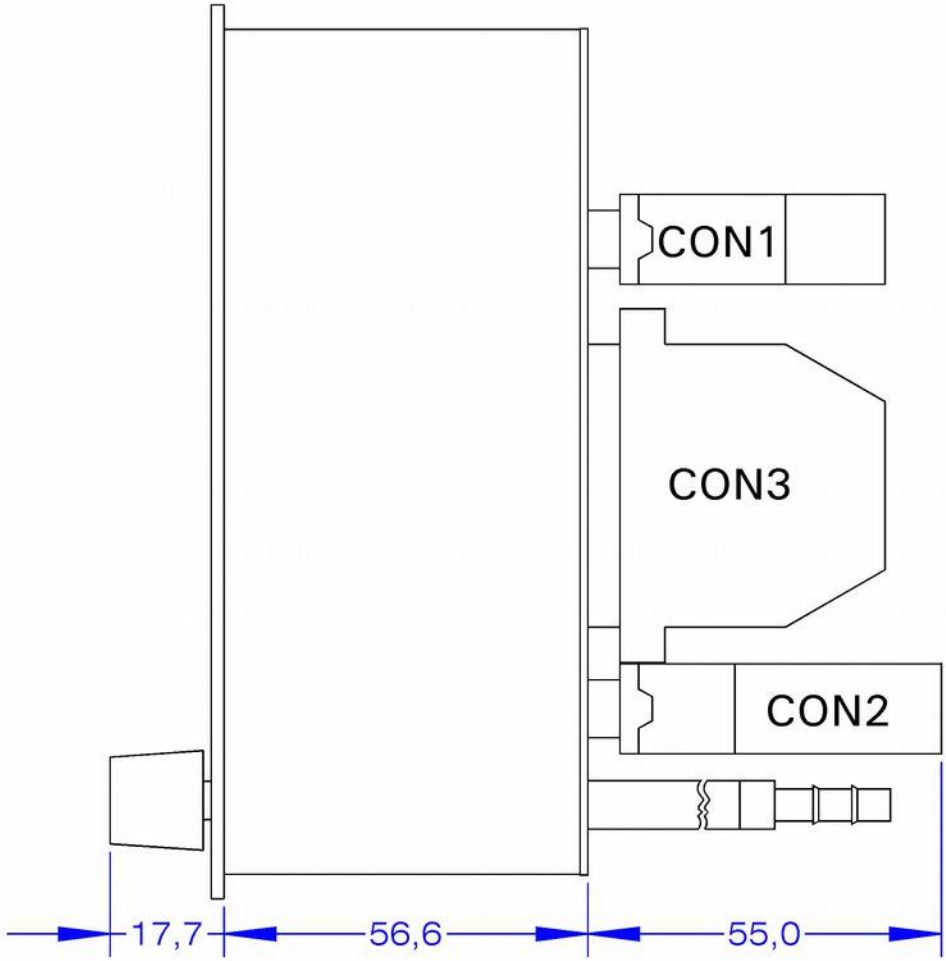
To fully customize the Eclipse you must perform many other settings, but they can also be made later.

ECLIPSE

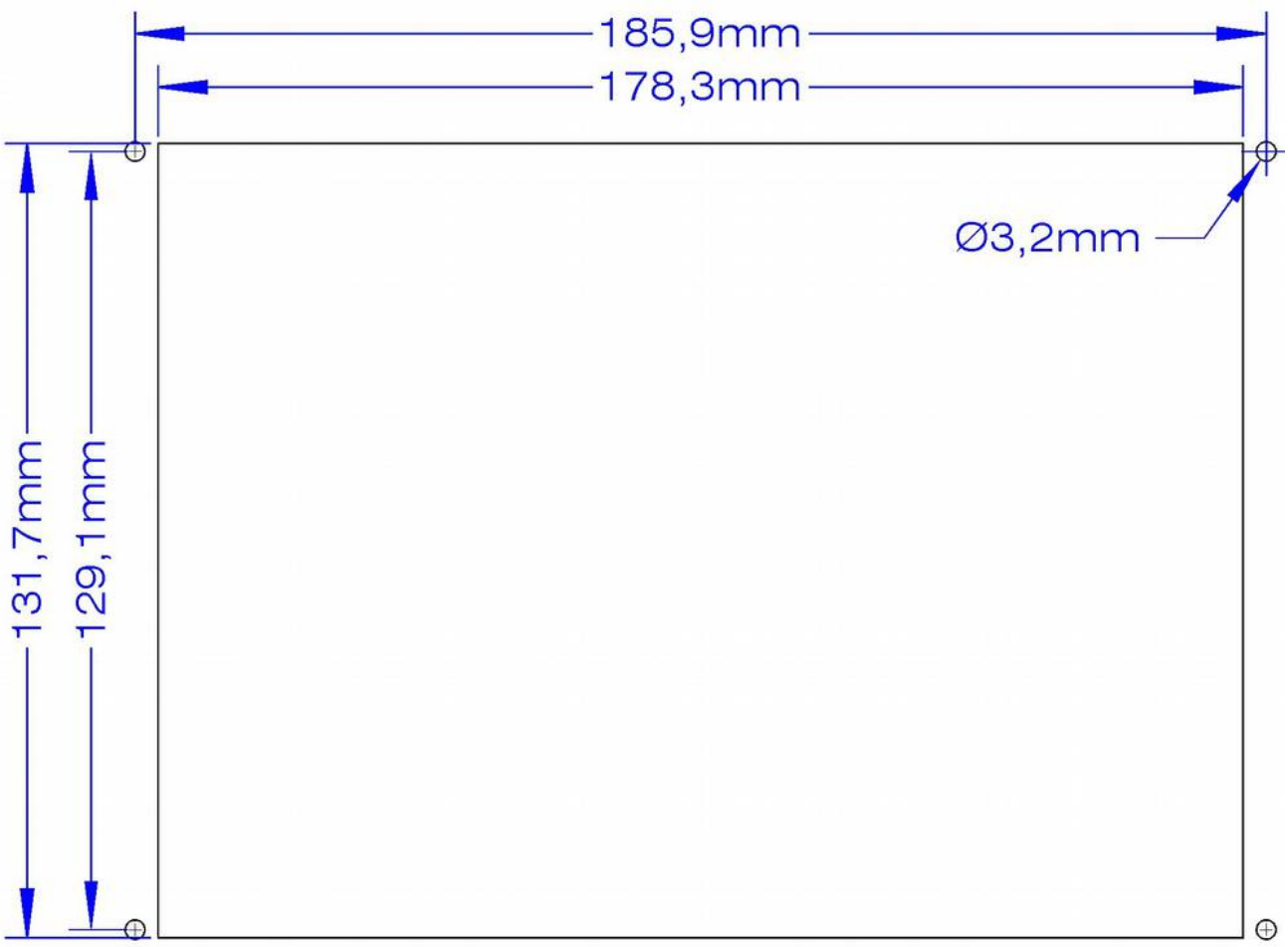
PART I - INSTALLATION

2. Dimensions





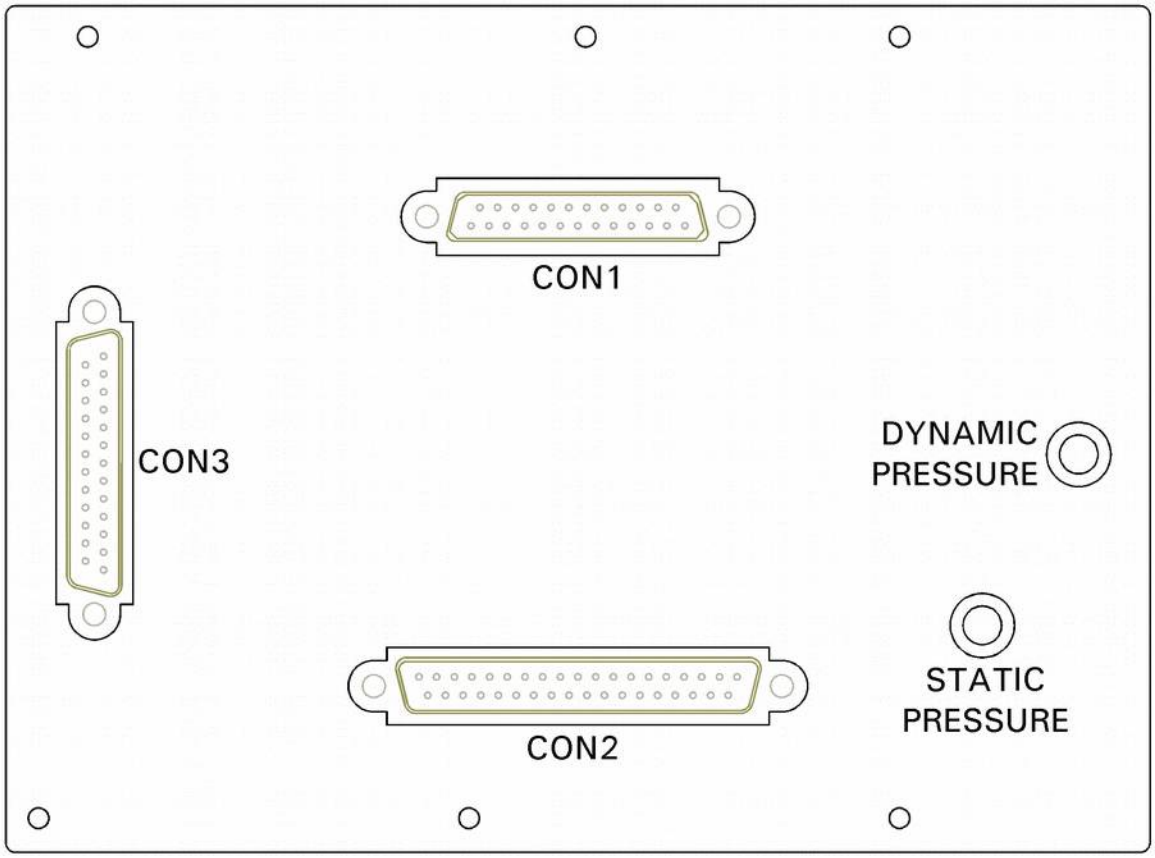
Panel cut-out



All dimensions are in millimeters.

Notes on installing ECLIPSE

- Leave at least two centimeter of free space around the instrument for heatsink. Specially on the upper and lower part of the instruments leave as much space as possible.
- During use the instrument become warm so it's necessary to have some air circulation inside the instruments room, to avoid that the temperature increase over the operating limits.
- Avoid placing n hot locations (for example near heater vents).
- Find a location where the display will always be completely visible.



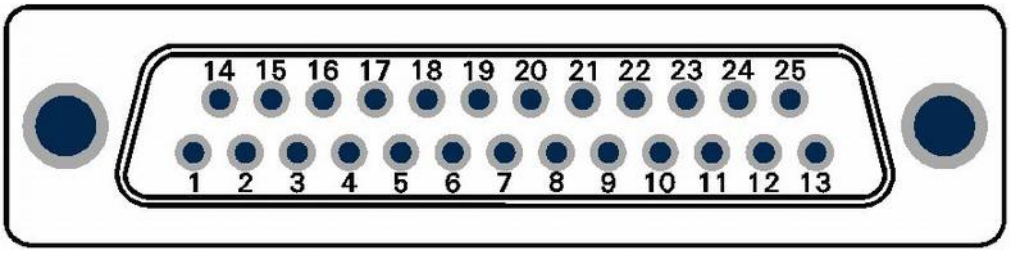
- STATIC AND DYNAMIC PRESSURE CONNECTIONS: Connect the pipe fittings on the back of the instrument to the statyc and dynamic pressure lines; the furnished pipe fittings is suitable for pipes with internal diameter of 5 mm.

- ELECTRICAL CONNECTIONS: On the backpanel of the ECLIPSE there is 3 D-SUB connectors:

- **CON1:** 25 poles, receptacle
- **CON2:** 37 poli, plug
- **CON3:** 25 poli, plug

- All 3 connectors is supplied with the corresponding connector to be wired (plug 25 poles for CON1, receptacle 37 poles for CON2 and receptacle 25 poles for CON3).
- In the CON3 connector there are all the thermocouple inputs: all wires must be crimped and not soldered, using the furnished crimp contacts and connector.
- All the wires to CON1 e CON2 connectors can be soldered.

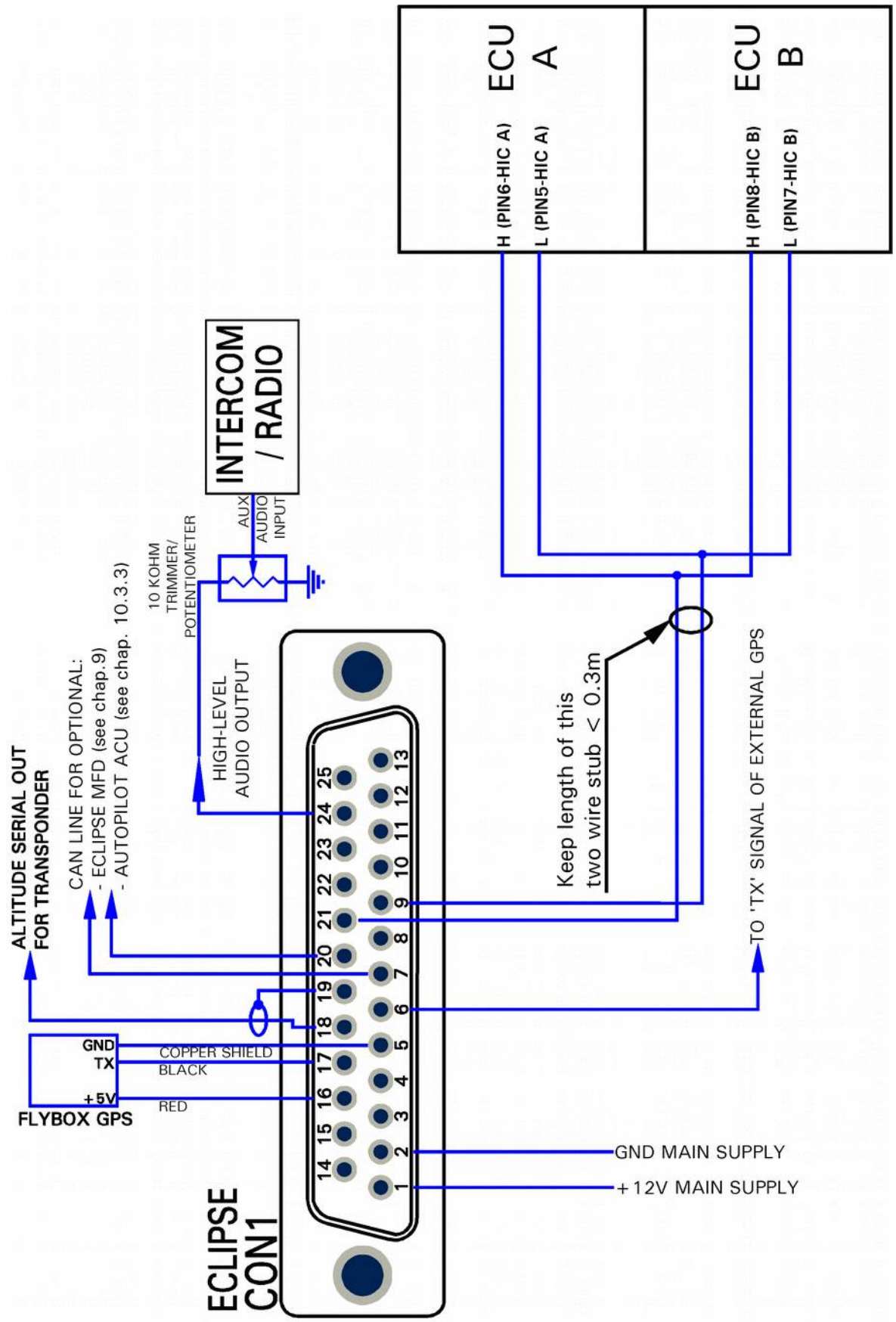
- **GENERAL WIRING HINTS:**
- Take care to properly insulate any exposed wire to avoid short circuits.
- The engine must be connected to electrical ground (GND) because many sensors are connected to engine or aicraft body.
- Do not solder thermocouple wires terminations. If it is necessary to split in separable harnesses the thermocouples connections you must use proper cables and connectors, available also from Flybox® (see "4.1 - Separable connectors for thermocouples").
- Insert a 3-Amperes circuit breaker to the power lead (+12V).
- Use aeronautic cable for the wiring.
- WARNING: Voltage peaks on the supply line that exceeds the operating limits can damage the device.



25-pin d-sub plug, view from wiring side

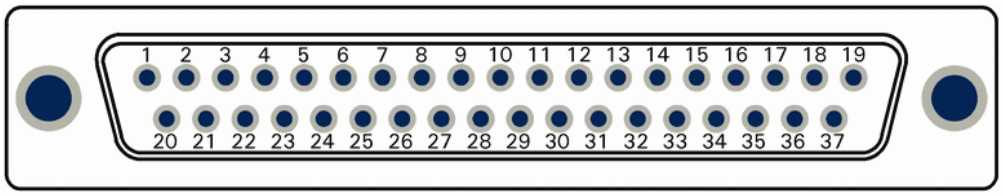
TABLE 1 CON1 CONNECTIONS

Pin #	Description
1	+12V Main supply
2	GND Main supply
3	GND
4	Not used/Reserved
5	GND for GPS serial input (connect to copper shield of Flybox® GPS cable)
6	TX signal of external GPS (RS232 level and polarity)
7	CAN0 **H** signal for connection with ECLIPSE MFD and/or autopilot control unit ACU
8	Not used/Reserved
9	CAN1 **L** – To the CAN line of the Rotax 912iS ECU
10	Not used/Reserved
11	GND
12	Not used/Reserved
13	Not used/Reserved
14	Not used/Reserved
15	Not used/Reserved
16	+5V for GPS (connect to red wire of Flybox® GPS)
17	GPS TX (connect to black wire of Flybox® GPS)
18	Altitude serial out for transponder
19	GND for altitude serial out (connect to copper shield)
20	CAN0 **L** signal for connection with ECLIPSE MFD and/or autopilot control unit ACU
21	CAN1 **H** – To the CAN line of the Rotax 912iS ECU
22	GND
23	Not used/Reserved
24	High level audio output
25	GND



CON1 connections (25-pin d-sub plug, view from wiring side)

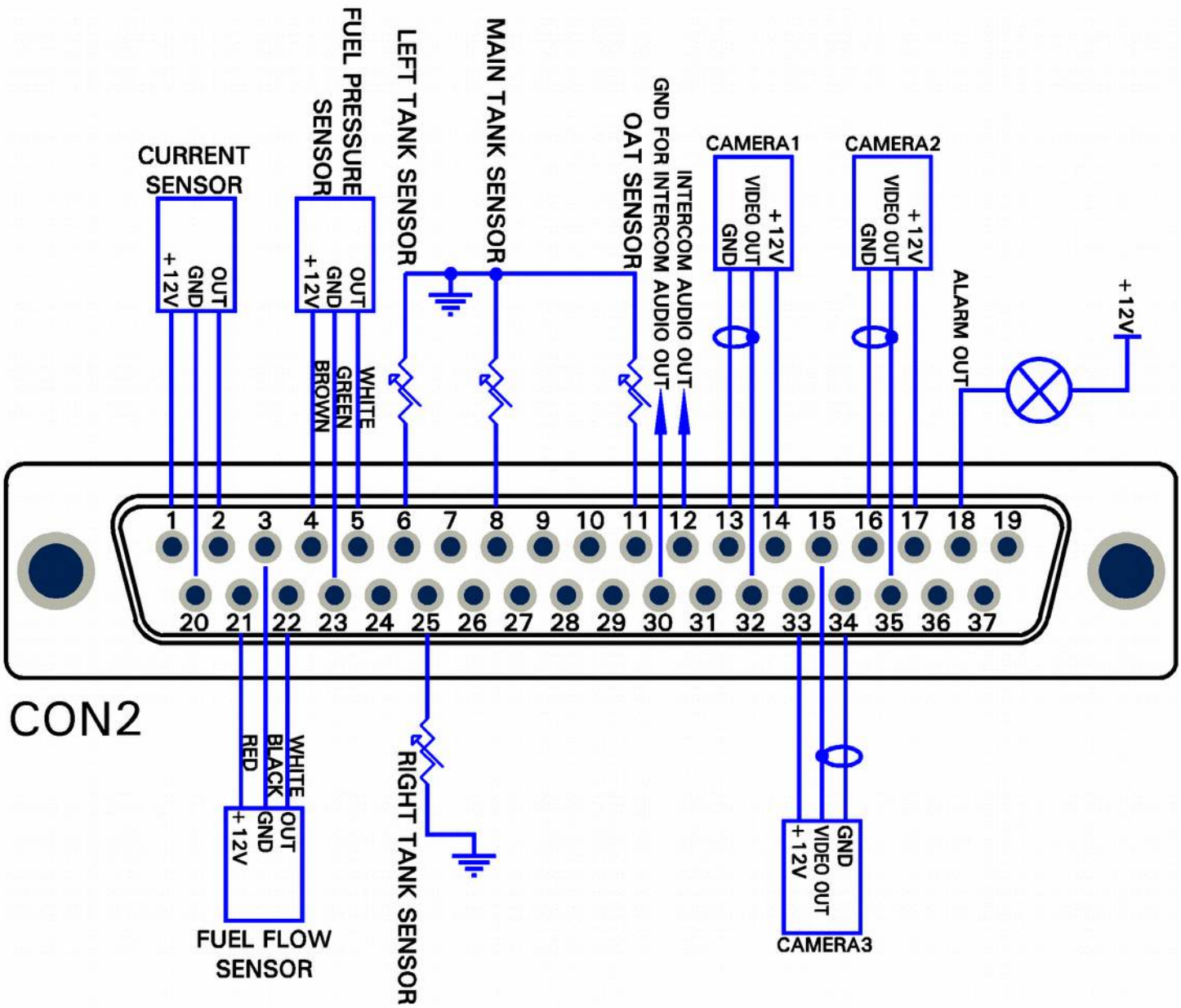
NOTE: The external GPS connection to pin#6 is used for "RESERVE" indication of Fuel Computer and for the NAV function if you have installed also the Flybox® ACU autopilot control unit. To enable the external GPS enter in the menu-->Fuel Computer and set the "Ext. GPS for reserve indication" to "YES".



37-pin d-sub receptacle, view from wiring side

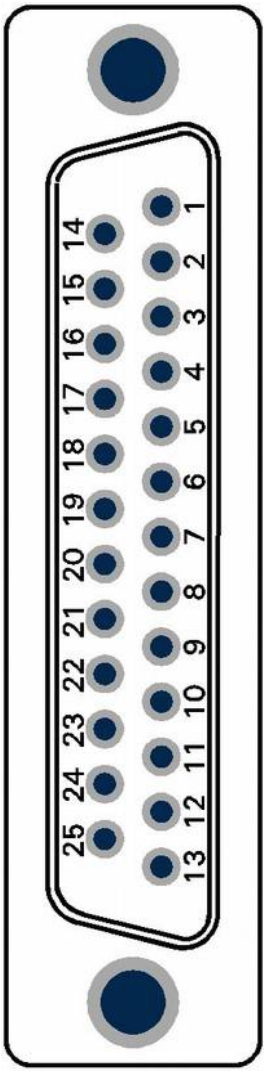
TABLE2 CON2 CONNECTIONS

Pin #	Description
1	+12 V for current sensor
2	Current sensor signal input
3	GND for fuel flow sensor
4	+12V for fuel pressure sensor
5	Fuel pressure sensor input
6	LEFT Televel input
7	GND
8	MAIN Televel input
9	GND
10	Not used/reserved
11	OAT (outside air temp.) sensor input
12	Low-level intercom audio out (use shielded wires)
13	GND for video input #1
14	+12V for camera #1
15	Video input #2
16	GND for video input #3
17	+12V for camera #3
18	Open-collector alarm-out (active low) max 400mA / 5W
19	Not used/reserved
20	GND for current sensor
21	+12V for fuel flow sensor
22	Fuel flow sensor input
23	GND for fuel pressure sensor
24	+12V for capacitive fuel level sensor (if used)
25	RIGHT Televel input
26	+12V for capacitive fuel level sensor (if used)
27	Not used/Reserved
28	Not used/reserved
29	Not used/reserved
30	GND for low-level intercom audio out (use shielded wires)
31	GND
32	Video input #1
33	+12V for camera #2
34	GND for video input #2
35	Video input #3
36	Not used/Reserved
37	GND



CON2 connections (37-pin d-sub receptacle, view from wiring side)

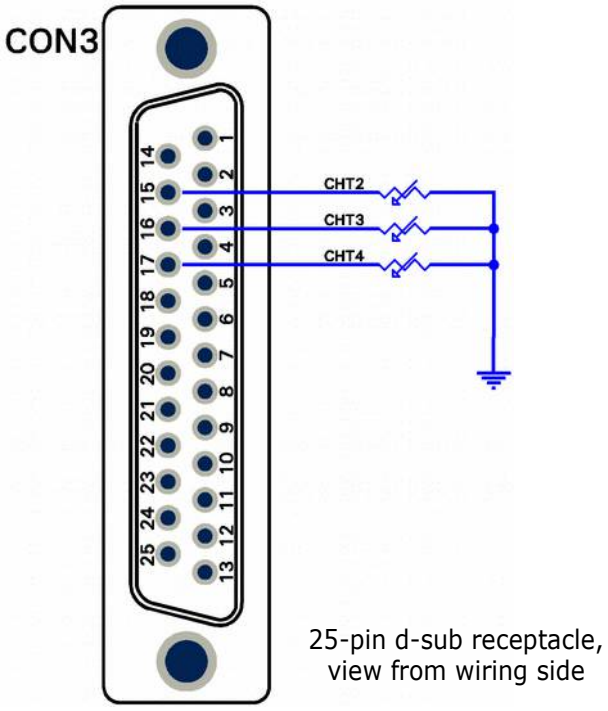
NOTE:
It is not necessary to connect the low-level audio output connections (pin #12 and #30) if you have already connected the high-level audio output (as explained in "CON1 connections"). The low-level output require more accurate wiring because is more susceptible to electric noise (use shielded wire and keep away from source of electric noise like, for example, radio antenna or wirings). For this reason is generally preferable to use the high-level audio output and leave unused the low-level output.



25-pin d-sub receptacle,
view from wiring side

TABLE3 CON3 CONNECTIONS

Pin #	Description
1	Not used
2	CHT2 thermocouple - (not used for other sensors type)
3	CHT3 thermocouple - (not used for other sensors type)
4	CHT4 thermocouple - (not used for other sensors type)
5	Not used
6	Autopilot remote button
7	Not used
8	Not used
9	Not used
10	Not used
11	Not used
12	Not used
13	Not used
14	Not used
15	CHT2 sensor input: Rotax, KTY, PT1000 or thermocouple +
16	CHT3 sensor input: Rotax, KTY, PT1000 or thermocouple +
17	CHT4 sensor input: Rotax, KTY, PT1000 or thermocouple +
18	Not used
19	Not used
20	Not used
21	Not used
22	Not used
23	Not used
24	Not used
25	Not used



25-pin d-sub receptacle,
view from wiring side

CHT sensors

The Rotax 912iS ECU already provides a coolant temperature (called 'CHT1' in the Eclipse). If you want to connect additional CHT probes, up to 3 sensors can be connected; the supported types of probes are:

- ROTAX CHT sensors
Connect between ground and pin# 15/16/17 (CHT2/CHT3/CHT4) of CON3 connector.

- J-type or K-type thermocouples
Thermocouple probes have a two wires connection: positive wire and negative wire. The positive wire are connected to pins #14 to #19 (CHT1 to CHT6) of CON3 connector, the negative wires are connected to pins #1 to #6.
NOTE: Use only thermocouples with insulated wires.

- PT1000 or KTY resistive sensors
This two wire resistive sensors must be connected between aircraft ground (GND) and pin# 15/16/17 (CHT2/CHT3/CHT4) of CON3 connector.

NOTES:
- It's not possible to mix different type of sensors (i.e. 2 Rotax + 2 thermocouples).

Outside air temperature sensor (OAT)

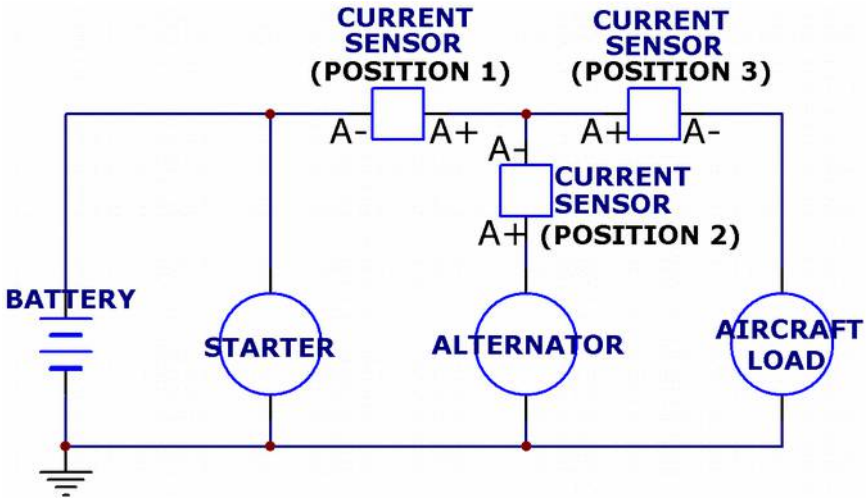
The supported types of OAT sensors are:
- PT1000 or KTY resistive sensors: Connect one wire to pin #11 of CON2 connector and the other wire to aircraft ground.

***Flybox*® OAT sensor:**

Flybox® OAT sensor is a PT1000 and can be fixed with a 5 mm countersunk screw.
For optimal outside temperature indication it must not be installed in direct sunlight locations or near heat sources.

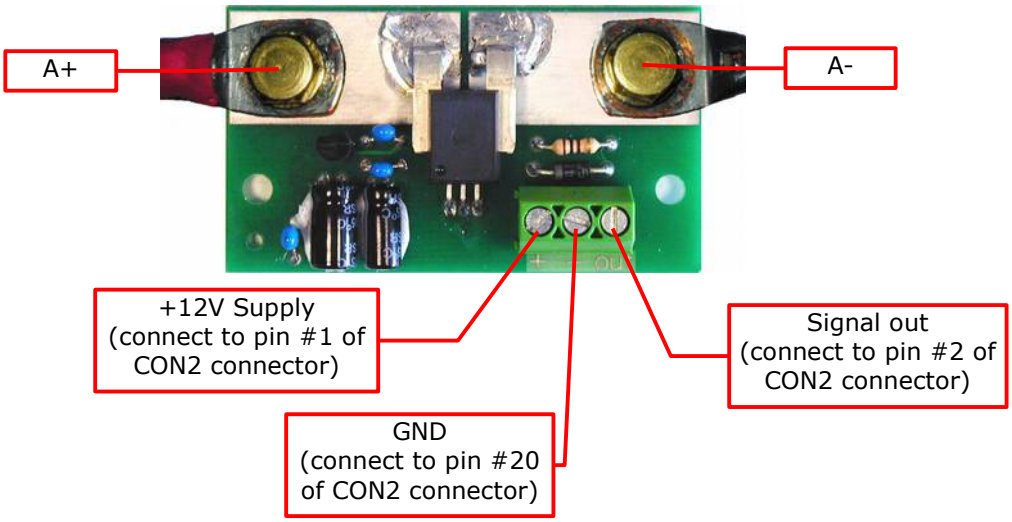
Current sensor

The current sensor supplied by Flybox® is able to measure current between -50 and +50 Amperes. It must not be installed between battery and starter circuit because of the high current flowing into this path.
The current sensor can be installed in one of the three locations as shown in the simplified electrical diagram below:



Position 1: in this position the current sensor measure current flow into or out of your battery (indicator show both positive and negative currents).
Position 2: in this position the current sensor measure only the current that the alternator supply to both battery and aicraft loads.
Position 3: in this position the current sensor measure the current flowing into the aircraft loads.

- Electrical connections:



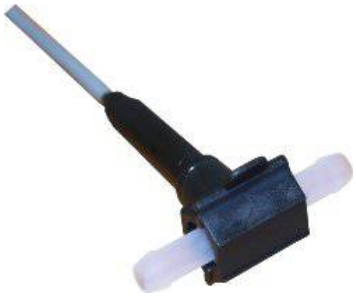
NOTE:

- To obtain maximum accuracy in the current indicator it's possible to perform current sensor calibration in this way:
  1 - Connect only the 3 wire from current sensor to the ECLIPSE and leave disconnected the 2 battery cable inputs (that is, "A+" and "A-" in figure above).
  2 - Now it's required to turn-on th ECLIPSE so temporarily connect together the two cable "A+" and "A-".
  3 - Turn-on th ECLIPSE and read the numeric value for the current indicator:
  - if it's zero there is no need to calibrate the current sensor.
  - if it's different from zero and is positive (in the green area) report that numeric value in the "AMP offset" parameter in System setup-->Sensor menu.
  - if it's different from zero and is negative (in the yellow area) report that numeric value, but with negative sign, in the "AMP offset" parameter in System setup-->Sensor menu.

  4 - Turn-off the ECLIPSE and restore the harness, reconnecting the two cables "A+" and "A-" to the current sensor.

Fuel flow sensor

The TFTHP flowmeter is developed to measure low range (3.6~120 l/hour) of fuel flow with high resolution output. It has high chemical resistance and it is suitable for aggressive liquids. The case can be opened for periodic monitoring and eventual replacement of the tube.



Recommendation of installation and use:

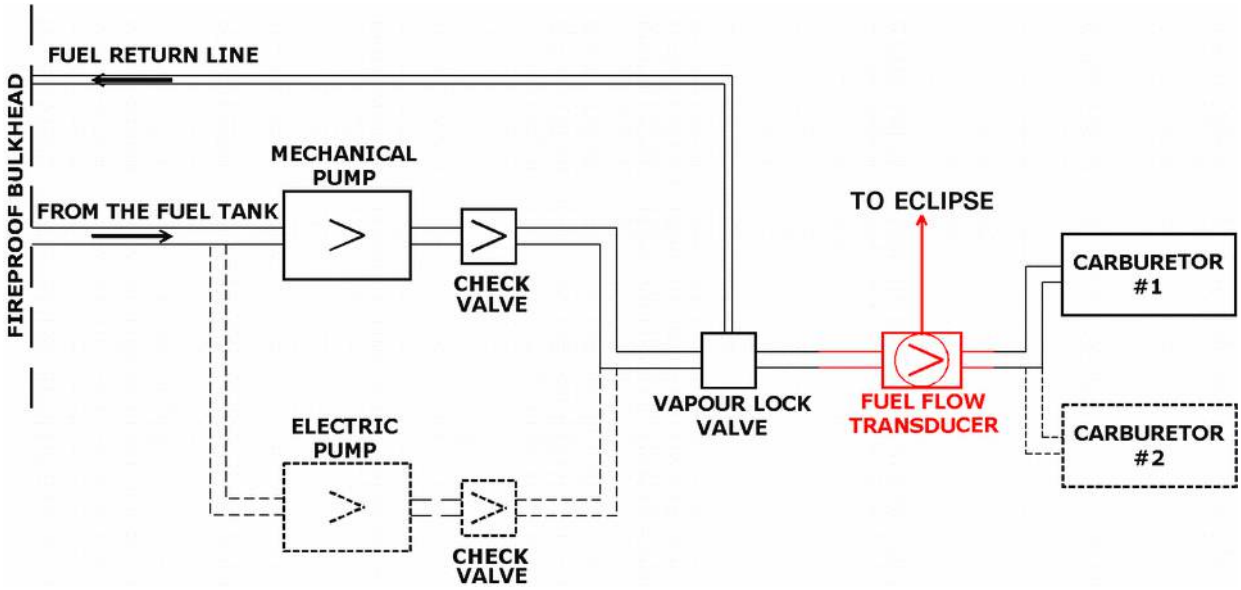
- Check flow direction (arrow on sensor).
- Never clean the sensor with compressed air.
- Install a filter in the fuel line before the sensor.
- Oil the fittings before mounting the tubes.
- The tubes before and after the sensor should be straight for at least 5 cm.
- Connection of fuel flow are suitable for 6 mm tubes.
- Use only spring band clamps of the type depicted here, with the appropriate diameter, in order to avoid deformation of the plastic fittings.

- Protect the sensor from high temperature with a firesleeve material.
- Check for leakage after system start.
- Inspect the fuel sensor every year or every 100 hours of aircraft use for leakage and aging.
  To inspect and clean the sensor, open it, remove the sensor tube from the fuel system and look inside the two fittings to check for material integrity, aging and deformation. In case of any anomaly of the sensor tube, it must be replaced. Verify that the sensor tube is clean and without any obstruction. If necessary clean with a flow of fuel in the opposite direction.
- The fuel flow transducer must be installed before the carburetor and after the eventual return line (Vapor lock).
- Don't fix it mechanically to the airplane structure to avoid vibrations damage.
- Mount the transducer lower than the carburetor, or no more higher than 10 cm every 30.

- **Electrical connections:**
  RED WIRE: +12V (connect to pin 21 of CON2 connector)
  BLACK WIRE: GND (connect to pin 3 of CON2 connector)
  WHITE WIRE: signal (connect to pin 22 of CON2 connector)

IMPORTANT: After completing the installation verify that the engine is working properly at every RPM speed; verify also that at full RPM the fuel pressure after the fuel flow transducer never drop below the minimum pressure indicated in your engine's manual.

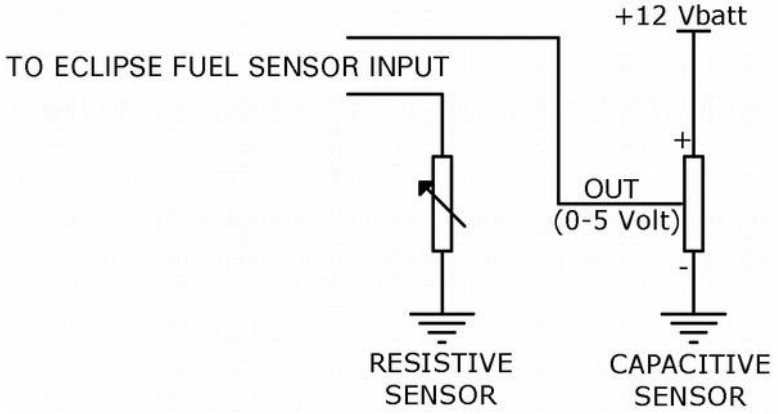
- Typical example installation of the fuel flow transducer -



Fuel level sensors

- ECLIPSE has 3 fuel level inputs that can be connected to both resistive sensors (with max resistance of 300 ohm) and capacitive sensors (with output voltage from 0~5 Volt).
- Resistive sensors can be of two types, both supported by ECLIPSE: resistive sensors that increase resistance as you add fuel and resistive sensors that decrease resistance as you add fuel.
- It's also possible to install a mixed type of sensors (i.e. 2 resistive + 2 capacitive).
- All fuel level sensors connected to ECLIPSE must not be connected to any other instrument. Disconnect any previously used instrument.

• FUEL LEVEL SENSORS CONNECTION:



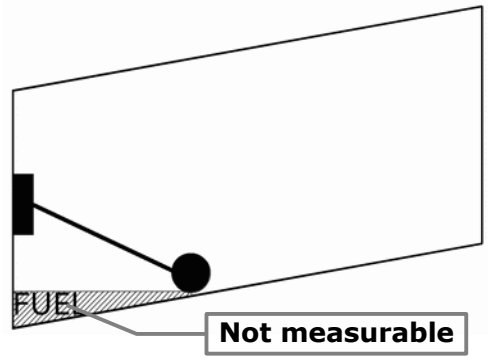
Refer to fuel level sensors manual for the detailed electrical and mechanical installation.

- Make sure that the fuel level sensors are mounted so that all the fuel in the tank can be measured. If the fuel sensor cannot measure completely the fuel in the tank the ECLIPSE will display inaccurate readings.

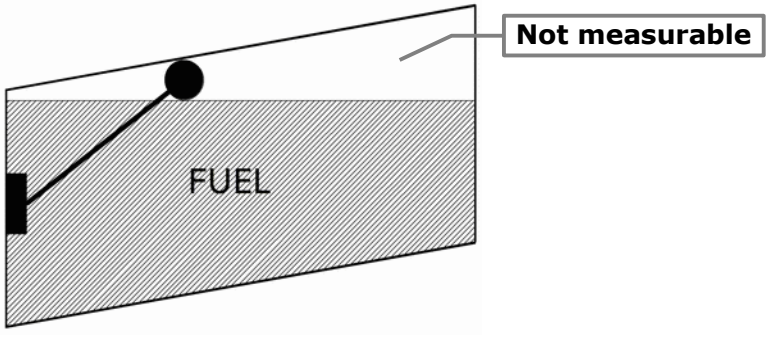
For example (pic.1) if a fuel sensor cannot measure the lowest part of the tank that contains 7 liters, ECLIPSE will display "0" (zero) for fuel level of 7 liters and below.

Another example (pic.2) is if a tank can holds 40 liters of fuel but at 25 liters the fuel is at the top of the sensor, the maximum that ECLIPSE will display is 25 liters.

PIC.1



PIC.2



Fuel pressure sensor

The fuel pressure transducer+fitting is supplied by Flybox®; the electrical connections are:

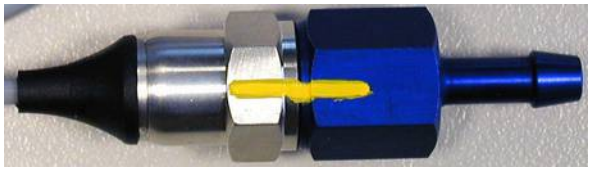
- white wire (signal out) to pin #5 of CON2 connector
- green wire (GND) to pin #23 of CON2 connector
- brown wire (+12V Supply) to pin #4 of CON2 connector

The pressure range accepted is from 0 to 4 bar.

NOTE: an improper wiring can cause damage to the fuel pressure transducer.

MECHANICAL INSTALLATION HINTS:

- Screw tight the transducer to the fitting; no other seal material is required because the sealing is ensured by the green fuel-resistant gasket of the transducer.
- To check that no screw out occur you must mark with a permanent pencil the transducer and fitting:



Video inputs

- Up to 3 color or b/w cameras can be connected to the ECLIPSE. Video signal must be PAL composite video (CVBS).
- Use shielded cable to connect the cameras to the ECLIPSE.

GPS

- GPS system is based on signal satellite reception: for this reason the GPS receiver must be installed on the high section of the aircraft, in a location free from metallic or other shielding material like carbon fiber. For example it can be installed above the instruments panel, near the windshield.
- GPS receiver is not water-resistant so it must be installed on the inside of the aircraft.
- Do not place it near transmitting antennas.
- A wrong placement of the GPS receiver can decrease the accuracy of the system.
- The GPS system is operated by United States government that is the solely responsible for its accuracy and maintenance.

ELECTRICAL CONNECTIONS:

Flybox® GPS receiver is supplied with a 3-poles shielded cable, connect it to **CON1** ECLIPSE connector as follows:
- RED WIRE to pin# 16
- BLACK WIRE to pin #17
- COPPER SHIELD to pin #5

Altitude serial out for transponder connection

If you use a transponder with serial input for receiving the altitude data, it can be connected to the Eclipse by following this steps:

- Ensure there is a shared ground between the Eclipse and the transponder.
- Wire a serial transmit line, using shielded cable, from the Eclipse (pin#18 of CON1 connector) to the respective receive connection on the transponder. The serial out of the Eclipse is RS232 type, refer to the transponder manual for its installation and configuration.

NOTE: To have the altitude data there must be a **PFD** or **IFIS** Eclipse.

The Eclipse does not require any configuration, the altitude data is transmitted once per second with the followig protocol:

Baud Rate	Message formatting	Example
9600 bps	ALT,space,five altitude digits,carriage return	ALT 05200[CR]

The message contains the current pressure altitude, in feet, with a fixed reference to 1013.25mB (29.92 inches mercury). The resolution is 10 ft.

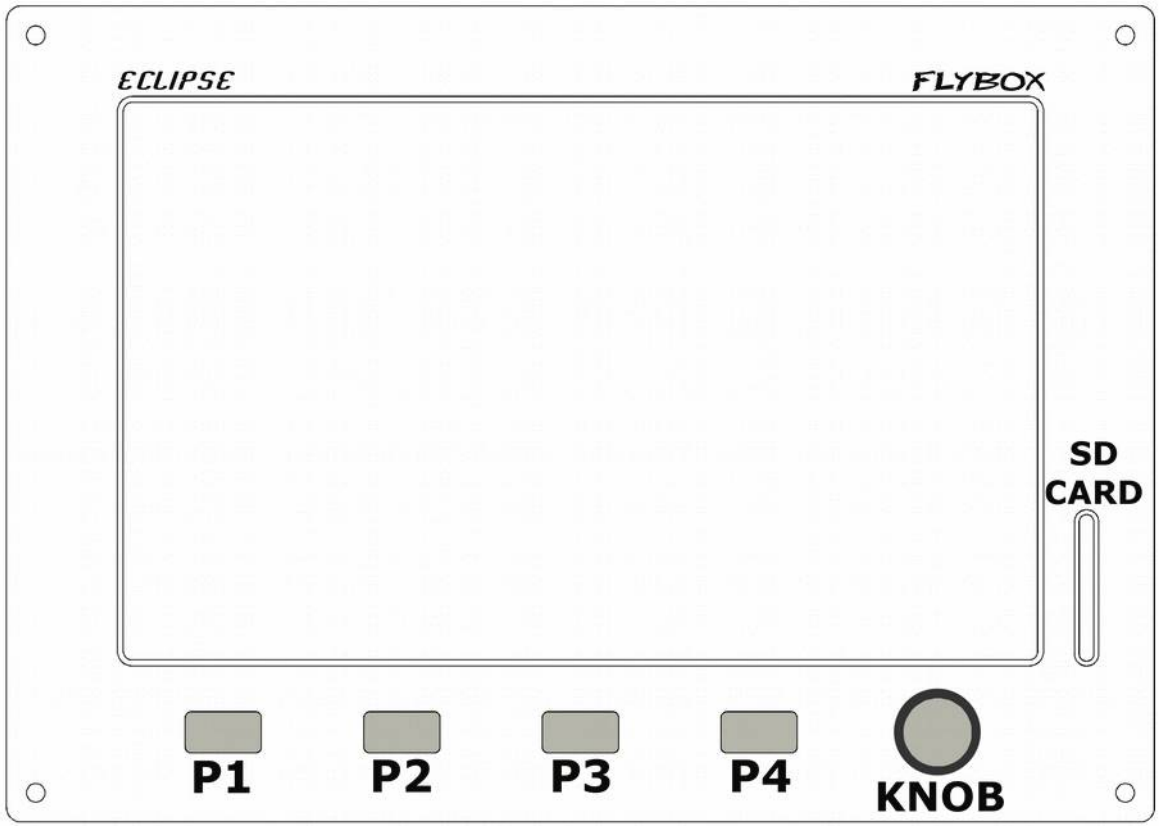
ECLIPSE

PART II - OPERATING MANUAL

5.1 Display cleaning

- Do not spray water or detergent directly onto the display.
- To clean the display use the supplied smooth cloth, slightly moistened with alcohol. ***Do not use other cleaners that may damage the display anti-reflective coating.***

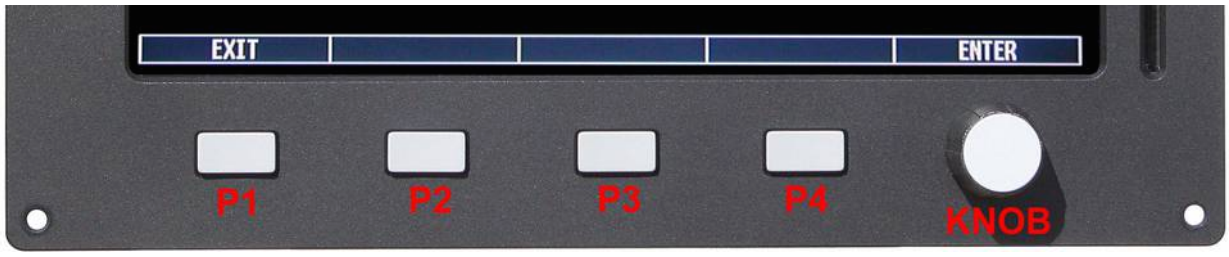
5.2 Panel indicators and commands



ECLIPSE have 4 buttons, that in this manual are indicated with the labels P1-P2-P3-P4 and a knob with pushbutton.

5.3 Using the menus

The buttons functionality, inside the configuration menus, is indicated by onscreen labels:



In this example P1 button is assigned to "exit" function (i.e. exit from the current menu) and knob button is assigned to "enter" function (pressing the knob it enter in the function currently selected).
To show the available menu and functions press one of the 4 buttons (P1,P2,P3 or P4). The menu is always shown on the bottom section of the display, with each button assigned to the corresponding function indicated by its onscreen label.
After a settable time the menu automatically disappear (see chap. 6, "CONFIGURATION MENU").
To enter in a function assigned to a button simply press it, to enter in a function assigned to the knob rotate it until the function become selected and then press the knob.

To clarify the operating mode of the menus we explain below an example of operation:

In this example P1 button is assigned to "EIS" function, P2 button to "ZERO PITCH" function, P3 button to "TRK" function. Rotating the knob will select one of the available functions ("LOG MARK", "CAMERAS", "ALT BUG", "HDG BUG/AP", "DIMMER", "RESET G"), pressing the knob will enter the selected function.
For example choosing the "DIMMER" function will display the following menu:

Now it's possible to set the function value rotating the knob (in this example the value is 10). Press P4 button (DONE) to save the changes and exit from the function.

The menus and functions available are dynamic and depends on the screen currently displayed, on the ECLIPSE model and on the sensors/functions enabled; on each section of this manual it's explained all the menus and functions available.

6. Instrument configuration

Before using your ECLIPSE you need to configure it; read completely this chapter and follow step by step the sections to completely configure all the sensors, alarms and preferences.

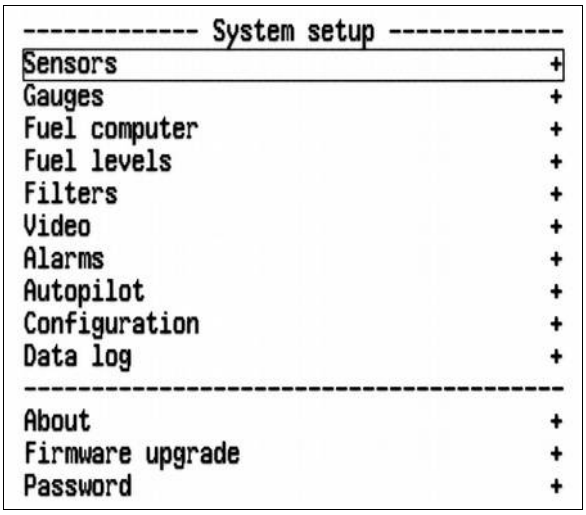
Note that this manual relate to ECLIPSE IFIS (complete version of ECLIPSE), your instrument may not have all the functions indicated below. The available ECLIPSE versions are:

- ECLIPSE IFIS (Integrated Flight Information System): complete version that include all athe functions described in this manual.
- ECLIPSE PFD (Primary Flight Display): attitude indicator and flight data version.
- ECLIPSE EIS (Engine Information System): engine and fuel management data version.
- ECLIPSE MFD (Multi Function Display): copilot side version that permits viewing all data available from main ECLIPSE unit (EIS, PFD or IFIS).

Note also that functions and screens of your ECLIPSE may differ from what depicted in this manual depending on what optional sensors you had installed.

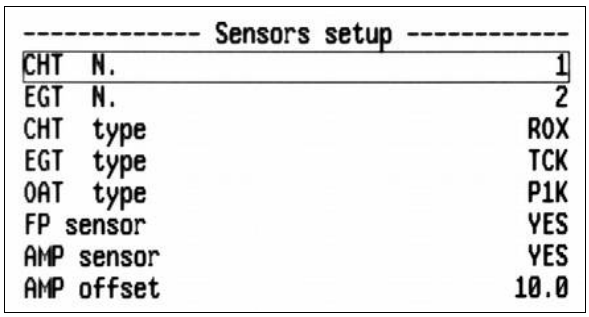
6.1 System setup menu

Press both P1 and P4 buttons for 2 seconds to enter in the setup menu (main instrument configuration menu):



- Rotate the knob to navigate through the menu items.
- Press the knob to enter in the selected item.

6.1.1 Sensor setup menu

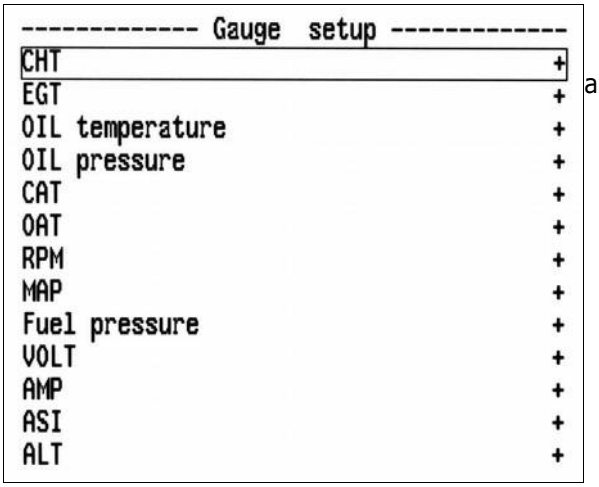


CHT N. : set the number of CHT sensors installed in your aircraft.
EGT N. : set the number of EGT sensors installed in your aircraft (set to 4 for Rotax 912iS).
CHT type : type of CHT sensors installed:

TCJ: J-type thermocouples
TCK: K-type thermocouples
KTY: KTY81 resistive sensors
P1K: PT1000 resistive sensors
ROX: do not use
VDO: standard ROTAX CHT sensors

EGT type : Not used for Rotax 912iS
OAT type : type of outside air temperature sensor installed:
KTY: KTY81 resistive sensor
P1K: PT1000 resistive sensor
NO: no OAT sensor installed
NOTE: If you use original Flybox® OAT sensors select "P1K" type.
FP sensor : YES/NO. Select whether you installed or not the Flybox® fuel pressure sensor.
AMP sensor : YES/NO. Select whether you installed or not the Flybox® current sensor.
AMP offset : Calibration of current sensor. See "Current sensor" in chap.4.

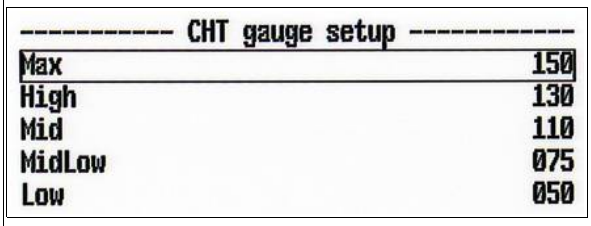
6.1.2 Gauge setup menu

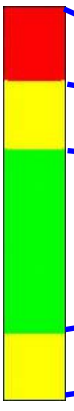


In gauge setup menu you will configure the setpoints/limits for all the measurements.
- Rotate the knob to navigate through the menu items.
- Press the knob to enter in the selected item.

WARNING: Default parameters are suitable for Rotax 912/914 engine so its mandatory, before using ECLIPSE in flight, to check that all parameters are correct for your engine.

- CHT GAUGE SETUP





Max : set the top limit of the CHT gauges.

High : set the transition temperature from high yellow to red zone of CHT gauges.

Mid : set the transition temperature from green to high yellow zone of CHT gauges.

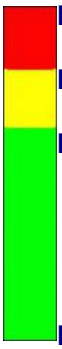
MidLow : set the transition temperature from low yellow to green zone of CHT gauges.

Low : set the bottom limit of the CHT gauges.

NOTE: This values must be adjusted depending on the cooling liquid used.

- EGT GAUGE SETUP

EGT gauge setup	
Max	900
High	880
Mid	850
Low	500



Max : set the top limit of the EGT gauges.

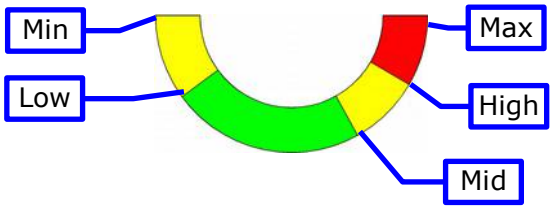
High : set the transition temperature from yellow to red zone of EGT gauges.

Mid : set the transition temperature from green to yellow zone of EGT gauges.

Low : set the bottom limit of the EGT gauges.

- OIL TEMPERATURE GAUGE SETUP

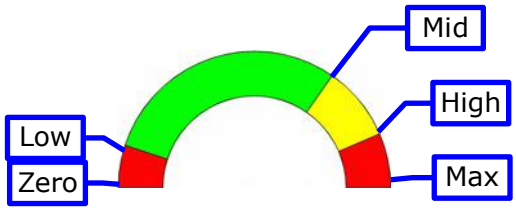
OIL temperature gauge setup	
Max	150
High	130
Mid	110
Low	090
Min	030
Clearance	050



Max : set the top limit of the oil temperature gauge.
High : set the transition temperature from high yellow to red zone of the oil temperature gauge.
Mid : set the transition temperature from green to high yellow zone of the oil temperature gauge.
Low : set the transition temperature from low yellow to green zone of the oil temperature gauge.
Min : set the bottom limit of the oil temperature gauge.
Clearance : setpoint to allow warming the oil before takeoff. Below this setpoint the number is blinking to indicate that the oil has not yet reached the minimum temperature for take off.

- OIL PRESSURE GAUGE SETUP

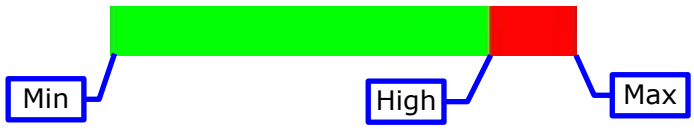
OIL pressure gauge setup	
Max	10.0
High	6.5
Mid	5.0
Low	2.0



Max : set the top limit of the oil pressure gauge.
High : set the transition pressure from yellow to high red zone of the oil pressure gauge.
Mid : set the transition pressure from green to yellow zone of the oil pressure gauge.
Low : set the transition pressure from low red to green zone of the oil pressure gauge.
NOTE: The minimum value is fixed to zero.

- CAT GAUGE SETUP

---------- CAT gauge setup ----------	
Max	100
High	080
Min	-20



Max : set the top limit of the CAT gauge.
High : set the transition pressure from green to red zone of the CAT gauge.
Min : set the bottom limit of the CAT gauge.

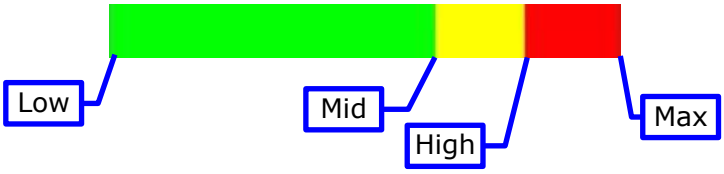
- OAT GAUGE SETUP

---------- OAT gauge setup ----------	
Max	100
Min	-20

Max : set the top limit of the OAT gauge.
Min : set the bottom limit of the OAT gauge.

- RPM GAUGE SETUP

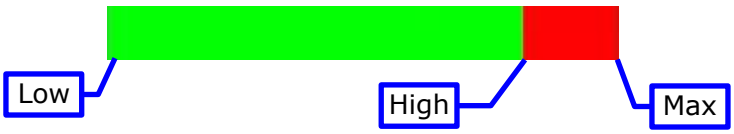
---------- RPM gauge setup ----------	
Max	6200
High	5800
Mid	5500
Low	1500



Max : set the top limit of the RPM gauge.
High : set the transition RPM from yellow to red zone of the RPM gauge.
Mid : set the transition RPM from green to yellow zone of the RPM gauge.
Low : set the bottom limit of the RPM gauge.

- MAP GAUGE SETUP

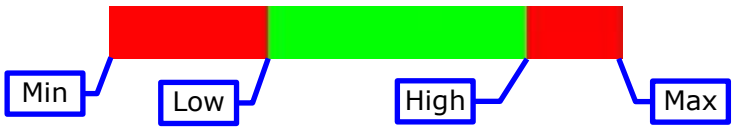
---------- MAP gauge setup ----------	
Max	40.0
High	35.0
Low	10.0



Max : set the top limit of the MAP gauge.
High : set the transition value from green to red zone of the MAP gauge.
Low : set the bottom limit of the MAP gauge.

- FUEL PRESSURE GAUGE SETUP

----- Fuel pressure gauge setup --------	
Max	0.50
High	0.40
Low	0.15
Min	0.00



Max : set the top limit of the fuel pressure gauge.
High : set the transition pressure from green to high red zone of the fuel pressure gauge.
Low : set the transition pressure from low red to green zone of the fuel pressure gauge.
Min : set the bottom limit of the fuel pressure gauge.

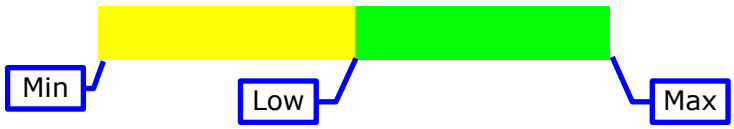
- VOLT GAUGE SETUP

---------- VOLT gauge setup ----------	
Max	16.0
High	15.0
Low	11.5
Min	10.0

Max : set the top limit of the voltage gauge.
High : set the transition voltage from green to high red zone of battery voltage.
Low : set the transition voltage from low red to green zone of battery voltage.
Min : set the bottom limit of the voltage gauge.

- AMP GAUGE SETUP

---------- AMP gauge setup ----------	
Max	050
Low	000
Min	-050



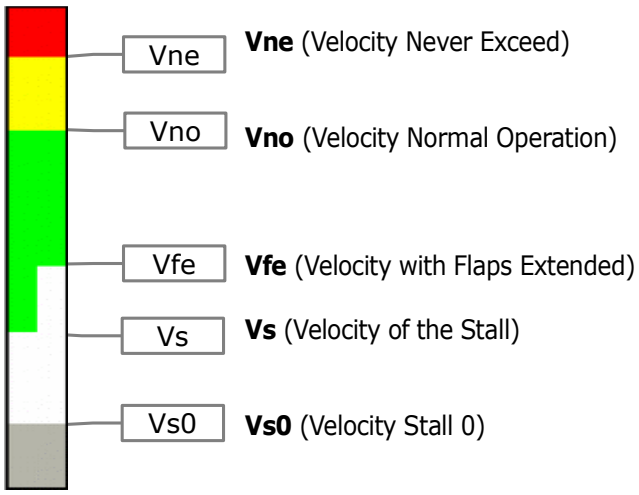
Max : set the top limit of the current meter gauge.
Low : set the transition voltage from yellow to green zone of the current meter gauge.
Min : set the bottom limit of the current meter gauge.

- ASI GAUGE SETUP

---------- ASI gauge setup ----------	
Vne	285
Vno	200
Vfe	120
Vs	100
Vs0	063
Vy	120
Vx	100
Unit	Km/h

NOTE: The default speed are all set to zero. Its mandatory to check your aircraft characteristics speed and set the following parameters accordingly.

Vne-Vno-Vfe-Vs-Vs0 : Set the speed setpoint for the moving tape airspeed indicator (see next picture).
Vy : Set the Vy of your aircraft.
Vx : Set the Vx of your aircraft.
Unit : Set the unit of measure for the air speed indicator in kilometers per hour (Km/h), miles per hour (Mph) or knots (Kts).



Vne (Velocity Never Exceed)

Vno (Velocity Normal Operation)

Vfe (Velocity with Flaps Extended)

Vs (Velocity of the Stall)

Vs0 (Velocity Stall 0)

NOTE: If you prefer the clean transition from white to green zone set the same value on Vs and Vfe.

- ALT GAUGE SETUP

---------- ALT gauge setup ----------	
VSI max	10
Altimeter unit	Mt
Pressure unit	mBar

VSI max : Set the maximum value for the vertical speed indicator.
Altimeter unit : Set the unit of measure for the altimeter in meters (Mt) or feets (Ft). The unit of measure for VSI change accordingly in meters per second or feets per minute.
Pressure unit : Set the unit of measure for pressure reference in milliBAR (mBAR) or inches of mercury (inHg).

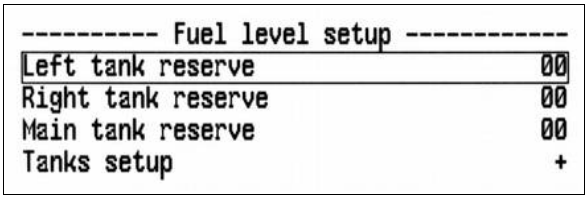
6.1.3 Fuel computer setup menu

--------- Fuel computer setup ----------	
Min quantity warning	030
Min time warning	030
Balance warning	010
Tank capacity	076
K factor	416400
K factor auto-calibration	+
Space unit	Km
Ext. GPS for reserve indication	YES
External GPS baud rate	4800
Fuel flow input	SENSOR
Fuel computer enable	YES

Min quantity warning : Set the amount of fuel below which is activated the corresponding alarm.
Min time warning : Set the time to empty below which is activated the corresponding alarm.
Balance warning : This function is useful to keep balanced two wing tanks, switching from one to the other after using a certain quantity of fuel. If the "Balance" alarm are enabled, Eclipse will activate an alarm every time the quantity of fuel used equals this value, showing "TANK BALANCE" on the display. To disable this function set the value to zero.
Tank capacity : Set the tank capacity (if there are more than one tank set the total capacity of the tanks).
K factor (only if external fuel flow sensor is installed): Set the fuel flow transducer's K-factor (K-factor of a fuel flow transducer is the number of electric pulses for 1 gallon of fuel consumption).
K Factor auto-calibration (only if external fuel flow sensor is installed): Refer to chapter 7.2 "Fuel flow transducer calibration". **NOTE:** It's recommended to execute the K factor calibration as soon as possible to have the maximum accuracy in fuel flow measurements.
Space unit : Set the unit of measure in kilometers (Km) or nautical miles (NM).
Ext. GPS for reserve indication : Select "YES" if you have connected an external GPS with "Goto" or "Flight plane" function to

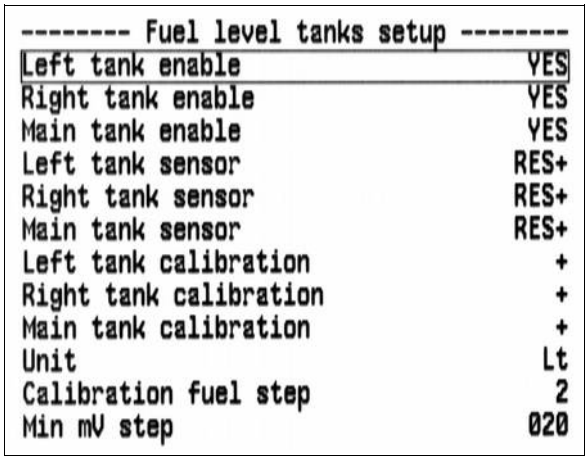
enable the "RESERVE" indication on the fuel computer section and to enable the NAV autopilot function.
Select "NO" if you have not connected any external GPS (apart from the Flybox® GPS furnished with the ECLIPSE).
External GPS baud rate: Set the baud rate of the external GPS.
Fuel flow input : Keep pressed the knob for two seconds to select which fuel flow data use:
Select "CANBUS" to use the fuel flow data received from the Rotax 912iS ECU.
Select "SENSOR" if you have installed an external fuel flow sensor.
Fuel computer enable : YES/NO. Enable or disable the fuel computer section display (only for EIS or IFIS ECLIPSE).

6.1.4 Fuel level setup menu



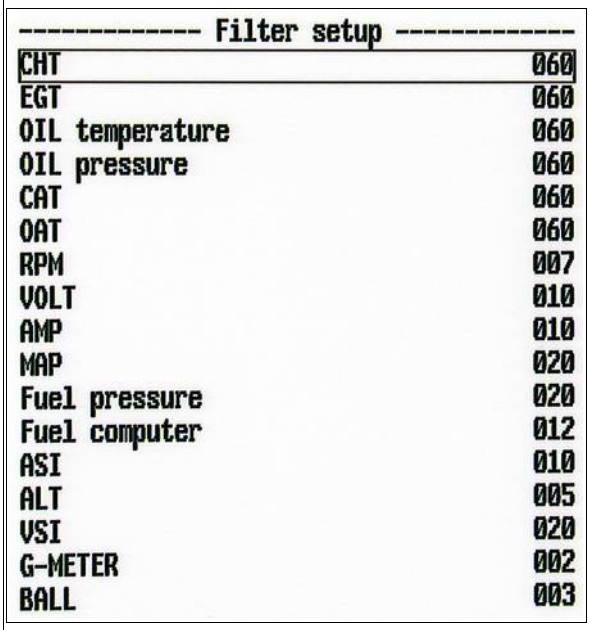
This menu contains the settings related to fuel level. The fuel level indications are obtained by reading the fuel level sensors installed in your aircraft and connected to ECLIPSE. **The indications are approximated, do not solely rely on the ECLIPSE to determine the fuel available in the tanks but always refer to primary instrument installed in your aircraft. The pilot is the solely responsible to check the real fuel quantity available in the tanks.**

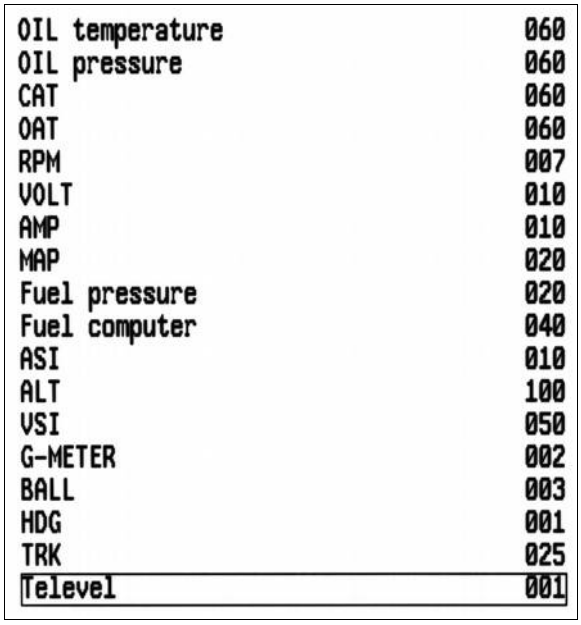
Left tank reserve : Set the amount of fuel below which is activated the corresponding alarm.
Right tank reserve : Set the amount of fuel below which is activated the corresponding alarm.
Main tank reserve : Set the amount of fuel below which is activated the corresponding alarm.
Tanks setup : Press the knob to enter in the submenu:



Left tank enable: Set "YES" if the LEFT tank fuel level sensor are installed and connected to FL1, set "NO" if not installed or not used.
Right tank enable: Set "YES" if the RIGHT tank fuel level sensor are installed and connected to FL1, set "NO" if not installed or not used.
Main tank enable: Set "YES" if the MAIN tank fuel level sensor are installed and connected to FL1, set "NO" if not installed or not used.
Left tank sensor: Set the fuel level sensor type installed in the LEFT tank:
"RES+" for resistive fuel sensors that increase resistance as you add fuel.
"RES-" for resistive fuel sensors that decrease resistance as you add fuel.
If you don't know what type of resistive sensors are installed please see chapter 7.3.1 "Fuel level sensors checkings".
"CAP" for capacitive fuel sensors.
"DRES" for fuel sensors model "DRES".
Right tank sensor: Set the fuel level sensor type installed in the RIGHT tank.
Main tank sensor: Set the fuel level sensor type installed in the MAIN tank.
Left/Right/Main tank calibration: Calibrate the fuel tanks (see chapter 7.3 "Fuel level sensors calibration").
Unit: Set the unit of measure in liters (Lt) or US Gallons (UsG). This unit is also used for fuel computer indications.
Calibration fuel step: Set the fuel quantity to add at each calibration step (see chapter 7.3 "Fuel level sensors calibration"). Range in liters: 1~9 - Range in Gallons: 0.1~2.3.
Min mV step: Minimum thresold to detect fuel sensors movement (default = 20, don't modify this value).

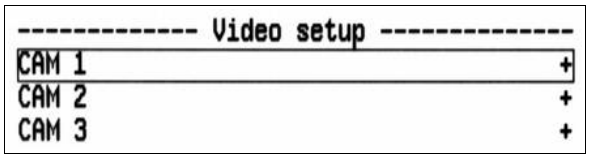
6.1.5 Filter setup menu



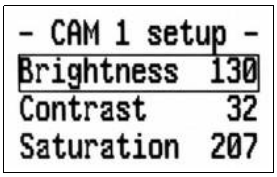


This parameters affect the readings and the gauges displayed: a low value means that the readings will be more fast and unfiltered (but subject to fluctuations), an high value means that the readings will be more slow and stable. Usually there is no need to change this parameters because the default value are mostly correct.

6.1.6 Video setup menu

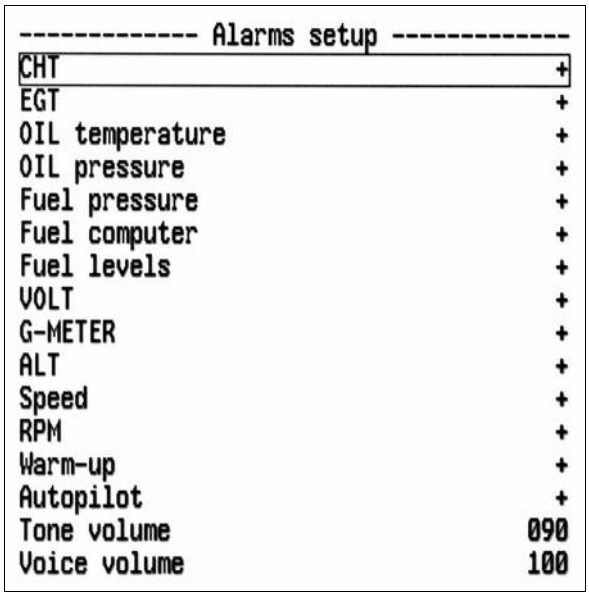


The video setup permits to correct brightness, contrast and saturation for every of the 3 video inputs available. The submenu is identical for all the 3 video inputs CAM1, CAM2 and CAM3:



Adjust **Brightness**, **Contrast** and **Saturation**: the video preview is showed in background if the cameras are connected and powered-on.

6.1.7 Alarm menu



The alarm setup permits to enable/disable and configure all the alerts that ECLIPSE can activate when a dangerous condition is detected.
Each possible alarm can be set and enabled/disabled within its submenu, for example the first "CHT" submenu is relative to the cylinder head temperature alarms.
Most of the alarms thresholds correspond with those previously configured in the "GAUGE SETUP" (chap.6.1.2). For some alarms the thresholds must be set directly inside its submenu, as explained below.

The last two menu parameters (**Tone volume** and **Voice volume)** set the volume for the tone alerts and for the vocal alerts.

The following parameters are common to all submenus:

- Enable: Select "YES" to enable the alarm relative to the measure that you are setting, select "NO" to disable it.
- Out: Select "YES" to enable also the alarm output (pin #18 of CON2 connector), useful for example to flash a LED or a light when it turns on the alarm that you are setting.
- Audio: Select "VOICE" to enable also the vocal alert, "TONE" to enable a tone alert or "NO" to disable the acoustic alerts. To hear this alerts you must have connected the audio output to your intercom (audio output is pin #12 of CON2 connector).
- Voice repeat count: number of repeats for the vocal alert.
- Voice repeat pause: pause in seconds between repeats of vocal alert.
- Activation delay: number of seconds for which the measure must be over the threshold before the alarm is activated.

Below are explained the additional parameters present in some submenus:

- CHT and EGT ALARM SETUP

Low threshold: if you prefer an alarm even when the temperatures drop below the minimum thresholds select "LOW", "MID" or "MIDLOW". The values which refers are the same set in the "Gauge Setup" menu (see chap.6.1.2). Select "NO" to disable the alarm on the low temperature thresholds.

- OIL TEMPERATURE ALARM SETUP

Low threshold: if you prefer an alarm even when the oil temperature drop below the minimum thresholds select "LOW" or "MIN". The values which refers are the same set in the "Gauge Setup" menu (see chap.6.1.2). Select "NO" to disable the alarm on the low temperature threshold.
Oil temperature alarm enable delay: Time, in seconds, that must pass after the take-off, before the low oil temperature alarm is enabled. This parameter is useful to don't have the low temperature alarm after the take-off because the oil is not yet in temperature.

- G-METER ALARM SETUP

Positive over G: Set the max vertical positive (upward) acceleration limit. Beyond this threshold (in G) it activates the alarm.
Negative over G: Set the max vertical negative (downward) acceleration limit. Beyond this threshold (in G) it activates the alarm.

- ALT ALARM SETUP

Max no oxygen altitude: Set the max altitude beyond which is activated the "No oxygen" alarm.

- SPEED ALARM SETUP

Overspeed threshold: Set the max speed beyond which is activated the overspeed alarm.

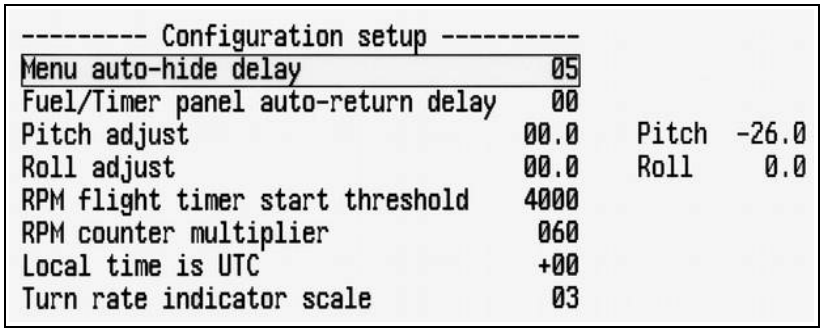
- WARM-UP ALARM SETUP

The warm-up is not a true alarm but just a vocal alert that indicates when the main measures are in the green zones and so you can take-off. To enable it select "VOICE" in the "Audio" parameter, otherwise select "NO" to disable it.
The measures monitored are: CAT, fuel pressure, oil pressure and temperature, all the CHTs.

6.1.8 Menu "Autopilot"

See chap. 10 "Autopilot system".

6.1.9 Configuration menu



Menu auto-hide delay: Set the time, in seconds, to automatically hide the menu if no buttons or knob are pressed.
Fuel/Timer panel auto-return delay: Set the showing time, in seconds, of the Fuel Computer and hourmeter window (only for ECLIPSE IFIS, see chap.8.3). After this time it return automatically to show the engine data window (set to zero to disable the automatic return to engine data window).
Pitch adjust: adjustment of the pitch to compensate the inclination of the instruments panel regards the longitudinal axis of the aircraft. This function must be executed only once after installation, in leveled attitude. Rotate slowly the knob until the number at the right become zero, then press it to store this value. Turn off and on the instrument after storing a new inclination value.
Roll adjust: adjustment of the roll to compensate misalignments due to installation. Rotate slowly the knob until the number at the right become zero, then press it to store this value. Turn off and on the instrument after storing a new inclination value.
RPM flight timer start threshold : set the RPM required to start the flight timer (the flight timer start automatically when the engine's RPM meets or exceeds this parameter for 30 seconds).
RPM counter multiplier :ratio between pickup electrical pulses and engine's effective RPM.
(RPM counter multiplier = [# of pulses per driving shaft turn] * 60).
Local time is UTC : Set the local time zone offset.
Turn rate indicator scale : Set the full scale, in degrees/seconds, of the turn rate indicator.

6.1.10 Data log menu

See chap. 8.5 "Datalogger".

6.1.11 About menu

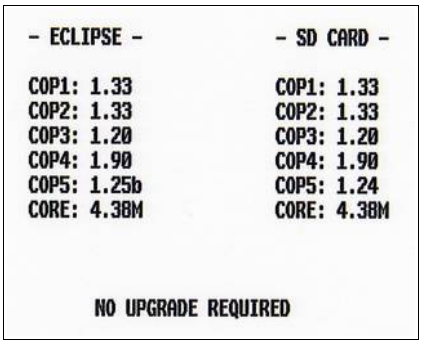
On this screen is possible to read current software versions, useful to check if your ECLIPSE is updated to the latest version.

Note: this manual is referred to the software version indicated on the first page. The version number to check is that indicated after the word "**CORE:** ".

6.1.12 Firmware upgrade menu

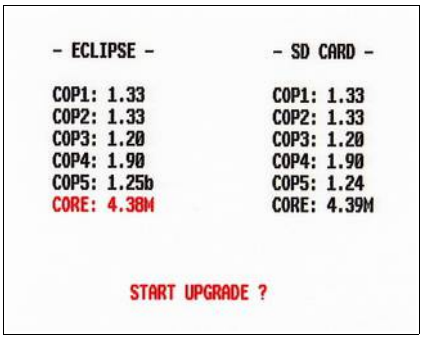
This menu is for upgrading the firmware/software versions of your ECLIPSE, using a SD memory card (Secure Digital, use only memory card with storage capacity not exceeding 2 Gb).
If you have the SD card with ECLIPSE firmware you can check or upgrade your ECLIPSE following this procedure:

- From the system setup menu, select "Firmware upgrade" will show (display will show "INSERT SD CARD").
- Insert the SD card in the ECLIPSE SD slot on the frontpanel.
- ECLIPSE automatically check if in the SD card are available upgraded firmware versions and it show a summary screen with all the firmware versions of the ECLPSE and available in the SD card.
- If the instrument are already upgraded to the latest firmware versions it show a screen like the following (notice the "NO UPGRADE REQUIRED" indication):

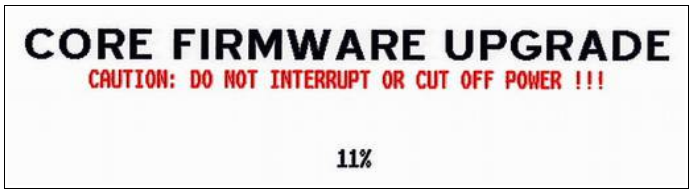


In this case no further action is required: turn off the ECLIPSE and remove the SD card (*).

- If instead in the SD card are available newer firmware versions ECLIPSE show a screen like the following (notice the "START UPGRADE?" indication):



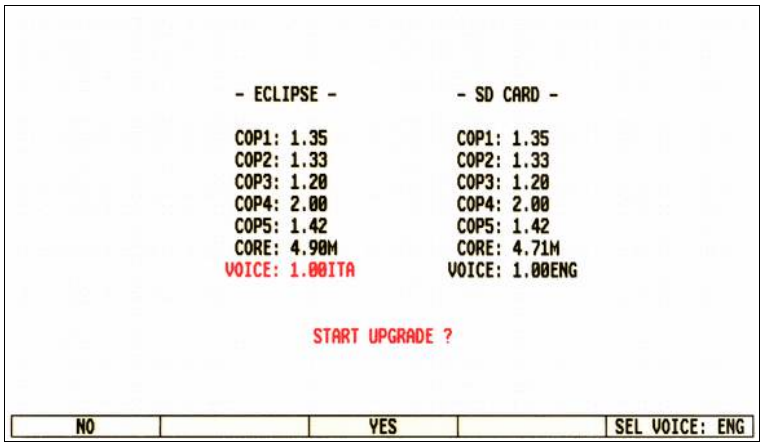
- To proceed with the upgrading procedure press "YES" (P3 button); ECLIPSE will show a screen with the current upgrading status:



- Wait until all availables firmware is upgraded completely. When the procedure is completed ECLIPSE will show the following screen:

Now your ECLIPSE is correctly upgraded. Turn off the instrument and remove the SD card.

(*) It's also possible at any time to make a firmware update for changing the language of the vocal alerts furnished by ECLIPSE on the audio output; to do this simply rotate the knob and select your preferred language, for example to switch from italian to english:



NOTE: This update affect only the vocal alerts, it does not change the menu language that is only in english.

6.1.13 Password menu

On this menu is possible to access to service functions of ECLIPSE after inserting the appropriate password.
To insert a password rotate the knob to increase/decrease the value and press it to switch to the next digit.

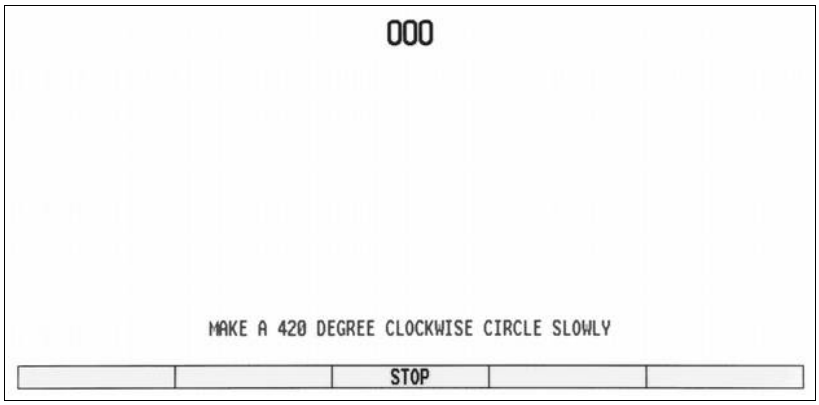
7.1 Magnetic calibration

Before using ECLIPSE in flight it's necessary to calibrate the magnetic sensors integrated in the instrument.

The heading readings is affected by magnetic field: to ensure accuracy it's necessary to perform correctly the calibration steps indicated below. Magnetic field are generated for example by ferro magnetic materials (iron, ferrites) or by large electric current in cables. The calibration can compensate for all static magnetic fields.

After completing the installation of your ECLIPSE, perform the calibration following this steps:

- Turn on the engine and go in a place far from possible magnetic fields (metallic shed, concrete floors with metal armatures, etc..) and where is possible to execute more turn with the aircraft (on the ground).
- Turn on all the electric load usually used in flight.
- On the ECLIPSE enter in the setup menu, go in "Password" and insert the password " **2 4 0 0** ".
- Press the "**START** " button.
- Wait the indication "MAKE A 420 DEGREE CLOCKWISE CIRCLE SLOWLY" on the display then start, with the aircraft on ground, a continuous slow circular movement toward right.



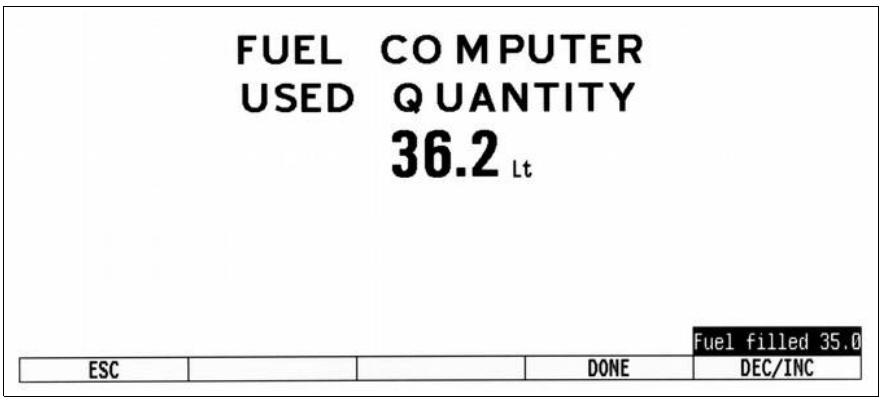
- On the display appear a number that indicate the rotation degrees, that starting from zero increase during the rotation of the aircraft.
- Continue the slow circular movement: the calibration end automatically when the number reach a value of 420 and the indication "CALIBRATION DONE !" appear on the display.
  IMPORTANT: To complete the turn required for the calibration you must take from 1 to 2 minutes.

- If you want to stop the calibration before the end without saving the calibration data press the button "STOP"
- After completing the calibration execute this check: with the ECLIPSE displaying the heading turn the aircraft exactly at North, South, West and East verifying the correct indication on display.

7.2 Fuel flow transducer calibration

If you have installed the fuel flow transducer, to increase accuracy in the measurement you must calibrate the transducer following this steps; it's recommended to execute the calibration right after installing the ECLIPSE and to repeat it once a year.
NOTE: if you have set the use of the fuel flow data from the Rotax 912iS ECU (System setup → Fuel Computer → Fuel flow input set to "CANBUS") this calibration is not required.

1- With the aircraft in level attitude, fill the tank/s of fuel; note that in the step #4 it's required to refill the tank/s at the exact level reached here.
2- Turn-on the ECLIPSE and select "**FILLED**" when asked for the fuel quantity.
3- Burn at least 3/4 of fuel in the tank/s: a greater amount of burned fuel will increase the accuracy, and you can do this step in more flights: at the start of each flights you must not add fuel in the tank/s and you must select "**NO REFUEL**" when asked after turning on the ECLIPSE.
4- Fill the tank/s with the exact same level reached in the step #1, accurately measuring the quantity of fuel added in the tank/s.
5- Turn on the ECLIPSE, select **"NO REFUEL"** (even if you have refilled is required to select "**NO REFUEL**").
6- Select the **"K factor auto calibration"** (menu System setup-->Fuel computer) and press the knob for 3 seconds until it's displayed the following screen:



Rotate the knob to insert in "**FUEL FILLED**" the exact quantity of fuel that you have added and measured in step #4; probably it doesn't correspond to the "**FUEL COMPUTER USED QUANTITY**" because this is the measurement from the transducer not yet calibrated and is showed for reference only.

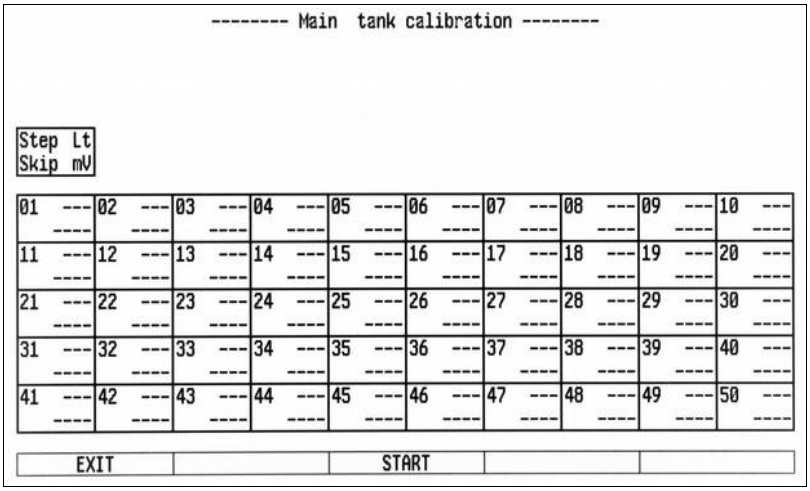
7- When you confirm pressing "**DONE**" the ECLIPSE store in memory the newly calculated K-factor.
It's recommended to annotate the K-factor value so that if you inadvertently modify it it's possible to manually reenter the value without doing again the calibration.

7.3 Fuel level sensors calibration

Before using the fuel level indications it's necessary to calibrate all the aircraft fuel tanks, following the procedure explained in this chapter.

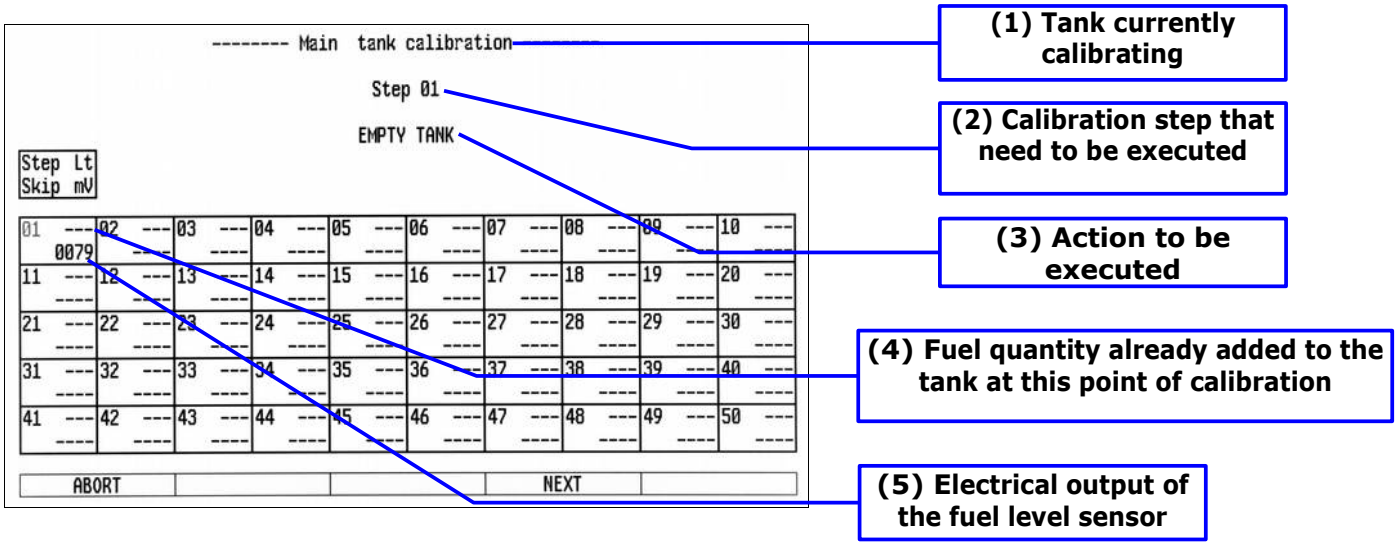
The calibration is divided in more calibration steps, in each step you will fill the tanks with predetermined fuel quantity. The calibration end when the tank is completely filled.
It's possible to choose the fuel quantity to add at each calibration step (item "Calibration fuel step" in System setup-->Fuel level -->Tanks setup menu), choose a proper value considering the tank capacity and how many calibration step you want to execute. For example with a 40 liters tank and "Calibration fuel step" set to 2 it's required 40 / 2 = **20** calibration steps. The maximum number of calibration steps is 50.
The "Calibration fuel step" parameter is used for all the 4 tanks calibrations, dont't modify it once you have choosed a value.

- **Begin calibration:** choose the tank to calibrate and select the relative item in the setup menu (System setup-->Fuel level -->Tanks setup-->Left/Right/Main tank calibration). The display shows this screen (*in the example that follow the unit of measure are set to liters, the "Calib.step" is set to 5 and the tank choosed for calibration is the LEFT)*:



This screen is a calibration summary table:
every calibration steps is represented as a cell.The first time you enter all the cells are empty because no calibration is present.

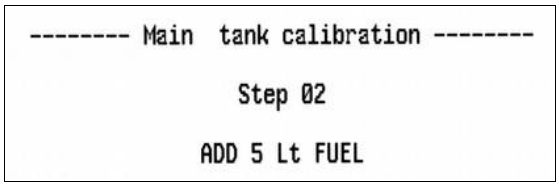
To start a new calibration press the "**START**" button, the display shows the following indications:



NOTE: Before executing the following procedure prepare the aircraft with a normal angle of attack and mantain it for all the calibration duration.

- Step #1 (EMPTY TANK): Drain the tank such that **only the fuel unusable remain in the tank.**
  Wait until the indication ***(5)*** is stable and click on "**NEXT**".

- Step #2: Add to the tank the indicated fuel quantity (it's the same quantity choosed with the "Calibration fuel step" parameter), on this example it's required to add 5 liters of fuel:



NOTE: It's important that the fuel quantity is exactly measured, to reach the maximum accuracy in the calibration.
Verify that the indication ***(5)*** of the second cell is stable and click on "**NEXT**".

- Next steps: repeat previous step (#2) until tank is completely filled.
- When the tank is filled: click on "**NEXT**" to confirm the last calibration step and then click on "**END**" to end the calibration. (When asked on display "END CALIBRATION ARE YOU SURE?" choose "YES").
  If you wish to know the tank capacity read the indication ***(4)*** of the last step on the calibration summary table.
  The calibration for the selected tanks is now completed. It's recommended to write down on paper the data.

NOTE: A common problem for many fuel level sensors is that they can't completely measure the tank capacity, so one or both of this conditions can occur (see also "Fuel level sensors" on chap.#4):
- As you add fuel to an empty tank it takes a certain amount of fuel before the fuel sensor start to move from the bottom.
- As you drain fuel to a filled tank it takes a certain amount of fuel before the fuel sensor start to move from the top.

If one of this conditions occur during calibration the ECLIPSE notice that the fuel sensor doesn't produce an electrical change and ask the user if fuel was already added for that calibration step:

If you are sure to have already added the fuel click on "YES" otherwise click on "NO" to go back to previous calibration step.

7.3.1 Fuel level sensors checkings

To operate correctly the fuel level indicators you need to know what type of fuel level sensors are installed in your aicraft. The resistive sensors can be of two types:
- Sensors that increase resistance as the fuel level increase
- Sensors that decrease resistance as the fuel level increase

If you don't know what type of resistive sensors are installed in your aircraft follow this procedure:
- Empty the tank that you want to check.
- On the ECLIPSE enter in the calibration for that tank (System setup-->Fuel level-->Tanks setup-->Left/Right/Main tank calibration).
- From the screen that appear click on "START" button and annotate the numerical value **(5) Electrical output of the fuel level sensor** (refers to picture in previous chapter).
- Add a certain amount of fuel to the tank and check if the numerical indication increase or decrease: if increase then the sensors installed increase the resistance as you add fuel (RES+), if decrease the sensors decrease the resistance as you add fuel (RES-).

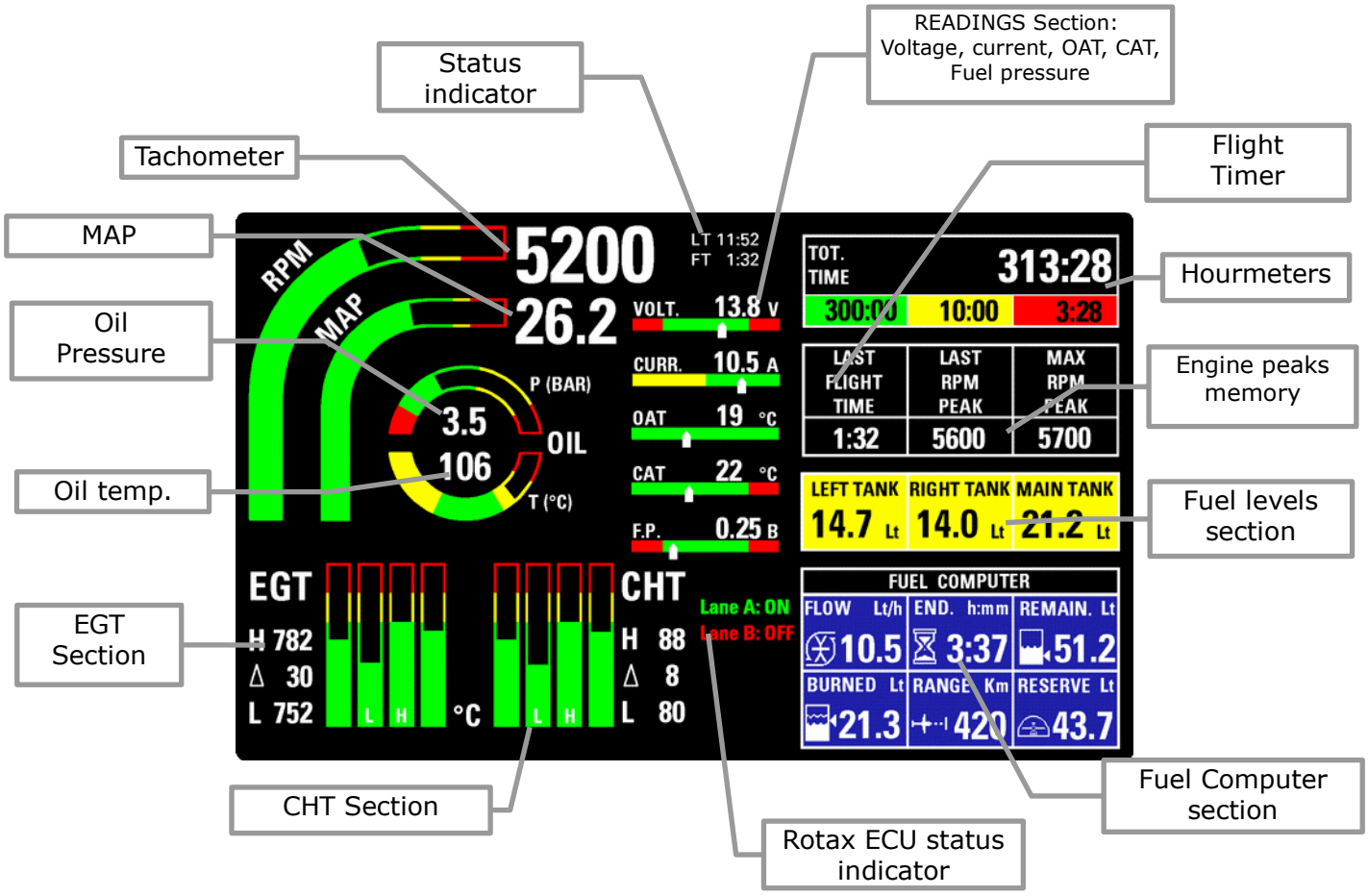
To exit from the calibration screen turn off the ECLIPSE or click on "ABORT".
Repeat the procedure for any other unknown sensors installed.

8. Using the ECLIPSE IFIS, PFD or EIS

ECLIPSE IFIS is organized in 3 monitoring pages: EIS (engine data), PFD (flight data) and IFIS (engine + flight data).

- If you have ECLIPSE EIS model, refer only to "EIS SECTION"
- If you have ECLIPSE PFD model, refer only to "PFD SECTION"

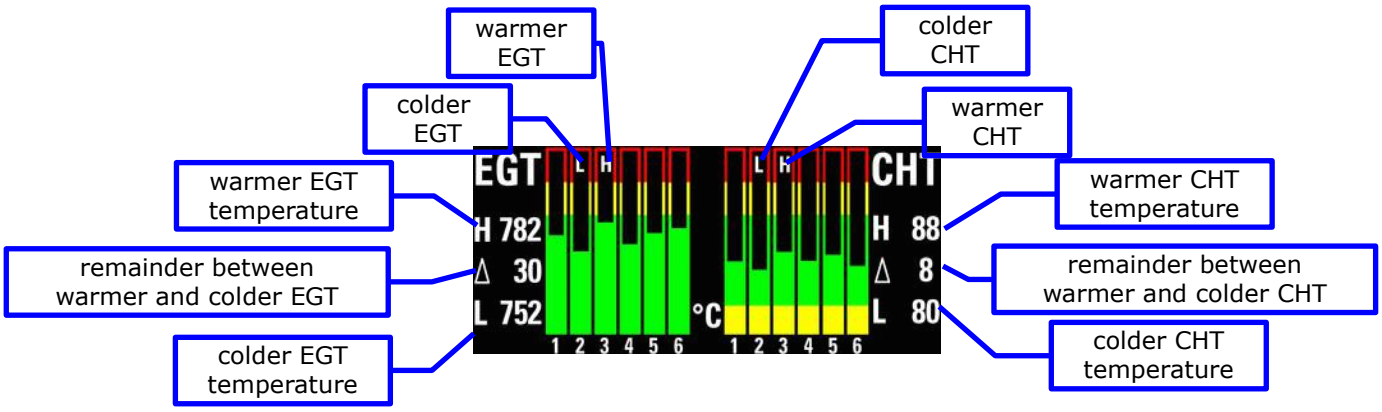
8.1 EIS section



In this page all the important engine and fuel data is clearly displayed in both graphical and numerical indications. All the green, yellow and red zones is completely customizable as explained in "GAUGE SETUP MENU"; when a measurement enter in its red range the corresponding numerical indication become blinking.

The available indications are:

- Tachometer with both graphical and numerical indication. The numeric indicator is normally white but become yellow or red when enter in this ranges.
- MAP with both graphical and numerical indication, in inches of mercury
- Oil pressure with both graphical and numerical indication in BAR.
- Oil temperature with both graphical and numerical indication in °C.
- EGT and CHT with graphical indications (complete cylinders indications is available only if installed optional EGT and CHT probes). Below each graphic bars there is the corresponding cylinder number.
  For both CHT and EGT is also available the following indications (see picture):



- Hourmeters: Total time accumulated by the engine (big number in white color). This time is further divided in total time accumulated in green, yellow and red zones (colored windows below the total time).
- FLIGHT TIMER: The flight timer starts automatically when the engine meets or exceeds for 30 seconds the parameter "RPM flight" in RPM setup menu and it stops automatically when the engine is turned off (0000 RPM). It remains stored in memory until you begin a new flight.
- PEAK RPM IN CURRENT FLIGHT : Maximum peak RPM reached by the engine in the current/last flight; it remains stored in memory until you begin a new flight.
- PEAK RPM EVER : Maximum peak RPM reached by the engine during its life.

- **READINGS SECTION**
- Battery voltage
- Battery current (if optional sensor is installed)
- OAT - Outside Air Temperature in °C (if optional sensor is installed)
- CAT - Caruburetor/Airbox Air Temperature in °C (if optional sensor is installed)
- Fuel pressure in BAR (if optional sensor is installed)

- **STATUS INDICATOR**

In the first line is showed the local time, as the GPS have the fix. To adjust the local time offset see the configuration menu, chap.6.1.9, parameter "**Local time is UTC"**.
The second line can shows the following indications:
"WARMUP" : This word, in red color, is showed before the take-off if the ECLIPSE notice that not all the main measures are in the green zones. The measures checked are: CAT, fuel pressure, oil pressure and temperature, all the CHTs. When all the measures becomes in its green zone ECLIPSE will show the word "READY", that disappear 30 seconds after take-off and is replaced by the flight timer (indicated with FT).

ROTAX ECU STATUS

This status indicate if the Eclipse is correctly wired and communicating properly with the two ECUs (A and B) of the Rotax 912iS engine.
If the communication is ok with both A and B ECUs the two indications are in green (**A:ON B:ON**).
If the communication is missing with one of the ECUs the relative indication is in red (**A:OFF** or **B:OFF**).

Communication with the ECUs is essential to read the following engine data: RPM, MAP, oil pressure and temperature, CAT-airbox temperature, CHT1-coolant temperature, EGT1/2/3/4 temperatures, fuel flow.

- **FUEL LEVELS SECTION**

The fuel level indications are obtained by reading the fuel level sensors installed in your aircraft and connected to ECLIPSE. The indications are approximated, do not solely rely on the ECLIPSE to determine the fuel available in the tanks but always refer to primary instrument installed in your aircraft.

Before using the fuel levels section you must be sure to have already set the following parameters:

- Set the unit of measure: USgallons or liters (set this before all the other parameters). See parameter "Unit" on menu System Setup-->Fuel Level-->Tanks setup.
- Activate only the tanks used (Left/Right/Main tank enable on menù System setup-->Fuel Level-->Tanks setup).
- Set the type of level sensors installed (Left/Right/Main tank sensor on menù System setup-->Fuel Level-->Tanks setup).
- Execute the calibration for each used tanks (see chap.7.3).

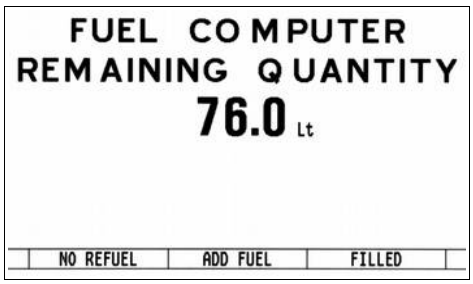
- **FUEL COMPUTER SECTION**

Before using the fuel computer section you must be sure to have already set the following parameters:

- Set the unit of measure: USgallons or liters (set this before all the other parameters). See parameter "Unit" on menu System Setup-->Fuel Level-->Tanks setup.
- Set the unit of measure: kilometers or nautical miles. See parameter "Space unit" on menù System Setup-->Fuel computer.
- Set the total tank/s capacity. See parameter "Tank capacity" on menù System Setup-->Fuel computer.
- Set the K-factor (only if external fuel flow transducer is installed): The K-factor of a fuel flow transducer is the number of electric pulses for 1 gallon of fuel consumption (if you have K-factor in liters you must moltiply this value by 3.78 before set k-factor in the ECLIPSE). If you use Flybox® TFTHP fuel flow transducer set k-factor to 416400.

It's recommended also to execute the K-factor calibration as soon as possible to have the maximum accuracy (refer to chapter 7.2 "Fuel flow transducer calibration").

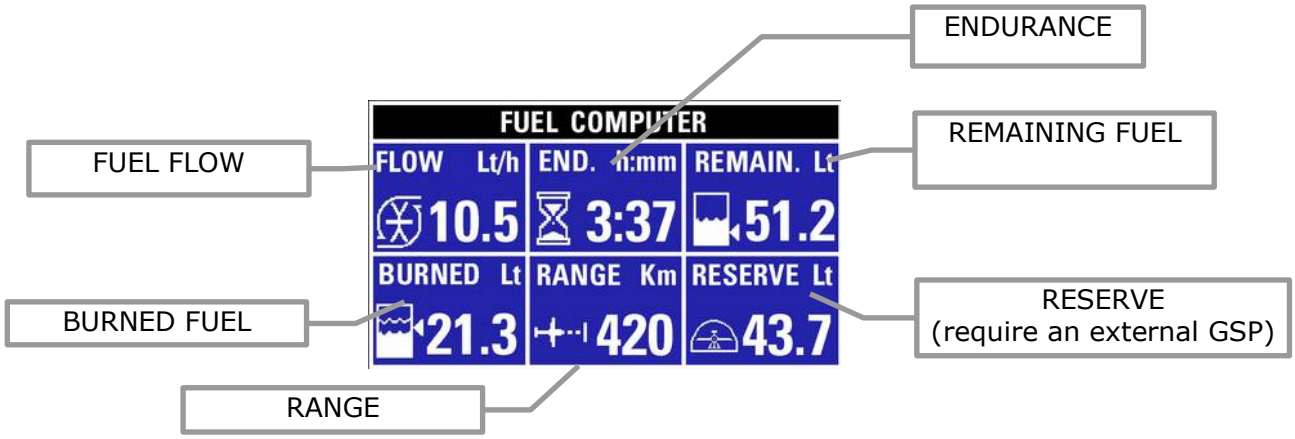
Everytime after powering-on the instrument the ECLIPSE ask if you have refuelled the tank; you must choose one of the 3 options available:



NO REFUEL : Select this option if you have not refuelled the tank.
ADD FUEL : Select this option if you have added fuel to the tank (in the next screen you can insert the exact amount of fuel added).
FILLED : Select this option if you have filled the tank. The display will show the quantity that has been added to reach the full level. (Before using this option you must have already set the tank capacity in the fuel computer setup).

NOTE: If you need to correct a wrong fuel quantity add, select "ADD FUEL" and insert a negative value.

When the fuel computer is ready to operate it shows the following indications:



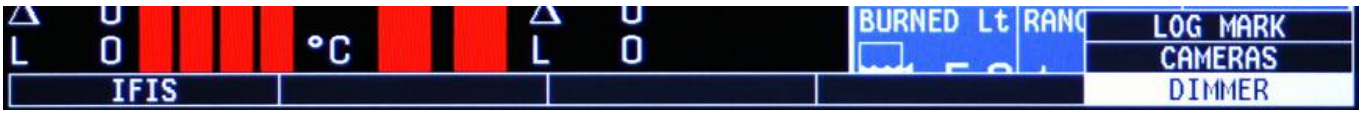
- **FUEL FLOW :** According to the selected unit of measure the flow is indicated in liters per hour (Lt/h) or gallons per hour (Gl/h).
- **REMAINING FUEL :** Display the fuel remaining in the tank. According to the selected unit of measure the flow is indicated in liters (Lt) or gallons (Gl).
  NOTE: The fuel remaining displayed here is not a measurement of the fuel in the tank, but it is calculated from the initial quantity and the burned quantity measured by the Rotax ECU (or measured by the external fuel flow transducer if installed).
- **BURNED FUEL :** Display the fuel burned from the starting. According to the selected unit of measure the flow is indicated in liters (Lt) or gallons (Gl).
- **ENDURANCE :** Display the time to empty, calculated considering the fuel remaining and the actual fuel flow.
  If it is not possible to calculate the time to empty (for example if the engine is not running) the display shows --:--
- **RANGE :** Display the range calculated considering the fuel remaining, the actual fuel flow and the ground speed furnished by the GPS.
  NOTE: if the display shows "WAITING GPS RMC" it means that the GPS don't have the fix.
  If it is not possible to calculate the range (for example if the engine is not running) the display shows --:--
- **RESERVE :** Display the fuel remaining at destination; the destination is intended as the approaching GPS waypoint.
  If the number is negative it means that there is not enough fuel to reach the destination.
  To enable this indication you must connect an external GPS (as explained in "CON1 Connections" on chap.3) and

enable the "RMB" sentence on it; you must also set to "YES" the parameter "Ext. GPS for reserve indication" on System setup-->Fuel computer menu.

If the display shows "WAITING GPS RMB" it means that the GPS is enabled but not connected, turned off or it don't have the fix.

If it is not possible to calculate the reserve (for example when the engine is not running) the display shows --:--

FUNCTIONS MENU AVAILABLE (press any key to display the menu):

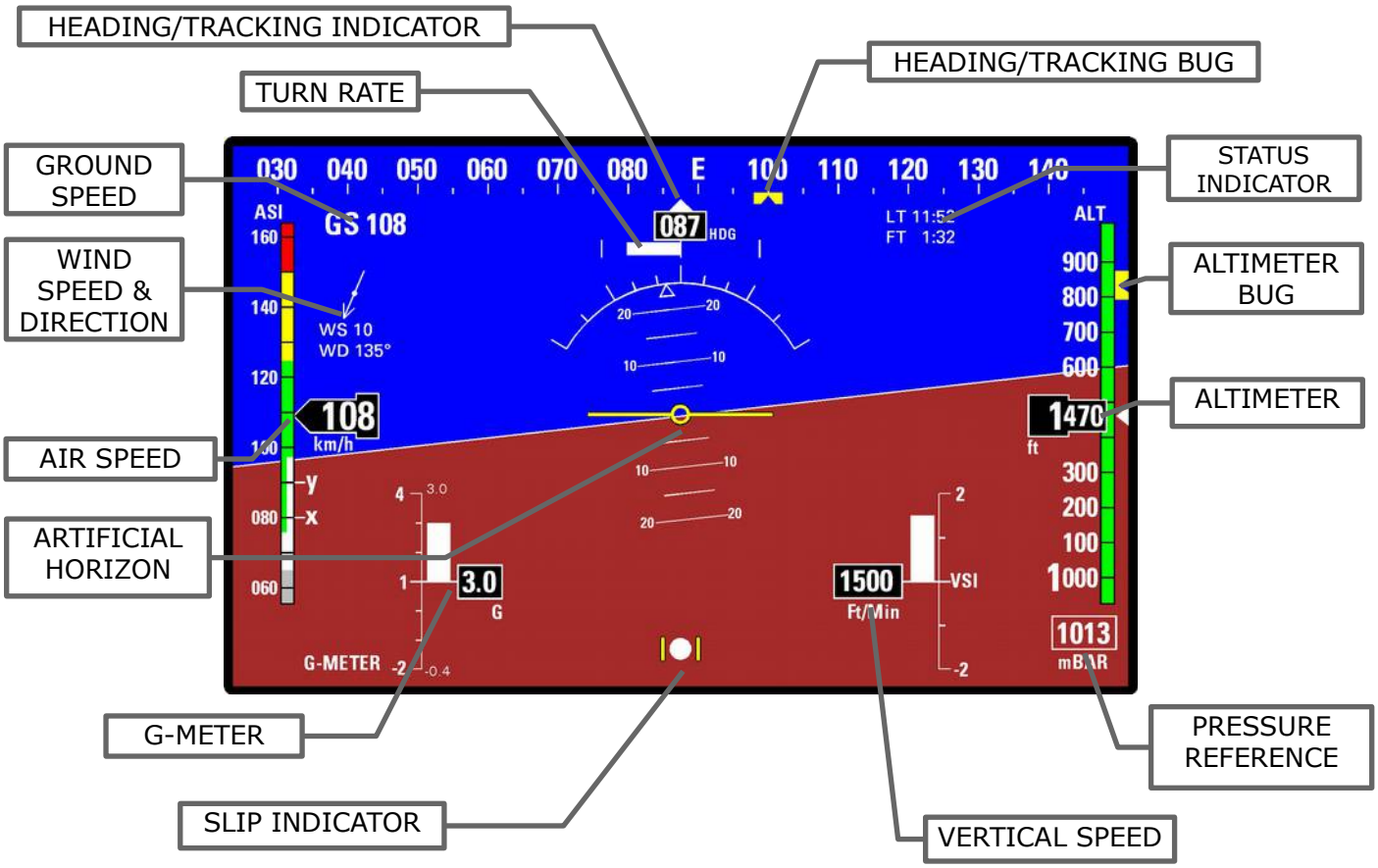


- **IFIS**: to switch to the IFIS page (only for ECLIPSE IFIS)
- **DIMMER**: display brightness adjustment (1=min. brightness, 10=max. brightness)
- **CAMERAS**: to switch to video/cameras page (see chap.8.4 "Video/cameras section").
- **LOG MARK**: to create a mark that will be visible in the datalog and in KML file for Google Earth (see chap.8.5 "Datalogger")

- **SYSTEM SETUP**: Press P1 + P4 for 2 seconds.

8.2 PFD section

This page display all flight data:



The available indications are:

- HEADING/TRACKING INDICATOR:

Placed in the upper part of the screen, the heading/tracking indication is represented with both tape and numeric indicator. The tape indicator shows numbers in degrees except for the four cardinal points which are shown as N , S , W , E.
It can show the *HEADING* (magnetic compass, indicated with "HDG") or the *TRACKING* (Track of the GPS, indicated with "TRK"). Note that after power-on the compass is set to *heading* and is switched to *tracking* when speed exceeds 60 Km/h. It's however possible to switch between the two indications: press any buttons to display the menu then press **P3** button.
Heading and tracking considerations:
The **Heading** is valid either stationary or moving and during aircraft turns the indicator is fluid and continuous. It compensate for aircraft attitude so that the indication is valid also with pitch or roll inclination.
The **Tracking** is read form GPS receiver and is updated once per second, so in case of fast turns it may not have a continuous and fluid indication. Provided that GPS receiver have a good satellites reception, the tracking indication (also called Course) is very accurate and compensated from wind.
NOTE: The GPS tracking is not valid when stationary or for speed below 20 km/h, in this case the indication remains fixed to the last valid received data.
To change the bug select "**HDG BUG/AP**" in the menu bar or, if you have autopilot system, rotate the "HDG/TRK" knob in the ACU panel.

- TURN RATE:

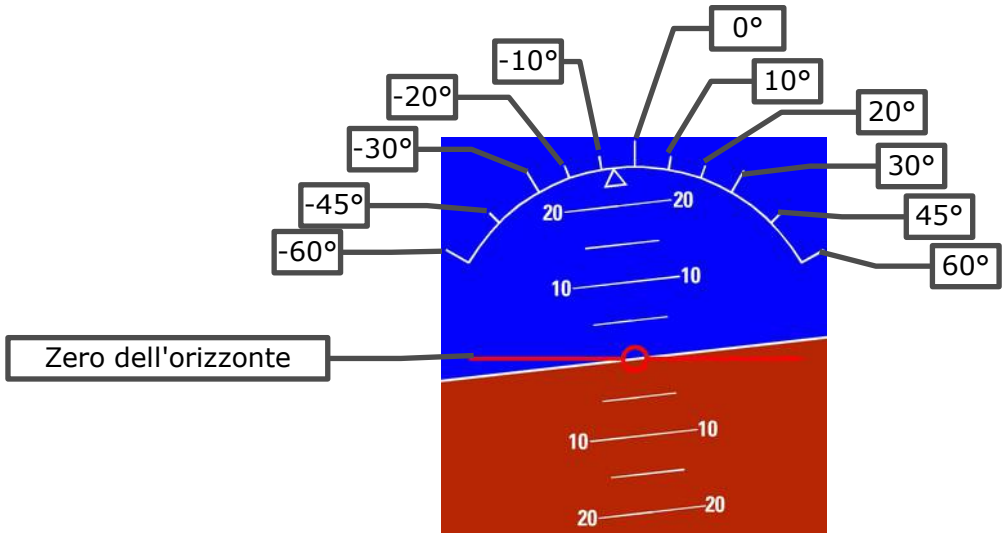
Graphical indications of the turn rate. To set the full scale see "Configuration menu", chapter 6.1.8.

- AIR SPEED:

The Air speed is represented with both tape and numeric indicator. The unit of measure can be km/h, Mp/h or knots. The range of measure is from 30 to 470 km/h (16~254 knots or 18~292 mph). Below 30 km/h of air speed the indication remain fixed to zero.
The speed thresold that define the coloured zone of the tape indicator are those previously set in "ASI GAUGE SETUP".
There are also the two indication marks for the Vx and Vy speeds.

- ATTITUDE INDICATOR:

With 360° continuous operation in both pitch and roll. Above and below the horizon line, major pitch marks and numeric indicators are shown for every 10°, up to +/- 40°. Minor pitch marks are shown for every 5°.
The **roll scale** show inclinations from -60 to +60°; mark lines are shown for the following inclination:

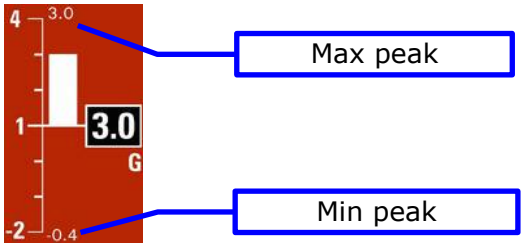


The colors used for the attitude indicator are brown for the ground and sky blue for the sky. The zero is represented by the red line.

IMPORTANT NOTES ON USING attitude indicator:

- The attitude indicator may loose accuracy during the flight for the following causes:
  - You have exceeded the maximum allowable turn rate on one or more axis (150° per second)
  - Rapid temperature changes or temperature outside the operating limit (-20°C~+70°C).
  - Continuous maneuvering at high accelerations, with absence of leveled flight attitude for long periods of time.
- Never use the attitude indicator as a reference for flight manoeuvres.
- Never use the attitude indicator as a reference in absence of visibility.

- G-METER:

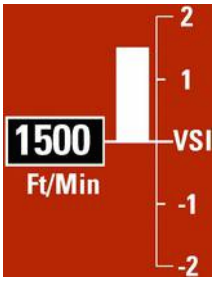


It show accelerations in g, with both graphical bar (-2~+4 G) and numeric indicator (absolute value in G). It also indicate the maximum and minimum peak accelerations reached (see picture above).
To reset the peak accelerations press any buttons to display the menu and then select with the knob the "**RESET G**" function.

- SLIP INDICATOR:

  It's a graphic indication of the lateral accelerations.

- VERTICAL SPEED INDICATOR:



It include both graphic bar and numeric indications (absolute value). The upper part of the graphic scale indicate an ascent rate, the lower part indicate a descent rate. The unit of measure can be feets/minute or meters/second (note that when in feets/minute the indication mark on the graphic scale have only the thousands digit).

- ALTIMETER:

  It include both a tape indicator and a numeric indicator. The unit of measure can be feets or meters, the range of measure is -1000~25000 feets (-300~ +7600 m). On the tape indicator the thousands digits are shown every 500 (i.e. 1500,2000, etc..) while the numeric indications is always displayed completely.
- To change the PRESSURE REFERENCE click the knob and then rotate it to change the numerical value.

- STATUS INDICATOR

In the first line is showed the local time, as the GPS have the fix. To adjust the local time offset see the configuration menu, chap.6.1.8, parameter "**Local time is UTC"**.
The second line can shows the following indications:
"WARMUP" : This word, in red color, is showed before the take-off if the ECLIPSE notice that not all the main measures are in the green zones. The measures checked are: CAT, fuel pressure, oil pressure and temperature, all the CHTs. When all the measures becomes in its green zone ECLIPSE will show the word "READY", that disappear 30 seconds after take-off and is replaced by the flight timer (indicated with FT).

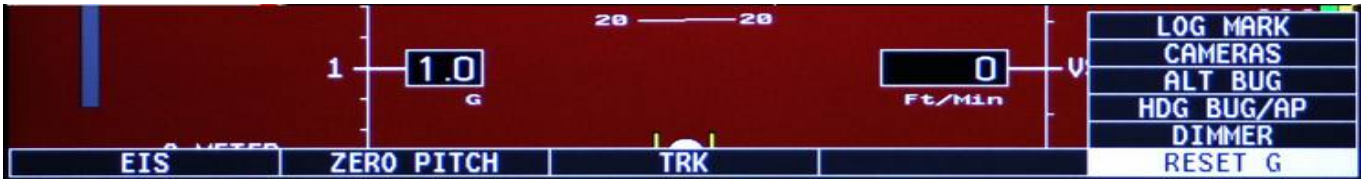
- GROUND SPEED

The ground speed is read from the GPS, the unit of measure is the same of the air speed indicator. If the GPS is not connected it will show the "NO GPS" indication, if the GPS don't have the fix it will show "NO FIX".

- WIND SPEED & DIRECTION

Wind speed (WS) is indicated with the same unit of measure of the air speed. Wind direction (WD) is represented graphically by an arrow and is also indicated in degrees (WD: 0~360°).
NOTE: For the proper operation of this indicator it's necessary a correct magnetic calibration (see chap.7.1) and a correct installation and calibration of the pitot line.

FUNCTIONS MENU AVAILABLE (press any key to display the menu):



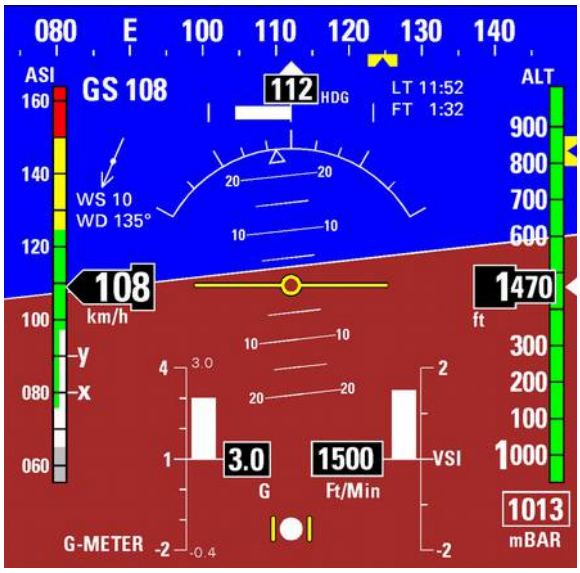
- **EIS**: to switch to the EIS page (only for ECLIPSE IFIS)
- **ZERO PITCH**: Reset the pitch of the attitude indicator. **This function must be used only when the aircraft is in leveled flight, never use it to reset the horizon during other flight attitude.**
- **TRK** or **HDG**: to switch between Heading/Tracking compass indications.
- **RESET G**: to reset the peak accelerations.
- **DIMMER**: display brightness adjustment (1=min. brightness, 10=max. brightness)
- **HDG BUG/AP**: to set the position of the bug related to compass indication or insert autopilot system (if installed). Turn the knob to adjust in steps of 1° the bug position on the compass tape indicator and press "Done" to confirm. Alternatively it's possible to press the "On Course" button to set bug to the actual Heading/Tracking. If the actual bug is out of the displayed scale a numeric indication is shown on the left or right limit, that indicate the actual position of the bug.
- **ALT BUG**: to set the position of the bug related to altimeter indication. Turn the knob to adjust in steps of 5 feets the bug position on the altimeter tape indicator and press "Done" to confirm. Alternatively it's possible to press the "Actual" button to set bug to the actual altitude. If the actual bug is out of the displayed scale a numeric indication is shown on the high or low limit, that indicate the actual position of the bug.
- **CAMERAS**: to switch to video/cameras page (see chap.8.4 "Video/cameras section").
- **LOG MARK**: to create a mark that will be visible in the datalog and in KML file for Google Earth (see chap.8.5 "Datalogger")

- SYSTEM SETUP: Press P1 + P4 for 2 seconds.

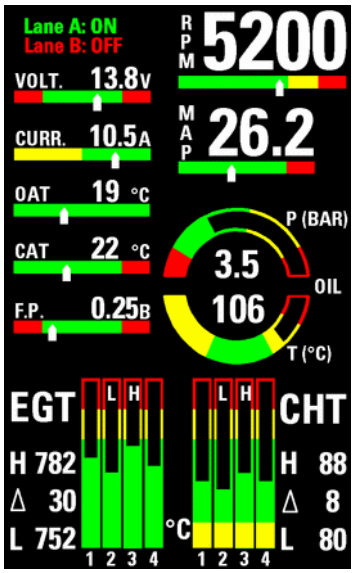
8.3 IFIS Section (for ECLIPSE IFIS only)

This is a mixed screen organized in two windows:

- On the left are shown all the flight data (after instrument turn on wait 10 seconds before moving your aircraft, to allow the setup of the attitude indicator).
- On the right are shown the engine data or the fuel/hourmeter data.

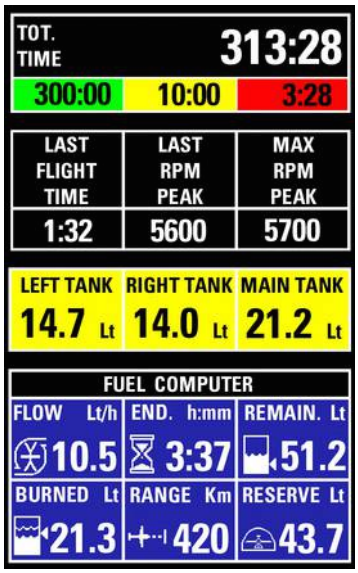


Left window



Right window with engine data

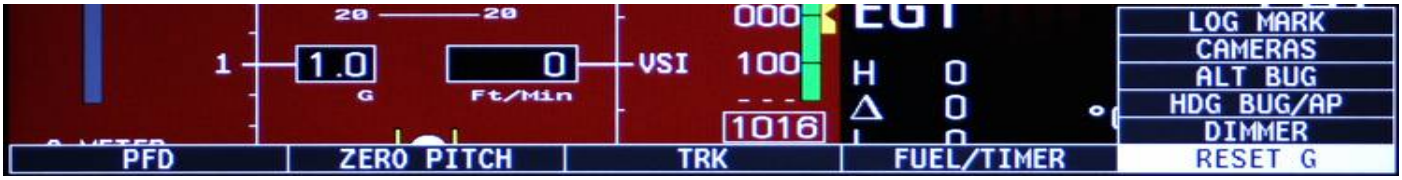
--->



Right window with fuel/hourmeter data

- The functions and indications of the left page are the same explained in the PFD section
- The functions and indications of the two right pages are the same explained in the EIS section.

FUNCTIONS MENU AVAILABLE (press any key to display the menu):



- **PFD**: to switch to PFD page.
- **ZERO PITCH**: Reset the pitch of the attitude indicator. **This function must be used only when the aircraft is in leveled flight, never use it to reset the horizon during other flight attitude.**
- **TRK** or **HDG**: to switch between Heading/Tracking compass indications.
- **ENGINE** or **FUEL/TIMER**: to switch right page between engine or fuel/hourmeter data.
- **RESET G**: to reset the peak accelerations.
- **DIMMER**: display brightness adjustment (1=min. brightness, 10=max. brightness)
- **HDG BUG/AP**: to set the position of the bug related to compass indication or insert autopilot system (if installed). Turn the knob to adjust in steps of 1° the bug position on the compass tape indicator and press "Done" to confirm.

Alternatively it's possible to press the "On Course" button to set bug to the actual Heading/Tracking. If the actual bug is out of the displayed scale a numeric indication is shown on the left or right limit, that indicate the actual position of the bug.

- **ALT BUG**: to set the position of the bug related to altimeter indication. Turn the knob to adjust in steps of 5 feets the bug position on the altimeter tape indicator and press "Done" to confirm. Alternatively it's possible to press the "Actual" button to set bug to the actual altitude. If the actual bug is out of the displayed scale a numeric indication is shown on the high or low limit, that indicate the actual position of the bug.
- **CAMERAS**: to switch to video/cameras page (see chap.8.4 "Video/cameras section").
- **LOG MARK**: to create a mark that will be visible in the datalog and in KML file for Google Earth (see chap.8.5 "Datalogger")

- SYSTEM SETUP: Press P1 + P4 for 2 seconds.

8.4 Video/cameras section

This page is a preview of the 3 video inputs of the ECLIPSE; to display at fullscreen a single video input press a button and then select ZOOM CAM 1/2/3.
NOTE: in the preview page the refresh rate of the display is limited. To have a smooth visualization you must select one of the 3 video inputs to be displayed at fullscreen.

FUNCTIONS MENU AVAILABLE (press any key to display the menu):

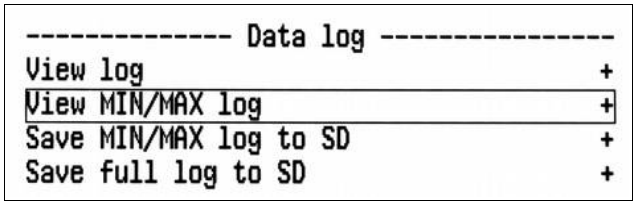
- **EXIT**: to turn back to the page previously displayed.
- **ZOOM CAM 1**: to shows at fullscreen the video input #1.
- **ZOOM CAM 2**: to shows at fullscreen the video input #2.
- **ZOOM CAM 3**: to shows at fullscreen the video input #3.

- **SYSTEM SETUP**: Press P1 + P4 for 2 seconds.

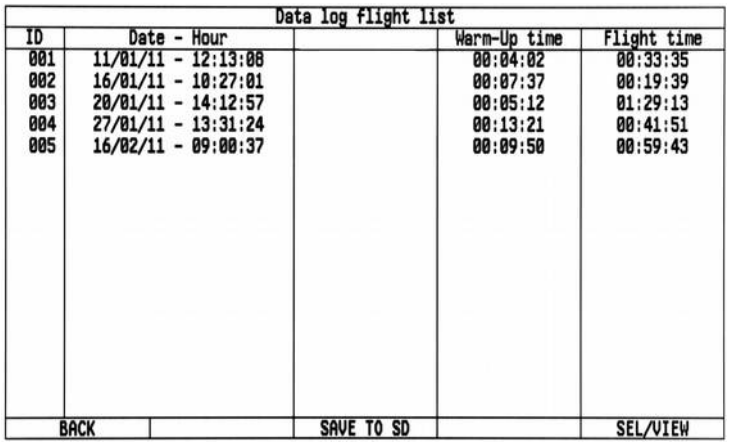
In the single video input fullscreen visualization select "**BACK**" button to return in the preview page or select "**ZOOM CAM ..**" to switch directly from one to another video input.

8.5 Datalogger

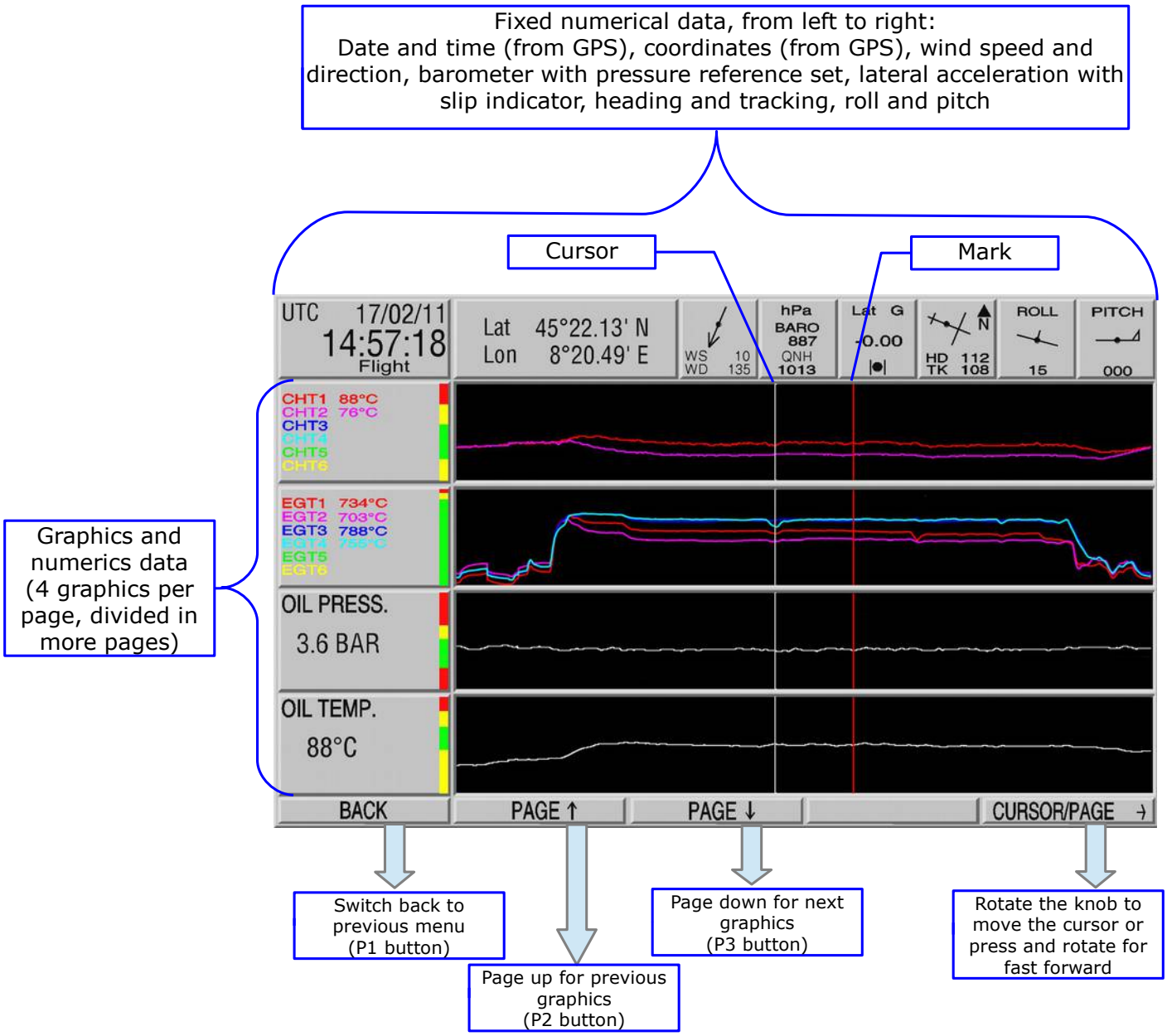
The datalogger is a useful data recording tool that permits later viewing in both graphical or numerical representation. It also allow the download of the data in a SD card.
Data are organized in separate recording sessions, each time the engine is started a new recording session will be initiated, identified with a sequential number.
The memory can store 12 hour of data, with a sampling of 1 second. Older data are automatically erased to make room for the new ones.
"Data log" menu is composed of the following items:



View log: Switch to the recordings selection screen (view next image)
View MIN/MAX log: Displays a screen with the max. and min. peak values for each measurement recorded by the datalogger.
Save MIN/MAX log to SD: Save to SD a file with the max. and min. peak values for each measurement recorded by the datalogger. (filename: dtlmm001.csv).
Save full log to SD: Save all recordings to the SD card.



RECORDINGS SELECTION SCREEN:
In this screen there is the complete lists of all the recordings made. Recordings are identified by the "ID" sequential number on the first column.
The second column shows date and time of start recording (informations read from the GPS).
To know the effective flight time read the last column. Note that Eclipse create a new recording every time the engine is turned on (or, for PFD version, airspeed exceed 30 km/h); in the "Warm-up time" column is shown the time spent for the engine warm-up.
Rotate the knob to select a recording and press it to switch to the recording analysis screen (see next image). Press **P3** button (Save to SD) to download the selected recording in the SD card, press **P1** button (BACK) to switch back to previous menu.



The cursor permits to analyze the flight throughout its duration. All numerical values are relative to the actual position of the cursor.
The "Mark" is a graphical reference that can be used during the flight to store a particular moment that can be easily find out on the graphic (it will be stored also on the .KML file for Google Earth). To store a new mark during a flight, select the "Log Mark" item from the menu bar.
Graphics are available for all data measured by the ECLIPSE, so depending on the version and assuming you installed all the optional probes, the available graphs are in the order:

- **ECLIPSE EIS**: CHT / EGT / OIL PRESSURE / OIL TEMP. / CAT / OAT / VOLTAGE / CURRENT / MAP / RPM / FUEL PRESSURE / FUEL FLOW.
- **ECLIPSE PFD**: PITCH / ROLL / G-METER / SLIP INDICATOR / ALTITUDE / ALTITUDE FROM GPS / VARIOMETER / BAROMETER / AIRSPEED / GPS SPEED / WIND SPEED / QNH SET / FUEL FROM FUEL LEVEL SENSORS / REMAINING FUEL CALCULATED BY THE FUEL COMPUTER / BURNED FUEL CALCULATED BY THE FUEL COMPUTER / SERVO POSITION (if installed).
- **ECLIPSE IFIS**: All the previous measures of both EIS and PFD.

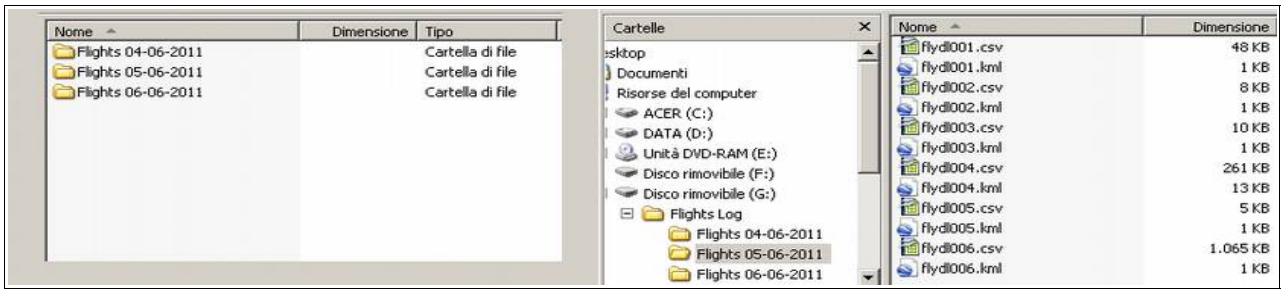
DOWNLOAD RECORDINGS ON A SD CARD

The save to SD function allow to use the recorded data in a personal computer, for analysis and visualization in a spreadsheet software (eg Excel) or to view flights in Google Earth software. The save to SD function make two files with same name and different extensions: the .CSV file contains all data formatted for spreadsheet software (ie Excel) while the .KML file is for viewing the flight on Google Earth software.

Detail on file created on the SD card:
- FLYDLxxx.KML (xxx=ID number of the flight): this file require "Google Earth" free software installed on your PC; simply double click on the KML file to view the recorded flight.
- FLYDLxxx.CSV (xxx=ID number of the flight): generic "comma-separated value" file format, importable by any spreadsheet software like Excel. Inside this CSV there are all the parameters recorded by ECLIPSE, that is all engine data for ECLIPSE EIS, all flight data for ECLIPSE PFD and both engine and flight data for ECLIPSE IFIS.

For example if you save to SD the flight #5 (ID=005) the filenames created are '*FLYDL005.CSV*' and '*FLYDL005.KML*'.

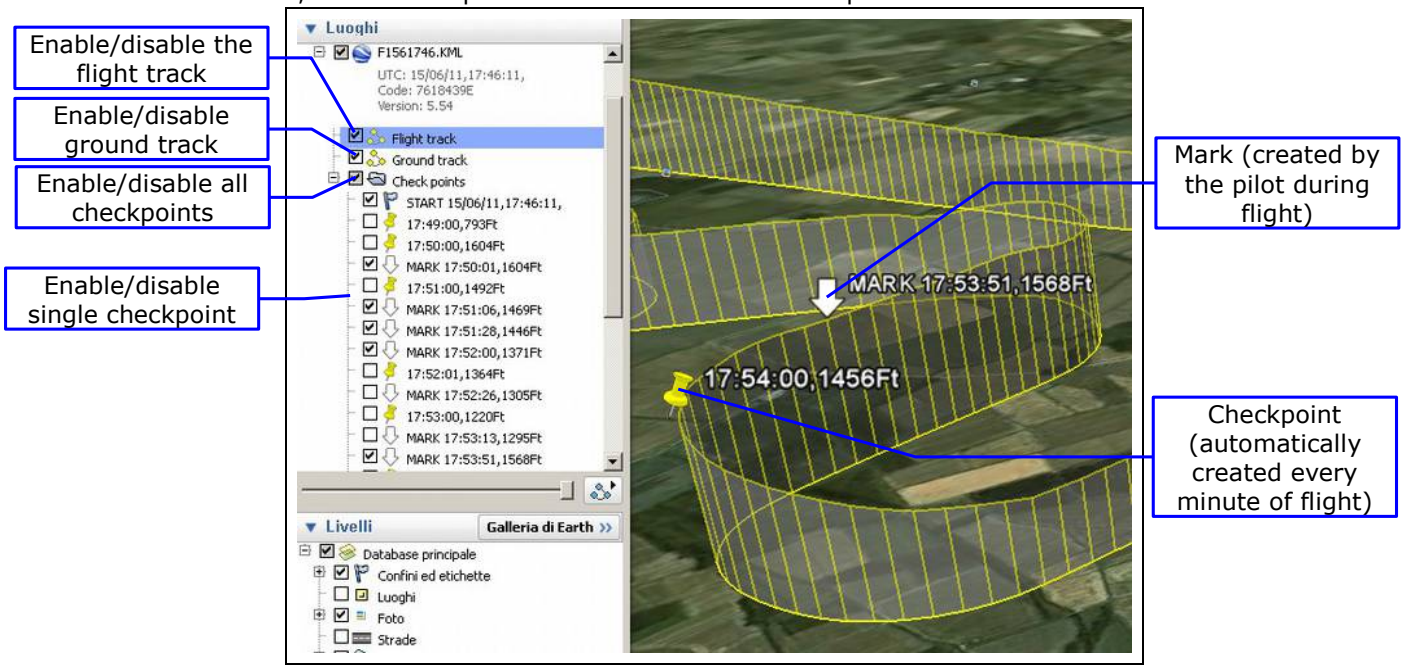
If you plan to keep archived all flights logs it's recommended to organize them in subfolders, for example creating a new folder every time you download the flights to the SD:



NOTE: When saving to SD use only memory card with storage capacity not exceeding 2 Gb.

VIEWING .KML FILES WITH GOOGLE EARTH

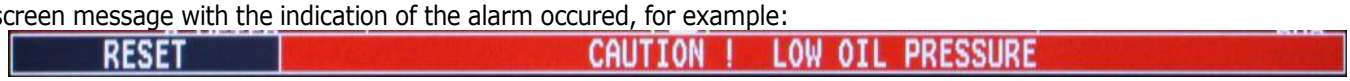
If you have already installed Google Earth software simply double click on any KML files to view it. In the following picture are indicated the basic functions, for the full explanation refer to the software help:



NOTE: Google Earth is a free software that may be updated and changed at any time by Google
© Google

8.6 Alarms

ECLIPSE continuously monitor all sensors/probes and when a measurement enter in its red zone it activates an alarm condition. All the alarms are fully configurable as explained in chap.6.1.7; activating all available options an alarm condition is composed of the following events:
- Onscreen message with the indication of the alarm occured, for example:



- Activation of the alarm output (if you have connected a led or lamp indicator they will be switched on flashing)
- Activation of the intercom audio output with an audio tone or with a vocal alert, depending on what has been set

To reset an alarm condition press the "RESET" button (P1).
In case of multiple alarms they will be reported sequentially: press "RESET" more times to see all the alarms occured.
Note that also after resetting an alarm, if a measure remains in the red zone, its indication will be shown in blinking red; for the CHTs and EGTs also the graphic bars become blinking in red.
Below are reported all the possible alarm messages:

- "HIGH BATTERY VOLTAGE !"
- "HIGH FUEL PRESSURE !"
- "HIGH OIL PRESSURE !"
- "HIGH EGT NUMBER 1...6"
- "LOW EGT NUMBER 1...6"
- "HIGH CHT NUMBER 1...6"
- "LOW CHT NUMBER 1...6"
- "LOW FUEL LEVEL! LEFT TANK"
- "LOW FUEL LEVEL! RIGHT TANK"
- "LOW FUEL LEVEL! MAIN TANK"
- "FUEL COMPUTER RESERVE!" : Reached the fuel reserve (calculated by the fuel computer section)
- "MINIMUM FUEL ENDURANCE!" : Reached the minimum endurance (calculated by the fuel computer section)
- "TANK SWITCHING!" : Alert switching tank for balancing (calculated by the fuel computer section)
- "WARNING! OVER G"
- "WARNING! OVERSPEED"
- "CAUTION! LOW BATTERY VOLTAGE"
- "CAUTION! LOW FUEL PRESSURE"
- "CAUTION! LOW OIL PRESSURE"
- "CAUTION! ENGINE OVERSPEED"
- "CAUTION! MAXIMUM NO OXYGEN ALTITUDE"
- "HIGH OIL TEMPERATURE!"
- "LOW OIL TEMPERATURE!"

8.7 Error messages

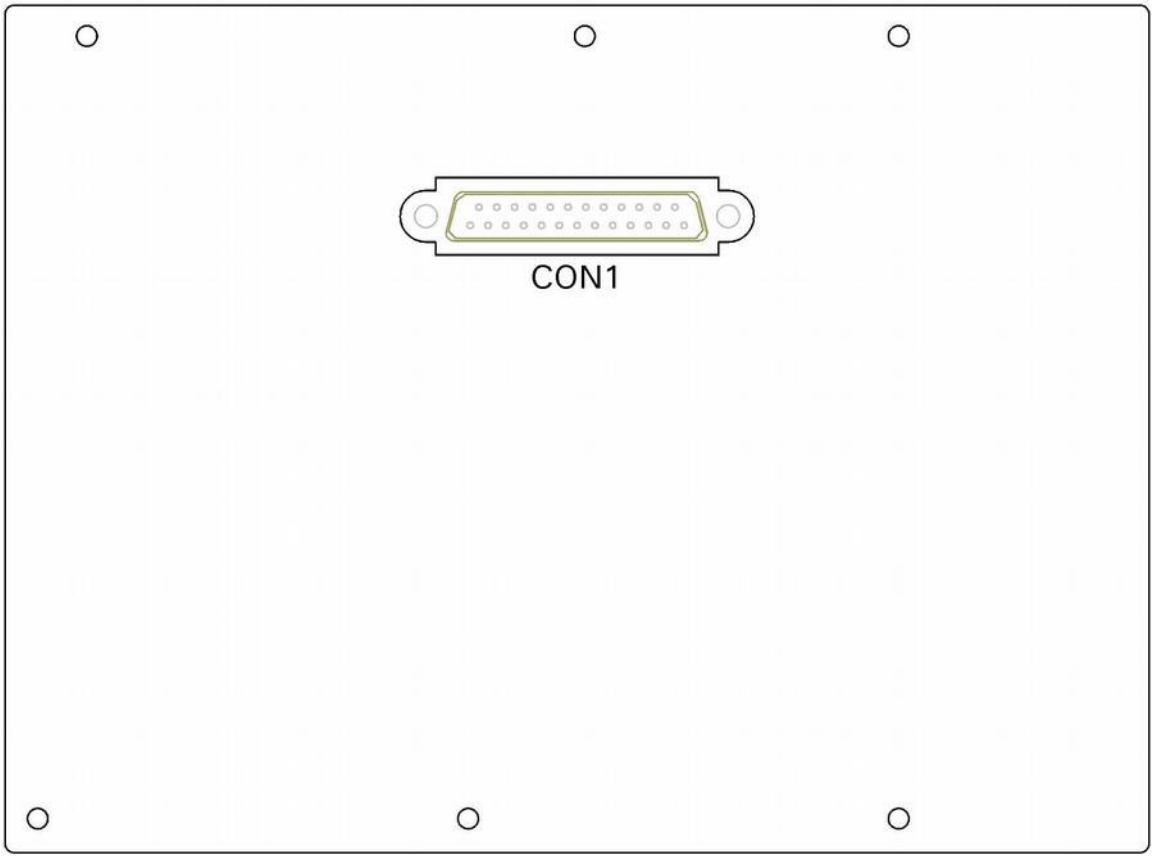
Similar to the alarm conditions of the previous chapter, various error messages can be shown by Eclipse, for example when it cannot find a sensor needed for a measurement: in this case the relative indication start blinking in red with the word "ERR" and for CHT and EGT also the graphic bars become blinking red.
When this condition happen you should check possible damage to wiring or sensor itself.
The sensors taken in consideration is only those enabled in the sensor setup menu (refer to chap.6.1.1, "Sensor setup"). For this reason you must assure to have enabled only those sensors installed in your aircraft and let disabled all the rest to avoid false alarms.
For the main sensors it are also activated an onscreen message and a tone alert on the intercom audio output. The possible sensor alarms are:

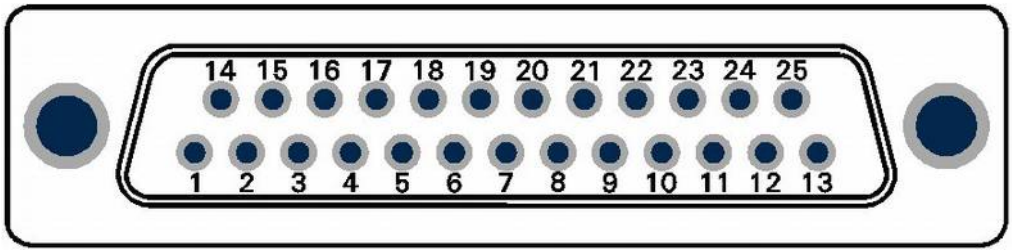
- "**FUEL PRESSURE SENSOR ERROR!**"
- "**OIL PRESSURE SENSOR ERROR!**"
- "**OIL TEMPERATURE SENSOR ERROR!**"
- "**CHT SENSOR ERROR NUMBER 1...6**"
- "**EGT SENSOR ERROR NUMBER 1...6**"

Other kind of error messages, not related to sensors/probes, are:
- "**NO GPS**": When Eclipse does not detect the GPS
- "**SENSORS TEMPERATURE OUT OF HIGH LIMITS**" and "**SENSORS TEMPERATURE OUT OF LOW LIMITS**": When the sensors temperature are out of the operating limits (-20 ~ +70 °C). In this case the attitude indicator does not work.

ECLIPSE MFD, connected to a main ECLIPSE unit (EIS, PFD or IFIS) permits showing all data on the copilot side. This version has the same design of the other 3 ECLIPSE models but it does not have any sensors integrated: it shows all data available on the main ECLIPSE to which is connected.

- **INSTALLATION AND DIMENSIONS**: same as EIS/PFD/IFIS ECLIPSE, refer to chapter 2.
- **ELECTRICAL WIRING**: Unlike the main ECLIPSE unit, in the MFD there is only the "CON1" connector:



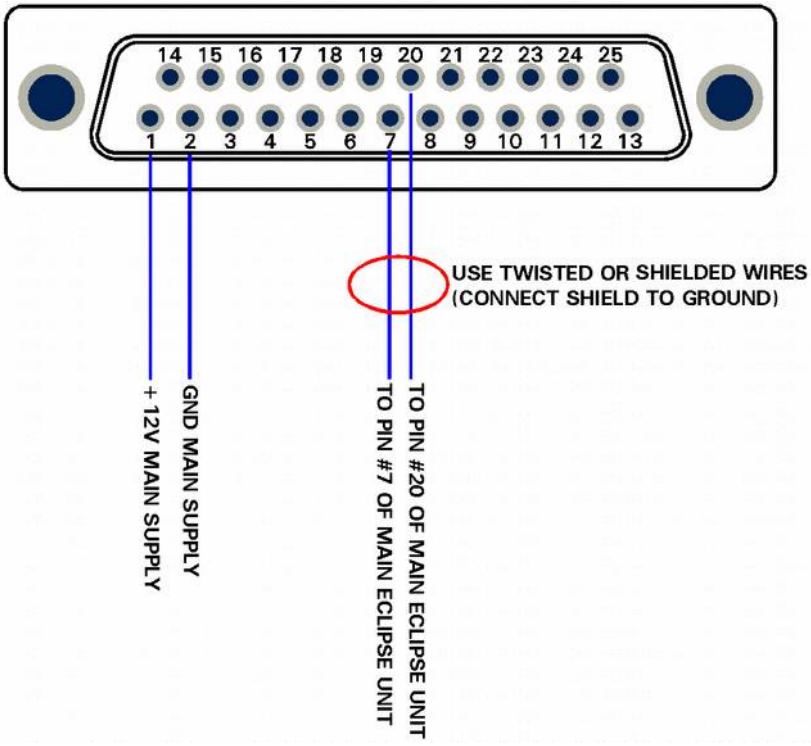


25-pin D-sub plug, view from wiring side

The wiring required are only +12V, GND and 2 connections to the main ECLIPSE unit, as follows:

TABLE 1 CON1 CONNECTIONS

Pin #	Description
1	+12V Main supply
2	GND Main supply
3	Not used
4	Not used
5	Not used
6	Not used
7	CAN0H signal for connection with main ECLIPSE unit (connect to pin#7 of main ECLIPSE)
8	Not used
9	Not used
10	Not used
11	Not used
12	Not used
13	Not used
14	+12V for optional auxiliary backup battery
15	Not used
16	Not used
17	Not used
18	Not used
19	Not used
20	CAN0L signal for connection with main ECLIPSE unit (connect to pin#20 of main ECLIPSE)
21	Not used
22	Not used
23	Not used
24	Not used
25	Not used



NOTE:

- Use twisted or shielded wires to connect pin #7 and pin #20 of the ECLIPSE MFD to the main ECLIPSE. **If you install also the autopilot system, the length of this node that connect the Eclipse MFD to the main Eclipse must be maximum 1 meter.**

USE AND CONFIGURATION OF ECLIPSE MFD

For using and configuring the ECLIPSE MFD refer to operating manual of main ECLIPSE (chapters# 5,6,8); the various menus of the MFD are the same of the main ECLIPSE but only a part of all the items are available.

After instrument turn-on if the ECLIPSE MFD is unable to communicate with the main unit (for example if the main unit is not connected or turned off) it display the following screen:

As soon as communication is established between the two instruments it become available the same pages available in the main ECLIPSE:

- If the main unit is ECLIPSE IFIS all 3 pages are available (see IFIS/PFD/EIS sections).
- If the main unit is ECLIPSE PFD only PFD page is available.
- If the main unit is ECLIPSE EIS only EIS page is available.

10
Autopilot system

10.1. Requirements

The following components are required for the autopilot to function:
- Flybox® ECLIPSE instrument with primary flight data (PFD or IFIS models).
- Autopilot Control Unit (Flybox® ACU).
- 1 Flybox® FX75 digital servo for roll control.
- 1 Flybox® FX75 digital servo for pitch control.

10.2. Autopilot overview

The autopilot system can use 1 or 2 servos, that need to be connected to the control stick for roll and pitch control.
The currently available functions are:

- Horizontal navigation (roll axis control):
  - Magnetic heading hold.
  - GPS tracking hold.
    - Track to a waypoint (GOTO function, require an external GPS with NMEA messages $GPRMC $GPRMB $GPGGA).
  - Track a flight plane (require an external GPS with NMEA messages $GPRMC $GPRMB $GPGGA).

- Automatic course reversal (180°).

- Vertical navigation (pitch axis control):
  - Altitude hold.
  - Altitude change.

10.3. Installation

Installation of the autopilot system consists of the following steps:
1) Mechanical installation of the servo/s. If your aircraft does not have predetermined location and control linkage you need to find a suitable location for the servo/s installation.
2) Mechanical installation of the instruments on the panel: Eclipse + Autopilot Control Unit ACU.
3) Electrical installation: wirings between Eclipse / ACU and between ACU / servos.
4) Ground based test and configuration of the autopilot system.
5) Flight based test and calibration of the autopilot system.

10.3.1 Mechanical installation of the servo/s

The Flybox® FX75 digital servos incorporates important safety features:

It has a reliable disengaging system: situations like severe turbolence or something other kind of anomaly will not be a problem, because the pilot can take in any case the immediate control of the plane.

When the autopilot isn't engaged, the internal gears are completely disconnected, then at difference as some servomotors the pilot will not feel no residual torque at the command stick, giving a confortable flight.
In case of mechanical failure, the gear train is engineered to be reversible: the pilot can overtop the power of the brushless motor, it provides to the servomotor a further safety level.

The output torque is electronically adjustable, and in case of forced action from the pilot on the command stick, the disengage will be without the breaking of a shear pin (unlike other servomotors on the market that use that mechanical safety system that after the break, needs a remediation action to work again).

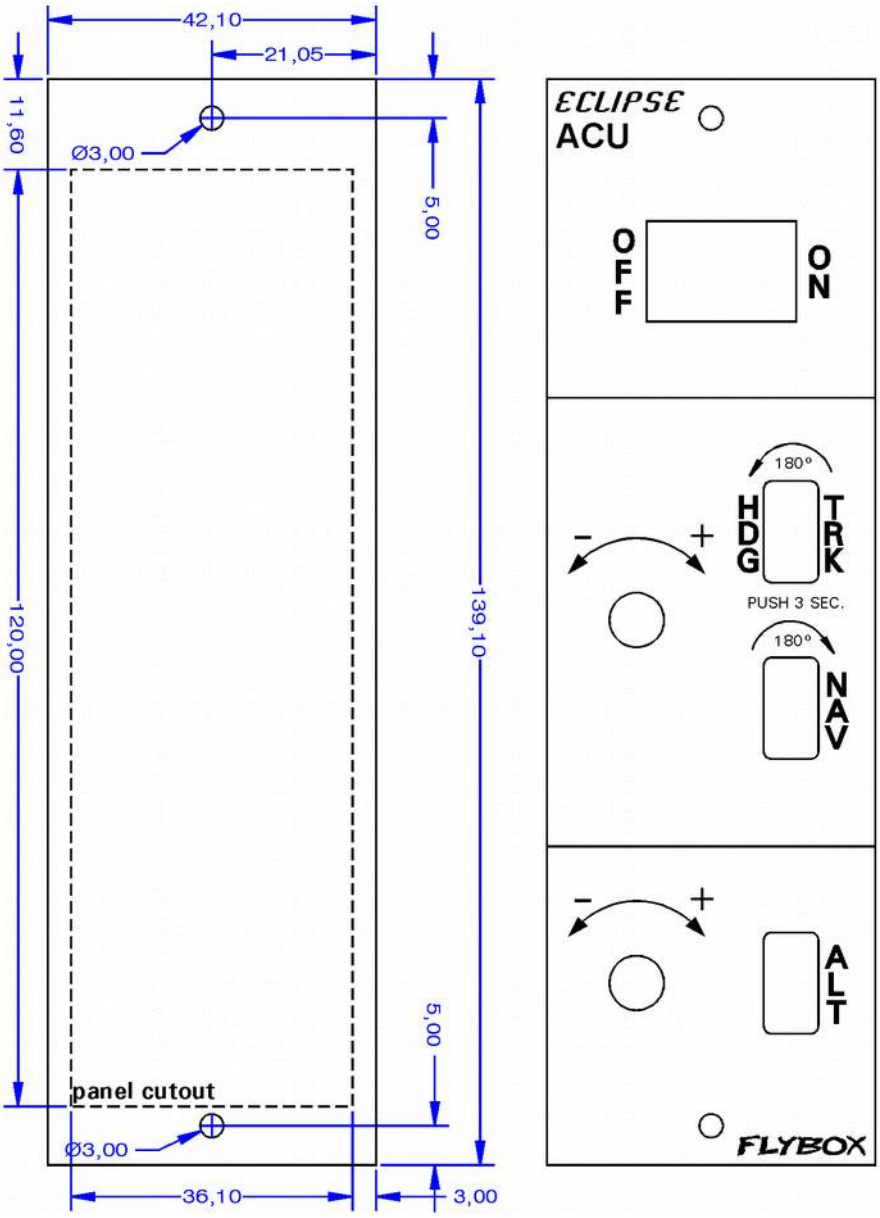
A software function disengage the autopilot if the pilot override the servo for more than 1 seconds.

It's recommended to install also the remote disengage button, to have an immediate way to disengage the autopilot even in presence of strong turbulence.

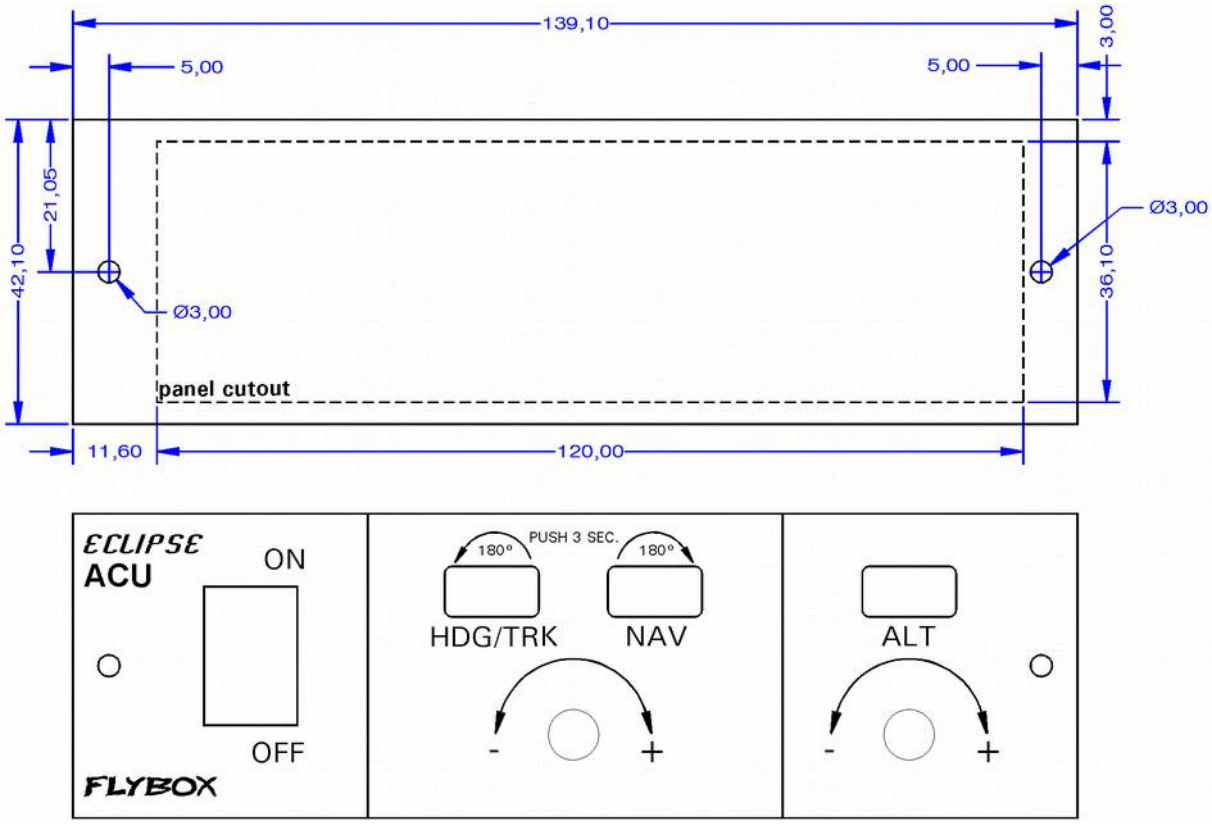
WARNING: improper installation of servos can lead to loss of control of the aircraft, resulting in damage to the aircraft itself and injury or death of the occupants.
BE SURE TO CAREFULLY FOLLOW THE INSTALLATION INSTRUCTIONS IN THE SERVO MANUAL AND CONSULT A QUALIFIED INSTALLER.

10.3.2 Mechanical installation of the autopilot control unit (Flybox® ACU)

The ACU control unit is suited for ECLIPSE instruments so it has the same vertical dimension, for easily installing it on the left or right of the ECLIPSE unit. It's however possible to install the ACU horizontally: contact Flybox® to request the horizontal adhesive front panel.
- Panel cutout required: 120 x 36.1 mm.
- Outer dimensions: 139.1 x 42.1 mm.
- Screw the ACU to the instruments panel with two M3 screws.



Vertical installation
(Dimensions are in millimeters, drawing not in scale)



Horizontal installation
(Dimensions are in millimeters, drawing not in scale)

10.3.3 Electrical wirings of the autopilot control unit (Flybox® ACU)

The ACU control unit has two Molex minifit-jr connectors:
- 1 four-pole connector (here called "CON4P")
- 1 eight-pole connector (here called "CON8P").

Included in the kit there are the corresponding socket connectors (Molex P/N: 5556-04R for 4-poles connector and 5556-08R for 8-poles connector) and the crimp terminals (Molex P/N: 5556-TL).

Each servos is provided with a 10-poles Molex Microfit connector (Molex 43025-1000) and the corresponding crimp terminals (Molex 43030-0007).

The electrical installation consists of the following wirings:
- 12 Volt power supply: the power supply input is in the ACU control unit and power also the connected servos. Use wire with adequate sizing to minimize voltage drop and avoid that the wire become warm (recommended size: AWG18).
  Power must be supplied through a breaker connected exclusively to the ACU control unit, easily accessible to the pilot and clearly identified as "Autopilot". If you have one servo only use a 4 Ampere breaker, if you have two servos use a 7.5 Ampere breaker.

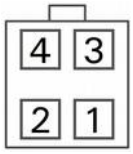
- Wirings between ACU control unit and ECLIPSE: the ACU is connected to the Eclipse with a two-wires CAN bus communication line. Use a two-pole twisted cable or a two-pole with shield cable (shield connected to ground in one point only). AWG24 wires should be enough.

- Wirings of the servos: each servo need to be connected to the ACU control unit with two wires for the power supply (use AWG18 wires) and need to be connected to the CAN bus communication line using a two-pole twisted cable or a two-pole with shield cable (shield connected to ground in one point only). AWG24 wires should be enough.
  NOTE: Do not route this line in parallel with transmitting antennas or other sources of known RF interference. Do not route this line in parallel with microphone cables or audio cables to avoid audible noise in headphones.

- Wiring of the remote disengage button (RECOMMENDED): connect it between ground and pin#6 of CON3 Eclipse connector.

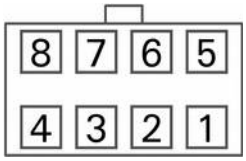
NOTES:
- Care should be taken to avoid that the wiring is subjected to chafing or excessive flexing.
- Avoid if possible junctions, that with excessive vibration may be subjected to fail or short-circuit.

- **CONNECTIONS DETAIL FOR ACU CON4P CONNECTOR**



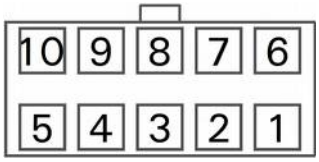
Pin #	Description
1	CAN bus communication line: CAN-H signal
2	+12V main supply
3	CAN bus communication line: CAN-L signal
4	GND main supply

- **CONNECTIONS DETAIL FOR ACU CON8P CONNECTOR**



Pin #	Description
1	GND for Pitch Servo
2	Not used
3	GND for Roll Servo
4	Not used
5	+12V for Pitch Servo
6	Not used
7	+12V for Roll Servo
8	Not used

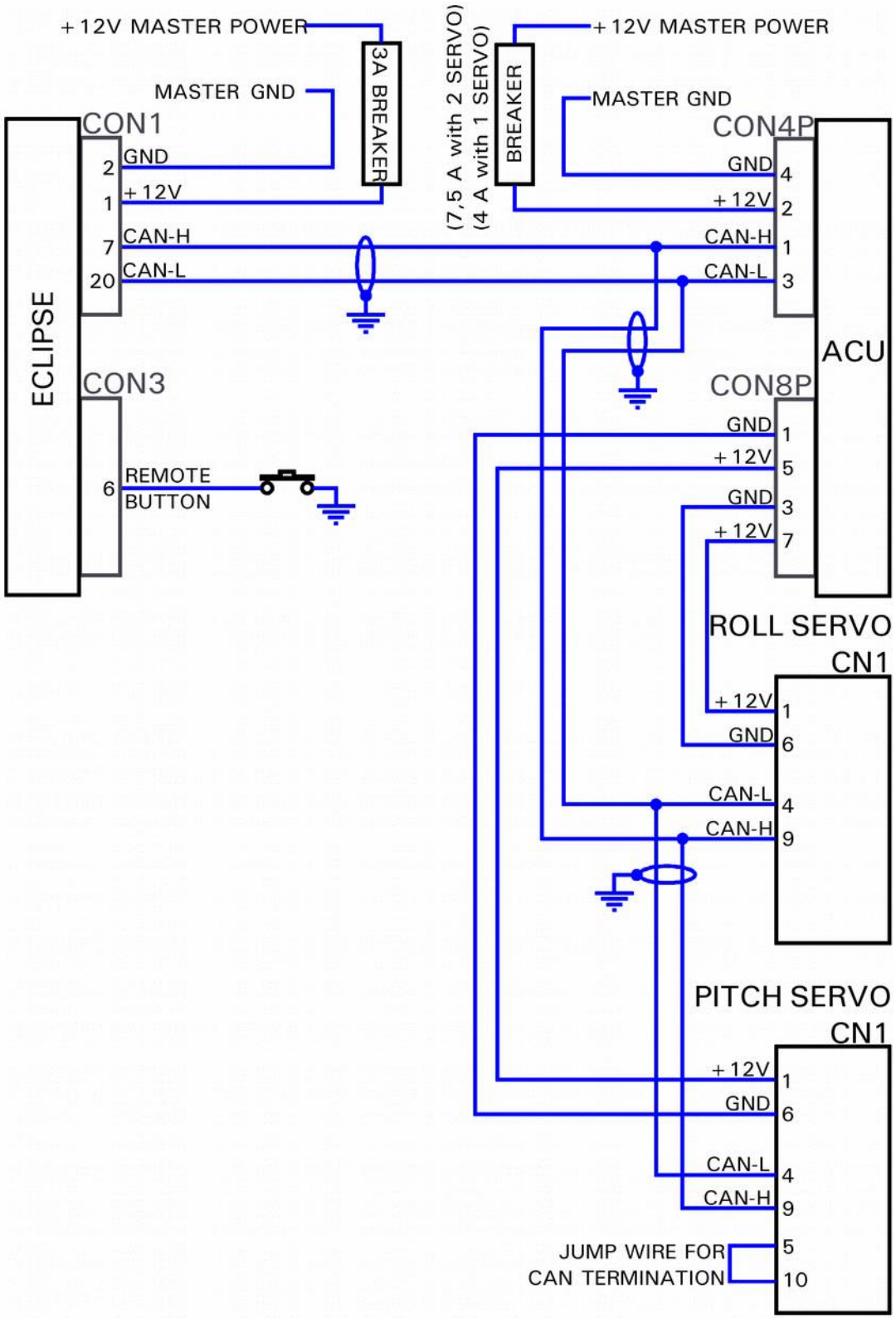
- **CONNECTIONS DETAIL FOR FX75 SERVO CONNECTOR**



Pin #	Description
1	+12V power supply
2	Not used
3	Not used
4	CAN bus communication line: CAN-L signal
5	CAN bus termination
6	GND power supply
7	Not used
8	Not used
9	CAN bus communication line: CAN-H signal
10	CAN bus termination

NOTE: The CAN bus termination (pin#5 connected with pin#10) must be done only on the last servo of the CAN bus line. If you install only one servo, the CAN line must be terminated on that servo.

ELECTRICAL CONNECTIONS FOR AUTOPILOT SYSTEM

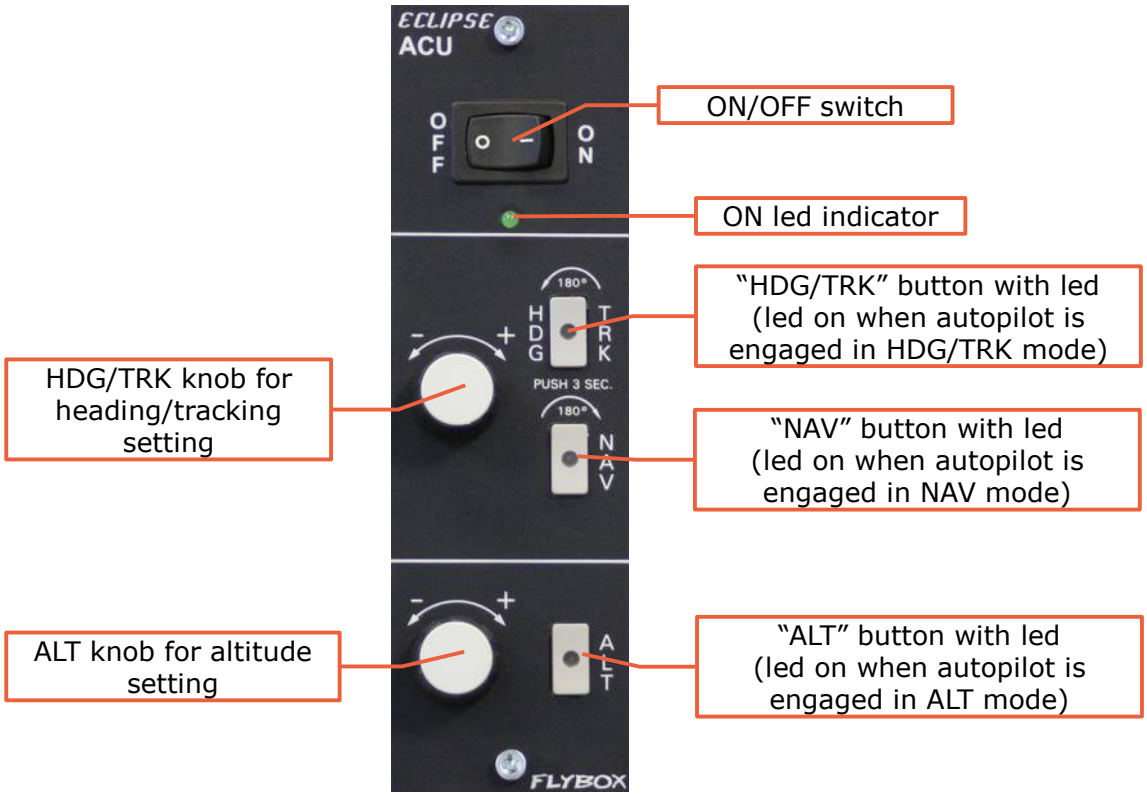


10.3.4 Post-installation checks

DO NOT FLY THE AIRCRAFT UNTIL ALL THE CHECKS INDICATED BELOW HAVE BEEN PROPERLY COMPLETED AND CORRECT FUNCTIONS HAVE BEEN OBSERVED.

- Verify that no controls are bindings during any position of the flight controls.
- Verify that the servos when not engaged will not restrict movement of any flight controls including maximum limits of the flight controls.

10.4. Indicators and commands of the ACU control unit



- Use the ON/OFF switch to turn on and off the autopilot control unit.
- Press the "HDG/TRK" button to engage/disengage the autopilot in heading or GPS tracking mode.
- Rotate the "HDG/TRK" knob to adjust the heading/tracking bug. Press the knob to center the bug to the actual heading or GPS tracking.
- Press the "ALT" button to engage/disengage the autopilot in altitude hold mode.
- Rotate the "ALT" knob to adjust the altimeter bug. Press the knob to center the bug to the actual altitude.
- Press the "NAV" button to engage/disengage the autopilot in flight plane or goto navigation.

10.4.1 Remote disengage button

It's recommended to install also the remote disengage button, that operate in this way:
- With autopilot engaged: push to disengage instantly.
- With autopilot disengaged: push for 2 seconds to engage it. This function must be enabled from menu: Autopilot setup → Remote button setup → Hold to engage enable (see chap.10.6.4).
- With autopilot engaged: keep pressed for more than 2 seconds to activate the Control Wheel Steering (CWS) mode: it's possible to fly the aircraft to a new heading/traking or altitude and then release the button to let the autopilot acquire and mantain the new values.

10.5. Autopilot system configuration

After the physical installation of the autopilot system it's required to check the connections and configure the parameters, as explained in the following two chapters.
The operations that you will perform in sequence are the following:

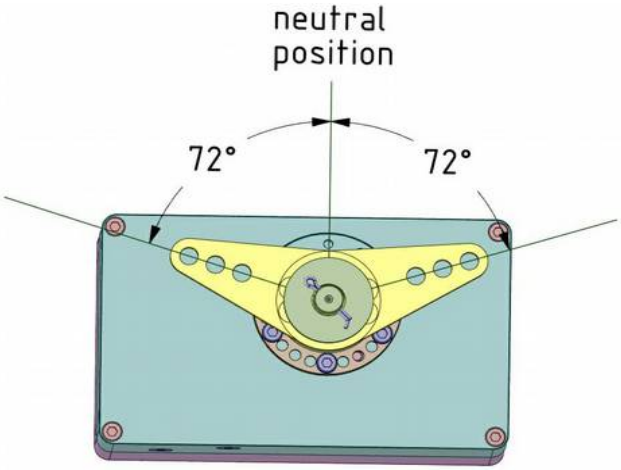
-->Ground based test and configuration:
- Servos calibration (chap.10.5.0)
- Communications check (chap.10.5.1)
- Remote button operation check (chap.10.5.2)
- Servos torque check (chap.10.5.3)
- "Min speed" and "Max speed" parameters setting (chap.10.6.1)
- Roll servo setup (chap.10.6.2)
- Pitch servo setup (chap.10.6.3)
- Remote button setup (chap.10.6.4)

-->Flight based test and configuration:
- Autopilot setup – roll axis (chap.10.7.1)
- Autopilot setup – pitch axis (chap.10.7.2)

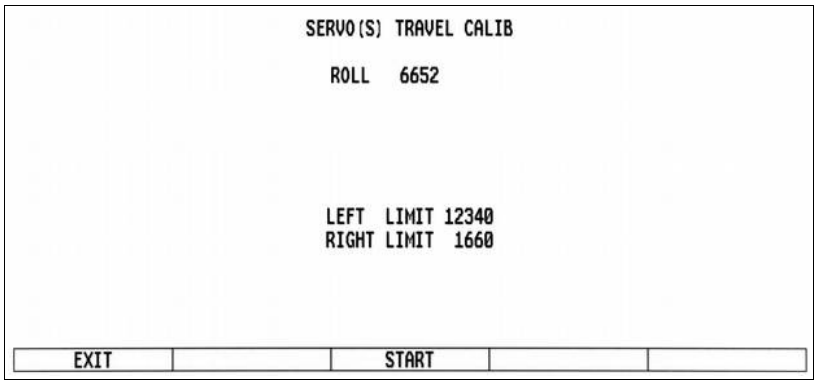
10.5.0 Servo/s calibration (ground based)

The calibration procedure is mandatory: if you try to engage the autopilot without first calibrate the servo, Eclipse will show the error message "AUTOPILOT DISENGAGE! ROLL/PITCH SERVO CALIB".
THE CALIBRATION MUST ALSO BE REPEATED IN THE EVENT OF ANY CHANGES TO MECHANICAL INSTALLATION OF THE SERVO/S.

NOTE: The "neutral position" terms used in the following explanation means the center of the servo arm travel relative to the position of the limiting bracket:



- To begin the calibration procedure:
  From the Autopilot setup menu select and enter in the "Servo(s) travel calib" menu. The display shows the word "IDENTIFICATION" or, if instead it was already made a previous calibration, the display shows the data of the previous calibration as in example below:



  NOTE: If appears the message "NO SERVO(S) FOUND" it means that the servos are not properly connected.

- Press **P3** button (START) and follow the onscreen instructions; if you have installed the servos on both axis the complete procedure will be as follows:
- Step#1: center the control stick in neutral position and then click on **P3** button (NEXT) to go to the next step.
- Step#2: position the control stick to the left limit (without forcing), paying attention to not move it in the pitch axis during the motion. After doing so, the calibration automatically switch to the next step:
- Step#3: center the control stick in neutral position and then click on **P3** button (NEXT) to go to the next step.
- Step#4: position the control stick to the forward limit (without forcing), paying attention to not move it in the roll axis during the motion. After doing so, the calibration automatically switch to the next step or, if you have not installed the pitch servo, click on **P3** button (NEXT) to go to the next step.
- Step#5: center the control stick in neutral position and then click on **P3** button (NEXT) to go to the next step.
- Step#6: position the control stick to the left limit (without forcing). Click on **P3** button (NEXT) or the remote button to store the position and go to the next step.
- Step#7: position the control stick to the right limit (without forcing). Click on **P3** button (NEXT) or the remote button to store the position and go to the next step.

NOTE: If appears the message "BAD MECHANICAL INSTALLATION! NOT ENOUGH SERVO TRAVEL" it means that the servo is not correctly installed, as the travel of the servo arm is too small to function properly. In this case you should modify the mechanical installation, for example by using an outer hole of the servo arm.

- Step#8: position the control stick to the forward limit (without forcing). Click on **P3** button (NEXT) or the remote button to store the position and go to the next step.

- Step#9: position the control stick to the backward limit (without forcing). Click on **P3** button (NEXT) or the remote button to store the position and end the calibration.
  NOTE: If appears the message "BAD MECHANICAL INSTALLATION! NOT ENOUGH SERVO TRAVEL" it means that the servo is not correctly installed, as the travel of the servo arm is too small to function properly. In this case you should modify the mechanical installation, for example by using an outer hole of the servo arm.

At the end of the calibration procedure the display briefly shows the confirmation message "Servo Calib Done".

⚠ **Once finished the calibration you must execute this check (ground based):**

- With Eclipse on the attitude indicator screen and ACU control unit turned on, insert the autopilot by pressing the "HDG/TRK" button on the ACU. Rotate clockwise the HDG/TRK knob (so that the heading bug is at the right of the actual heading) and check that the flight control move as to turn the aircraft right.
  Rotate counter clockwise the HDG/TRK knob (so that the heading bug is at the left of the actual heading) and check that the flight control move as to turn the aircraft left.
  Check also that the servo pitch does not move.
- Engage the autopilot on pitch axis by pressing the "ALT" button on the ACU. Using the ALT knob set the altitude bug to a higher value than the actual altitude and check that the flight control move as to increase the aircraft altitude; set the altitude bug to a lower value than the actual altitude and check that the flight control move as to decrease the aircraft altitude.

If movement direction of one or both servos is reversed it means that the calibration is wrong, so NEVER ENGAGE THE AUTOPILOT IN FLIGHT but repeat the servos calibration procedure and check again.

10.5.1 Communications check (ground based)

- Turn on Eclipse instrument only
- Turn on ACU control unit and check that appear "AP:OFF" in the top left of the attitude indicator section of the Eclipse.
  If no message appear means that there is a communication problem between Eclipse and ACU control unit: check again the electrical wirings.
- Press the "HDG/TRK" button on the ACU panel and verify that the message "AP:OFF" become "AP:HDG".
  If the message remains "AP:OFF" it means that there is a communication problem between ACU control unit and servo/s: check again the electrical wirings.

10.5.2 Remote button operation check (ground based)

- Continuing from previous step (autopilot engaged and message "AP:HDG" on display), press the remote disengage button and check that the message "AP:HDG" become "AP:OFF".
  If the message remains "AP:HDG" it means that there is a problem with the remote button: check the electrical wiring and the correct functionality of the button itself.

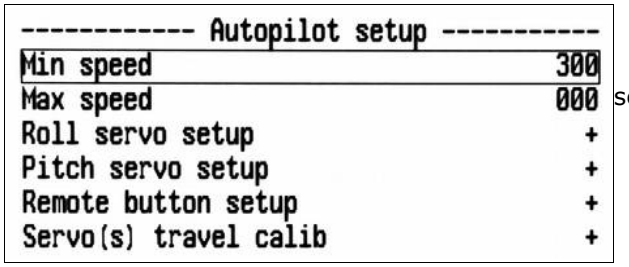
10.5.3 Servo torque check (ground based)

- Engage the autopilot by pressing the "HDG/TRK" button on the ACU (check the message "AP:HDG" on Eclipse display).
- Force the control stick to the left or right limit, so that you override the servo force and after 1 second the autopilot disengages automatically (check the message "AP:OFF" on display).
- Engage the autopilot by pressing the "ALT" button on the ACU (check the message "AP:ALT" on Eclipse display).
- Force the control stick to the forward or backward limit, so that you override the servo force and after 1 second the autopilot disengages automatically (check the message "AP:OFF" on display).

At this stage you should check also the override force: it must be strong enough to give a fairly good control authority to the servos, but not so strong as to be difficult to override with the control stick. See chap.10.6.2 for roll servo torque setup and chap.10.6.3 for pitch servo torque setup.

10.6. Autopilot setup menu

All the parameters configuration that follows are made on the Eclipse instrument. During the configuration it's required to turn on also the ACU control unit but without engaging the autopilot (so on the ACU control unit turn on the ON/OFF switch and don't press any other button).



To access all the autopilot parameters enter in the "System setup" on the Eclipse by pressing P1+P4 button, rotate the knob to select the "Autopilot" menu and press it to enter.

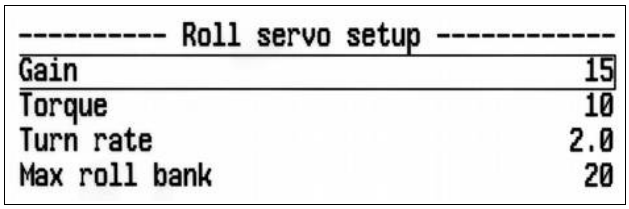
10.6.1 "Min speed" and "Max speed" parameters setting (ground based)

The autopilot system measures the airspeed and allows the pilot to set the minimum and maximum operating speed to ensure that the aircraft is in safe conditions when the autopilot is engaged.

Min speed: Select the minimum airspeed at which the autopilot will fly the aircraft. The unit of measure is the same set for the ASI (see chap.6.1.2 "ASI Gauge setup").
The autopilot cannot be engaged at airspeed below *Min speed*, with the exception of 0 for allowing ground testing (for Eclipse IFIS the engine also must be turned off for ground testing).
With autopilot engaged, if the airspeed drops below the minimum, it enters to an airspeed hold mode, to restore and maintain approximately the minimum airspeed.
Set *Min speed* to be at least 20% above the Vfe of your aircraft (to set Vfe see chap.6.1.2--->ASI GAUGE SETUP).

Max speed: Select the maximum airspeed at which the autopilot will fly the aircraft. The unit of measure is the same set for the ASI (see chap.6.1.2 "ASI Gauge setup").
With autopilot engaged, if the airspeed rises above the maximum, it enters to an airspeed hold mode, to restore and maintain approximately the maximum airspeed.
The choice of the *Max speed* value must be made according to the characteristics of your aircraft, it should be below the Vne speed of your aircraft but above the normal cruise speed (to set Vne see chap.6.1.2--->ASI GAUGE SETUP). *Max speed* parameter cannot be set to a value above 95% of Vne so you should first check the correctness of the ASI speeds set.

10.6.2 Roll servo setup



From the previous menu (Autopilot setup) select with the knob the "Roll servo setup" menu and press it to enter.

"Gain" parameter check (ground based)

Gain: This parameter specify how fast or slow the autopilot responds to deviations between commanded and actual heading/tracking. For now check only that the parameter is at the defulat value (**10**), because it will be set in flight as explained later. The range min-max is: 1~40.

"Torque" parameter setting (ground based)

Torque: set the desired torque, that is the force of the servo when engaged.
To set a correct value, keep in mind that the torque must be strong enough to give a fairly good control authority to the servos, but not so strong as to be difficult to override with the control stick.
To test the torque after setting a new value, perform the "Servo torque check" as explained in chap.10.5.3.
The min-max range is: 1~40, when the autopilot system detects for the first time that the servo is set as a roll servo, it set the default value of 10.

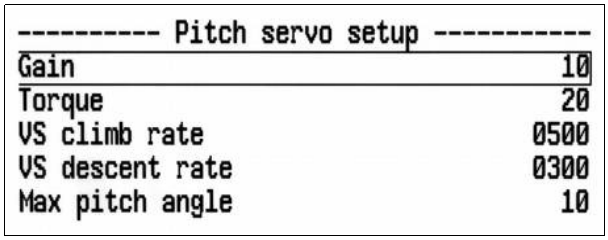
"Turn Rate" parameter setting (ground based)

Turn Rate: Select your desired target rate of turn when autopilot is engaged. The unit of measure is degrees per second and the range min-max is from 0.5°/s to 3.0°/s.
When selecting your desired turn rate consider that the autopilot may slightly exceed the turn rate target during regulation.

"Max Roll Bank" parameter setting (ground based)

Max Roll Bank: This parameter specifies a maximum bank angle which the autopilot will not exceed during turns. Set an appropriate bank limit, the min-max range is: 5~30 degrees.

10.6.3 Pitch servo setup



From the previous menu (Autopilot setup) select with the knob the "Pitch servo setup" menu and press it to enter.

"Gain" parameter check (ground based)

Gain: This parameter specify how fast or slow the autopilot responds to deviations between commanded and actual altitude. For now check only that the parameter is at the default value (**13**), because it will be set in flight as explained later. The range min-max is: 1~40.

"Torque" parameter setting (ground based)

Torque: set the desired torque, that is the force of the servo when engaged.
To set a correct value, keep in mind that the torque must be strong enough to give a fairly good control authority to the servos, but not so strong as to be difficult to override with the control stick.
To test the torque after setting a new value, perform the "Servo torque check" as explained in chap.10.5.3.
The min-max range is: 1~40, when the autopilot system detects for the first time that the servo is set as a pitch servo, it set the default value of 20.

"VS climb rate" parameter setting (ground based)

VS climb rate: This parameter sets the average vertical speed for autopilot-commanded climbs.The unit of measure is meters/second or feet/minute, depending on what you have choosen for the altimeter.
The range min-max is: 50~2000 feet/minute (0.1~10 meters/second).
When selecting your desired climb rate consider that the autopilot may slightly exceed from target value during regulation.

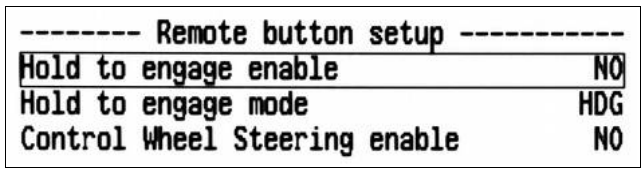
"VS descent rate" parameter setting (ground based)

VS descent rate: This parameter sets the average vertical speed for autopilot-commanded descents.The unit of measure is meters/second or feet/minute, depending on what you have choosen for the altimeter.
The range min-max is: 50~2000 feet/minute (0.1~10 meters/second).
When selecting your desired descent rate consider that the autopilot may slightly exceed from target value during regulation.

"Max pitch angle" parameter setting (ground based)

Max pitch angle: This parameter specifies a maximum pitch angle which the autopilot will not exceed during climbs or descents. Set an appropriate bank limit, the min-max range is: 5~20 degrees.

10.6.4 Remote button setup (ground based)



From the Autopilot setup menu select with the knob the "Remote button setup" menu and press it to enter.

Hold to engage enable: Enable (YES) or disable (NO) the function to engage the autopilot when the button is pressed for 2 seconds. The default value is "NO" so the remote button will only serve to disengage the autopilot when already engaged.
Hold to engage mode: Select the autopilot engage mode using the remote button (if enabled, see previous parameter). Set to "HDG" to engage the autopilot in horizontal navigation (roll), set to "ALT" to engage the autopilot in vertical navigation (pitch), set to "HDG/ALT" to engage the autopilot in both axes.
Control wheel steering enable: Enable (YES) or disable (NO) the following auxiliary function of the remote button: during autopilot control, press and hold for more than 2 seconds the button (on the display will be displayed "**AP:CWS**") and fly to a new heading and/or altitude, then release the button to reengage the autopilot. By default this function is disabled.

10.7. Flight based test and configuration

During this phase you calibrate the servo response to match your aircraft flight dynamics. Although flight testing may be carried out in different ways, it's recommended to follow the procedures indicated in the following chapters.

⚠ Any test and configuration during flight must be executed in VFR conditions, with good weather and visibility conditions, at an adequate altitude and no traffic or obstacles in the flight path.
It's also recommended to have another pilot on board during first flight configuration.

NOTE: In case you need to instantly disengage the autopilot you can use either one of this way:
- Turn off the ON/OFF switch on the ACU control unit.
- Press shortly the remote button
- Press the "HDG/TRK" button on the ACU, if autopilot is in heading/tracking mode, or press the "NAV" button if autopilot is in navigation mode.

Remember these actions so that it can be carried out instinctively in case of difficulties or emergencies.

Before starting the first test flight verify once more for safety that all the parameters are correctly set:
- Enter in the "System seyup" by pressing P1+P4 buttons
- Rotate the knob to select the "Autopilot" menu and press it to enter
- Rotate the knob to select the "Roll servo setup" menu and press it to enter
- Verify that the "Gain" parameter is set to default value, that is **10**.
- Verify that the "Torque", "Turn rate" and "Max Roll Bank" parameters are set according to your preferences, as explained in previous chapter.
- Go back by pressing P1 button, rotate the knob to select the "Pitch servo setup" submenu and press it to enter.
- Verify that the "Gain" parameter is set to default value, that is **13**.
- Verify that the "Torque", "VS climb rate", "VS descent rate" and "Max pitch angle" parameters are set according to your preferences, as explained in previous chapter.

10.7.1 Autopilot setup – Roll axis (flight based)

Autopilot engage - "Gain" parameter set

- Start the flight and when you are in safe condition (read chap.10.7) insert the autopilot by pressing the "HDG/TRK" button on the ACU control unit (the led will turn on as confirmation). Note that the autopilot will only hold the current heading by controlling the roll axis, so the pitch axis must be controlled by the pilot; ensure that you are not affecting the roll axis, so that you can determine the autopilot performance.

If the autopilot behavior is sufficiently stable keep it engaged for some minutes and observe the way in which it mantains the heading/tracking:
- If the autopilot deviates heavily from the heading/tracking set or make very slow adjustments you need to increase the value of the "Gain" parameter.
- If the autopilot is too aggressive with excessively fast adjustments you need to decrease the value of the "Gain" parameter.

The "Gain" parameter selects the amount of autopilot activity for a given roll angle error (that is the difference between the desired heading/tracking and the actual heading/tracking). With low "Gain" values (minimum=1) the autopilot system is very slow with few corrections, with high "Gain" values (maximum=40) the autopilot is more "aggressive" with a lot of fast corrections. Above a certain upper limit, however, the system becomes unstable and start to oscillate.

To change the "Gain" parameter:
- Enter in the "System setup" by pressing P1+P4 buttons
- Rotate the knob to select the "Autopilot" menu and press it to enter
- Rotate the knob to select the "Roll servo setup" menu and press it to enter
- Rotate the knob to select the "Gain" parameter and press it.
- Rotate the knob to change the value and press it to store the new value.

Heading/tracking change

During this phase you observe the autopilot behavior during a turn, further optimizing the "Gain" parameter which as said is what establishes the autopilot response.

- With the autopilot engaged in "HDG/TRK" mode, start an autopilot commanded turn by rotating the HDG/TRK knob on the ACU control unit.
- Repeat again some heading/tracking change, observing the behavior of the autopilot:
    - If the autopilot will cause excessive oscillations (fast left/right bank movements) and seems too "aggressive" in the regulation, you need to decrease the "Gain" parameter.
    - If the autopilot is too "smooth" and slow to reach the heading/tracking set (or cannot reach it) you need to increase the "Gain" parameter.
- It's recommended to change the value by 1 or 2 steps and then observe the effects on the autopilot behavior.

As you can imagine the optimal setting is highly dependent on the flight controls and the aircraft type, so you probably find the optimal setting after some flights, in which you learn also the way the autopilot control the aircraft.

You should be able to find a "Gain" value that is acceptable for both heading holds and turns in smooth air; may be required, in case of turbulence, to change this value (probably needs to be increased a bit).

Check of the parameters "Turn rate" and "Max Roll Bank"

It's possible to check if the values set for the turn rate and for the maximum bank angle are compatible by measuring the time the autopilot takes to complete a turn: for example if in the "Turn Rate" parameter you have set a value of 2°/s, the aircraft must take nearly 45 seconds to complete a 90° turn. If it takes more time it means that the "Max Roll Bank" parameter are set too low, so the autopilot is forced not to exceed this angle and as a result also the turn rate become slower than what set in "Turn Rate" parameter.

Now you have checked and configured all the parameters so you can disengage the autopilot by pressing the HDG/TRK button on the ACU control unit (the led will turn off as confirmation).

10.7.2 Autopilot setup – Pitch axis (flight based)

Autopilot engage - "Gain" parameter set

- Start the flight and when you are in safe condition (read chap.10.7), at the desired altitude and trimmed for level flight, insert the autopilot by pressing the "ALT" button on the ACU control unit (the led will turn on as confirmation). Note that the autopilot will only hold the current altitude by controlling the pitch axis, so the roll axis must be controlled by the pilot; ensure that you are not affecting the pitch axis, so that you can determine the autopilot performance.

If the autopilot behavior is sufficiently stable keep it engaged for some minutes and observe the way in which it mantains the altitude:
- If the autopilot deviates heavily from the altitude set or make very slow adjustments you need to increase the value of the "Gain" parameter.
- If the autopilot is too aggressive with excessively fast adjustments you need to decrease the value of the "Gain" parameter.

The "Gain" parameter selects the amount of autopilot activity for a given altitude error (that is the difference between the desired altitude and the actual altitude). With low "Gain" values (minimum=1) the autopilot system is very slow with few corrections, with high "Gain" values (maximum=40) the autopilot is more "aggressive" with a lot of fast corrections. Above a certain upper limit, however, the system becomes unstable and start to oscillate.

To change the "Gain" parameter:
- Enter in the "System setup" by pressing P1+P4 buttons
- Rotate the knob to select the "Autopilot" menu and press it to enter
- Rotate the knob to select the "Pitch servo setup" menu and press it to enter
- Rotate the knob to select the "Gain" parameter and press it.
- Rotate the knob to change the value and press it to store the new value.

Altitude change

During this phase you observe the autopilot behavior during an altitude change, further optimizing the "Gain" parameter which as said is what establishes the autopilot response.

- With the autopilot engaged in "ALT" mode, start an autopilot commanded altitude change by rotating the ALT knob on the ACU control unit.
- Repeat again some altitude change, observing the behavior of the autopilot:
    - If the autopilot will cause excessive oscillations (fast pitch angle movements) and seems too "aggressive" in the regulation, you need to decrease the "Gain" parameter.
    - If the autopilot is too "smooth" and slow to reach the altitude set (or cannot reach it) you need to increase the "Gain" parameter.
- It's recommended to change the value by 1 or 2 steps and then observe the effects on the autopilot behavior.

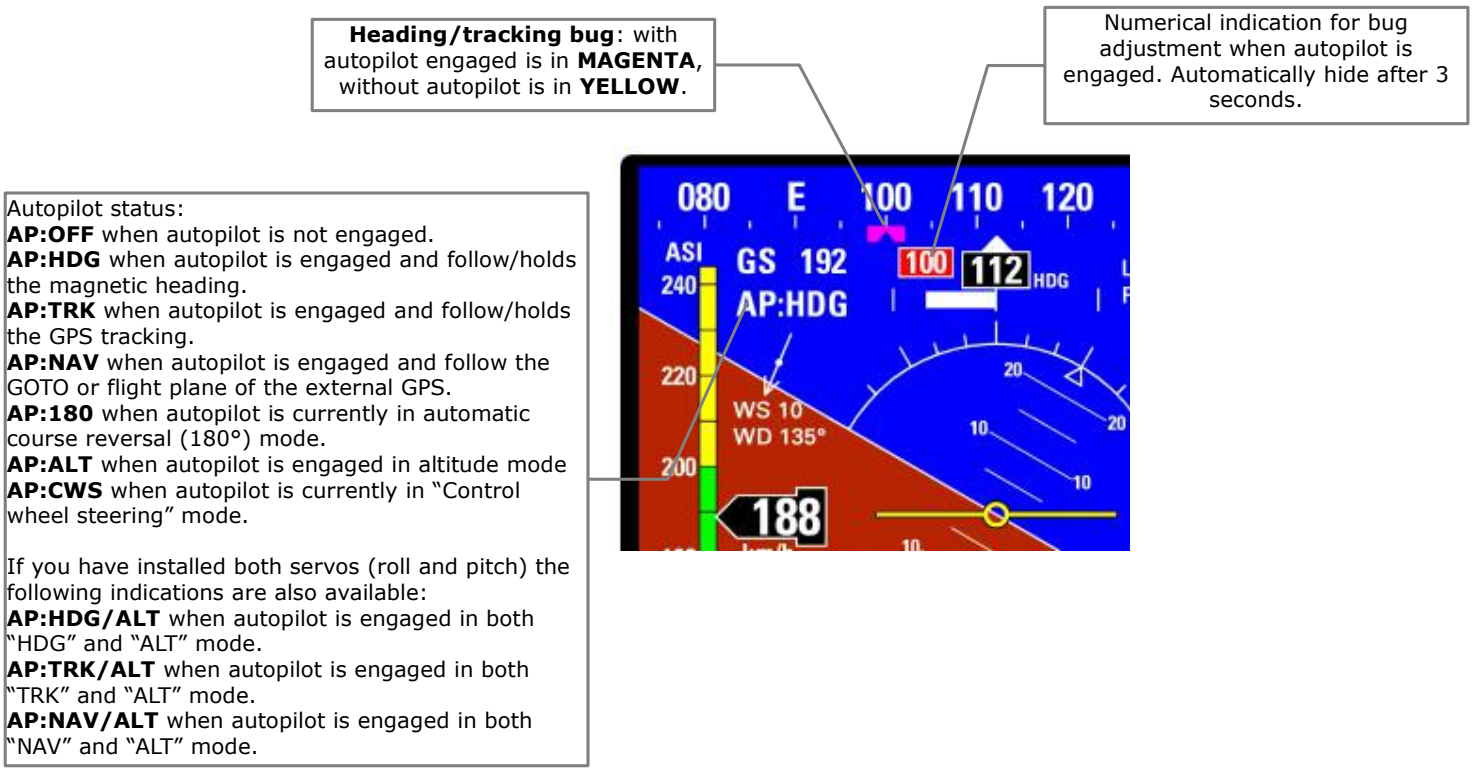
As you can imagine the optimal setting is highly dependent on the flight controls and the aircraft type, so you probably find the optimal setting after some flights, in which you learn also the way the autopilot control the aircraft.

You should be able to find a "Gain" value that is acceptable for both heading holds and turns in smooth air; may be required, in case of turbulence, to change this value (probably needs to be increased a bit).

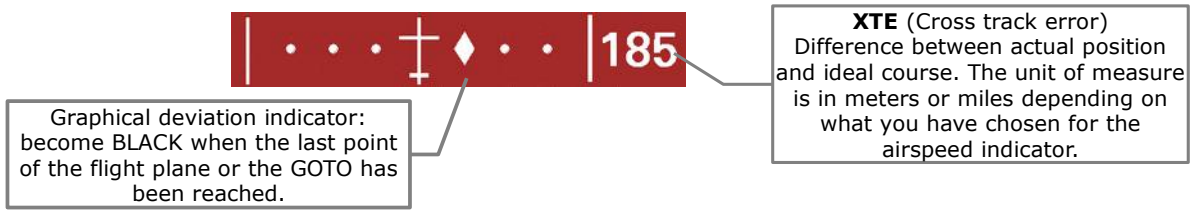
10.8
Autopilot operation

10.8.1 Display indications

The autopilot status indications are in the upper left side of the attitude indicator screen:



Another useful indication with autopilot engaged in NAV mode is the CDI/Course Deviation Indicator (on bottom of the screen):



10.8.2 How to engage and disengage the autopilot

The autopilot system can be engaged in several ways:

- Pressing the "HDG/TRK" button on the ACU control unit (the led will turn on)
- Pressing the "NAV" button on the ACU control unit (the led will turn on)
- Pressing the "ALT" button on the ACU control unit (the led will turn on)
- From the ECLIPSE menu, in the following way:
  From the attitude indicator screen, press any button to show up the menu bar, rotate the knob to select the "HDG BUG/AP" or "ALT BUG/AP" item and press to select it, after which press **P2** button ("ENGAGE AP").
- If enabled, by pressing for more than 2 seconds the remote button

NOTE: Before to engage the autopilot on both axis, be sure to trim the aircraft for level flight.

The autopilot cannot be engaged if any of the following conditions occurs:

- ACU control unit is turned off.
- Faulty communications between ECLIPSE and ACU or between ACU and servos.

- The airspeed measured is out of the minimum/maximum range ("Min speed" and "max speed" parameters).
- A servo reports a fault condition.
- A servo reports a position beyonds its control limits (limits stored during the calibration procedure).
- The attitude indicator of ECLIPSE reports invalid data.
- The actual bank or pitch angle is out of the maximum limit ("Max roll bank" and "Max pitch angle" parameter).
- Only for "NAV" mode, if no valid data are received or no flight plane/GOTO has been done on the external GPS.

NOTE: A display and a vocal (on the audio out) alert comes when the autopilot cannot engage for any of the above conditions.

If engaged, the autopilot will automatically disengage if any of the following conditions occurs:

- The ACU control unit is turned off.
- Loss of communication between ECLIPSE and ACU or between ACU and servos.
- A servo reports a fault condition.
- A servo reports a position beyonds its control limits (limits stored during the calibration procedure).
- The attitude indicator of ECLIPSE reports invalid data.
- Only for "NAV" mode, if no valid data are received or the flight plane on the external GPS is removed.
- On the ground, if you turn on the engine.
- Pilot taking control of the stick and overriding the servos for more than one second.

NOTE: A display and a vocal (on the audio out) alert comes when the autopilot automatically disengage for any of the above conditions.

The autopilot system can be disengaged by the pilot via the following actions:

- If engaged in "HDG/TRK" mode: by pressing the "HDG/TRK" button on the ACU control unit (led will turn off).
- If engaged in "NAV" mode: by pressing the "NAV" button on the ACU control unit (led will turn off).
- If engaged in "ALT" mode: by pressing the "ALT" button on the ACU control unit (led will turn off).
- From the ECLIPSE menu, in the following way (only for "HDG/TRK" or "ALT" modes):
  From the attitude indicator screen, press any button to show up the menu bar, rotate the knob to select the "HDG BUG/AP" or "ALT BUG/AP" item and press to select it, after which press **P2** button ("DISENGAGE AP").
- Pressing the remote button, if installed
- **Turning off the ACU with the ON/OFF switch.**
- **Opening the circuit breaker which provides power to the ACU**

⚠ **The ACU control unit must be turned off during landing and takeoff.**

10.8.3 Details of operation

PREFLIGHT CHECK:

Everytime you intend to use the autopilot system perform the following checks on ground:

1- Move to its limits the flight controls (with autopilot disengaged) and check that full manual control is present.

2- Check servo direction:

With Eclipse on the attitude indicator screen and ACU control unit turned on, insert the autopilot by pressing the "HDG/TRK" button on the ACU. Rotate clockwise the HDG/TRK knob (so that the heading bug is at the right of the actual heading) and check that the flight control move as to turn the aircraft right.

Rotate counter clockwise the HDG/TRK knob (so that the heading bug is at the left of the actual heading) and check that the flight control move as to turn the aircraft left.

Engage the autopilot on pitch axis by pressing the "ALT" button on the ACU. Using the ALT knob set the altitude bug to a higher value than the actual altitude and check that the flight control move as to increase the aircraft altitude; set the altitude bug to a lower value than the actual altitude and check that the flight control move as to decrease the aircraft altitude.

3- Check servos torque: with the autopilot engaged, manually force the control stick to its limits and check that it's not difficult to override the force applied by the servos. Check also that after 1 second of overriding the servo, the autopilot disengage.

⚠ **If any of the previous checks is not successful, turn off the autopilot via the ON/OFF switch on the ACU control unit and never turn it on during flight.**

ENGAGE AUTOPILOT IN "HDG/TRK" MODE (HEADING OR TRACKING HOLD/CHANGE)

- Once in flight and with Eclipse already turned on, turn on the ACU control unit via the ON/OFF switch.
- Choose between heading or tracking (on the Eclipse, from the attitude indicator screen, press any button to show up the menu bar and press P3 button to switch between heading or tracking).
- Trim the roll and pitch of the aircraft, if present.
- Press the "HDG/TRK" button on the ACU control unit (led will turn on) or press for 2 seconds the remote button (if installed and enabled as explained in chap.10.6.5).
- Set the desired heading/tracking by rotating the "HDG/TRK" knob on the ACU.
- If you press the HDG/TRK knob during an autopilot-commanded turn, the autopilot will maintain the actual heading/tracking (the heading/tracking bug is centered).

AUTOMATIC COURSE REVERSAL

The automatic course reversal mode may be used as an emergency aid to pilot who inadvertently enters IMC conditions and need to execute an immediate course reversal.

- With autopilot engaged in "HDG/TRK" or "NAV" mode, press for 3 seconds the "HDG/TRK" button on the ACU to start a counter clockwise course reversal, or press for 3 seconds the "NAV" button to start a clockwise course reversal. During the maneuver the autopilot status indicator will show "AP:180". After completing the maneuver the autopilot return engaged in the HDG or TRK mode.
- You can cancel the course reversal function rotating the HDG/TRK knob or pressing the "HDG/TRK" button.

ENGAGE AUTOPILOT IN "NAV" MODE (FLIGHT PLANE OR GOTO NAVIGATION)

The "NAV" mode is based from data received from an external GPS, before using this function for the first time check that the GPS input of the Eclipse is enabled: enter in system setup by pressing P1+P4 buttons, select the "Fuel computer" menu and check that the "Ext. GPS for reserve indication" is set to "YES".

- Once in flight and with Eclipse already turned on, turn on the ACU control unit via the ON/OFF switch.
- Set a flight plane or a GOTO in the external GPS.
- Press the "NAV" button on the ACU control unit (led will turn on). Now the autopilot willl follow the flight plane or GOTO.

NOTE:
When the flight plane is completed or the GOTO has been reached you need to manually disengage the autopilot.

ENGAGE AUTOPILOT IN "ALT" MODE (ALTITUDE HOLD/CHANGE)

- Once in flight and with Eclipse already turned on, turn on the ACU control unit via the ON/OFF switch.
- Trim the aircraft for level flight.
- Press the "ALT" button on the ACU control unit (led will turn on) or press for 2 seconds the remote button (if installed and enabled as explained in chap.10.6.4).
- Set the desired altitude by rotating the "ALT" knob on the ACU. The autopilot maintain a vertical speed as set in the **VS climb rate** and **VS descent rate** parameters (see chap.10.6.3).
- If you press the ALT knob during an autopilot-commanded altitude change the autopilot will maintain the actual altitude (the altimeter bug is centered on the actual altitude).

AUTOPILOT DISENGAGE

- If engaged in "HDG/TRK" mode, press the "HDG/TRK" button on the ACU control unit (led will turn off) or press the remote button (if installed).
- If engaged in "NAV" mode, press the "NAV" button on the ACU control unit (led will turn off) or press the remote button (if installed).
- If engaged in "ALT" mode, press the "ALT" button on the ACU control unit (led will turn off) or press the remote button (if installed).

In case of emergency or malfunction turn off the autopilot via the ON/OFF switch on the ACU control unit or open the circuit breaker which provides power to it.

10.9. Autopilot related alarms

The autopilot disengage automatically if it detects any anomaly; at the same time it will show an error message on display and, if enabled, activate the audio and alarm outputs.

To enable and set the autopilot related alarms on the Eclipse go in System setup → Alarms setup → Autopilot alarm setup. See also chap.6.1.7.

The alarm messages that may appear on display are the following:

- "**AUTOPILOT DISENGAGED! ACU COM**" : Appears when communication between Eclipse and ACU is lost (check wirings) or if you turn off the ACU when autopilot is engaged.
- "**AUTOPILOT DISENGAGED! (ROLL) or (PITCH) SERVO COM**": Appears when communication between the ACU and the indicated servo (roll or pitch) is lost. Check the wirings.
- "**AUTOPILOT DISENGAGED! (ROLL) or (PITCH) SERVO ERROR**": Appears in case of failure or malfunction of the indicated servo (roll or pitch).
- "**AUTOPILOT DISENGAGED! (ROLL) or (PITCH) SERVO SLIPPING**": Appears in case of servo force override; it may means that the pilot took control of the control stick or can occur in case of strong turbulence, when the force to apply to the flight controls are excessive. If this message appears frequently during normal use of the autopilot it's recommended to adjust the torque of the servo that cause the error (*See chap.10.6.2 for roll servo torque setup and chap.10.6.3 for pitch servo torque setup*).
- "**AUTOPILOT DISENGAGED! (ROLL) or (PITCH) SERVO LIMIT**": Appears when a servo detects that the control stick is outside the operating limits. Can occur if the pilot force the control stick to the limits or can occur if the pilot try to engage the autopilot when the control stick is close to the limits.
- "**AUTOPILOT DISENGAGED! BANK LIMIT**" : Appears if you try to engage the autopilot when the bank angle of the aircraft is outside the maximum limit (see chap.10.6.2 for setting the bank limit).
- "**AUTOPILOT DISENGAGED! PITCH LIMIT**" : Appears if you try to engage the autopilot when the pitch angle of the aircraft is outside the maximum limit (see chap.10.6.3 for setting the pitch limit).
- "**AUTOPILOT DISENGAGED! AIRSPEED LIMIT**" : Appears if you try to engage the autopilot when the airspeed is outside the minimum or maximum limits (see chap.10.6.1 for setting the limits).
- "**AUTOPILOT DISENGAGED! (ROLL) or (PITCH) SERVO CALIB**" : Appears if you try to engage the autopilot before completing the servos calibration procedure.
- **"AUTOPILOT DISENGAGED! (ROLL) or (PITCH) CLUTCH ERROR"**: Appears in case of malfunction of the indicated servo (roll or pitch). If this message appears repeatedly, contact the manufacturer.
- "**AUTOPILOT DISENGAGED! NAV DATA TIMEOUT**" : Appears when the autopilot does not receive any data from the external GPS. Check that the Eclipse GPS input is enabled (System setup → Fuel computer → "Ext. GPS for reserve indication" must be set to "YES"). Check also the GPS wirings and check that the GPS is configured to provide the correct flight data (RMB sentence / NMEA output / 4800 baud rate).
- "**AUTOPILOT DISENGAGED! NO VALID NAV DATA**" : Appears when there is no flight plane or no GOTO set in the external GPS.

10.10. Important notices – safety checks

Never use the autopilot without first conduct satisfactory pre-flight check of the autopilot system and its components. Autopilot operations should be verified for correctness before flight.

After every software update of the Eclipse or a servo, check the correctness of the setup as explained in chap.10.8.3.

The autopilot system require a correct measurement of the airspeed. Check that the speed indicated by the Eclipse instrument is correct.

The circuit breaker that powers the ACU control unit and therefore the servos must be easily accessible to the pilot and clearly identified so that in case of emergency can be instantly disconnected.

Every pilot that will use the autopilot system must be trained in the use and limitations.

All parts related to the autopilot system must be installed using aviation standards and must comply with safety requirements. All components, including linkages between servos and flight controls, must be accessible for regular pre-flight checks.

The autopilot system must be TURNED OFF during takeoff and landing of the aircraft.

11 Technical specifications

- TFT colors LCD
- Dimensions: 195.9 x 139.1 x 60.8 mm
- Weight: 900 g
- Supply voltage: 11 ~ 15 V=
- Supply current: 1 A
- Operating temperature range: -20 ~ +70°C
- SD card slot on front panel (use memory card with storage capacity not exceeding 2 Gb)
- Electrical connections: D-Sub connectors
- CAN BUS line for connection with Rotax 912iS ECU.
- GPS Flybox® input
- 3 video input for color or b/w cameras (PAL signal, composite video input)
- Microphone input
- Speaker/Headphone input
- Intercom audio alarm out (1.2 Vpp with 10Kohm load)
- Alarm out (open-collector, active low, max current 500mA)
- GPS input: RS-232, data format: NMEA-0183 (4800bps), messages required: $GPRMC $GPRMB $GPGGA

EIS MODEL/SECTION:

- Current input from Flybox® sensor
- Fuel flow from Flybox® transducer
- Fuel pressure from Flybox® transducer
- RPM input
- Oil pressure from ROTAX or JABIRU sensors
- Oil temperature from ROTAX, JABIRU or resistive sensors
- Carburetor air temperature from resistive sensor
- Outside air temperature from resistive sensor
- 6 Cylinder head temperature from ROTAX, J/K thermocouples or resistive sensors
- 6 Exhaust gas temperature from J/K thermocouples
- 3 inputs for fuel level sensors (resistive or capacitive)

PFD MODEL/SECTION:

- All inertial and pressure sensors are integrated
- MAP with range 10~60 InHg
- Altimeter with range -1000~+25000 feets
- VSI
- Airspeed with range 30~470 Km/h
- Compass
- Attitude indicator
- G-meter and slip indicator

12 Warranty

This product is warranted to be free from defects for a period of 12 months from the user invoice date.
The warranty only covers manufacturer defects and shall not apply to a product that has been improperly installed, misused or incorrect maintenance, repaired or altered by non-qualified persons. This warranty shall not apply to any product that has been disassembled.

MICROEL s.r.l.
Via Mortara 192-194
27038 Robbio (PV) - **ITALY**
Tel +39-0384-670602 - Fax +39-0384-671830
www.flyboxavionics.it

- Problems/suggestions contact form:

First name: _____ Last name: _____ City/Town: _____

Address: _____ Phone: _____ e-mail: _____

MODEL: ***ECLIPSE*** _____ S/N: _____ Date of purchase: _____

YOUR NOTES:

Revision History

Date	Revision level	Description	
7/2013	2.3	First release Eclipse manual for Rotax 912iS	
9/2013	2.4	Altitude serial out	
9/2013	2.5	Minor corrections	
10/2013	2.6	Minor corrections	
12/2013	2.7	Minor corrections	
2/2014	2.8	CON1 connections	
3/2014	2.9	Updated chap.8.5	
5/2016	3.0	Updated autopilot with FX75 digital servomotors	
4/2019	3.1	Added VDO item for CHT Inputs	