Oblò

The easiest way to fly

FLYBOX®

Document release 3.7, 23/06/2017
For software version 4.47

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SECTIONS

Thank you for purchasing a Flybox® product.
We hope it provides many years of service to you, becoming a useful instrument for easy and immediate consultation. Developing Oblò our intent was to create a compact and lightweight attitude indicator / EFIS, easy to install and to use. Oblò is equipped with state-of-the-art highly visible display and the latest generation of solid state inertial sensors to ensure reliability and accuracy over time.

SYMBOLS USED IN THE MANUAL

NOTE: Used to highlight important informations.

CAUTION: Used to warn the user and indicate a potentially hazardous situation or improper use of the product.

WARNING: Used to indicate a dangerous situation that can cause personal injury or death if the instruction is disregarded.

NOTE: Keep this manual in the aircraft.
This document must accompany the instrument in the event of change of ownership.

NOTE: This device is intended for installation onto non type certified aircraft only, because it has no aviation certifications. Refer to your local aviation authorities to check if this device may be installed in your aircraft.

CAUTION: Read entirely this manual before installing the instrument in your aircraft, and follow the installation and operating instructions described here.

CAUTION: 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.

CAUTION: This instrument cannot be used under any circumstances to conduct flights in IMC conditions.

CAUTION: 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.

CAUTION: Using this instrument over the maximum allowable ranges can cause malfunction or wrong indications.

CAUTION: 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.

WARNING: 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.

WARNING: Do not solely rely on the Oblò to determine the primary flight informations. Always compare the informations provided with other primary flight instruments to recognize eventual malfunction.

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

Microel s.r.l. reserves the right to change or improve its products. Information in this document is subject to changes without notice.

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INSTALLATION SECTION

SECTION 1

1.1 MECHANICAL INSTALLATION

1) Oblò fits in a standard 3 1/8” (80 mm) cutouts. On the panel it's necessary to make the cutout for the knob on the lower right hole.

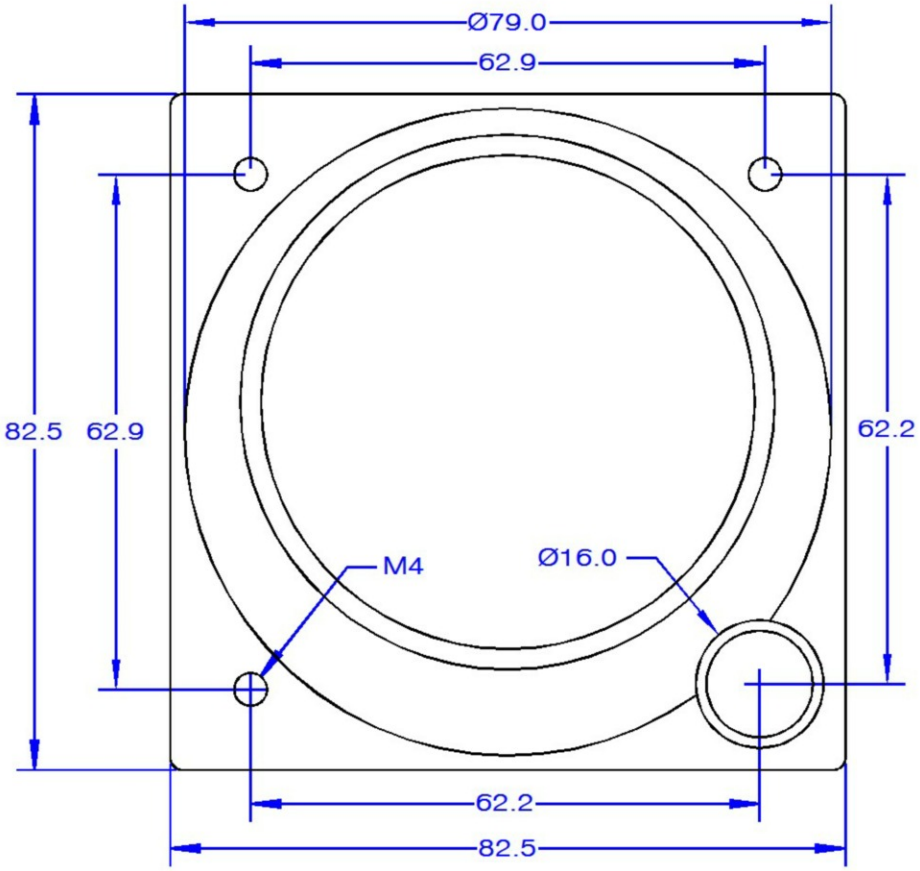
2) The installation location must be carefully chosen since Oblò contains magnetic sensors for the compass indication. Given that a location without magnetic interference can be difficult or impossible to find, it’s recommended to install the instrument in the top row of the instrument panel, to limit the interference of cables, switches and breakers that are usually found at the bottom.
   Do not install near any magnetic sources (wires that carry large amount of current, magnets/electromagnets, electric motors, airplane parts or metal parts that may have residual magnetic field). As a general rule keep a minimum distance of 30cm, but 60cm or more are recommended.
   To test if the location where you intend to install it is appropriate, turn on all the electrical loads (in particular radio and strobe lights) and move a handheld compass around the area making sure that the compass needle is stable (should not cycles back and forth) and is approximately indicating the magnetic North.
   Small deviations from the North can be compensated with the magnetic calibration (see chap.4.3)

3) 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.

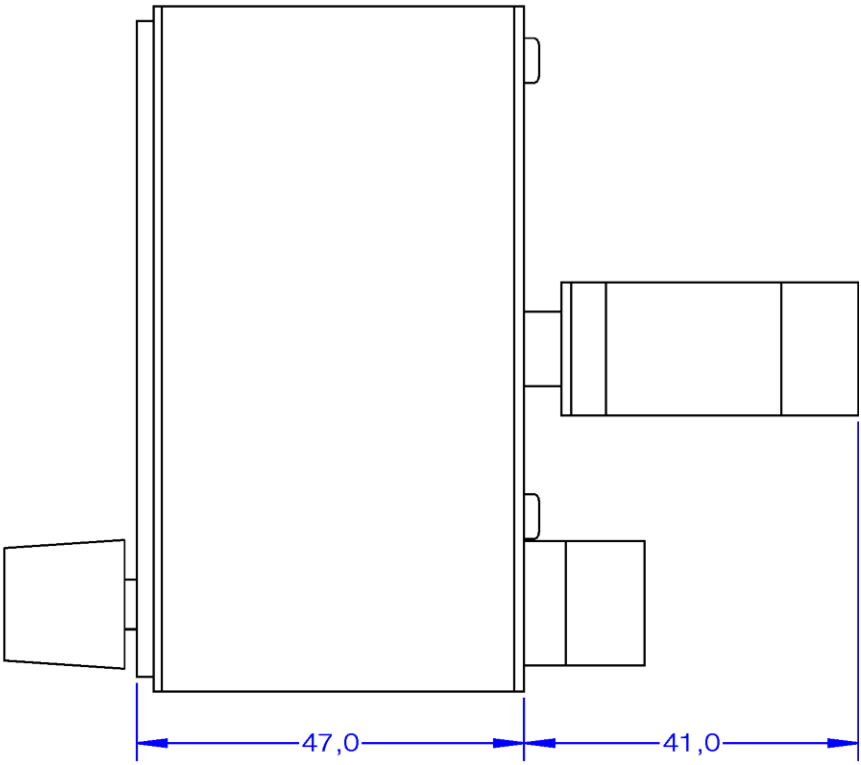
4) Avoid placing in hot locations (for example near heater vents).

5) Find a location where the display will always be completely visible.

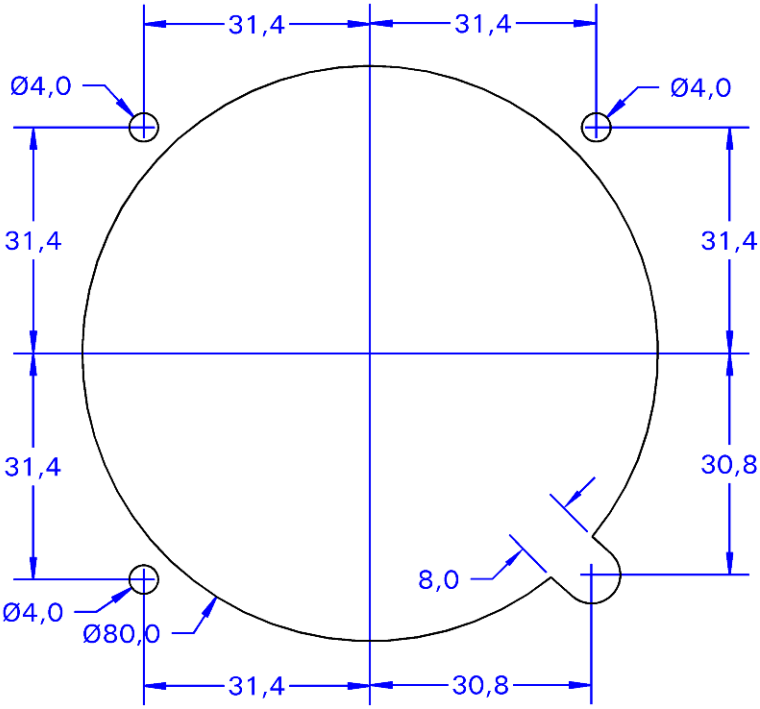
Front view



Side view



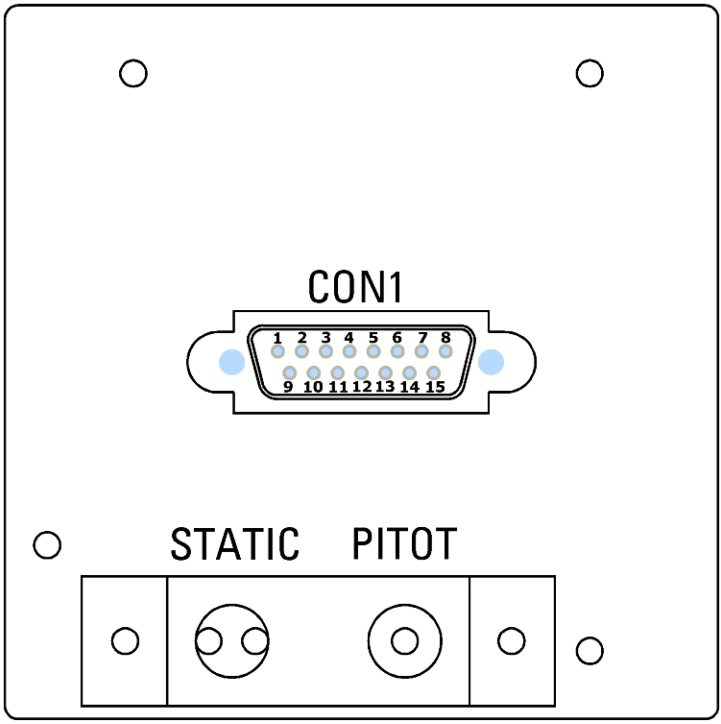
Panel cut-out



- All dimensions are in millimeters.

1.2 ELECTRICAL AND PNEUMATIC INSTALLATION

On the backpanel of the Oblò there is a 15 poles D-sub plug connector, supplied with the corresponding 15-pole receptacle, one static and one pitot port.

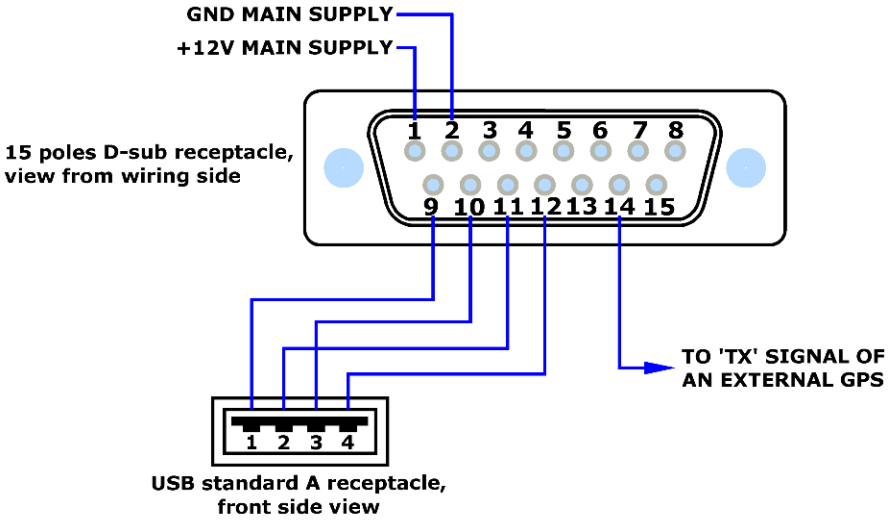


Use 1/8" NPT male fittings to connect the static pressure (STATIC) and the dynamic pressure (PITOT).

CAUTION: Don't blow air inside the fittings.

CON1 connector pinout

PIN#	Description
1	+12V Main supply
2	GND Main supply
3	CAN H signal for autopilot control unit connection (see chap.2.2)
4	CAN L signal for autopilot control unit connection (see chap.2.2)
5	Open-collector alarm-out (active low) max 400mA / 5W (see chap.2.2)
6	Transponder altitude serial out (see chap.1.3)
7	Autopilot remote button (see chap.2.2)
8	Not used
9	USB-VCC
10	USB-D+
11	USB-D-
12	USB-GND
13	Low-level intercom audio out (see chap.2.2)
14	GPS input (connect to TX signal of an external GPS)
15	Not used



PIN	NAME	STANDARD COLORS
1	VCC	RED
2	D-	WHITE
3	D+	GREEN
4	GND	BLACK

NOTE: Connections of pin#9-10-11-12 to a USB connector is used for software upgrades and for datalogger function (in development).

CAUTION: The connection of the external GPS is highly recommended to increase the accuracy of the attitude indicator. It is also required for the tracking indication and for the automatic correction of magnetic declination.
If you connect a GPS that is not powered by the aircraft bus (for example battery-powered), connect together the ground of the GPS and of the Oblò. If no external GPS is available use the Flybox® GPS cod. 810010.

GENERAL WIRING HINTS:

- Take care to properly insulate any exposed wire to avoid short circuits.

- Insert a 1-Ampere circuit breaker to the power lead (+12V).

- Use aeronautic cable for the wiring.

CAUTION: Voltage peaks on the supply line that exceeds the operating limits (20V) can damage the device.

OPTIONAL ACCESSORIES AVAILABLE:

- Ready to use wiring (ord. cod. 802000).

- GPS receiver module (ord. cod. 810010).

- USB flash drive, for eventual software upgrades.

- Backup battery system (ord.cod. 810020).

NOTE: Visit our web page http://www.flyboxavionics.it/en/oblo.html for updated prices and informations.

1.3 ALTITUDE SERIAL OUT FOR TRANSPONDER CONNECTION

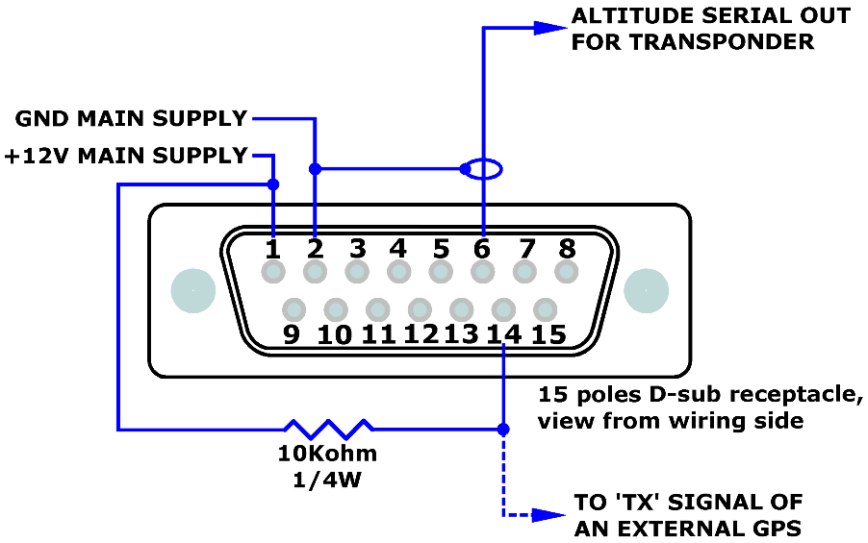
If you use a transponder with serial input for receiving the altitude data, it can be connected to the Oblò by following this steps:

- To enable the transponder output it's required to connect a 10Kohm resistor between pin#1 and pin#14 (whether or not it's connected the external GPS on pin#14).

- Ensure there is a shared ground between the Oblò and the transponder.

- Wire a serial transmit line, using shielded cable, from the Oblò (pin#6 of the connector) to the respective receive connection on the transponder. The serial out of the Oblò is RS232 type, refer to the transponder manual for its installation and configuration.

Connection of altitude serial out for transponder:



The Oblò 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.

NOTE: If you use the ready-to-use wiring (ord. cod. 802000 or 802010), the 10 Kohm resistor between pin#1 and pin#14 is already fitted inside the connector housing of the wiring.

1.4 PRIMARY ACTIONS AFTER INSTALLATION

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

1) Airspeed bar thresholds setting: 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 4.2, section “ASI”. 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) Magnetic calibration: The magnetic calibration after the installation of your Oblò 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 4.3.

3) 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.4.2, “Pitch” parameter.

SECTION 2

2.1 MECHANICAL INSTALLATION

OBLÒ-A/P INSTALLATION

- Mechanical installation of Oblò A/P is identical to the standard Oblò (see chap.1.1) with the addition of:

- Mechanical installation of ACU autopilot control unit.

- Mechanical installation of servo/s.

ACU AUTOPILOT CONTROL UNIT INSTALLATION

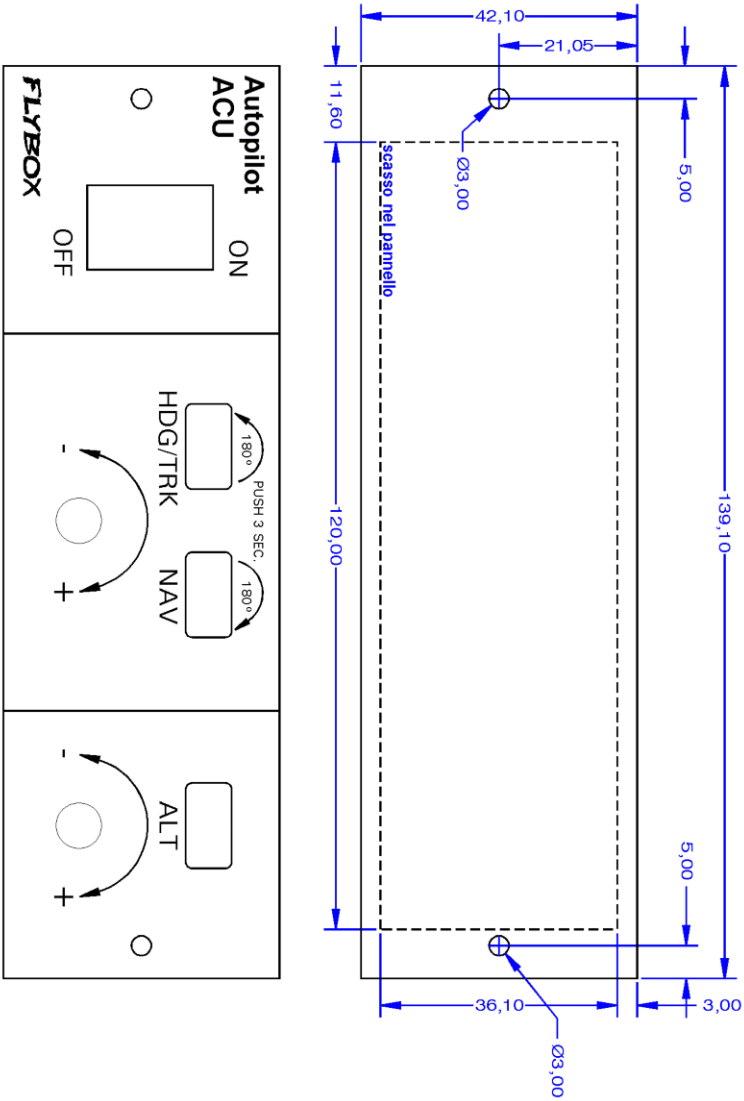
The ACU is available in two versions, for horizontal or vertical mounting.

- Required panel cutout: 120 x 36.1 mm.

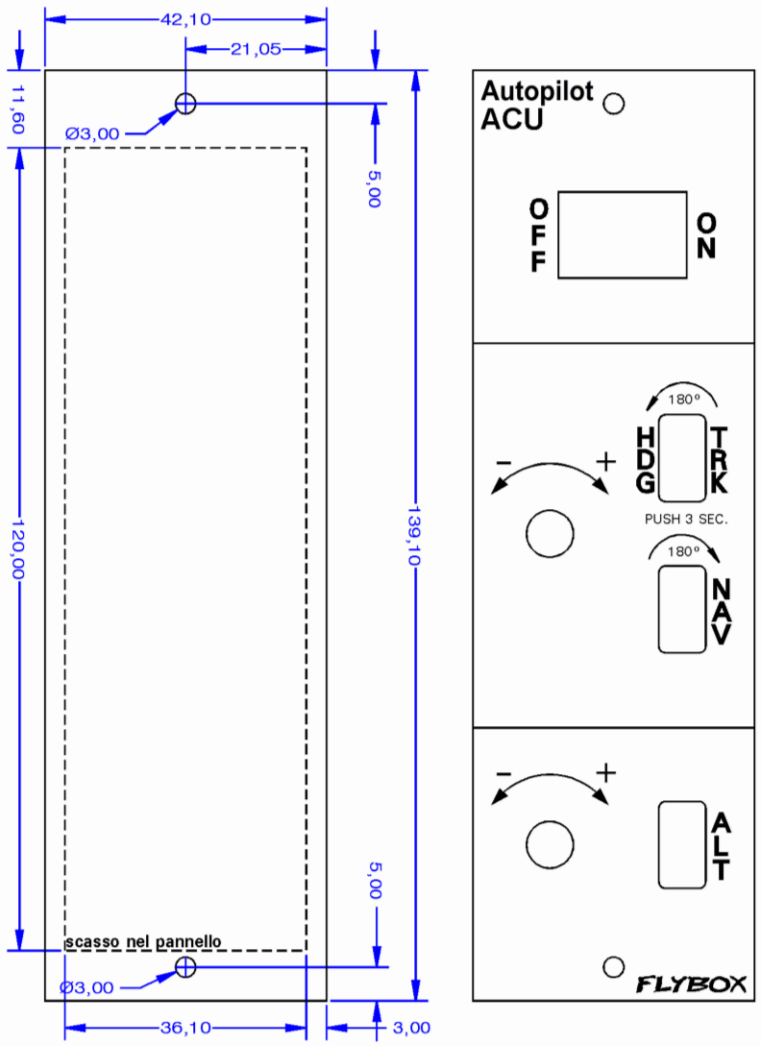
- Outer dimensions: 139.1 x 42.1 mm.

- Screw the ACU to the instruments panel with two M3 screws.

Horizontal installation (dimensions in millimeters)



Vertical installation (dimensions in millimeters)



SERVO/S INSTALLATION :

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.

For installation instructions refer to the installation manual, which is included with each servo.

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, AND CONSULT A QUALIFIED INSTALLER.

2.2 ELECTRICAL INSTALLATION

AUTOPILOT SYSTEM INSTALLATION:

• To install the autopilot system, in addition to perform the standard installation as described in chap.1.2, you must also perform the following wirings:

- Oblò ==> ACU control unit
- ACU control unit ==> servo/s

• 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).

CAUTION: 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.

1) Wirings between ACU control unit and Oblò instrument: the ACU is connected to the Oblò 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.

2) 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.

⚠ **CAUTION**: 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.

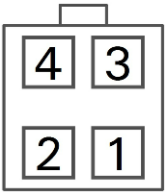
3) Wiring of the remote disengage button (RECOMMENDED): connect it between ground and pin#7 of the Oblò connector. The type of the button must be NORMALLY OPEN (NO).

⚠ **CAUTION:**

- 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.

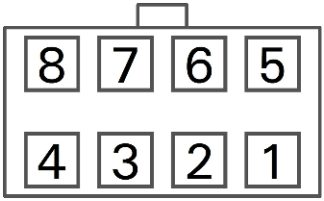
CONNECTIONS DETAIL FOR ACU CON4P CONNECTOR



Socket view (from wire's insertion side)

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

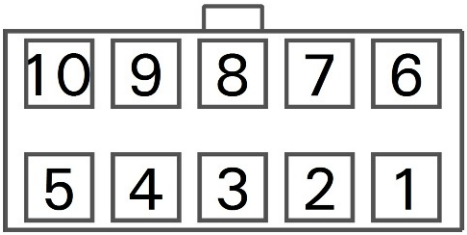
CONNECTIONS DETAIL FOR ACU CON8P CONNECTOR



Socket view (from wire's insertion side)

Pin#	Descriprion
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

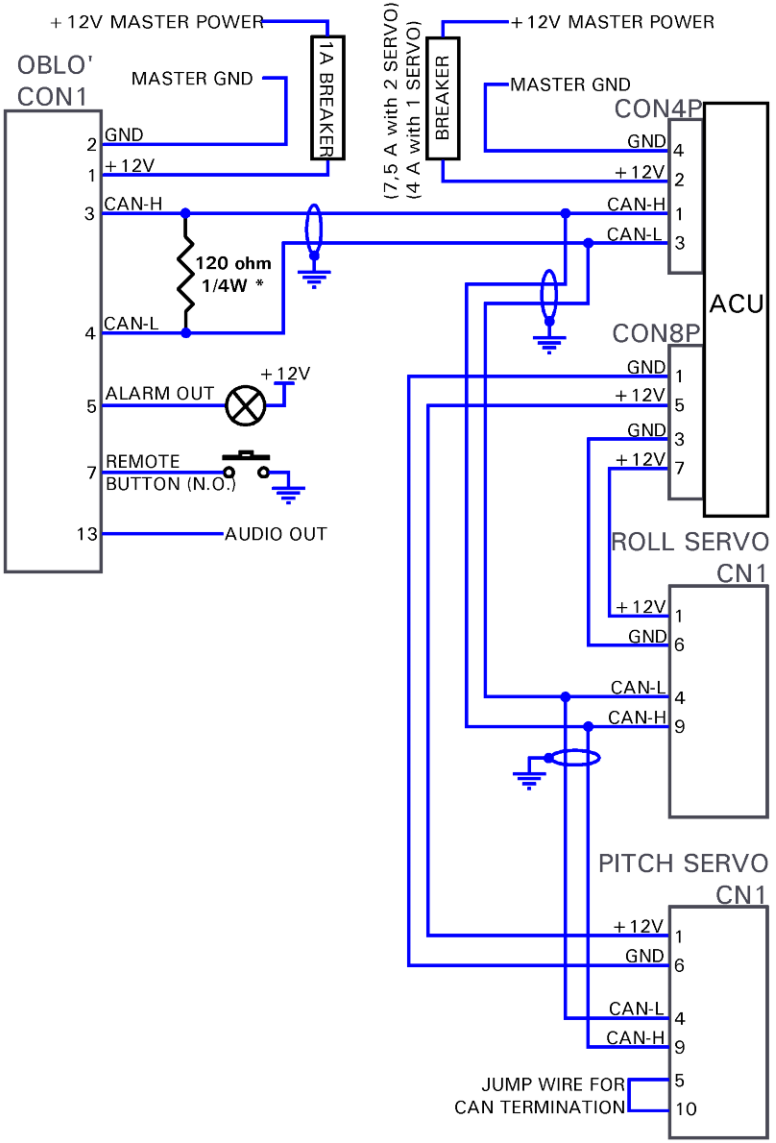
CONNECTIONS DETAIL FOR FX75 SERVO CONNECTOR



Socket view (from wire's insertion side)

Pin#	Descriprion
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

Electrical connections for autopilot system



***NOTE:** If you use the ready-to-use wiring (ord. cod. 802010), the 120 ohm resistor between pin#3 and pin#4 is already fitted inside the connector housing of the wiring.*

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.

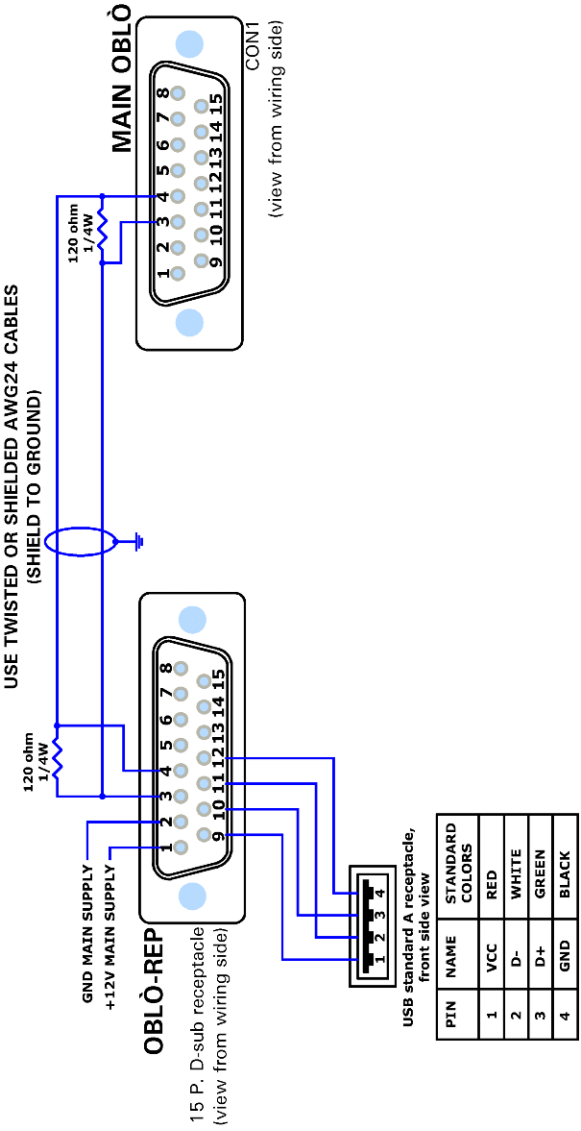
SECTION 3

3.1 OBLÒ-REP (REPEATER) INSTALLATION

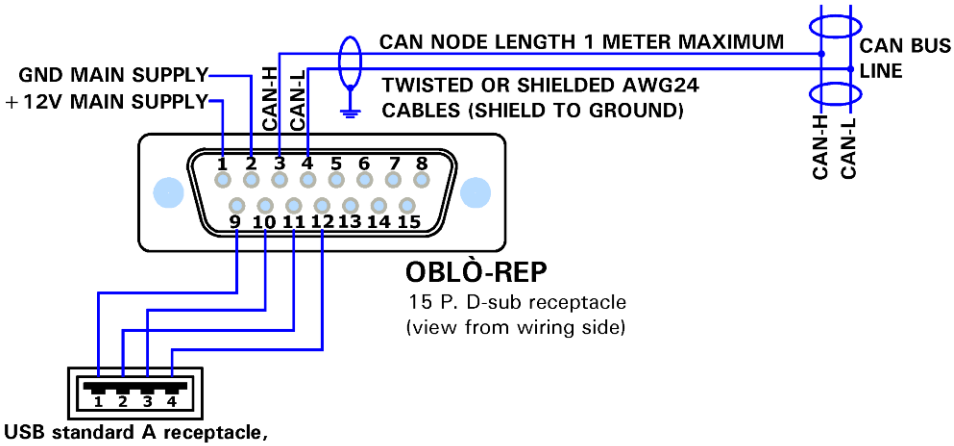
Dimensions & mechanical installation of Oblò-REP are the same of standard Oblò (see chap.1.1)

Electrical installation is different and depends if the Oblò-REP is connected to a standard Oblò or if it is connected to a Oblò-A/P with autopilot control unit and servos. See next pages for the appropriate wiring diagrams.

3.1.1 ELECTRICAL INSTALLATION OBLÒ-REP CONNECTED TO A STANDARD OBLÒ



3.1.2 ELECTRICAL INSTALLATION OBLÒ-REP CONNECTED TO A OBLÒ-A/P WITH AUTOPILOT



PIN	NAME	STANDARD COLORS
1	VCC	RED
2	D-	WHITE
3	D+	GREEN
4	GND	BLACK

NOTE: The Oblò-REP share the same CAN bus line of the autopilot system. It can be connected at any point of the CAN bus line but the length of the wiring that connects the Oblò-REP must be maximum 1 meter.

USE
SECTION

SECTION 4

4.1 MAIN MENU CONFIGURATION

Before using your Oblò you need to configure it; read completely this chapter and follow step by step the sections to fully configure it according to your preferences.

Navigation through the menu is very simple and quick and is performed with the knob:

- Press the knob for 1 second to enter in the functions menu. The menu automatically disappears if you don't press or rotate the knob for 5 seconds.

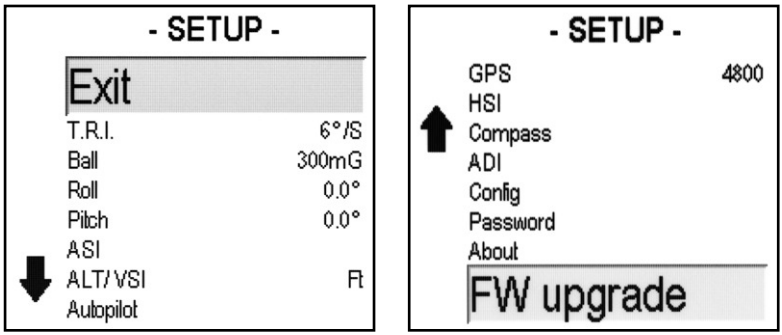
- Rotate the knob to navigate through the menu items.

- Press the knob to enter in the selected item.

- The first item on every menu (“Exit” or “Back”) is used to exit the current menu and go back to the previous.

- **EXIT:** exit the menu and returns to the main screen.
- **ZERO PITCH:** use this function only in flight because it reset the pitch to the actual attitude. Use only when the aircraft is in leveled flight and at constant speed, never use it to reset the horizon during other flight attitude.
- **TRK** or **HDG:** switch between Heading/Tracking compass indications. (Tracking available only if an external GPS is connected).
- **LIGHT:** display brightness adjustment (1=min. brightness, 19=max. brightness). Default value=19.
- **SETUP:** enter in the setup menu.
- **G-METER RESET:** Show/reset g-meter. Turning the knob to highlight this item will display the maximum and minimum peaks of vertical acceleration.
  Press the knob if you want to reset the two peaks.

4.2 SETUP MENU CONFIGURATION:



- **EXIT:** exit the menu and returns to the main screen.

- **T.R.I.:** (Turn rate indicator) Click the knob to enter the turn rate indicator configuration.

  The available settings are:

  - ***Scale:*** set the full scale, in degrees/seconds. Default value=6°/s.

  - ***Filter:*** filter setting. 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. Default value=80.

- **BALL:** (Slip indicator) Click the knob to enter the slip indicator configuration.

  The available settings are:

  - ***Scale:*** set the full scale, in milliG. Default value=300mG.

  - ***Filter:*** filter setting. 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. Default value=80.

- **ROLL:** Click the knob to enter the roll scale configuration.

  The available settings are:

  - Arc mode: Set the roll indicator mode: set to 1 to choose a stationary roll scale (while the arrow moves to stay perpendicular to the horizon). Set to 2 to choose to rotate the scale while the arrow stay fixed at the center.
  Default value=1.

- Adjust:
adjustment of the roll to compensate misalignments due to installation. On the ground, with wings of the plane perfectly leveled, rotate slowly the knob until the number at the bottom become zero, then press it to store this value. Turn off and on the instrument after storing a new inclination value.
Default value=0°

- **PITCH:** Click the knob to enter the pitch axis configuration.

The available setting is:

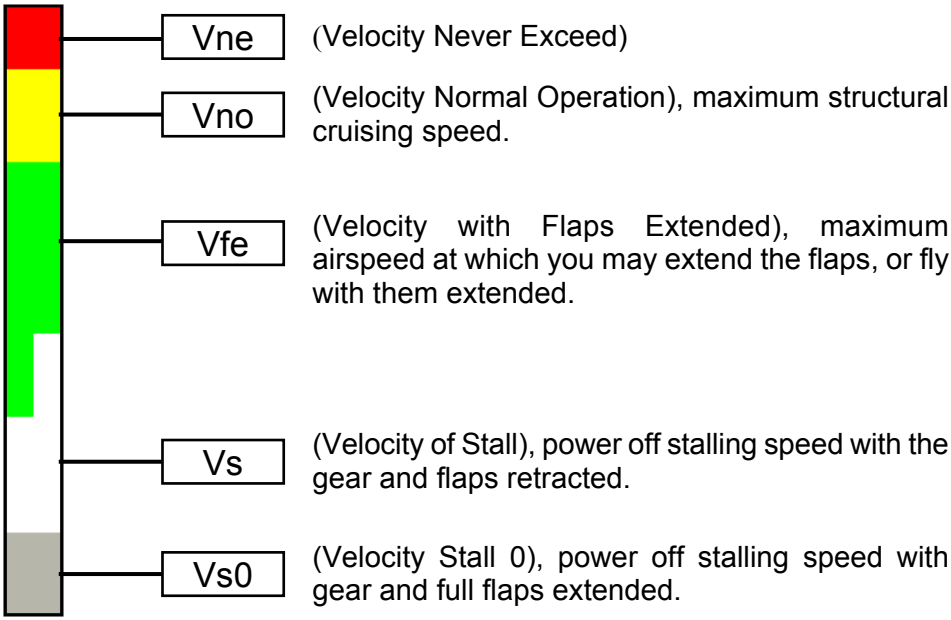
- Adjust: adjustment of the pitch to compensate the inclination of the instruments panel regards the longitudinal axis of the aircraft. This function must be executed only once after installation, on the ground, in leveled attitude.
Read the number printed on the bottom of the display and copy the same value on this parameter by clicking the knob and rotating it. For example if the number printed on the bottom is -3.6° rotate the knob to the left to set exactly -3.6°. If the number printed on the bottom is +1.2° rotate the knob to the right to set exactly +1.2°. Click the knob to store the value and turn off and on again the instrument.
Default value=0°.

- **ASI:** Click the knob to enter the airspeed indictor configuration.

  The available settings are:

  - Vne-Vno-Vfe-Vs-Vs0: Set the speed setpoint for the moving tape airspeed indicator. Default value=0 Km/h.

NOTE: Before setting these thresholds you must choose the unit of measure (see next parameter).



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

- Unit: Set the unit of measure for the airspeed indicator in kilometers per hour (Km/h), miles per hour (Mph) or knots (Kts). Default value=Km/h.

- Filter: filter setting. 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.
Default value=90.

- **ALT/VSI:** Click the knob to enter the altimeter and vertical speed indicator configuration.

  The available settings are:

  - Oxygen: Set the max altitude above which the altitude tape turns red to indicate the hazardous condition.

  Default value=12000 Ft.

  - Alt unit: Set the unit of measure for the altimeter in meters (Mt) or feets (Ft). Default value=Ft.

  - Baro unit: Set the unit of measure for pressure reference in hectoPascal (hPa) or inches of mercury (inHg).

  - Alt Filter: altimeter filter setting. 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. Default value=90.

- Vsi Filter: vertical speed indicator filter setting. 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. Default value=95.

- **AUTOPILOT:**(Only for autopilot enabled Oblò) see 6.2

- **G-METER:** Click the knob to enter the g-meter indicator configuration.

  The available settings are:

  - Filter: filter setting. 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.
  Default value=50.

  - Refresh:
  with this parameter you can choose the display update rate between 1 (1 display refresh per second) and 3 0 (30 display refresh per second).
  Default value=2.

  - Max: Show the maximum peak reached by the g-meter.

  - Min: Show the minimum peak reached by the g-meter.

  - Reset min/max: Click the knob after selecting this item to reset the maximum and minimum peaks of the g-meter.

- **GPS:** Click the knob to enter the external GPS configuration (if connected).
  The available settings are:

  - Baud: Set the baud rate of the external GPS.
  Default value=4800 bps.
  - Utc: To check if the GPS is properly connected and the baud rate is correct verify that this indication provides the UTC time.
  If it shows –:-- it means that the GPS is not connected or setup correctly.
  - Satellites: To check if the reception is good (and therefore also to know if you have choosen a good location where to install the GPS) read the number of satellites indicated: the higher the number, the better the reception. For a good reception at least 4 satellites should be indicated.

CAUTION: In case of communication problems between GPS and Oblò check the following settings on the external GPS:

- Baud rate/communication speed: must be set to the same value as that set in the Oblò.

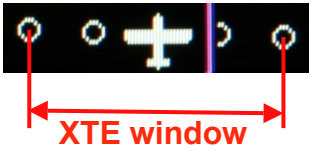
- Data protocol: must be set to **NMEA**.

- Enabled messages: must be enabled on the GPS the **$GPRMC** e **$GPGGA** messages (standard messages that every GPS should transmit). If you want to use the HSI page or if you have installed the autopilot system and you want to use the “navigation to a waypoint” function, it must be enabled also the **$GPRMB** message.

- **HSI:** Click the knob to enter the HSI (Horizontal Situation Indicator) configuration menu.

  The available settings are:

  - XTE win.: Set the window amplitude of the cross track error indicators (the XTE window is measured from the two external dots). Default=1.0 Km.



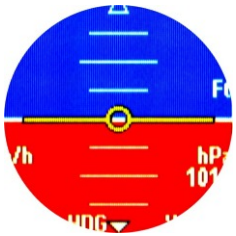
  - Unit: Set the unit of measure for the indications on the HSI page. Choose between kilometers (KM), Nautical miles (NM) or Miles (MI). Default=KM.

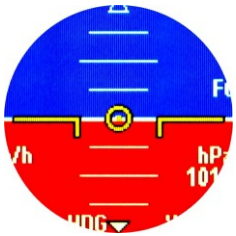
- **COMPASS:** Click the knob to enter the compass configuration. The available settings are:

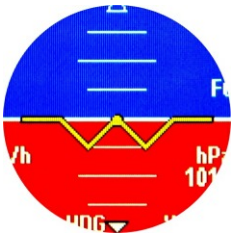
  - Auto H/T: YES/NO. Set to "YES" to enable tha automatic switch between heading and tracking. In this mode if the actual speed is below the speed set in the next parameter the compass is set to heading; when the actual speed is higher the compass is set to GPS tracking.
  This feature is useful to automatically switch from magnetic heading when you are in ground to GPS tracking, with wind correction, when you are in flight. Default value=YES.
  - Speed: Set the speed for the automatic switch between heading and tracking (see previous item). Default value=60 Km/h.
  - Calibration: Magnetic calibration. See next chapter.
  - Mag.Dec.: Displays the magnetic declination of the actual place (the indication appear only with the GPS connected).

- **ADI:** Click the knob to enter the attitude director indicator setup. The available settings are:

  - Mode: 1 / 2 / 3. There are three different display mode of the indicator:


MODE 1


MODE 2


MODE 3

- **CONFIG:** Click the knob to enter the configurations menu. The available configurations are:

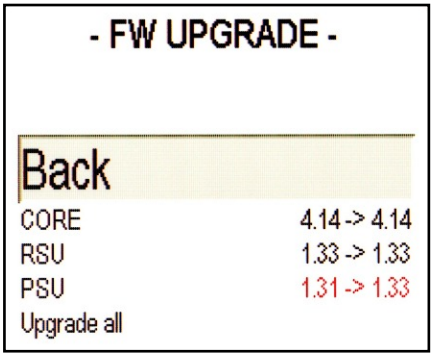
  - Start page: Set the start page (on instrument turn-on). Choose between the attitude indicator page (HOR), the HSI page (HSI) or the drum altimeter page (ALT). Default=HOR.
  - Return delay: Set the auto return to the start page after the time, in seconds, set here. Set to zero to disable the auto return. Default=0.

  - Knob: Set the operating mode of the knob. Rotate the knob to select the submenu called "**Menu DN**" and click to enter. The available settings are:
  - CCW: select this mode to set that by turning the knob counter-clockwise you move down in the menus.
  - CW: select this mode to set that by turning the knob clockwise you move down in the menus.

- **ABOUT:** On this screen it's possible to read current software versions, useful to check if your Oblò is updated to the latest version. The version number to check is in the first row, indicated after the word "CORE". Check frequently our web site www.flyboxavionics.it to see if there are any software updates.

NOTE: this manual is referred to the software version indicated on the first page.

- **FW UPGRADE:** Menu for USB software upgrade. If you want to upgrade to a newer version, (see previous item to check the actual software version) after selecting this item keep pressed the knob for 2 seconds until the following screen appears:



- Insert the USB flash drive on which you copied the updated software and select if you want to upgrade the Oblò (by selecting "CORE") or if you want to upgrade the roll or pitch servo (by selecting "RSU" or "PSU").
To upgrade all select "Upgrade All".
If you have the Oblò standard without autopilot, you can only upgrade the instrument itself by selecting the "CORE" item.

4.3 MAGNETIC CALIBRATION

Oblò integrates the magnetic sensors for the heading indication. The sensors are affected by all magnetic fields present around them, which, if ignored, can lead to considerable errors in the heading indication. Magnetic fields are generated for example by ferro magnetic materials (iron, ferrites), large electric current in cables, electric motors; if possible it's recommended to avoid installation of the instrument near these source of magnetic fields.It's possible to compensate for weak static magnetic fields by performing the calibration as explained below. Please note that in particular cases (presence of strong magnetic fields) may be insufficient to perform this calibration; in this case the heading provide incorrect or approximate indications and it's necessary to install an external remote magnetometer (in development).

CAUTION: Before using Oblò in flight it's necessary to perform the magnetic calibration to obtain a correct indication of the heading.

The calibration must be performed after the installation is complete, by following this steps:

1) 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).

2) Turn on all the electric load usually used in flight.

3) On the Oblò enter in the Setup-->Compass and select the “Calibration” item. Keep pressed the knob for 3 seconds to enter in the calibration.

4) Now the display show “PUSH TO START CALIBRATION”: briefly press the knob to start calibration (if you want to cancel and return to the previous menu keep pressed the knob for 3 seconds).

5) 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.

6) In the center of 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 PUSH TO EXIT" appear on the display.
Now you can press the knob to terminate the calibration.

IMPORTANT: To complete the 420 degrees turn required for the calibration you must take from 1 to 2 minutes.

7) After completing the calibration perform this check: with the Oblò displaying the heading turn the aircraft exactly at North, South, West and East verifying the correct indication on display. If external GPS is connected you will automatically obtain the magnetic declination correction.

SECTION 5

5.1 USING THE OBLO'

The Oblò is organized in 3 different pages:

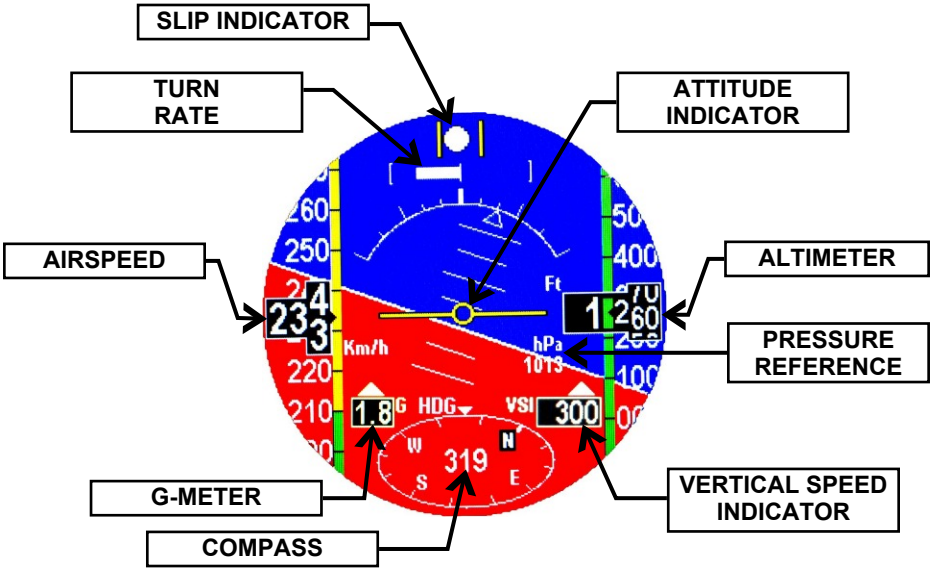
- Attitude indicator page
- HSI (Horizontal Situation Indicator) page
- Drum altimeter page

By default, after power-on the Oblò shows the attitude indicator page, but you can set your preferred start page by going in the Setup menu → Config → Start page.

To switch between the pages you need to "**fast rotate**" the knob: fast rotate the knob clockwise to switch from attitude indicator page to HSI page and from HSI page to drum altimeter page; fast rotate the knob counterclockwise to go back in reverse order.
The "fast rotate" of the knob is thought to avoid involuntary page change.

You can also set a time to automatically return to the start page after you have switched to another page (See Setup menu → Config → Return delay).

5.1.1 ATTITUDE INDICATOR PAGE:



- **COMPASS:** Placed in the lower part of the screen, the heading/tracking indication is represented with the numerical indication at the center of the graphics. The four cardinal points 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**", available only if an external GPS is connected).

  - Note that after power-on the compass is set to heading and can automatically switch to tracking above a certain speed if you enable the "Auto H/T" function in the compass setup menu (see chap.4.2).

  - It's however possible to manually switch between the two indications: keep pressed the knob for 1 second and in the menu that appear choose "HDG" or "TRK".

• 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. If external GPS is connected you will automatically obtain the magnetic declination correction.

• The **TRACKING** is read from external GPS receiver and is usually 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 is very accurate and compensated from wind.

NOTE: The GPS tracking is not valid when stationary or for speed below 20 km/h.

- **TURN RATE:** Graphical indications of the turn rate. To set the full scale go in the Setup menu-->T.R.I.-->Scale (see chap.4.2).

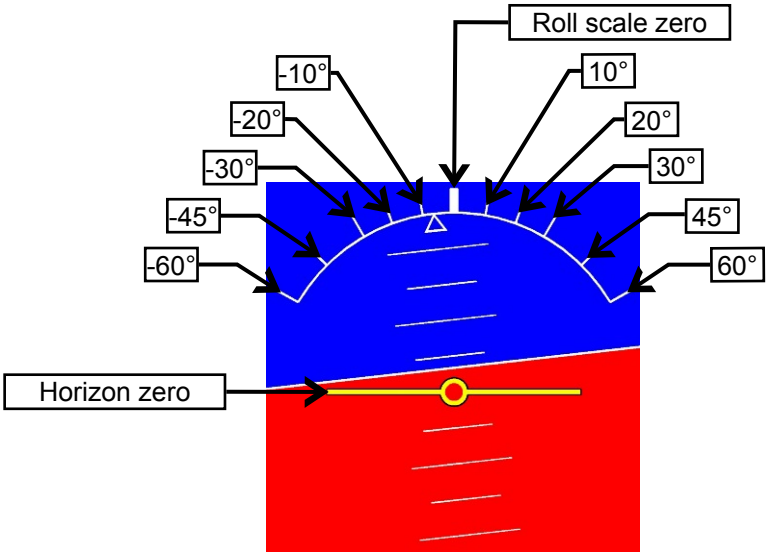
- **AIR SPEED:** The Air speed is represented with both tape and numeric indicator. The unit of measure can be km/h, Mp/h or knots. The range of measure is from 30 to 650 km/h (16~350 knots or 18~403 mph). Below air speed of 30 km/h the indication remain fixed to zero.

  To set the unit of measure and the speed thresold that define the coloured zone go in the Setup menu-->ASI (see chap.4.2).

- **ATTITUDE INDICATOR:** With 360° continuous operation in both pitch and roll. Above and below the horizon line, major pitch marks 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:

  0° - 10° - 20° - **30°** - 45° - **60°**.



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

IMPORTANT NOTES ON USING ATTITUDE INDICATOR:

- The attitude indicator may loose accuracy during the flight for the following causes:

  - During uncoordinated, accentuated or acrobatics maneuvers.

  - Rapid temperature changes or temperature outside the operating limit (-20°C~+70°C).

  • Never use the attitude indicator as a reference for flight manoeuvres.

  • Never use the attitude indicator as a reference in absence of visibility.

  NOTE: This instrument is not certified.

- ***SLIP INDICATOR:*** It's a graphic indication of the lateral accelerations.

- ***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; click again to store the new reference.

- ***VERTICAL SPEED INDICATOR:*** Displays the numerical indication (absolute value). The unit of measure is meters per second if altimeter is set in meters or feet per minute if the altimeter is set in feet. The arrow pointing up indicate an ascent (positive value), the arrow pointing down indicate a descent (negative value).

- ***G-METER:*** Indicate the vertical acceleration in g; it display also an upward arrow during positive accelerations or a downward arrow during negative accelerations.

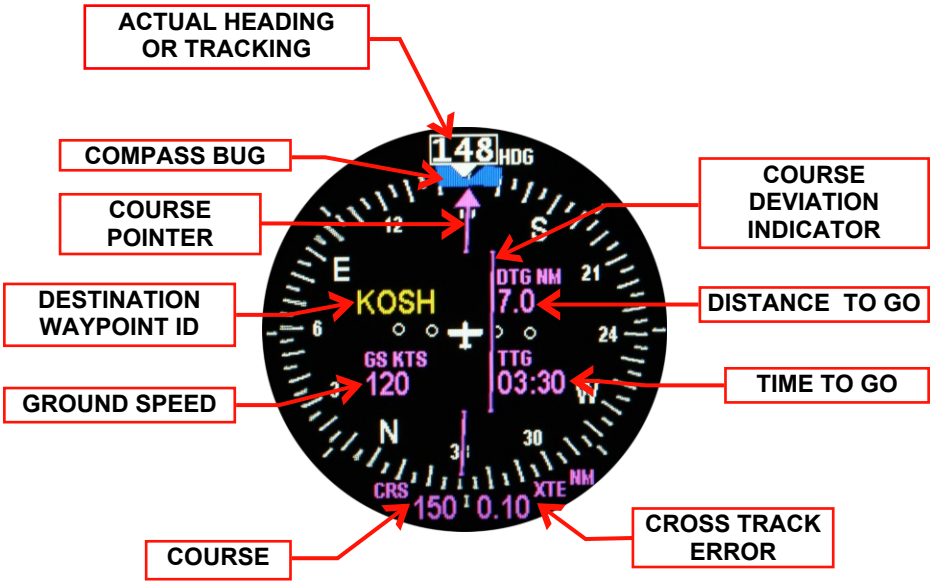
  The g-meter has a memory for storing the maximum and minimum acceleration peaks: to see them entern in the function menu by pressing the knob for 1 second and then select the item “G-meter reset”.

CAUTION: If the instrument's internal temperature exceeds the maximum allowed (70°C) it appears to display the message “SENSOR TEMPERATURE OUT OF HIGH LIMIT”. High temperatures can be reached for example if the aircraft is parked in the sun without any instruments panel protection. In this case to decrease the temperature it's sufficient to ventilate the instruments panel.

If the temperature exceeds the minimum allowed (-20°C) it appears to display the message “SENSOR TEMPERATURE OUT OF LOW LIMIT”. In both cases the data provided by the instrument may be not reliable.

It's possible to check the instrument's internal temperature on the “About” menu (“Int. Temp” item).

5.1.2 HSI PAGE:



The HSI (Horizontal Situation Indicator) page reduces pilot workload by providing heading/tracking, course reference, course deviation and other navigation aid. In order to work, the HSI page needs that the Oblò is connected to an external GPS navigation system, in which a flight plane, route or GOTO has been set.

The available indications are the followings:

- **ACTUAL HEADING OR TRACKING:** It can shows 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 can automatically switch to tracking above a certain speed if you enable the “Auto H/T” function in the compass setup menu (see chap.4.2).

During the flight is possible to manually switch between the heading or the tracking: keep pressed the knob for 1 second and in the menu that appear choose “HDG” or “TRK”.

- **COMPASS BUG**: The compass bug can be freely moved by the pilot by clicking the knob and rotating to select a new heading/tracking. If it’s installed the optional autopilot system and you start a navigation on it, the bug will be coupled to the autopilot.

- **COURSE POINTER:** This pointer indicates the currently selected course (it is automatically programmed by the GPS route).

- **COURSE DEVIATION INDICATOR**: The CDI indicates how far to the left or right you are from the selected course. A series of "dots" provides a linear indication of how far the aircraft is "off course". To set the full scale of the dots, go in the setup menu → HSI → XTE win parameter.

- **DESTINATION WAYPOINT ID**: It shows the name of the destination waypoint, if transmitted by the GPS navigator. If no information is received this field is left blank.

- **DISTANCE TO GO**: It shows the distance from your aircraft’s position to the next waypoint (in kilometers (KM), Nautical miles (NM) or Miles (MI), depending on what you have set on the HSI setup menu).

- **TIME TO GO**: It shows the time needed to reach the next waypoint.

- **GROUND SPEED**: It shows the ground speed (this data is received from the GPS).

- **COURSE**: It shows the course to mantain to reach the waypoint.

- **CROSS TRACK ERROR**: It shows the numerical indication of the deviation from the selected course (in kilometers (KM), Nautical miles (NM) or Miles (MI), depending on what you have set on the HSI setup menu).

5.1.3 DRUM ALTIMETER PAGE:

This page simulates the graphic of a traditional drum altimeter.

To change the **PRESSURE REFERENCE** click the knob and then rotate it to change the numerical value; click again to store the new reference. The settable pressure reference is the one corresponding to the unit of measure setted on the Setup menu → ALT/VSI → Baro unit.

SECTION 6

6.1 AUTOPILOT SYSTEM

REQUIREMENTS:

The following components are required for the autopilot to function:

- Flybox® Oblò-A/P instrument or Oblò with autopilot function enabled (see chap.7.6).

NOTE: Upgrade your Oblò to the latest version before using the autopilot function (check web site http://www.flyboxavionics.it/en/software-updates.html)

- Autopilot Control Unit (Flybox® ACU).
- 1 Flybox® FX75 digital servo for roll control.
- 1 Flybox® FX75 digital servo for pitch control.

AUTOPILOT OVERVIEW:

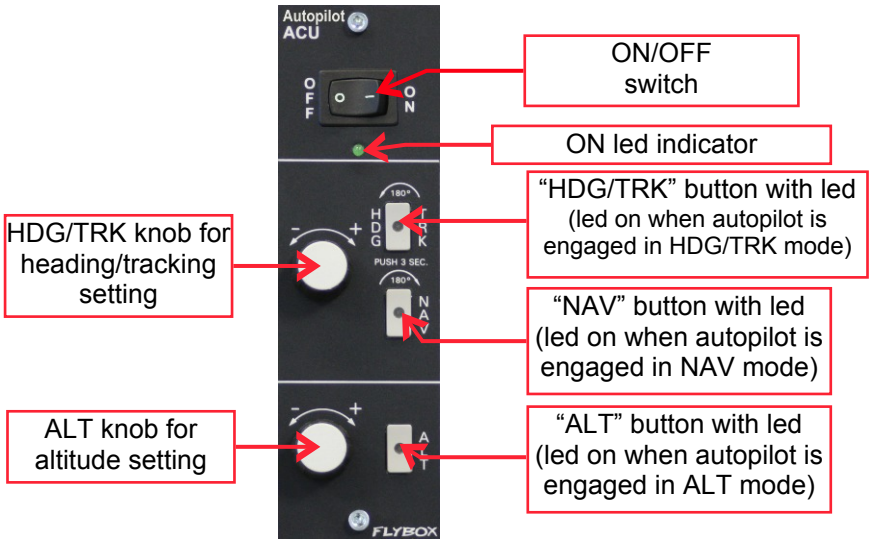
The autopilot system can use 1 or 2 servos, that need to be connected to the control stick for roll and pitch control.

The 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.



- 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.

REMOTE DISENGAGE BUTTON:

It's recommended to install also the remote disengage button, that operate in this way:

- With autopilot engaged: push shortly to disengage.

- With autopilot disengaged: push for 2 seconds to engage it. This function must be enabled from menu: Setup → Autopilot → Remote button → HtoE enable (see chap.6.3.4).

- 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. This function must be enabled from menu: Setup → Autopilot → Remote button → CWS enable (see chap.6.3.4).

6.2 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.6.2.1)
  - Communications check (chap.6.2.2)
  - Remote button operation check (chap.6.2.3)
  - Servos torque check (chap.6.2.4)
  - "Min speed" and "Max speed" parameters setting (chap.6.3.1)
  - Roll servo setup (chap.6.3.2)
  - Pitch servo setup (chap.6.3.3)
  - Remote button setup (chap.6.3.4)

- **Flight based test and configuration:**
  - Autopilot setup – roll axis (chap.6.4.1)
  - Autopilot setup – pitch axis (chap.6.4.2)

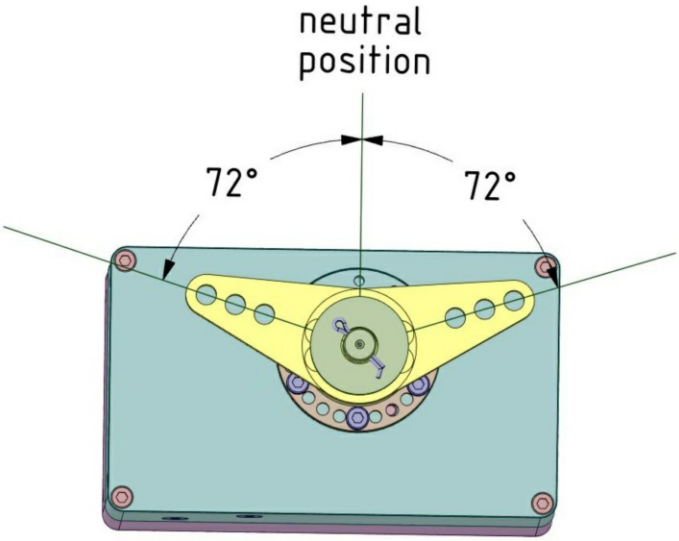
6.2.1 SERVO/S CALIBRATION

The servo/s calibrations is GROUND BASED.

The calibration procedure is mandatory: if you try to engage the autopilot without first calibrate the servo, the Oblò 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:

  - Press for 1 second the knob to enter in the function menu.

  - Rotate the knob to select the “Setup” menu and click to enter.

  - Rotate the knob to select the “Autopilot” menu and click to enter.

  - Rotate the knob to select the “Servo(s) calib”.

  - Press the knob for 3 seconds until the display shows the word “**IDENTIFICATION**”. 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 the knob to start the calibration and follow the onscreen instructions; for example if you have installed the servos on both roll and pitch axis the complete procedure will be as follows:

- **Step#1:** center the control stick in neutral position and then click the knob 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 the knob 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 the knob to go to the next step.

- **Step#5:** center the control stick in neutral position and then click the knob to go to the next step.

- **Step#6:** position the control stick to the left limit (without forcing).
  Click the knob 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 the knob 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 the knob 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 the knob 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".
To exit the calibration menu keep pressed the knob for 3 seconds.

SERVO/S CALIBRATION CHECK

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

- With the Oblò and ACU control unit turned on, insert the autopilot on roll axis 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.

6.2.2 COMMUNICATIONS CHECK

This check must be performed GROUND BASED.

- Turn on Oblò instrument only.
- Turn on ACU control unit and check that appear "AP:OFF" in the top left corner of the display.
If no message appear means that there is a communication problem between Oblò 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.

6.2.3 REMOTE BUTTON OPERATION CHECK

This check must be performed GROUND BASED.

- Engage the autopilot by pressing the “HDG/TRK” button on the ACU (check the message “AP:HDG” on the Oblò 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.

6.2.4 SERVO TORQUE CHECK

This check must be performed GROUND BASED.

- Engage the autopilot by pressing the “HDG/TRK” button on the ACU (check the message “AP:HDG” on the Oblò display).

- Force the control stick to the left or right limit, so that you override the servo force and after 1 seconds 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 the Oblò display).

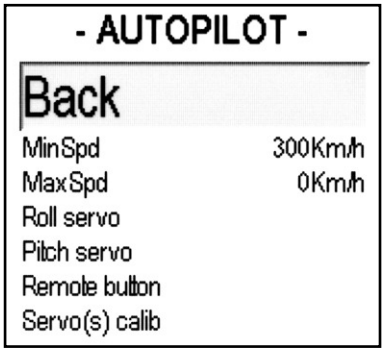
- Force the control stick to the forward or backward limit, so that you override the servo force and after 1 seconds the autopilot disengages automatically (check the message “AP:OFF” on display).

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.6.3.2 for roll servo torque setup and chap.6.3.3 for pitch servo torque setup.

6.3 AUTOPILOT SETUP MENU

The parameters configuration is performed on the Oblò 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).



All the configurable parameters are on the Oblò menu, accessible in this way:

- Press for 1 second the knob to enter in the function menu.

- Rotate the knob to select the “Setup” menu and click to enter.

- Rotate the knob to select the “Autopilot” menu and click to enter.

6.3.1 "MINSPD" AND "MAXSPD" PARAMETERS SETTING

This settings must be performed 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 SPD: Select the minimum airspeed at which the autopilot will fly the aircraft. The unit of measure is the same set for the ASI (see Setup menu → ASI → Unit). The autopilot cannot be engaged at airspeed below Min Spd, with the exception of 0 to allow 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 Spd to be at least 20% above the Vfe of your aircraft. The Vfe speed must be set in the Oblò according to the specifications of your aircraft (to set the Vfe, see Setup menu → ASI → Vfe).

MAX SPD: Select the maximum airspeed at which the autopilot will fly the aircraft. The unit of measure is the same set for the ASI (see Setup menu → ASI → Unit).

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 Spd 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. The Vne speed must be set in the Oblò according to the specifications of your aircraft (to set the Vfe, see Setup menu → ASI → Vne).

Max Spd parameter cannot be set to a value above 95% of Vne, so you should first check the correctness of the ASI speed settings.

6.3.2 ROLL SERVO SETUP

This settings must be performed GROUND BASED.

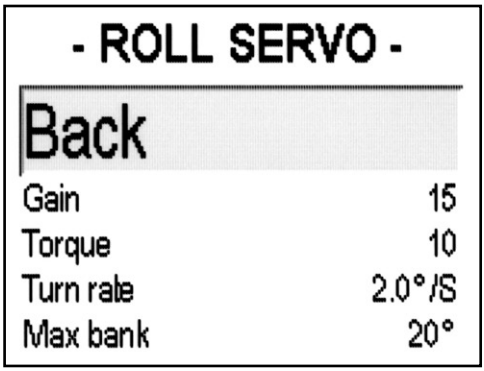
This settings can be performed inside the “ROLL SERVO” menu, that can be reached in this way:

- Press for 1 second the knob to enter in the function menu.

- Rotate the knob to select the “Setup” menu and click to enter.

- Rotate the knob to select the “Autopilot” menu and click to enter.

- Rotate the knob to select the “Roll servo” menu and click to enter.



- **"GAIN" PARAMETER CHECK**

  This check must be performed 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 default value (10), because it will be set in flight as explained later in chap.6.4.1.
  The min-max range is: 1~40.

- **"TORQUE" PARAMETER SETTING**

  This settings must be performed 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.6.2.4.

  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 to 10.

Autopilot setup menù

- **"TURN RATE" PARAMETER SETTING**

  This settings must be performed 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 BANK" PARAMETER SETTING**

  This settings must be performed GROUND BASED.

  MAX 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.

6.3.3 PITCH SERVO SETUP

This settings must be performed GROUND BASED.

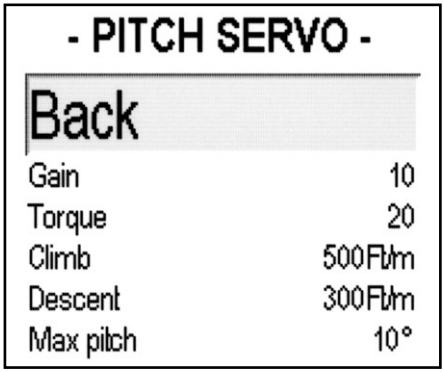
This settings can be performed inside the “PITCH SERVO” menu, that can be reached in this way:

- Press for 1 second the knob to enter in the function menu.

- Rotate the knob to select the “Setup” menu and click to enter.

- Rotate the knob to select the “Autopilot” menu and click to enter.

- Rotate the knob to select the “Pitch servo” menu and click to enter.



- **"GAIN" PARAMETER CHECK**

  This check must be performed GROUND BASED.

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

- **"TORQUE" PARAMETER SETTING**

  This settings must be performed 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.6.2.4.

  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 to 20.

- **"CLIMB" PARAMETER SETTING**

  This setting must be performed GROUND BASED.

  CLIMB: 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. (Default value = 500).

- **"DESCENT" PARAMETER SETTING**

  This setting must be performed GROUND BASED.

  DESCENT: 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. (Default value = 300)

- **“MAX PITCH” PARAMETER SETTING**

  This setting must be performed GROUND BASED.

  MAX PITCH: 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 (Default value = 10).

6.3.4 REMOTE BUTTON SETUP

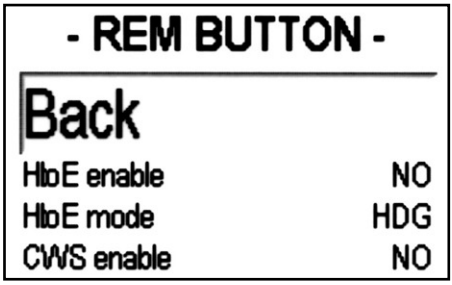
The 'Remote Button' setup menu can be reached in this way:

- Press for 1 second the knob to enter in the function menu.

- Rotate the knob to select the “Setup” menu and click to enter.

- Rotate the knob to select the “Autopilot” menu and click to enter.

- Rotate the knob to select the “Remote button” menu and click to enter.



The settings must be performed GROUND BASED.

Autopilot setup menù

- **HtoE enable (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.

- **HtoE mode (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.

- **CWS enable (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.

6.4 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.

CAUTION: 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.
- Push 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:

- Press for 1 second the knob to enter in the function menu.

- Rotate the knob to select the “Setup” menu and click to enter.

- Rotate the knob to select the “Autopilot” menu and click to enter.

- Rotate the knob to select the “Roll servo” menu and click to enter.

- Verify that the “Gain” parameter is set to default value, that is 10.

- Verify that the “Torque”, “Turn rate” and “Max Bank” parameters are set according to your preferences, as explained in chapter 6.3.2.

- Rotate the knob to select the “Back” item and press it to go back to the autopilot menu.

- Rotate the knob to select the “Pitch servo” menu and click to enter.

- Verify that the “Gain” parameter is set to default value, that is 13.

- Verify that the “Torque”, “Climb”, “Descent” and “Max pitch” parameters are set according to your preferences, as explained in chapter 6.3.3.

6.4.1 AUTOPILOT SETUP – ROLL AXIS (FLIGHT BASED)

- **AUTOPILOT ENGAGE AND "GAIN" PARAMETER SET**

  - Start the flight and when you are in safe condition (read chap.6.4) 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:
- Press for 1 second the knob to enter in the function menu.
- Rotate the knob to select the “Setup” menu and click to enter.
- Rotate the knob to select the “Autopilot” menu and click to enter.
- Rotate the knob to select the “Roll servo” menu and click to enter.
- Rotate the knob to select the “Gain” parameter and click to enter.
- Rotate the knob to change the value and press it to store the new value.

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.

- **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).

6.4.2 AUTOPILOT SETUP – PITCH AXIS (FLIGHT BASED)

- Start the flight and when you are in safe condition (read chap.6.4), 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:**
  - Press for 1 second the knob to enter in the function menu.
  - Rotate the knob to select the "Setup" menu and click to enter.
  - Rotate the knob to select the "Autopilot" menu and click to enter.
  - Rotate the knob to select the "Pitch servo" menu and click to enter.
  - Rotate the knob to select the "Gain" parameter and click to enter;
  - Rotate the knob to change the value and press it to store the new value.

  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.

- **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).

SECTION 7

7.1 AUTOPILOT OPERATION

The autopilot indications appear when you turn on the ACU control unit, and are the following:

- ***AUTOPILOT STATUS INDICATOR:***

- **AP:OFF** when autopilot is not engaged.
- **AP:HDG** when autopilot is engaged and follow/holds the magnetic heading.
- **AP:TRK** when autopilot is engaged and follow/holds the GPS tracking.
- **AP:NAV** when autopilot is engaged and follow the GOTO or flight plane of the external GPS.
- **AP:180** when autopilot is currently in automatic course reversal (180°) mode.
- **AP:ALT** when autopilot is engaged in altitude mode.
- **AP:CWS** when autopilot is currently in "Control wheel steering" mode.

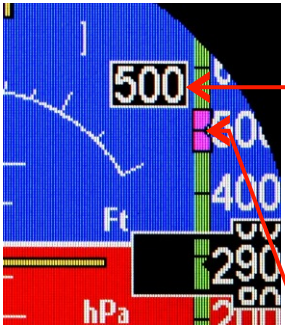
If you have installed both servos (roll and pitch) the following indications are also available:

- **AP:HDG/ALT** when autopilot is engaged in both "HDG" and "ALT" mode.
- **AP:TRK/ALT** when autopilot is engaged in both "TRK" and "ALT" mode.
- **AP:NAV/ALT** when autopilot is engaged in both "NAV" and "ALT" mode.

- ***ALTITUDE BUG:***

The altitude bug is a graphical representation on the altimeter indicator, at the altitude that the autopilot must maintain/reach. The bug can be set by turning the "ALT" knob on the ACU control unit. While setting the altitude with the "ALT" knob, it also appears a numeric window to allow fine adjustment. This window automatically hide after 3 seconds.

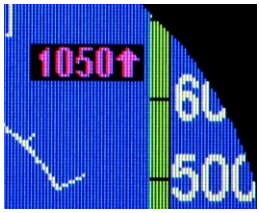
With autopilot turned on but not engaged the bug is yellow, with autopilot engaged is magenta.



Numerical indication for bug adjustment when autopilot is engaged. Automatically hide after 3 seconds.

Altitude bug: with autopilot engaged is in MAGENTA, without autopilot is in YELLOW.

If the bug is set on an altitude outside the screen (higher or lower than the values currently displayed by the altitude tape), it appears a numerical indication with an arrow pointing up or down:



- ***HEADING/TRACKING BUG:***

The heading/tracking bug is a graphical representation on the heading/tracking indicator, at the heading/tracking that the autopilot must maintain/reach. The bug can be set by turning the “HDG/TRK” knob on the ACU control unit. While setting the heading/tracking with the “HDG/TRK” knob, it also appears a numeric window to allow fine adjustment. This window automatically hide after 3 seconds.

With autopilot turned on but not engaged the bug is yellow, with autopilot engaged is magenta.

Bug: with autopilot engaged is in MAGENTA, without autopilot is in YELLOW.

Numerical indication for bug adjustment when autopilot is engaged. Automatically hide after 3 seconds.

7.2 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).
  - With the remote button, if installed and enabled.

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 Oblò and ACU or between ACU and servos.
  - If the airspeed measured is out of the minimum/maximum range (“Min spd” and “Max spd” 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 the Oblò reports invalid data.
- The actual bank or pitch angle is out of the maximum
- 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 alert comes when the autopilot cannot engage for any of the above conditions. Press the knob of the Oblò to cancel this alert.

- **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 Oblò 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 the Oblò reports invalid data.
  - Only for “NAV” mode, if no valid data are received or the flight plane on the external GPS is removed.
  - Pilot taking control of the stick and overriding the servos for more than 1 second.

NOTE: A display alert comes when the autopilot cannot engage for any of the above conditions. Press the knob of the Oblò to cancel this alert.

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).
- By briefly 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.**

CAUTION: The ACU control unit must be turned off during landing and takeoff.

7.3 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 allowed.

2) Check the servos torque: with the autopilot engaged, manually force the control stick to its limits and check that it's possible to override the force applied by the servos.

CAUTION: 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 until you have fixed the problem.

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

  - Once in flight and with Oblò already turned on, turn on the ACU control unit via the ON/OFF switch.

  - Choose between heading or tracking (press the knob on the Oblò, turn it to select HDG or TRK and press again).

  - 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.6.3.4).

  - 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 by pressing the HDG/TRK knob. Note that the autopilot remains engaged in the HDG/TRK mode.

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

  - Once in flight and with the Oblò 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. When the flight plane is completed or the GOTO has been reached you need to manually disengage the autopilot.

NOTE:

- The autopilot disengages in case of failure or loss of GPS signal; the display will show the message "AUTOPILOT DISENGAGED! NAV DATA TIMEOUT".

- With autopilot engaged in NAV mode, if you press the "HDG/TRK" knob it will be set in "HDG/TRK" mode, centering the heading/tracking bug at the current value; the display will show the message "AUTOPILOT BASIC MODE".

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

  - Once in flight and with the Oblò 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.6.3.4).

  - Set the desired altitude by rotating the "ALT" knob on the ACU. The autopilot maintain a vertical speed as set in the "Climb" and "Descent" parameters (see chap.6.3.3).

  - 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).

NOTE: 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.

7.4 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 reset an alarm click the knob.

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

- "AUTOPILOT DISENGAGED! ACU COM" : Appears when communication between Oblò 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). If this message appears repeatedly, contact the manufacturer.
- "AUTOPILOT DISENGAGED! (ROLL) or (PITCH) SERVO SLIPPING": This message may means that the pilot took control of the control stick OR it 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 indicated servo (roll or pitch) as explained in chap.6.3.2 and 6.3.3.

- "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.6.3.2 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.6.3.3 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.6.3.1 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 wiring between external GPS and Oblò is correct.

  - Check that the GPS baudrate is set in the same way of the external GPS. To set the GPS baudrate:
  - Press for 1 second the knob to enter in the function menu.
  - Rotate the knob to select the "Setup" menu and click to enter.
  - Rotate the knob to select the "GPS" menu and click to enter.
  - Rotate the knob to select the "Baud" menu and click to enter.
  - Rotate the knob to change the value and press it to store the new value.

- "AUTOPILOT DISENGAGED! NO VALID NAV DATA" : Appears when there is no flight plane or no GOTO set in the external GPS.

7.5 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 Oblò or a servos, check the correctness of the setup as explained in chap.7.3.

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

7.6 AUTOPILOT ACTIVATION PROCEDURE

If you already have a standard Oblò you can upgrade it to the autopilot version by purchasing the activation key (cod. 801020) and following this activation procedure.

NOTE: Upgrade your Oblò to the latest version before activating the autopilot function (check web site http://www.flyboxavionics.it/en/software-updates.html)

Follow this procedure to upgrade your standard Oblò to the autopilot version:

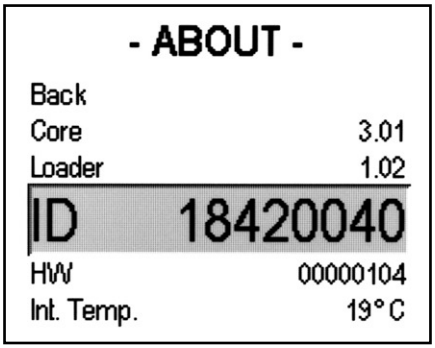
- Turn on the instrument.

- Press for 1 second the knob to enter in the function menu.

- Rotate the knob to select the “Setup” menu and click to enter.

- Rotate the knob to select the “About” menu and click to enter.

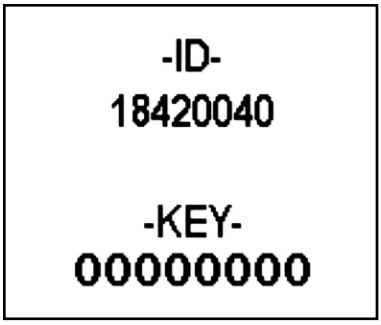
- Write down the “ID” numeric code and communicate it when you purchase the autopliot activation key:



After purchase you will be given a numeric key to enter the Oblò in the following way:

- Turn on the instrument.
- Press for 1 second the knob to enter in the function menu.
- Rotate the knob to select the “Setup” menu and click to enter.
- Rotate the knob to select the “Password” menu and click to enter.
- Insert the password “143835” by turning the knob to increase/decrease the digit and press it to go to the next digit.

The following screen appears:



- Insert the numerical key that you have received after purchase (turn the knob to increase/decrease the digit and press it to go to the next digit).

The correct entry code will be confirmed by the "AUTOPILOT ENABLED" message on display.

WRITE DOWN HERE THE ACTIVATION DATA:

ID: _____

(code to provide when you purchase the autopilot activation key)

KEY: _____

(key supplied after purchase, to be inserted as explained above)

SECTION 8

8.1 USE OF THE OBLÒ-REP (optional)

Oblò-REP, connected to a main Oblò unit, allows to view the data on copilot side also. This model does not have any sensor inside, but it displays all the data available in the standard Oblò to which is connected.

- **INSTALLATION & DIMENSIONS:** same as the standard Oblò, refer to chap.1.1.
- **ELECTRICAL CONNECTIONS:** see chap. 3.2.

For using and configuring the Oblò-REP refer to the operating manual of the standard Oblò (chapters# 4 & 5 of this manual).

The settings are independent (you can, for example, set different unit of measure).
Note that the setup menus includes only a part of the standard Oblò menus.

After instrument turn-on, if the Oblò-REP 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 between the two instruments is established, the Oblò-REP will show the attitude indicator and all the other indications, replicating exactly what you see in the main Oblò.

SECTION 9

9.1 TECHNICAL SPECIFICATIONS

- Dimensions: 83 x 83 x 61 mm.
- Weight: 300 g.
- Operating temperature range: -20 ~ +70°C.
- Power supply: 10~20 Vdc, 0.26 A.
- Connections via DSUB 15 poles connector.
- TFT LCD color display.
- Brightness: 1200NITS, adjustable.
- 1 low-level audio output for intercom.
- 1 alarm output (open-collector, active low, max current 400mA / 5W).
- GPS input: RS-232, data format: NMEA-0183, sentences required: $GPRMC $GPGGA.
- USB port for software updates.
- CAN BUS communication ports.
- Solid-state sensors.
- Altimeter with range -1000~+25000 feets (-300 ~ +7600 m).
- Airspeed with range 30~650 Km/h (16~350 knots or 18~403 mph).

APPENDIX "A"

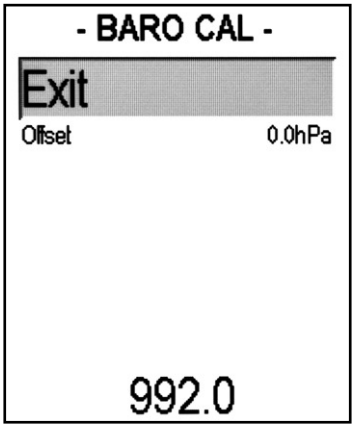
ALTIMETER CALIBRATION

The altimeter is calibrated in factory and usually requires no calibration. Perform this procedure only if you notice large differences compared to a reference altimeter.

1. Turn-on the Oblò and press the knob for 1 second to enter in the function menu. Rotate the knob to select the "Setup" menu and click to enter.

2. Rotate the knob to select the "Password" menu and click to enter.

3. Insert the password "590691" by turning the knob to increase/decrease the digit and press it to go to the next digit.
   The following screen appears:



4. Turn-on the reference altimeter and set it to QFE, unit of measure: milliBAR.

5. Warm up both instruments for about 15 minutes.

6. In the Oblò select the “Offset” parameter and click the knob to enter.

7. Read the pressure measured by the reference altimeter and adjust the Oblò pressure with the same exact value (number in the bottom of the display, rotate the knob to adjust it).

8. Click the knob to exit and store the new pressure offset then click on “Exit” or turn off the instrument.

APPENDIX "B"

DETAIL OF OPTIONAL WIRING FOR OBLO' (cod. 802000)

LABEL	DESCRIPTION	LENGTH.	PIN #	NOTE
+ 12	+12V Main supply	0.5 m	1	
GND	GND Main supply	0.5 m	2	
TRANSPONDER	Altitude serial out for transponder	0.5 m	6	See **note 1**
(USB)	USB connector	1 m	9-10-11-12	
5V FLYBOX GPS	To red wire of the optional Flybox GPS (not used for other GPS)	0.5 m	9	See **note 2**
GPS TX	GPS TX input	0.5 m	14	

All shielded cable braid are connected to ground (GND).
WARNING: Insulate not used wires.

Note1: The 10Kohm resistor needed to enable the transponder output is already fitted inside the connector housing of the wiring between pin#1 and pin#14.

Note2: THIS WIRE IS EXCLUSIVELY USED TO CONNECT THE OPTIONAL FLYBOX GPS COD.810010. DO NOT CONNECT IT BUT LEAVE IT INSULATED IF YOU DON'T HAVE THE FLYBOX GPS COD.810010. A VOLTAGE APPLIED TO THIS WIRE PERMANENTLY DAMAGE THE INSTRUMENT.

DETAIL OF OPTIONAL WIRING FOR OBLO'-A/P (cod. 802010)

LABEL	DESCRIPTION	LENGTH.	PIN #	NOTE
+ 12	+12V Main supply	0.5 m	1	
GND	GND Main supply	0.5 m	2	
AP BUS	Autopilot communication line	1 m	WHITE=3, BLUE/WHITE=4	See **note 1**
TRANSPONDER	Altitude serial out for transponder	0.5 m	6	See **note 2**
SWITCH	Autopilot remote switch	2 m	7	
(USB)	USB connector	1 m	9-10-11-12	
5V FLYBOX GPS	To red wire of the optional Flybox GPS (not used for other GPS)	0.5 m	9	See **note 3**
AUDIO	Audio output	0.5 m	13	
GPS TX	GPS TX input	0.5 m	14	

All shielded cable braid are connected to ground (GND).
WARNING: Insulate not used wires.

Note1: White wire must be connected to pin#1 of CON4P ACU autopilot control unit connector, blue/white wire must be connected to pin#3 of the same connector.
Between pin#3 and pin#4 there is a 120 ohm resistor already fitted inside the connector housing of the wiring.

Note2: The 10Kohm resistor needed to enable the transponder output is already fitted inside the connector housing of the wiring between pin#1 and pin#14.

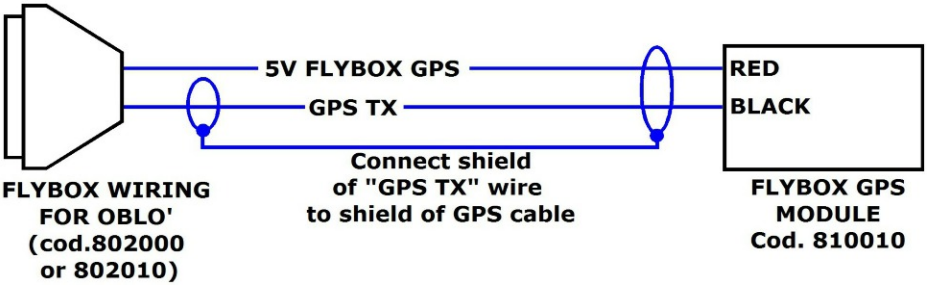
Note3: THIS WIRE IS EXCLUSIVELY USED TO CONNECT THE OPTIONAL FLYBOX GPS COD.810010. DO NOT CONNECT IT BUT LEAVE IT INSULATED IF YOU DON'T HAVE THE FLYBOX GPS COD.810010. A VOLTAGE APPLIED TO THIS WIRE PERMANENTLY DAMAGE THE INSTRUMENT.

APPENDIX "C"

ELECTRICAL INSTALLATION FOR OPTIONAL GPS MODULE (COD.810010)

Case 1

Follow this schematic if you have the ready to use Flybox® wirings for Oblò (cod.802000 or 802010):

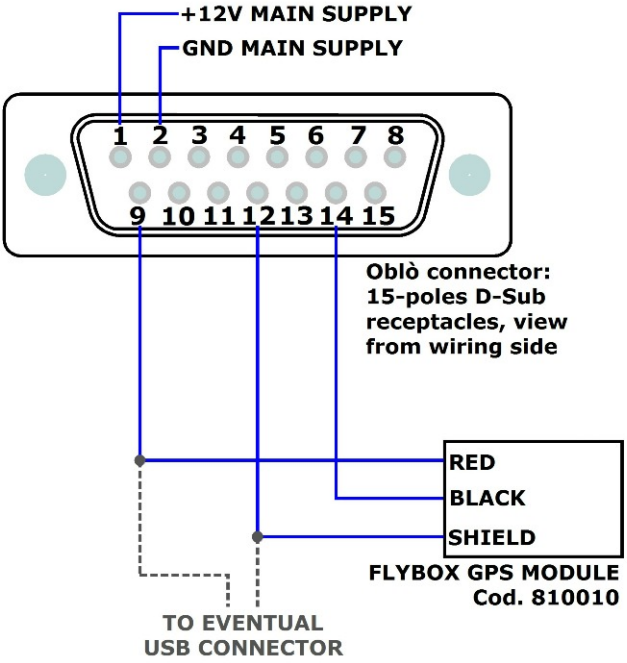


The Flybox® GPS has one shielded wire with two poles:

RED WIRE: +5V positive supply (connect to wire "5V Flybox GPS" of Flybox® wiring).
BLACK WIRE: GPS TX signal (connect to wire "GPS TX" of Flybox® wiring).
SHIELD: Ground shield (connect to shield of wire "GPS TX").

Case 2

Follow this schematic if you made by yourself the wirings:



The Flybox® GPS has one shielded wire with two poles:

RED WIRE: +5V positive supply (connect to pin #9 of Oblò connector)
BLACK WIRE: GPS TX signal (connect to pin#14 of Oblò connector)
SHIELD: Ground shield (connect to pin#12 of Oblò connector)

NOTE: Power supply of the GPS share the same wires of the eventual USB connector (pin #9 and pin#12 of the Oblò connector).

Check frequently our web site
www.flyboxavionics.it
to see if there are any software updates.

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.

Date	Revision	Description
9/2013	19	Minor corrections
10/2013	20	Minor corrections
01/2014	21	Updated with Oblò-REP
04/2014	22	Chap.1.3 note
06/2014	23	Layout update
11/2014	24	Altimeter calibration and “Light” parameter
3/2015	25	Minor corrections
4/2015	26	Minor corrections
5/2015	27	Updated with “ADI” menu
7/2015	28	Updated with “Config” menu
11/2015	29	Updated chap.1.1
2/2016	30	Updated autopilot with FX75 servo
03/2016	31	Minor corrections
05/2016	32	Minor corrections
09/2016	33	Minor corrections
11/2016	34	Minor corrections
03/2017	35	Updated with Appendix “B” and “C”
04/2017	36	Updated with HSI and drum altimeter page
06/2017	37	Minor corrections

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