

SBX

eCopilot Sensor Box

System Installation Manual 1.1



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1 Important Notices

The LXNAV system is designed for VFR use only as an aid to prudent navigation. All information is presented for reference only. Terrain, airports and airspace data are provided only as an aid to situation awareness.

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A Yellow triangle is shown for parts of the manual which should be read very carefully and are important for operating the system.



Notes with a red triangle describe procedures which are critical and may result in loss of data or any other critical situation.



A bulb icon is shown when a useful hint is provided to the reader.

1.1 Limited Warranty

This LXNAV product is warranted to be free from defects in materials or workmanship for two years from the date of purchase. Within this period, LXNAV will, at its sole discretion, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts and labour, provided that the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident, or unauthorised alterations or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL LXNAV BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE, OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. Some states do not allow the exclusion of incidental or consequential damages, so the above limitations may not apply to you. LXNAV retains the exclusive right to repair or replace the unit or software, or to offer a full refund of the purchase price, at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

To obtain warranty service, contact your local LXNAV dealer or contact LXNAV directly.

2 Introduction

The printed version of this installation manual is in grayscale. Some figures and diagrams are coloured. Please refer to electronic version to see colours. The latest electronic version of this manual can be downloaded from <http://www.lxnav.com> section downloads-manuals.

This manual will guide you through the installation process of all systems, components, basic setup and check of the system.



Before using any part of the system, please read and understand the installation and user manuals!



There are no serviceable parts within the unit, hence the unit must be taken to the factory for service.



Opening the unit by the user will void warranty and airworthiness.

3 Overview of the System

3.1 Packing list

- 1x SBX
- 1x GPS antenna (3.1m)
- 1x cable with temperature sensor and 2.5 mm jack connector (1.5m)

3.2 Overview

SBX is a sensor box unit for providing information about airplane attitude. It combines data from internal pressure sensors, GPS receiver, 3-axis gyro, 3-axis accelerometer and, if available, also from external Compass. Data for user is available as altitude and speed, GPS position and attitude of unit (airplane). Its communication with main unit goes over CAN bus.

4 System Planning

In this chapter the installer will be informed how and where SBX can be installed. Unit has some environmental and location requirements. Read this manual carefully.

4.1 Power Consumption

SBX obtain power from the main unit, thus it does not need a circuit breaker as the main unit takes care of this. But beware that voltage on SBX is the same as on eCopilot.

Table 1: Absolute maximum ratings

Parameter	Symbol	Rating	Units
Power supply	U	35.00	V
Power consumption	I	150	mA

Table 2: Recommended electrical and mechanical characteristics

Parameter	Symbol	Min	Typ	Max	Units
Power supply	U	10.0	12.0	28.0	V
Power consumption @ 12 V, stby	I	0.10	0.12	0.14	A
Voltage on SC, VP, IO0 ... IO3	U	3.25	3.30	3.35	V
Voltage on OAT pin	U	5.80	5.85	5.90	V
Operating temperature range	T	-30.0	-	+60.0	°C
Storage temperature	T	-40.0	-	+80.0	°C
Weight (without screws and cables)	m	-	304	-	g

4.2 Cooling Requirements

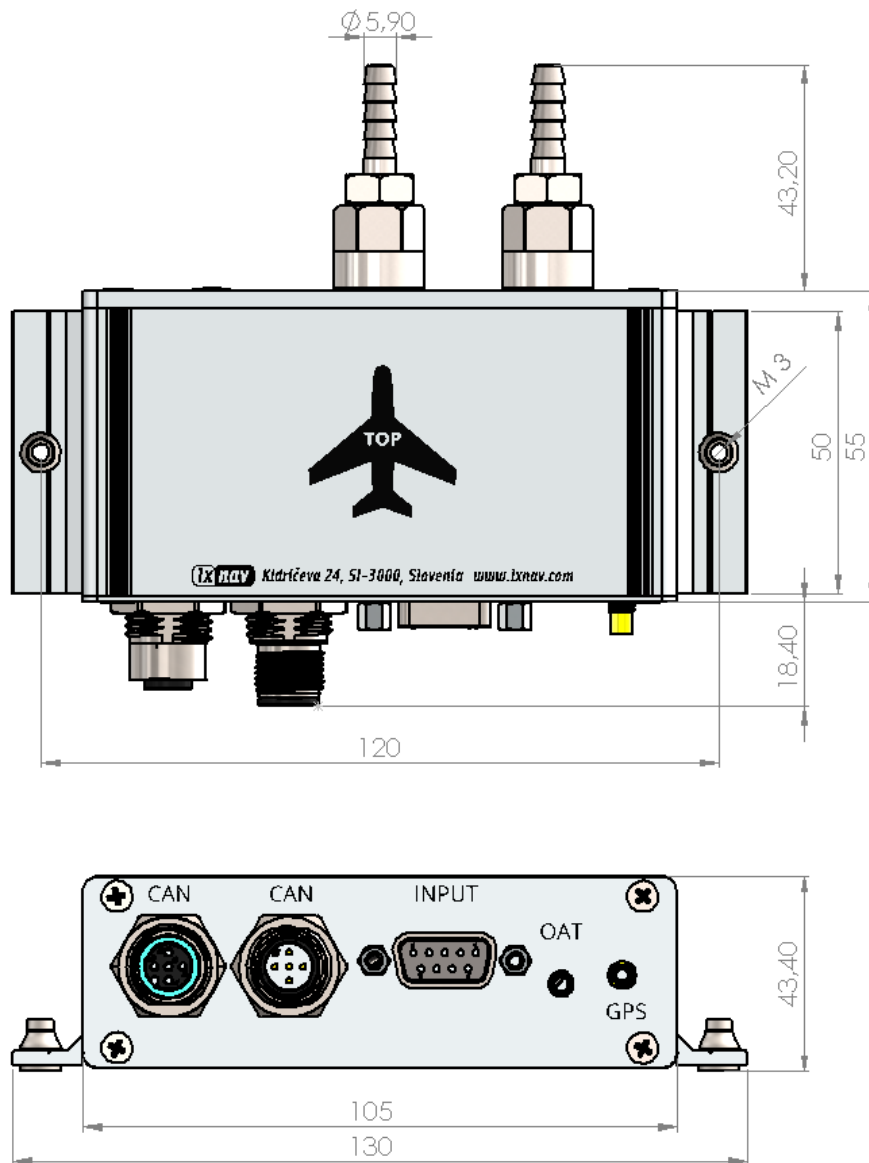
Currently there are no cooling requirements. Unit itself does not produce much heat. If possible, mount SBX away from direct sunlight and especially engine heat.

4.3 Mounting Requirements

As most other LXNAV units, SBX is fastened with screws. Unit is designed for mounting horizontally to a flat solid surface. To prevent jumping of unit, under it can be laid part of thick cloth or rubber.

Because of build-in attitude sensors, align it with longitudinal, lateral and vertical axis. Required is position in center of gravity (CG) of the airplane, but as this is not possible in most airplanes, try to maintain as small distance of unit from CG as possible. For right orientation follow markings on SBX enclosure. In no way do not mount it on a firewall or other objects where are possible vibrations.

4.4 Dimensions



Drawing is not to scale

4.5 System Communication Wiring

4.5.1 Communication BUS and connector pinout

Sensor box uses CAN communication to talk with other devices. On unit enclosure are mounted two M12 connectors for this purpose. Both of them, male and female, have 5 pins for communication and power supply. To main unit is connected with appropriate 5-pin cable which should be routed first as they are bigger than other cables. Tight them firmly to airplane fuselage.

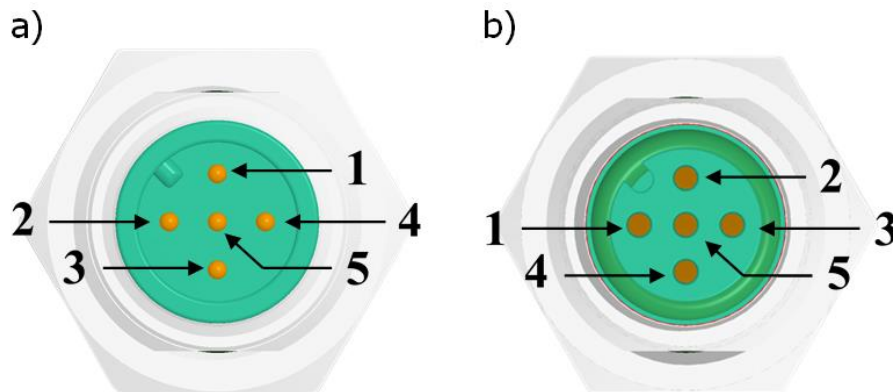


Figure 1: Pinout of M12 connectors: a) male b) female

Table 3: M12 connector pinout

Pin	Type	Description
1	Shield	Cable shielding pin
2	PWR	Positive power supply
3	GND	Ground pin
4	CAN-H	CAN high signal line
5	CAN-L	CAN low signal line

4.5.2 Splitters and terminators

LXNAV CAN bus is designed that it does not need separate splitters for communication. Each device with CAN has two M12 connectors for cable. Thus it acts like splitter. If there are more devices in system, simply wire cable from available M12 connector to next unit. When units are connected together it is mandatory that CAN terminator is mounted on each end. Without them communication could work, but it is not reliable in all situations.

4.5.3 Basic Installation

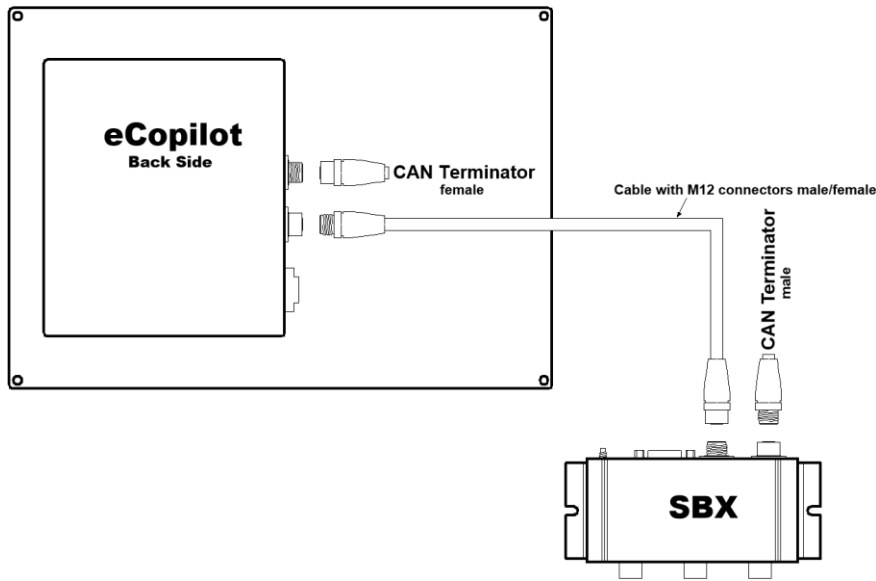


Figure 2: Connection scheme with eCopilot and SBX

4.5.4 More Complex Installation

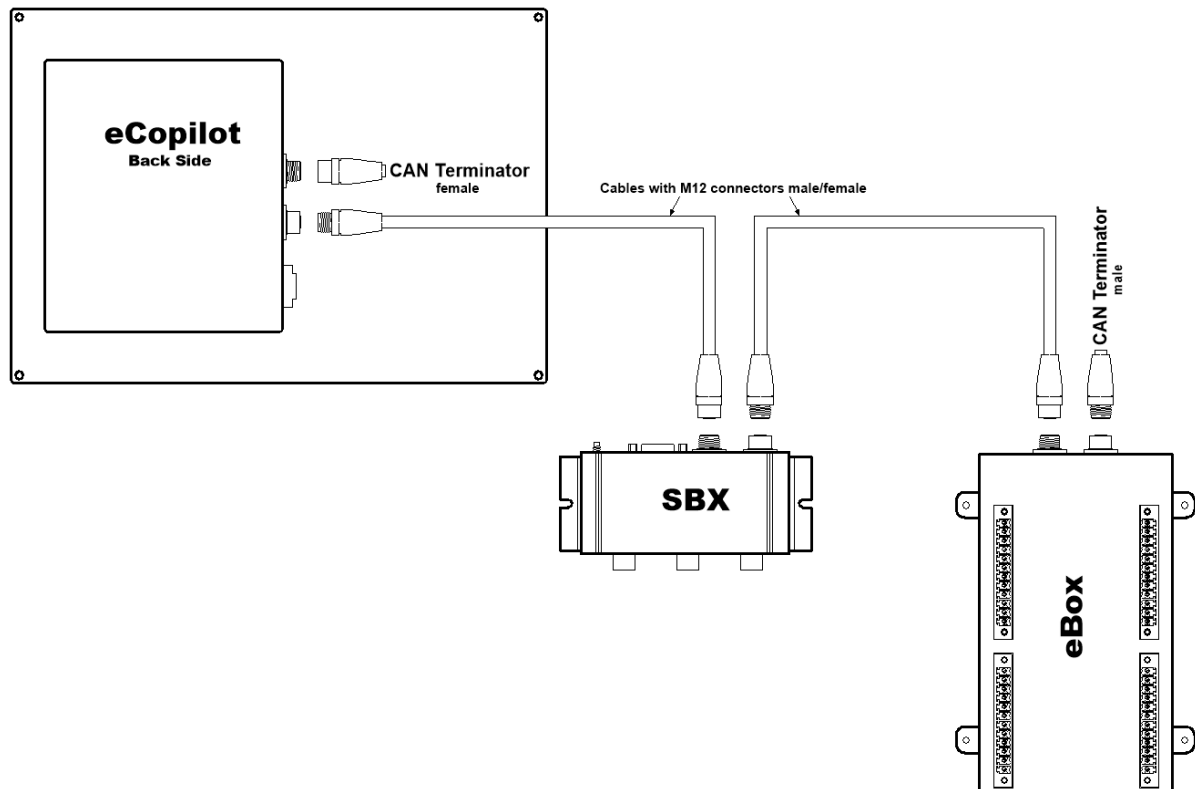


Figure 3: Connection scheme with eCopilot, SBX and eBox

4.5.5 Available Cables and Terminators

Table 4: With SBX compatible cables and terminators

Cable Part Number	Description
Connection cable with M12 male/female 0.5 m Order Nr.: eCopilot CAN BUS M12 cable 0.5m	Cable for connection between CAN units. With male and female connectors. Length: 0.5 m
Connection cable with M12 male/female 2 m Order Nr.: eCopilot CAN BUS M12 cable 2m	Cable for connection between CAN units. With male and female connectors. Length: 0.5 m
Connection cable with M12 male/female 3 m Order Nr.: eCopilot CAN BUS M12 cable 3m	Cable for connection between CAN units. With male and female connectors. Length: 0.5 m
Connection cable with M12 male/female 5 m Order Nr.: eCopilot CAN BUS M12 cable 5m	Cable for connection between CAN units. With male and female connectors. Length: 0.5 m
CAN terminators with male and female M12 Order Nr.: currently not available separately	M12 CAN terminators, 2pcs in pack, with male and female connector

4.6 Pneumatics

There are available two versions of SBX. Standard one has on its front panel two pressure ports, P_{st} and P_{tot} . Second option has additional pressure port for Angle of Attack (AOA). Please carefully connect tubes to the correct port of the SBX:

- **P_{st}** = Static pressure (P_{static})
- **P_{tot}** = Pitot or Total pressure (P_{total})
- **AOA** = Angle of Attack



Figure 4: Static ports on front panel of SBX

4.7 GPS antenna

SBX supports active GPS antennas with SMA connector. They should be mounted away from electronics and cables, on a place with clear view to the sky. Avoid metal and carbon covers due to signal reception.

4.8 Temperature sensor

Because pressure varies with temperature, LM335 temperature sensor has to be mounted in airplane ventilation, away from heat sources, to calculate as precise pressure as possible.

4.9 Inputs on SUB D9

Several inputs can be used on SBX for various purposes, either for use with remote control stick or warning switches. Each of six inputs can be configured individually. On eCopilot they can be set under *Setup menu->Hardware->Sensor box*. Currently are supported functions for:

- ENTER button on PFD
- ESC button on PFD
- DOT button on PFD
- ENTER button on SFD
- ESC button on SFD
- DOR button on SFD
- Canopy locked
- Radio PTT active
- Engine failure
- Low fuel

Inputs have fixed internal pull-up resistors tied to 3.3 V. They should be wired to ground for activation. However, depending on the type of switch (normally open/closed) active states of inputs can be inverted. On sensor box is mounted female SUB D9 connector, so the user should use appropriate male type on the opposite side. Pins are arranged as in the picture bellow but they are marked on the connector as well.

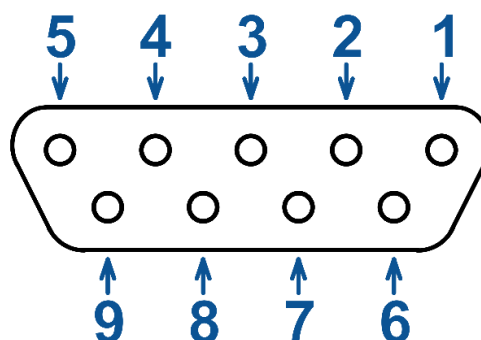


Figure 5: Pinout of SUB D9 connector on SBX

Table 5: Pinout of SUB D9 connector

Pin	Type	Description
1	DNC	Do not connect
2	SC	SC input pin
3	VP	VP input pin
4	IO3	Input pin 3
5	GND	Ground pin
6	IO0	Input pin 0
7	IO1	Input pin 1
8	IO2	Input pin 2
9	GND	Ground pin

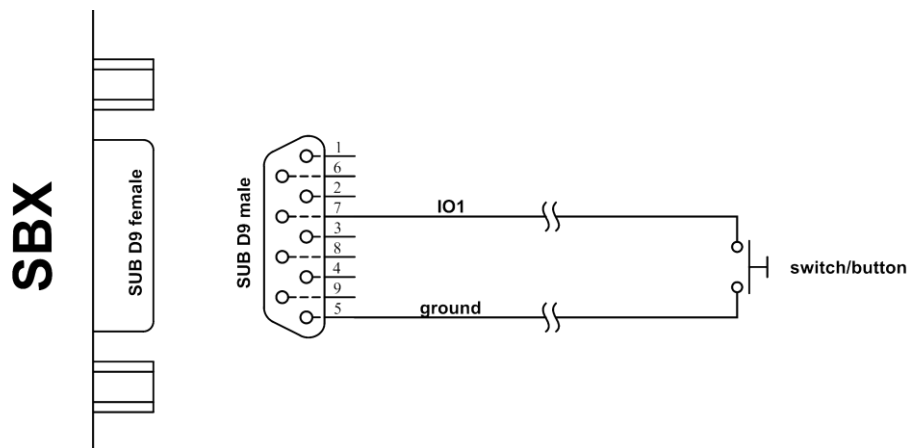


Figure 6: Example of switch wired to input 1

5 Connection and Functionality Check of All Peripheral Units

The SBX unit is connected to 12 V power via CAN bus. Usually only master device is supplied with power, all other units get power from it. Before powering up the system, check all wires and cables sit firmly in their position, then make sure that input power on eCopilot has correct polarity. Red (or white) wire must be tied to positive supply lead and blue (or black) wire to ground.

After that, turn power on and eCopilot will automatically power all devices on CAN bus (as long as they don't have separate power wires). SBX does not have any visual indication that makes you sure it works. Instead of that wait for eCopilot to start and then go to "Setup" menu, scroll down to "Data sources" submenu and enter. In the list you should see SBX option.

If you do not see Sensor Box Unit check cables and terminators. Last one must be mounted on each end of CAN bus wiring.

6 Firmware Updates

All firmware updates are performed by entering password "89891" in the setup menu of main unit. If on the SD card is only one update file, eCopilot will automatically select it and update appropriate unit. If there is more than one update, next step is to choose the firmware file named App_NINC_x.xx.lxfw, where x.xx is version of update file.

7 Revision History

Date	Revision	Description
August 2017	1.0	Initial release of installation manual
April 2022	1.1	Added input functionality 4.9



The Pilot's Choice

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