



Figure 14.1: Connecting the battery to the FOX3-2G/3G/4G devices

7.3.1. How to enter the PIN of the inserted SIM card

To insert the PIN of the SIM card follow the steps below (as reference use fig. 15):

- 1) Install the **Workbench** software,
- 2) Connect your FOX3-2G/3G/4G to a free PC COM port via its Promotion Kit and power up your device. **How to set up your FOX3-2G/3G/4G using a Evalboard, is currently in preparation.**
- 3) Start the **Workbench** software, open a **COM Port (1)**, a **Terminal (2)** and an **Editor (3)**, then select the COM port **(4)** and port settings (115200 bps, 8 Data bits, No Parity bit, 1 Stop bit, None Flow control).
- 4) Next, click on the **Connect** icon (II) on the left of the text "Port", to connect to. Connect the **Console (5)** to the **COM Port** and the **Editor (6)** to the **Console** on the **Connection view**. For more details refer to the Workbench User's Guide.
- 5) Finally, type the command **\$PFAL,Cnf.Set,GSM.PIN=xxxx** on the the editor (xxxx=PIN of your SIM card) and then send it to the device by double-click. For more details refer to the manual "[AVL_PFAL_Configuration_Command_Set.pdf](#)".

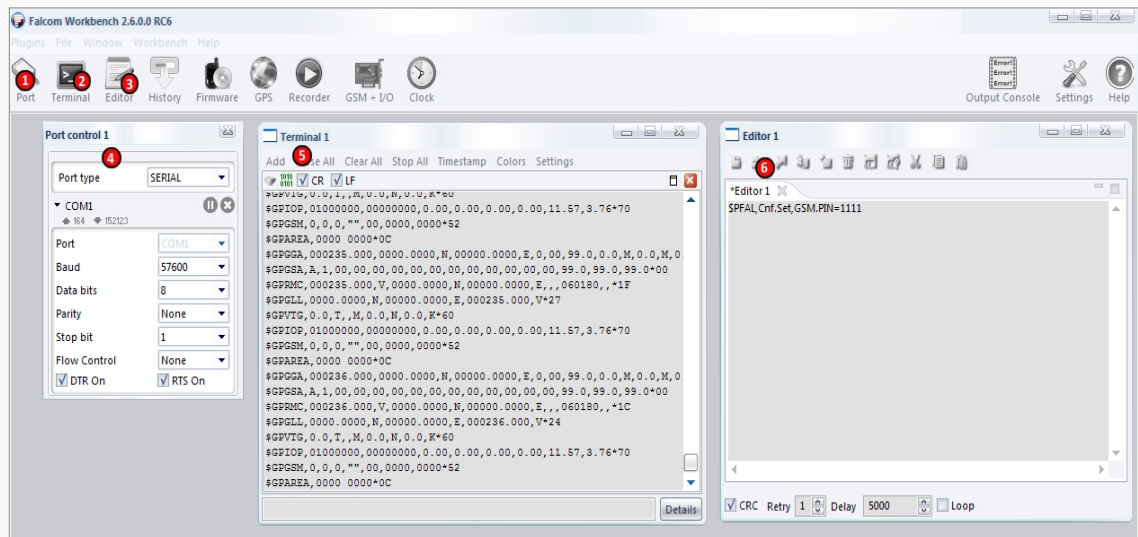


Figure 15: Entering the PIN code of the inserted SIM card.

7.4. LED indicators

The actual state of the FOX3-2G/3G/4G can be displayed by three LED's on the front panel of the unit. These programmable and accessible LEDs can be interfaced to the build-in components to show their state. References how to customize the device configuration can be found in the FOX3-2G/3G/4G software manual "AVL_PFAL_Configuration_Command_Set.pdf".

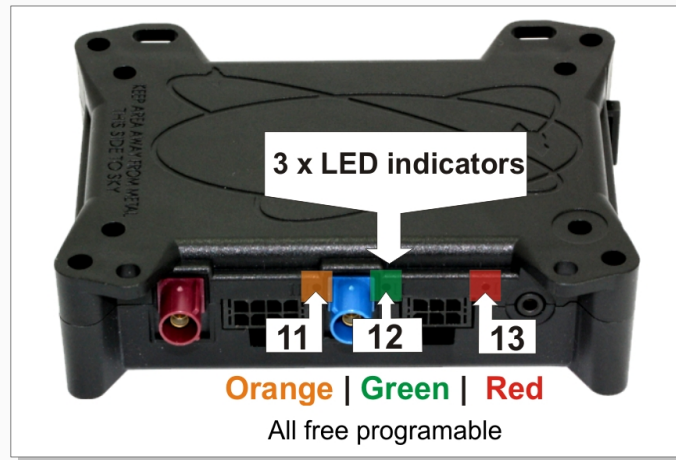


Figure 16: View of LED indicators

To turn on one of these LEDs, use the following command:

```
$PFAL,IO11.Set=high           // 11=LED Orange;
$PFAL,IO12.Set=hpulse,2000    // 12=LED Green;
$PFAL,IO13.Set=cyclic,2000,1000 // 13=LED Red;
```

To turn off these LEDs, use the following command with corresponding index number:

```
$PFAL,IO[11,12,13].Set=low
```

7.5. 10pin mini-USB port

This port supports a SPI and a USB 2.0 interface. The following table gives you an overview about the provided pins on this 10pin mini-USB-port.

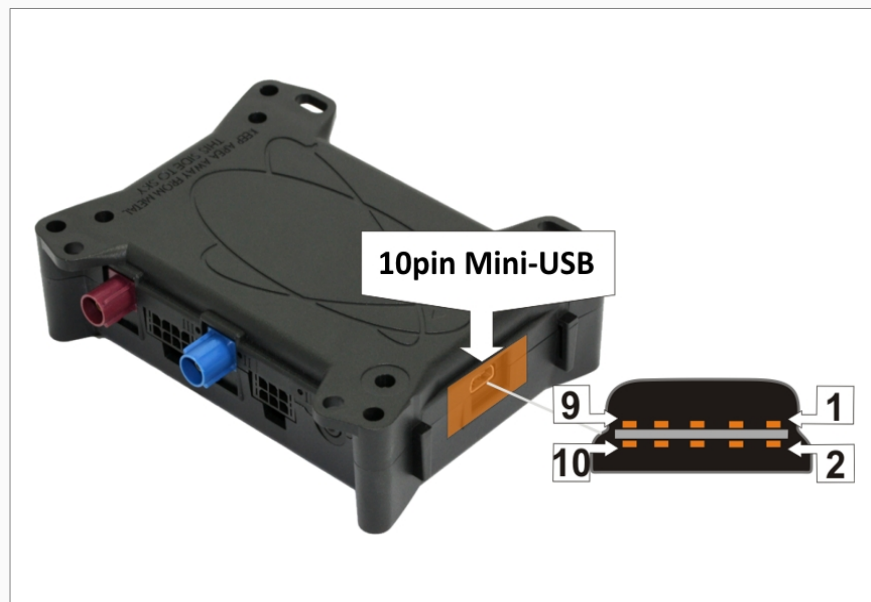


Figure 17: Pin assignments of the 10pin mini-USB port.

This table shows the pinout of 10pin mini-USB connector.

PIN	NAME	DIRECTION	DESCRIPTION	LEVEL
1	MOSI	Output	Master output, slave input	
2	USB_V+	Input / Output	Power supply for IO-BOX	+ 3.6 ... + 5.25 V
3	MISO	Input	Master input, slave output	
4	DM	Input	USB Data -	Complies to the USB 2.0 specifications
5	CLK	Output	Serial clock	
6	DP	Output	USB Data +	Complies to the USB 2.0 specifications
7	Detect USB		Detects the connection to a USB master port.	
8	+IN	Input	=+IN (Pin 1 on 8pin connector)	$V_{+IN} = + 10.8 \dots + 32.0 \text{ V}$; $I_{max} \leq 1\text{A}$
9	CS	Output	Chip select	
10	GND	-	Ground	

Table 10: Pin description of the 10pin mini-USB.

This port can be used to connect the FOX3-2G/3G/4G to the IOBOX-MINI device, which is offered as an accessory to the FOX3-2G/3G/4G device.

7.5.1. Setting up a USB connection for FOX3-2G/3G/4G

To setup a USB connection with FOX3-2G/3G/4G, do the following steps:

1. Download the USB driver free of charge from our website "[FOX3_CDC_driver.zip](https://www.falcom.de/uploads/media/FOX3_CDC_driver.zip)". Please login first then click the link below to download the driver (https://www.falcom.de/uploads/media/FOX3_CDC_driver.zip)
2. Connect the FOX3-2G/3G/4G to a free USB port on your PC via your own mini-USB to USB cable and install the driver. How to install the CDC driver refer to the sub-chapter below.
3. Open a terminal program and send the command `$PFAL,MSG.Send.USB,0,"Speed=&(Speed)"` from the serial port (e.g. Serial 1/0) to the FOX3-2G/3G/4G. The answer to this command will be shown on the terminal program where FOX3-2G/3G/4G is connected to.

7.5.1.1. Installing the CDC driver files for FOX3-2G/3G/4G

To install the FOX3-2G/3G/4G CDC driver, do the following steps:

1. After downloading the driver from our website "[FOX3_CDC_driver.zip](https://www.falcom.de/uploads/media/FOX3_CDC_driver.zip)". Unzip the contents to a separate folder.
2. Connect the FOX3-2G/3G/4G to your PC. You will see a message pop up that installation failed.
3. Right-click the popup, and choose "Browse my computer for Driver Software",

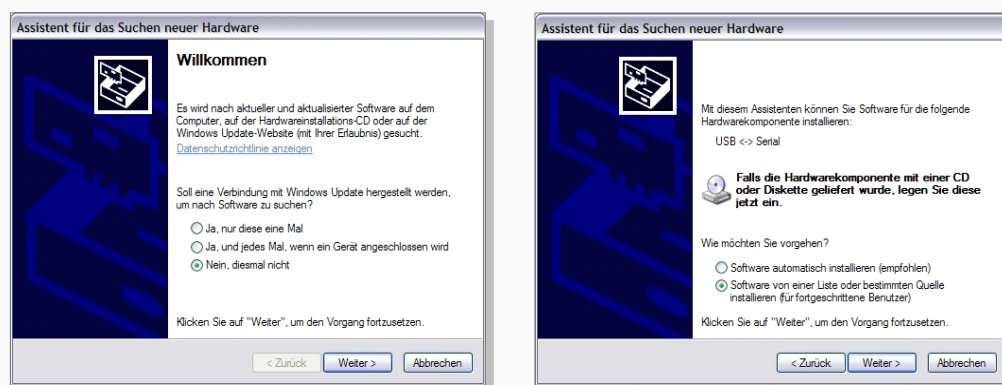


Figure 18: Search for USB drivers for FOX3-2G/3G/4G hardware.

4. In the Browse window, navigate to the folder where you extracted the contents of the Zip driver file. Please note that a double (manual) driver installation is required. In the ZIP file of the FOX3-2G/3G/4G USB driver you can find the file: "*mambo2cdc.inf*"

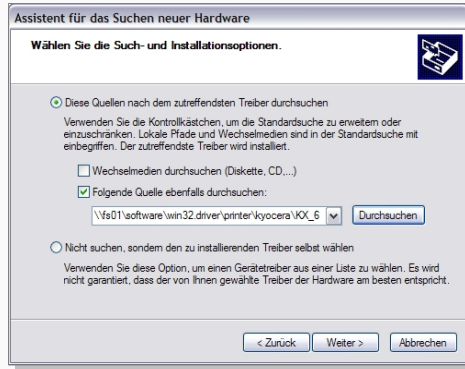


Figure 19: Navigate to the USB CDC driver folder.

5. Follow the remaining prompts and Windows will install the driver.

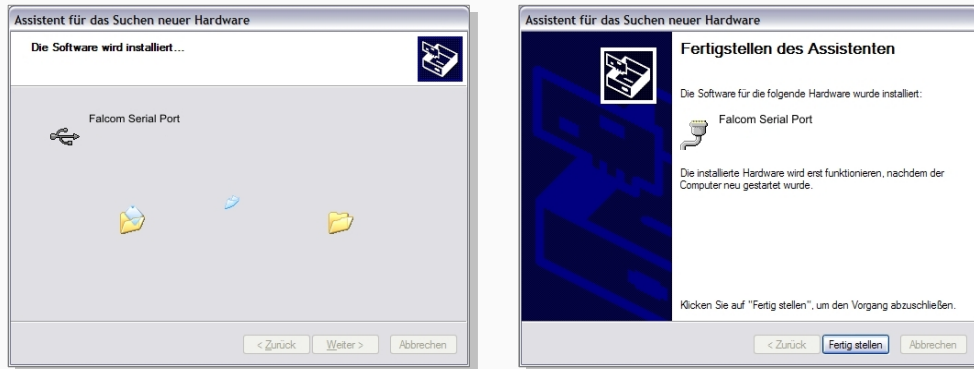


Figure 20: Installing the USB drivers.

6. To find the COM port assigned to the FOX3, open Device Manager, go to "Connections" (as shown in figure below).

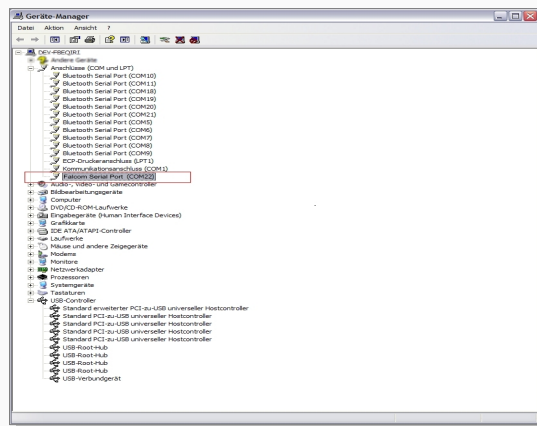


Figure 21: Search for the assigned serial port number.

7. After installation is complete, you can delete the files you downloaded. Windows will reuse the installed driver information for any future FOX3-2G/3G/4G devices.
8. To communicate with FOX3-2G/3G/4G via the USB port, use a Terminal program and select the USB serial port number assigned by the Windows to the installed USB driver in the Device Manager.

7.5.2. IOBOX-MINI/CAN/WLAN accessory devices for FOX3-2G/3G/4G

7.5.2.1. Connecting IOBOX-MINI/CAN/WLAN to FOX3-2G/3G/4G

Requirements for mounting the IOBOX-MINI/CAN/WLAN to the FOX3-2G/3G/4G devices:

- T6-TORX screwdriver

To mount the IOBOX-MINI or IOBOX-CAN to one of the FOX3-2G/3G/4G devices or IOBOX-WLAN to one of the FOX3-3G/4G devices, follow next steps:

1. Remove the power supply and any other connections from the device. Use a T6-TORX screwdriver as shown in step (1) and unscrew 4 screws as shown in step (2).
2. Open the casing of the device as shown in step (3).
3. Indicate the USB connector on the device PCB and plug in the IOBOX-MINI or IOBOX-CAN to it as shown in steps (4) and (5).
4. Hold pressed the front of the IOBOX-MINI or IOBOX-CAN or IOBOX-WLAN as shown in step (6) and place the lower case on to the upper case of the device. Insert carefully the two tabs of the IOBOX-MINI or IOBOX-CAN or IOBOX-WLAN into the two slots of the lower case of the device (6) and then slide the lower case until it stops (7).
5. Close the device with all 4 screws (8). Make sure that both cases fit to each other and there is no space between them. When tightening the screws, apply a tightening torque equal to these values: TORX 6 screwdriver with a fixed torque of 0.5 - 0.6 Nm



Figure 22: Mounting IOBOX-MINI or IOBOX-CAN/WLAN to the FOX3-2G/3G/4G devices.

7.5.2.2. IOBOX-MINI pinout

The IOBOX-MINI is offered for the FOX3-2G/3G/4G as an accessory for input/output extensions. To connect external input/output ports to the IOBOX-MINI, you have to order **CA38** - 16pin cable.



FOX3-2G/3G/4G with IOBOX-MINI plugged in

IOBOX-MINI assignment

Figure 23: IOBOX-MINI pinout.

This table shows the pinout of IOBOX-MINI.

PIN	NAME	I/O	DESCRIPTION	LEVEL
1	GND	-	Ground.	0 V
2	IN5	I	Digital input.	0 .. +32.0 V DC ($V_{+IN} = +IN$)
3	-	-	No function	-
4	IN6	I	Digital input.	0 .. +32.0 V DC ($V_{+IN} = +IN$)
5	-	-	No function	-
6	IN7	I	Digital input.	0 .. +32.0 V DC ($V_{+IN} = +IN$)
7	ANA	I	Analogue input with 10 bits resolution.	0 .. +32.0V DC
8	IN0	I	Digital input.	0 .. +32.0 V DC ($V_{+IN} = +IN$)
9	OUT0	O	Open collector output *	100 mA max. @ 0 .. +32.0V DC
10	IN1	I	Digital input.	0 .. +32.0 V DC ($V_{+IN} = +IN$)
11	OUT1	O	Open collector output *	100 mA max. @ 0 .. +32.0V DC
12	IN2	I	Digital input.	0 .. +32.0 V DC ($V_{+IN} = +IN$)
13	OUT3	O	Open collector output *	100 mA max. @ 0 .. +32.0V DC
14	IN3	I	Digital input.	0 .. +32.0 V DC ($V_{+IN} = +IN$)
15	OUT2	O	Open collector output *	100 mA max. @ 0 .. +32.0V DC
16	IN4	I	Digital input.	0 .. +32.0 V DC ($V_{+IN} = +IN$)

* It is strongly recommended to connect a separate flyback diode across the high inductive loads (e.g. relay). For details, refer to the connection diagram shown in Figure 10.

Table 11: IOBOX-MINI pinout

The indices of these inputs and outputs can be found in the manual "AVL_PFAL_Configuration_Command_Set.pdf".

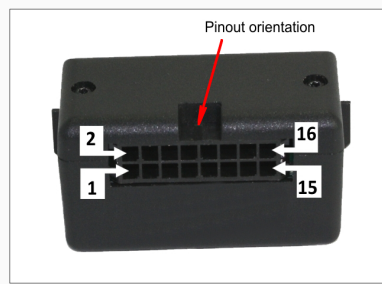
7.5.2.3. IOBOX-CAN/WLAN pinout

The IOBOX-CAN/WLAN are offered for the FOX3-3G/4G as accessory devices for using an additional CAN Bus interface (known in the firmware as CANB interface) and extend the input/output ports on the FOX3-2G/3G/4G. To connect external input/output ports to the IOBOX-CAN/WLAN and use also second CAN Bus features, you have to order **CA38** - 16pin cable.

Please note that, the IOBOX-WLAN is an IOBOX-CAN with WLAN connectivity. It connects to a WLAN access point and delivers real time data via WLAN to your server. WLAN is supported with AVL firmware 3.0 and higher. For more details refer to the related documents [17] and for D8 functionality, refer to the related documents [16].



FOX3-2G/3G/4G with IOBOX-CAN/WLAN plugged in



IOBOX-CAN/WLAN assignment

Figure 24: IOBOX-CAN/WLAN pinout.

This table shows the pinout of IOBOX-CAN/WLAN.

PIN	NAME	I/O	DESCRIPTION	Main function	Alternative function	LEVEL
1	V5CAN	O	Power Supply Output	-	-	Vout = 5V DC ; I _{max} ≤ 50mA
2	IN1	I	Digital/Analogue input	Analogue 10-bit resolution	Digital	0 V DC .. +52.0 V DC
3	GND	-	Ground			0 V
4	IN2	I	Digital/Analogue input. Alternative as D8 data input (reading live data from VDO and Stoneridge tachographs)	Analogue 10-bit resolution	Digital	0 V DC .. +52.0 V DC
5	OUT1	O	Open collector output*	Output	-	100 mA max. @ 0 .. +32.0V DC
6	IN3	I	Digital/Analogue input	Analogue 10-bit resolution	Digital	0 V DC .. +52.0 V DC
7	OUT2	O	Open collector output*	Output	-	100 mA max. @ 0 .. +32.0V DC
8	IN4	I	Digital/Analogue input	Analogue 10-bit resolution	Digital	0 V DC .. +52.0 V DC
9	OUT3	O	Open collector output*	Output	-	100 mA max. @ 0 .. +32.0V DC
10	CAN_H	I/O	CAN HIGH-level	-	-	-
11	OUT4	O	Open collector output*	Output	-	100 mA max. @ 0 .. +32.0V DC
12	CAN_L	I/O	CAN LOW-level	-	-	-
13	K-LINE	I/O	Currently not supported	-	-	-
14	L-LINE	O	Currently not supported	-	-	-
15	VCAN	I	Currently not used	-	-	
16	GND_CAN	-	Ground	-	-	0 V

* It is strongly recommended to connect a separate flyback diode across the high inductive loads (e.g. relay). For details, refer to the connection diagram shown in Figure 10.

Table 12: IOBOX-CAN/WLAN pinout

The indices of these inputs and outputs and information how to use this CAN interface can be found in the manual "AVL_PFAL_Configuration_Command_Set.pdf" and "AppNote_CAN_FMS_CAN_OBDII_Howto.pdf".

7.6. Mounting

FOX3-2G/3G/4G offer different mounting possibilities, depending on the kind of the antenna used.

1. When installing one of FOX3-2G/3G/4G with internal antennas, please make sure the FOX3-2G/3G/4G' back side with the text "THIS SIDE TO SKY" is facing up to the sky, with no metal objects above or under the device case that can interfere with GPS reception.
2. When installing a FOX3-2G/3G/4G with external antennas, there are two connectors on the device for connecting a GPS/GNSS antenna such as FAL-ANT-11 (*shown in figure below*) or FAL-ANT-12. During the installation, please make sure the receiving side of the GSM/GPS antenna is up, with no metal object above or under the antenna and device that interfere with GPS reception.

Each of FOX3-2G/3G/4G provide 8 holes to be attached to suitable locations (see figure below). It can be mounted in different directions and different locations such as on wall or in vehicle. Fasteners can be Hexagon head with collar self drilling screws DIN 7504 K, ST3.5 x 32(12) mm and different length. **There are no screws included in the delivery pack.** More detailed information how to install the device in the vehicle, refer to the application note "AppNotes_AVL_Installation_Guide.pdf".

FOX3-2G/3G/4G are NOT waterproof or sealed devices. Care must be taken to ensure the devices are kept away from water or any other liquids.

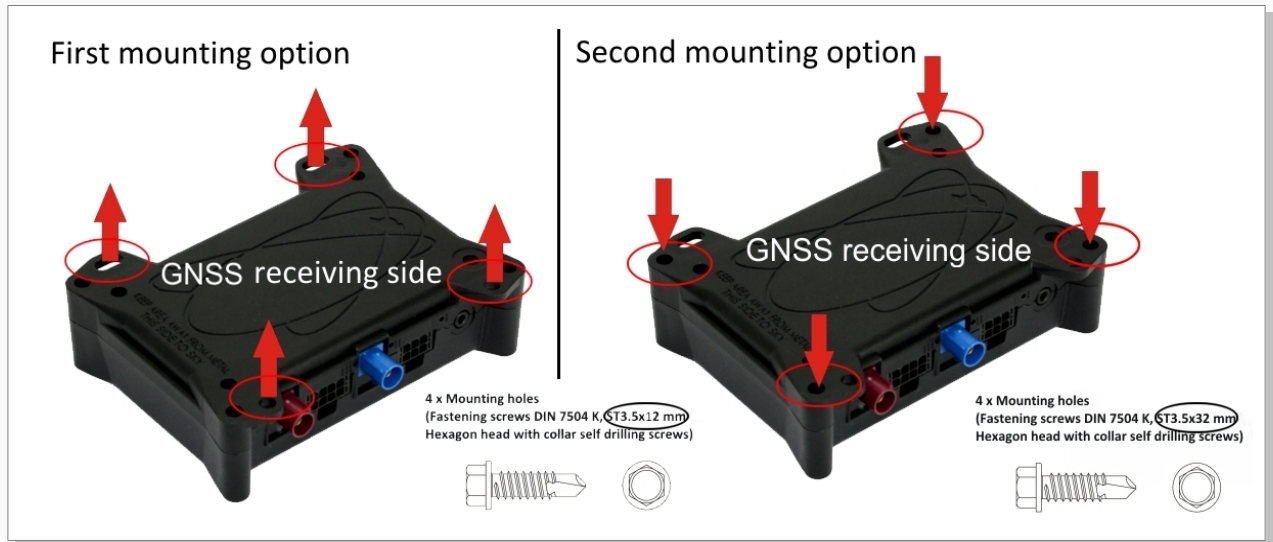


Figure 25: View of the mounting holes

7.6.1. External Antenna Ports

FOX3-2G/3G/4G are fitted with two male *SMB FAKRA* connectors that accept a wide variety of GSM/GNSS antenna styles for using external antennas instead of the internal ones. The **Bordeaux** connector (see figure below) is for connecting a GSM antenna. The **Blue** connector (see figure below) is for connecting a GNSS antenna. **There is no antenna included in the standard delivery, it needs to be ordered separately.**

We provide two combined *GSM/GNSS* antenna (FAL-ANT11) especially, for the FOX3 series, the 2G/3G/GNSS antenna (FAL-ANT-12) for FOX3-3G series and FAL-ANT-14 for FOX3-4G Series.

For more details about the FAL-ANT-11, FAL-ANT-12 and FAL-ANT-14, refer to the data sheet available on our web page.



Figure 26: GSM/GPS antenna ports

CAUTION : Be careful not to accidental swap the GSM and GPS connectors. The device will not function if the antennas are swapped.

In order to comply with RF exposure requirements, install the antenna so that a distance minimum of 20 cm can be maintained between the antenna and persons.

To connect the **FAL-ANT-11** or **FAL-ANT-12** combined GSM/GPS antenna to the FOX3 or FOX3-3G devices:

- ✓ Plug the **Bordeaux**-coloured connector of the antenna to the **Bordeaux** coloured connector of the device.
- ✓ Plug the **Blue**-coloured connector of the antenna to the **Blue** coloured connector of the device.

To remove the **FAL-ANT-11** or **FAL-ANT-12** GSM/GPS antenna from the FOX3 or FOX3-3G devices:

- ✓ Press down the latches on the antenna connectors and then pull the antennas.

Do not mount the antenna visible on the dashboard but mount it in a location underneath the dashboard. Hiding the antenna is key to successful security in the event of theft. FOX3-2G/3G/4G devices generate events in case of the GNSS antenna is connected, disconnected or cut off. If an intruder cuts off the GNSS antenna cable, an event is generated which can be used to trigger alarm notifications to the user.

7.7. Audio Interface

Only FOX3 and FOX3-3G-AU devices have a 2.5 mm audio female 4pin connector for connecting an external active SPK/MIC device. If you are going to connect a loudspeaker directly to these devices, we highly recommended the cable of the loudspeaker or the loudspeaker which is galvanic isolated from the audio channel of the FOX3/-3G devices. This ensures a properly operation of the loudspeaker.

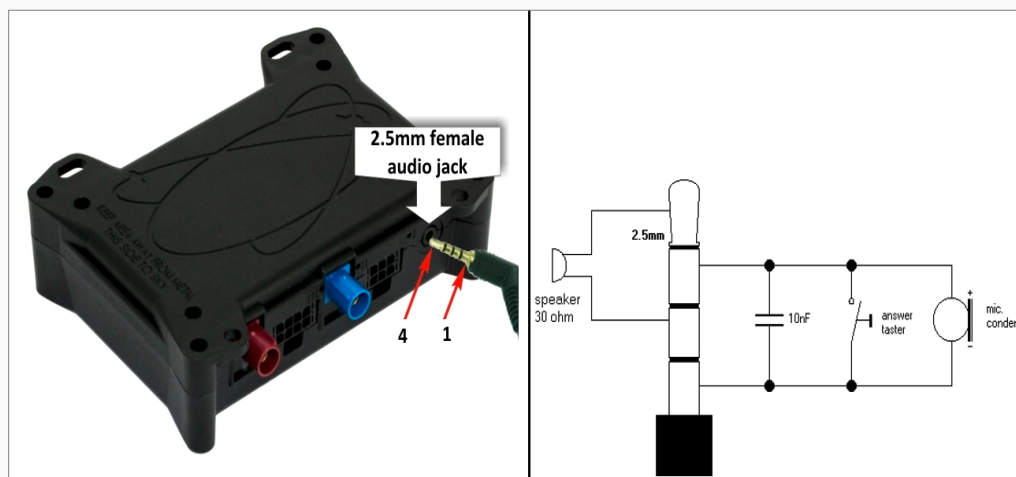


Figure 27: Audio plug 4pin connector

To know the pinout of the audio jack on the FOX3-2G/3G/4G-AUDIO, see table below.

Pin	Pin name	Description	Pin	Pin name	Description
1	MIC	Mic -	3	MIC	Mic +
2	R_SPKR	Right audio speaker	4	L_SPKR	Left audio speaker

The following table lists some typical electret microphone electrical and speaker characteristics when connecting them directly to the FOX3-2G/3G/4G-AUDIO audio interfaces:

Microphone	The microphone should be a electret condenser microphone @ 2.2 k.
Speaker	The speaker should be a passive headset with 80 ohm or a active speaker with symmetric balanced input. Asymmetric non balanced input will cause GSM noise in the speaker.

We provide an adapter cable (called "**CA81b**") with an integrated transformer that provides a full galvanic isolation between the FOX3-2G/3G/4G-AUDIO audio interfaces and your loudspeaker. It allows connection to any loudspeaker on the market. If you would like to use this audio adapter cable, then you need to order it using the order designation "**CA81b**".

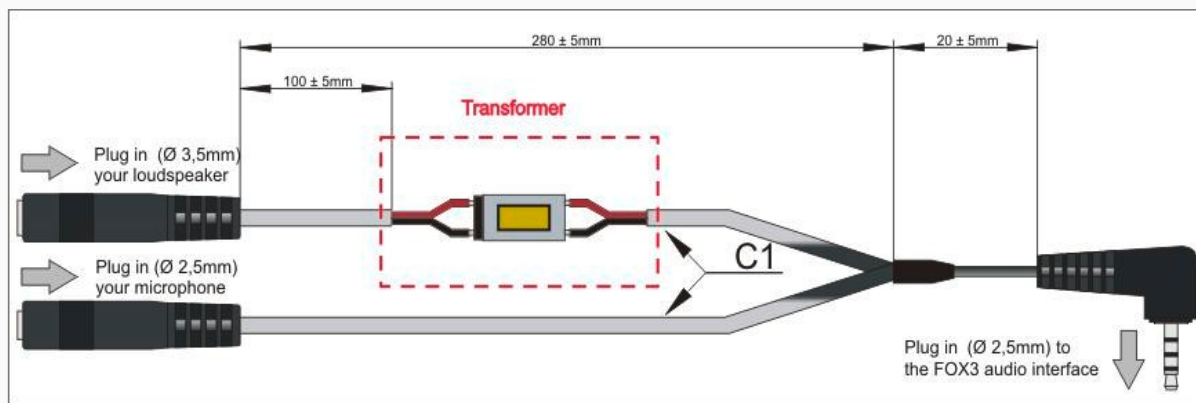


Figure 27.1: CA81b - Audio cable with integrated transformer provided by us

8. HOUSING

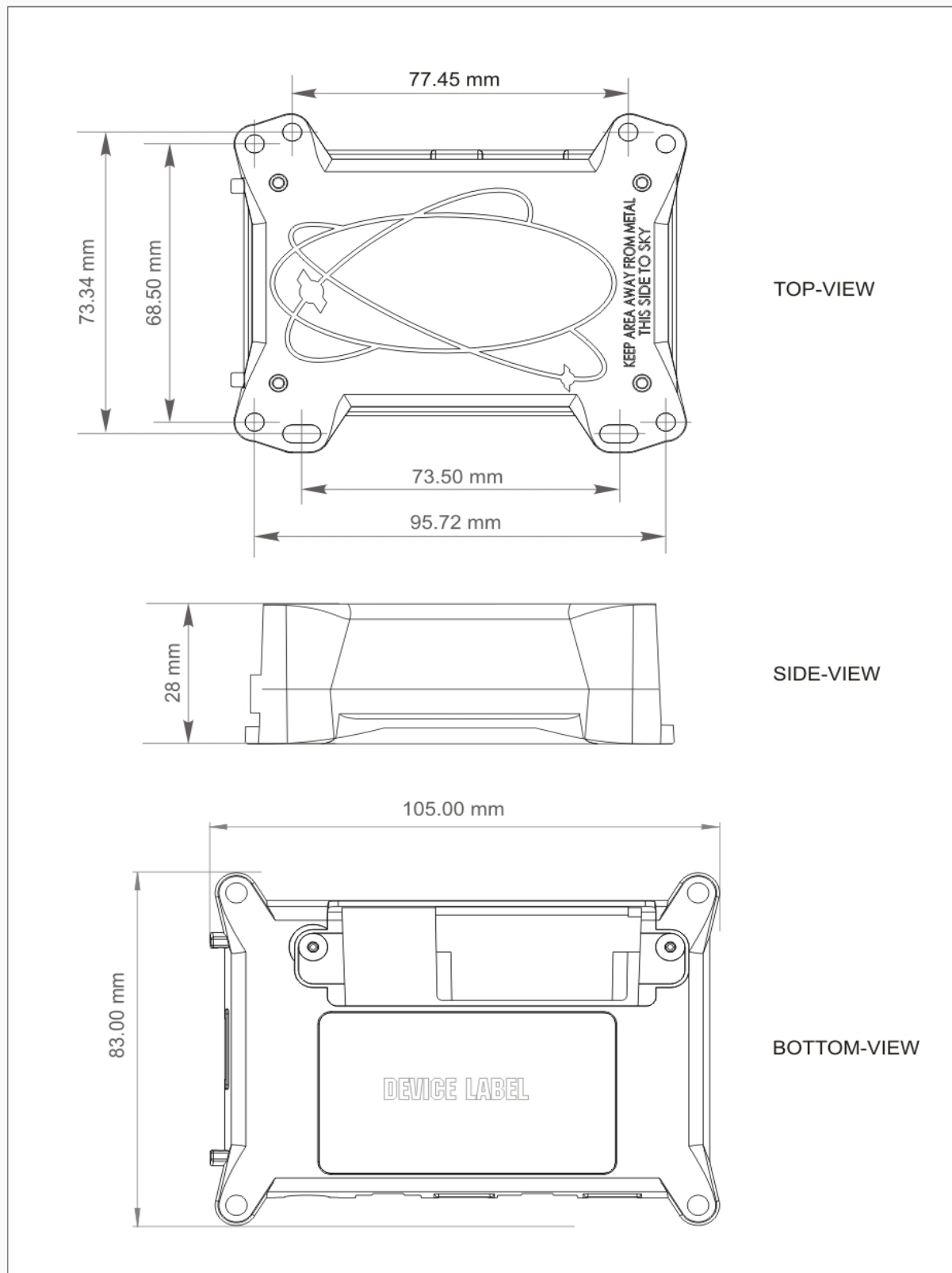


Figure 28: FOX3-2G/3G/4G housing

9. APPENDIX

9.1. Schematics

The figure below illustrates a common schematic of how to install the FOX3-2G/3G/4G devices in the vehicle. For detailed information, refer to the related documents [AppNotes_AVL_Installation_Guide.pdf].

9.1.1. Installation guidance

When installing the FOX3-2G/3G/4G in a vehicle, you will be able to track and locate the vehicle all the time and also you will be automatically notified when disagreements with your stored configuration into the FOX3-2G/3G/4G device are occurred. Depending on the user requirements, the operator may program the digital outputs to activate something e.g. a relay, buzzer, turn on a lamp, etc. The digital inputs can individually be configured e.g. to detect something when it is opened or closed; changes on digital inputs may trigger an output to activate, for example, a relay or buzzer. The IGN line can be connected to the vehicle ignition key to monitor its ON/OFF position.

Note: Turn the car ignition off before making any connection. Use a common ground point for all device ground pins. To avoid ground loops and second grounds, isolate all grounded pins of the FOX3-2G/3G/4G from the vehicle body. Do not connect power from a different system to the FOX3-2G/3G/4G.

The outputs of the FOX3-2G/3G/4G devices must be supplied with the same voltage applied to the (+IN) pin. The operating voltage MUST never exceed its range, due to the device is not protected against continuous overvoltage. For security reasons, it is recommended to integrate an external 2A fuse between the positive wire of the FOX3-2G/3G/4G (+IN) and d.c. - power source.

When using an external antenna, be sure to mount it on the dash or on the windshield of the vehicle with the GPS side facing the sky.

Apply power to the FOX3-2G/3G/4G devices only with external antenna connected (if used) and vehicle ignition off. First, connect the GND pin and finally, apply power to the +IN pin of the FOX3-2G/3G/4G.

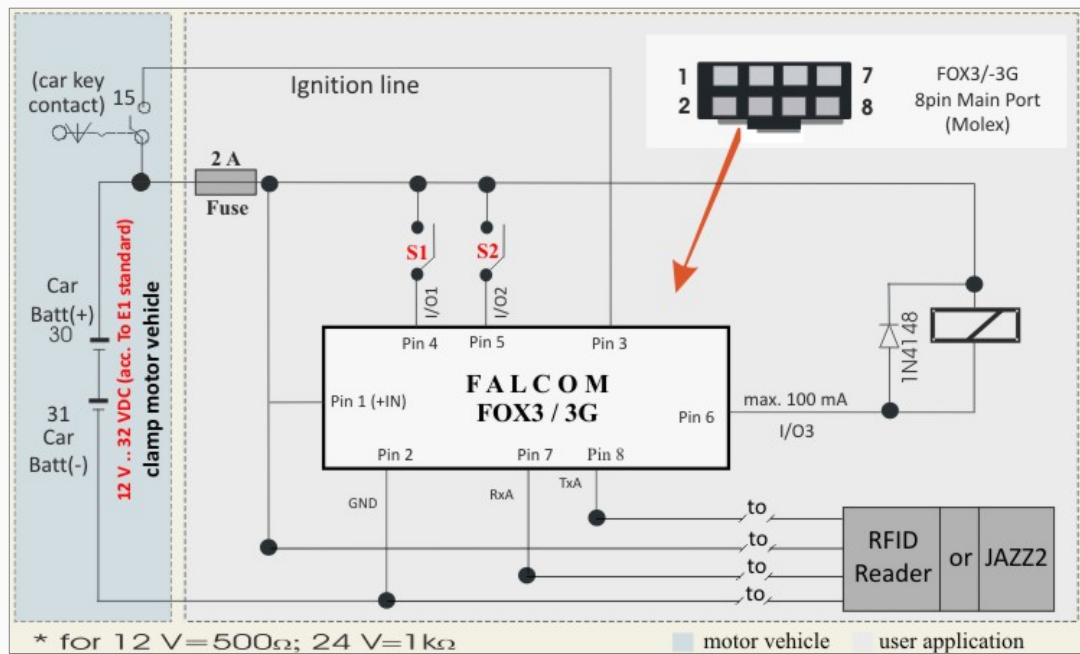


Figure 29: Schematic example of installation guidance.

9.2. What should be considered when using FOX3-2G/3G/4G device

FOX3-2G/3G/4G are devicea controlled by means of the PFAL commands which are developed by us. These PFAL commands can be executed when the operating firmware inside the device is running. In order to create application with the FOX3-2G/3G/4G devicea and to obtain maximum benefit from the FOX3-2G/3G/4G operating firmware, you have to setup a specific configuration and store it in the device. All PFAL commands can be sent to the FOX3-2G/3G/4G with the help of the Workbench software, which is free of charge and can be downloaded from our website. All PFAL commands supported by the FOX3-2G/3G/4G and other AVL devices are listed and described in a

separate manual called “AVL_PFAL_Configuration_Command_Set.pdf” which is accessible online on our website under the password-protected area.

9.3. GPRS Coding scheme

Coding scheme	1 Timeslot	2 Timeslots	4 Timeslots
CS-1:	9.05 kbps	18.1 kbps	36.2 kbps
CS-2:	13.4 kbps	26.8 kbps	53.6 kbps
CS-3:	15.6 kbps	31.2 kbps	62.4 kbps
CS-4:	21.4 kbps	42.8 kbps	85.6 kbps

Table 13: Coding schemes and maximum net data rates over air interface

Please note that, the values listed above are the maximum ratings which, in practice, are influenced by a great variety of factors, primarily, for example, traffic variations and network coverage.

10. CONFORMITY

10.1. Federal Communications Commission (FCC) Compliance Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: ?

- This device may not cause harmful interference. ?
- This device must accept any interference received, including interference that may cause undesired operation.

This device has been tested and found to comply with the limits for a Class B digital pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy.

It not installed and used in accordance with the instructions, may cause harmful interference to radio communications. here is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: ?

- Reorient or relocate the receiving antenna. ?
- Increase the separation between the equipment and receiver. ?
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. ?
- Consult the dealer or an experienced radio/TV technician for help.

10.1.1. FCC Caution:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

10.2. FCC RF Exposure statement

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

This device contains 850/900/1800/1900 MHz GSM/GPRS functions, 850/900/1700/1900/ 2100 MHz UMTS functions and is operational in these frequencies respectively. Following frequency bands are not operational (must not be used) in U.S. Territories.

- GSM: 900/1800 MHz
- UMTS: 2100/1700 MHz

10.3. ISSED Notice

This device complies with Innovation, Science and Economic Development Canada licensee exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

10.4. ISED RF Exposure Information

This device complies with ISED radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the ISED radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

Cet appareil est conforme aux limites d'exposition aux rayonnements de la ISED CNR-102 définies pour un environnement non contrôlé. Afin d'éviter la possibilité de dépasser les limites d'exposition aux fréquences radio de la ISED CNR-102, la proximité humaine à l'antenne ne doit pas être inférieure à 20 cm (8 pouces) pendant le fonctionnement normal