



FOX5 Series Hardware Manual

FOX5 - 4G

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Revision History

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September 2026	A	Initial document

For the latest revision of this product document, please check our online documentation at www.lantronix.com/support/documentation.

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1: About this Guide

Purpose

This document provides detailed information about the FOX5 secure intelligent gateway hardware, including functions, specifications, installation, and setup.

This product manual is intended for qualified personnel who are well skilled in electrical/electrical installation and not for private consumers/end users. Only qualified personnel should install, implement, or operate the product.

The latest product information is available on the [FOX5 Series](#) product page of the Lantronix website.

For additional support and product resources, please visit the [Lantronix Technical Support](https://ltrxdev.atlassian.net/wiki/spaces/LTRXTS/overview) portal (https://ltrxdev.atlassian.net/wiki/spaces/LTRXTS/overview).

Summary of Chapters

The remaining chapters in this guide include:

Chapter	Description
Chapter 2: Introduction	Provides information about the different device models, features, and applications
Chapter 3: Product Description	Provides information about the device hardware interfaces and power
Chapter 4: Installation	Provides information about package contents and installation
Chapter 5: Initial Setup	Provides instructions to connect to and configure the device
Chapter 6: Safety Information	Provides safety instructions and precautions to be followed
Appendix A: Compliance Information	Provides compliance information
Appendix B: Vehicle Installation	Provides instructions to install the device in a vehicle
Appendix C: Sample Configuration	Provides the device sample configuration
Appendix D: Third Party Applications Disclaimer	Provides disclaimer for using third party products and applications with device
Appendix E: Lantronix Technical Support	Provides instructions for contacting Lantronix Technical Support

Additional Documentation

Visit the [Lantronix Product Index](https://www.lantronix.com/resources/product-index) (https://www.lantronix.com/resources/product-index) for the latest documentation for this product series.

Document	Description
FOX5 Series QSG	Provides instructions to setup and start using your FOX5 device. It includes information about the contents of the FOX5 package and the FOX5 Promo Kit
PFAL Command Reference	Provides the description of the internal firmware and the complete list of supported PFAL commands used to manage/administer different parts of an application built on the FOX5 series devices.
Workbench User Guide	Provides instructions to use Workbench tool.
Application Notes	https://www.lantronix.com/resources/app-notes/
App Note: Activation of premium features for FOX3-2G/3G/4G and Bolero40 Series	Provides instructions to activate a PREMIUM-FEATURE on an AVL device.
App Note: CAN Applications with AVL Devices	Provides instructions to connect AVL devices to a vehicle, and to configure and use the CAN-Bus features.
App Note: How to collect FMS/J1939/OBD-II data with FOX3-2G/3G/4G series	Provides instructions to connect AVL devices to a vehicle, and to configure and use the CAN-Bus/FMS/OBDII features.
App Note: Getting started with 1-Wire Devices	Provides instructions to use the 1-Wire interface on the FOX3-2G/3G/4G Series.
App Note: In-Vehicle Installation Guidelines for FOX3-2G/3G/4G and Bolero40 Series	Provides the necessary instructions to install your product properly and safely in a vehicle.
App Note: How to use IOBOX-WLAN with a FOX3 Series Device	Provides information on how to configure your FOX3-3G/4G and FOX5-4G Series devices in combination with the accessory box IOBOX-WLAN, connect the IOBOX WLAN to your AP (access point) and send data over WLAN to your platform server.
App Note: How to use IOBOX-mini with FOX Series Devices	Describes the hardware interfaces of the IOBOX-mini and provides instructions to use it with FOX Series devices.

2: Introduction

FOX5 is a secure intelligent serial gateway. It is designed for demanding industrial and transportation environments and 4G LTE Cat 1 bis, GNSS, and BLE 5.4, along with a range of industrial and vehicle protocols including Modbus, CAN, and J1939. Serial connectivity is provided via RS-485 and RS-232 interfaces.

Models

This document applies to the FOX5-4G (LTE Cat1 bis) model.

Key Features

- ◆ PREMIUM features are available for mobile data logging, storing, processing, and sending.
- ◆ The device acts as a mobile client for various applications such as AVL, fleet management, security, and recovery of assets. The device offers firmware features such as TCP data encryption, several History Modes, and Eco-drive/Behavior logging besides standard items like status reports, messaging alerts, and Geo-fencing.
- ◆ Geofence features for territory management, route verification, prohibited locations, parking area, and exception reporting for events such as arrivals, departures, deliveries, pick-ups, illegal entries, unauthorized movement etc. are implemented in the firmware.
- ◆ Contains a data-logger (history feature) that enables archiving of unique vehicle locations in sequence up to approximately 231 days with an archiving interval of 20 seconds.
- ◆ The physical interface to the device's application is made through integrated main and accessory ports as well as the 10pin mini-USB port. These ports are required for controlling the units, receiving GNSS location data, transferring data, power supply, extending the number of I/Os, and to use additional external devices which are not integrated in the In-Vehicle Computers.
- ◆ Dead Reckoning
- ◆ Dual SIM
- ◆ Real Time Clock Support

The setup and configuration of the device is performed through Serial Ports, over SMS, and over TCP using PFAL commands. These PFAL commands are unique to AVL devices and can be used for all communications including Serial, SMS, CSD, TCP, and SMTP. Refer to the *PFAL Command Reference* (see [Additional Documentation](#)) for more details.

Safety Standards

Your Cellular/GNSS devices comply with all applicable RF safety standards.

FOX5 devices meet the safety standards for RF receivers, and the standards and recommendations for the protection of public exposure to RF electromagnetic energy established by government bodies and professional organizations such as Directives of the European Community, Directorate General V in matters of radio frequency electromagnetic energy.

Lantronix Services

- ◆ **Lantronix PercepXion:** PercepXion is a cloud or on-premise portal for the centralized management of Lantronix devices. A browser-based interface that allows an administrator to view status, logs and charts, update firmware and configuration, view and edit telemetry, execute PFAL commands, and monitor Lantronix devices.
- ◆ **LEVEL Technical Services:** Lantronix LEVEL Technical Services provides dedicated technical support experts to assist your team with technical challenges you may encounter. LEVEL services offer global phone support, extended limited lifetime hardware warranty, dedicated account technical specialists, and a knowledge base. To learn more about LEVEL Technical Services visit <https://www.lantronix.com/level-technical-services/>.

Applications

FOX5 devices can be used for the following:

- ◆ Real time online tracking
- ◆ Fleet management / monitoring
- ◆ Security / emergency services
- ◆ Real time satellite navigation
- ◆ Territory management
- ◆ Personalized drivers' logbook
- ◆ Route verification
- ◆ Trip management / Distance calculations
- ◆ Theft protection
- ◆ Toll collection / pay as you drive
- ◆ Eco-Drive - (PREMIUM feature)
- ◆ Encrypted TCP communication based on AES 128-bit algorithm - (PREMIUM feature) and more

Ordering Information

Table 2-1 FOX5 Device Models

Device	SKU	Fallback	Region
FOX5-4G	F54R000S	NA	North America
	F54R00FS		Global

Technical Data

Table 2-2 General Specification

Component	Specification
Physical	
Casing	Fully Shielded
Dimensions (W x D x H)	105 ± 0.5 mm x 83.0 ± 0.5 mm x 28.0 ± 0.5 mm
Weight	ca. 130 gm
Environmental	
Operating temperature	-30 °C ~ +85 °C
Storage temperature	-30 °C ~ +85 °C
Air Humidity	5% ~ 95% (non-condensing)
Memory	
Flash memory	64 MB
RAM	32 MB
Power	
Input power	+10.8 V DC ~ +60.0 V DC
Automotive power source (vehicle battery)	+12 V DC or +24 V DC
Power Saving	10 power saving modes, programmable with PFAL commands
Battery	
1 x Battery	1000 mAh rechargeable battery
Interfaces	
1 x Main port	8-pin row connector
1 x Accessory port	6-pin row connector
1 x Mini-USB port	10-pin
2 x SIM card holders	4FF (nano) SIM card holders
3 x LED indicators	Free-programmable (red, green, and yellow)
2 x External antenna connectors	Cellular and GNSS antennas
Internal Antennas	
1 x Cellular	-
1 x GNSS	-
External Antenna Connectors	
1 x Cellular antenna connector	Bordeaux Violet SMB FAKRA male connector
1 x GNSS antenna connector	Blue SMB FAKRA male connector
Cellular	
LTE FDD Cat 1 bis	3GPP Release 14 Compliant
GNSS	
GNSS Systems	GPS/GLONASS/BDS/Galileo/QZSS
Dead Reckoning	Embedded Sensor

Component	Specification
Position Accuracy	1.5 m CEP
Bluetooth	
Bluetooth Classic Support	Yes
BLE Support	BLE 5.4
Software	
Firmware	◆ Embedded TCP/IP stack, including TCP, IP, SMTP, and UDP protocols ◆ Upgradable
Supported Protocols	◆ NMEA Msg: GLL, GGA, RMC, VTG, GSV, and GSA ◆ Own Msg: IOP, GSM, AREA, 3DP, and BIN

Cellular Engine Features

Supported Frequencies

The table below lists the frequencies supported by FOX5 device Cellular engine.

Table 2-3 Frequency Bands Supported by FOX5 Device

Device	Region	Category	Frequency Bands	
			LTE	Fallback
FOX5-4G	North America	LTE Cat 1 bis	B2/B4/B5/B12/B13/B14/B66	NA
	Global	LTE Cat 1 bis	B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/B19/B20/B25/B26/B28/B66/B34/B38/B39/B40/B41	NA

Output Power

Class 3 (0.2 W, 23 dBm)

Data

LTE Cat 1 bis: Uplink up to 5 Mbps/Downlink up to 10 Mbps

SMS

Text Mode

GNSS Engine Features

GNSS Engine

- ◆ Multi-channel GNSS receiver: 48 Track & 2 Fast Acquisition
- ◆ GPS: L1 C/A
- ◆ GLONASS: L1
- ◆ Galileo: E1
- ◆ BDS: B1I
- ◆ QZSS: L1 C/A

- ◆ SBAS: WAAS/EGNOS/MSAS/GAGAN

Accuracy

- ◆ Position: 1.5 m CEP
- ◆ Time to First Fix (TTFF):
 - ◆ Hot starts: 2 seconds
 - ◆ Cold starts: 32 seconds

Sensitivity

- ◆ Tracking: -162 dBm
- ◆ Reacquisition: -152 dBm
- ◆ Autonomous acquisition: -145 dBm

A-GNSS Support

- ◆ A-GNSS: Autonomous, with Dead Reckoning
- ◆ Embedded 6-axis MEMS sensor

Operational limits

- ◆ Velocity: 515 m/s
- ◆ Altitude: 18000 m
- ◆ Max. update rate: 10 Hz

Considerations when using FOX5 device

FOX5 devices are controlled by means of PFAL commands which are developed by Lantronix. These PFAL commands can be executed when the operating firmware inside the device is running. To create an application with the FOX5 devices and to obtain maximum benefit from the operating firmware, you have to setup a specific configuration and store it in the device. PFAL commands can be sent to the device with the help of the Workbench tool which can be downloaded from Lantronix website (see [Workbench](#)). The PFAL commands supported by the FOX5 device and other AVL devices are listed and described in the *PFAL Command Reference* (see [Additional Documentation](#)).

Workbench

The Workbench tool provides an essential interface between your PC and the FOX5 device. It allows you to send PFAL commands, and perform different configurations and functions related to the device.

To download Workbench and view related documentation see <https://www.lantronix.com/products/workbench/>.

FOX5 Series Promotion Kit

This FOX5 Series Promotion Kit provides the necessary hardware and accessories to power on, connect to, setup, and evaluate the performance of your FOX5 device. It allows system integrators and developers to test the factory preloaded configuration of the device and see how the device works.

The FOX5 Series Promotion Kit has to be ordered separately. The contents of the Promotion Kit are described in the *FOX5 Series QSG*, see [Additional Documentation](#).

3: Product Description

Hardware Interfaces



Figure 3-1 FOX5 Device Hardware Interfaces

The table below lists the FOX5 device hardware interfaces and their corresponding specifications/functions:

Table 3-1 FOX5 Device Hardware Interfaces and Specifications/Functions

Interface	Specification/Function
Main Port	8-pin double-row connector, MOLEX-43045-08-MICRO FIT. It provides IN/OUT, power supply and first serial port (SER0) lines
Accessory Port	6-pin double-row connector, MOLEX-43045-06-MICRO FIT. It provides 1-Wire bus, I2C master interface, second serial port (SER1) lines
10-pin mini-USB Port	10-pin mini-USB port with SPI interface and USB Master interface
Optical LED Indicators	3x LED indicators, free programmable using PFAL commands to show the current device state
Mounting Holes	8x mounting holes for attaching the device to a suitable location (use M4x20 self-tapping or machine screws for mounting, not included)
External Antenna Ports	FAKRA connectors for connecting Cellular and GNSS antennas
SIM Card Holder	2x SIM Card Holders to insert your 4FF (nano) SIM cards for using Cellular services
Battery Port	1x battery port to connect the rechargeable battery

Main Port (8 pin)



Figure 3-2 8-pin Main Port Pin Assignment

The table below lists the 8-pin main port pinout:

Table 3-2 8-pin Main Port Pinout

Pin	Name	Direction	Description	Level
1	+IN	Input	Power supply input - The power supply should meet the requirements of current consumption. Care must be taken so that the operating voltage applied to the device stays within the voltage range. Applying a voltage outside of the voltage range can damage the device. For security reasons, it is recommended to integrate externally a 2A fuse link between power source and FOX5 device (see Figure 3-5).	$V_{+IN} = +10.8 \dots +60.0 \text{ V}$ $I_{max} \leq 1.5 \text{ A}$
2	GND	-	Ground.	0 V
3	IGN	Input	General purpose input - It can be either connected to the vehicle ignition and be used for journey START and STOP reports or connected to the operating voltage +IN to wake up the FOX5 device from IGN-Sleep mode (awakening from this mode requires a HIGH signal). See section IGN Pin (pin 3)	HIGH $\geq +10.8 \dots +60.0 \text{ V DC}$; LOW = 0 V

Pin	Name	Direction	Description	Level
4	I/O1	Input/Output	Software configurable pins - Each pin has dual functions, analog or digital. Each digital pin can individually be set either as input or output. Every time the device starts up, a level change occurs on the I/O2 and I/O3 pins. Only I/O1 does not change the level on device start up. Pins I/O2 and I/O3 support CAN communication if this interface is activated. The CAN-Bus interface can be activated using the corresponding PFAL command (see PFAL command set for more details). In this case the I/O2 = CAN_L and the I/O3 = CAN_H.	OUT: 100 mA max. @ +0 V... +60.0 V DC (open collector) IN: +0 V... +60.0 V DC (High & Low levels are free-programmable) Analog: Up to +60.0 V DC/10 bits resolution
5	I/O2			
6	I/O3			
7	RxA_0	Input	Serial Port 0 - The serial port (receive data) for direct connection to the host PC (for configuration and evaluation of firmware). If this pin is not used leave it open.	V24, ±12 V
8	TxA_0	Output	Serial Port 0 - Serial port (transmit data) for direct connection to the host PC (for transmitting history data, output GPS protocols, and more). If not used leave it open.	

Special Pin Description (pins 4,5, and 6)

The I/O2 and I/O3 (pins 5 and 6) can also operate as CAN-Bus interface if CAN is activated on the FOX5 devices. For more details about the CAN interface refer to the following documents under section [Additional Documentation](#)

- ◆ *PFAL Command Reference*
- ◆ *App Note: CAN Applications with AVL Devices*
- ◆ *App Note: How to collect FMS/J1939/OBD-II data with FOX3-2G/3G/4G series*

These pins have dual functions. They are controlled by the internal firmware of FOX5 device. You must define whether to use them as analog or digital pins. The configured digital pins can function as input or output pins while the analog pins can only function as input pins.

Their function is controlled by the command **PFAL, IO0[1,2].Config**. For example, if you want to use I/O1 as an analog pin, and the I/O2 and I/O3 as digital, use the following commands:

\$PFAL,IO0.Config=AI,2,11	//0 = I/O1; AI = analog; 2 and 11 = min. and max. voltages for low and high events
\$PFAL,IO1.Config=DI,5,10	//1 = I/O2; DI = digital input; 5 and 11 = min. and max. voltages for low and events
\$PFAL,IO2.Config=DI,5,10	//2= I/O3; DI = digital input; 5 and 10 = min. and max. voltages for low and high events

If you want to use the pins as digital output pins, use the following PFAL commands:

\$PFAL,IO4.Set=high	//4= I/O1; high = sets output to high
\$PFAL,IO5.Set=high	//5 = I/O2; high = sets output to high
\$PFAL,IO6.Set=cyclic,2000,1000	//6 = I/O3; cyclic = sets output to high for 2 seconds and low for 1 second

When using an I/O as digital pin you must first set it to high (with PFAL command **\$PFAL,IO4.Set=high** or **\$PFAL,IO5.Set=high** or **\$PFAL,IO6.Set=high**), otherwise 0 V will be measured and the device could get damaged.

Some examples of how to use them are provided below:

Using I/O pins (4, 5, 6) as analog inputs:

These pins can operate either as digital or analog inputs, however they should be configured and calibrated with PFAL commands for such purposes.

Analog voltages of up to 60.0 V with 12 bits resolution can be processed and remotely evaluated by a server application. A pull-up resistor to a constant input voltage allows for resistive transducers to ground, e.g., fuel sensor or thermistors.

To use these IOs as analog inputs, send the following command to the device.

\$PFAL,IO0[1,2].Config=AI,2,11

where 0, 1 and 2 are indices corresponding to IO1 (pin 4), IO2 (pin 5), and IO3 (pin 6) respectively, while the values 2 and 11 are min. and max. voltages that will be used to generate Low and High events, respectively. For detailed information, refer to *PFAL Command Reference* (see [Additional Documentation](#)).

Connection example 1 (for I/O1 and I/O2):

An analog input can be connected to a temperature sensor (NTC resistor for instance). In the diagram below a fixed resistor is used between input voltage and I/O2, and a variable resistor (Negative Temperature Coefficient whose resistance or capacitance decreases when temperature increases), between I/O2 and ground. It is possible to set a low temperature alarm and a high temperature alarm. Passage through these thresholds will trigger an alarm. We recommend using SMS or TCP as alarm type with GPIOP protocol. The SMS can be received on a mobile phone, modem, or any Cellular device when changes are detected. The analog-to-digital converter (ADC) inside the unit has an input voltage range from 0 to 2.5 V. An application example is shown below.

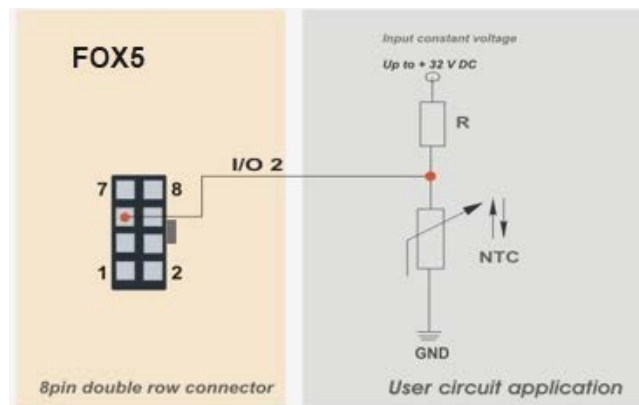


Figure 3-3 Connection example 1 when using it as analog input

Connection example 2 (for I/O1 and I/O2):

An analog input can be connected to a tachometer generator. The maximum output voltage of the tachometer should be +60.0 V (see example in figure below).

Both circuit examples (the NTC diagram above and the Tachometer below) are only illustrations to show the aim of these I/Os when using them as analog inputs.

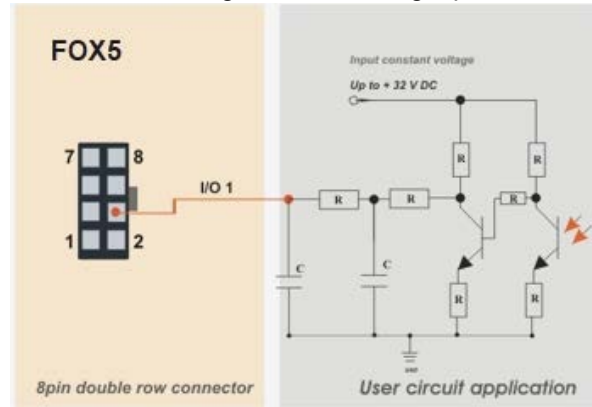


Figure 3-4 Connection example 2 when using it as analog input

Using I/O pins (4, 5, 6) as digital Inputs:

These pins are high active when used as digital inputs, so you can set $V_{IN(LOW)}$ and $V_{IN(HIGH)}$ to any levels within the range from +0 to +60.0 V DC. The High and Low levels can be set with PFAL command **PFAL,IO0[1,2].Config=DI,5,10** where 0, 1 and 2 are indices corresponding to IO1 (pin 4), IO2 (pin 5) and IO3 (pin 6) respectively. The values 5 and 10 are min. and max. voltages that will be used to generate Low and High events respectively. For information about PFAL commands, refer to *PFAL Command Reference* (see [Additional Documentation](#)).

The figure below illustrates how these inputs can be used in practice. When the internal software detects input changes from High to Low or vice versa, a Falling or Rising edge Event is respectively generated. Therefore, depending on the alarm type, the FOX5 device can react to the input changes and release different alarms such as sending out SMS, email messages, TCP packets, opening a CSD connection or activating output ports. The alarm type is configuration dependent.

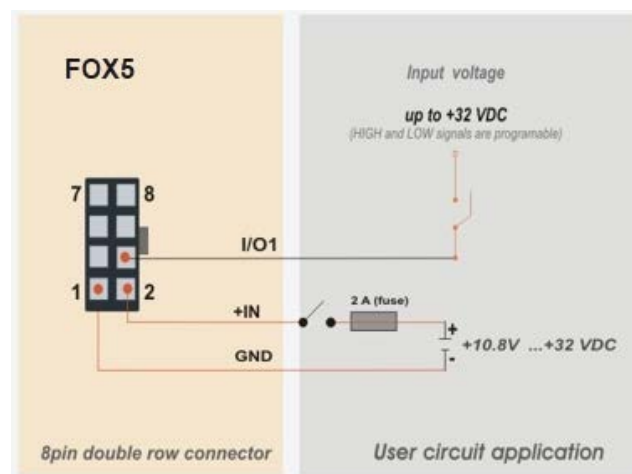


Figure 3-5 Connection example when using it as digital input

A completed circuit example for all inputs is provided in [Appendix B: Vehicle Installation](#)

Using I/O pins (4, 5, 6) as digital outputs:

FOX5 devices support three IOs which can be used either as input or output. These outputs are open collectors. They can be connected directly via resistors (R) to LEDs, Relays etc. and require power of 100 mA @ up to +60.0 V DC. The figures below show the schematic of possible output connections. To activate these outputs, use the command

\$PFAL,IO4[5,6].Set=high[low,hpulse,lpulse,cyclic] for **IO1**, **IO2** and **IO3** respectively or you can configure one or more alarms that activate these outputs when specific events occur (e.g., **\$PFAL,Cnf.Set,AL0=IO.e8=redge:IO4.Set=cyclic,1000,2000**).

To evaluate the alarm, send the alarm configuration to the FOX5 devices and then trigger IGN-pin to High. As a result, the IO1 goes High for 1 sec and Low for 2 sec. To set IO1 to Low, execute the command **PFAL, IO4.Set=Low**. For details on how to activate an output and how to configure an alarm, see *PFAL Command Reference*. Both figures below show the schematic connections of how to use this output.

Note: The power should not be applied directly to an output pin without having e.g., a resistor between them.

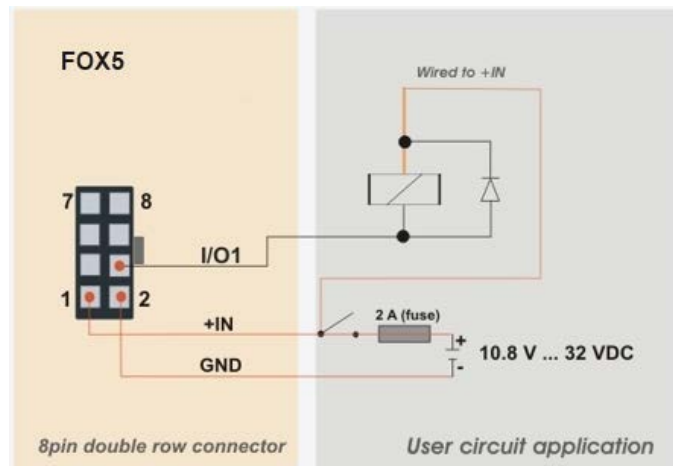


Figure 3-6 Connection example when using it to control a Relay

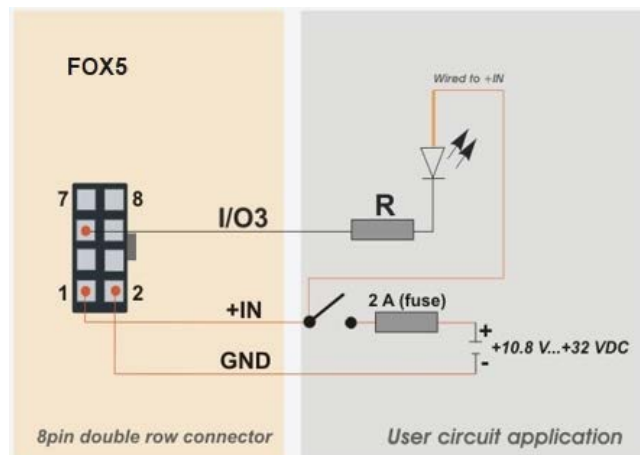


Figure 3-7 Connection example when using it to control an LED

IGN Pin (pin 3)

It is strongly recommended to connect this pin to the ignition key to support the IGN-power saving function when the vehicle is off.

The IGN-pin has two functions:

- ◆ To wake up the FOX5 device from the IGN-sleep mode (when sleeping).
- ◆ To monitor the vehicle ignition state and report/store the trip START and STOP by using the events **IO.e8=redge** and **IO.e8=fedge** respectively.

IGN-sleep mode is one of the eight supported energy-saving modes of the device operation in which all unnecessary components are shut down. On IGN wake-up signal, the device returns to full functionality.

Note that, FOX5 devices power on automatically when external power is applied, and IGN pin provides an additional "wake up" function for the IGN-sleep mode when it is requested.

In case of unauthorized vehicle access/start, you are automatically alerted by SMS or TCP and the vehicle recovery can be started by knowing its exact location. In such a case, use the IGN generated event as a condition to start the vehicle tracking.

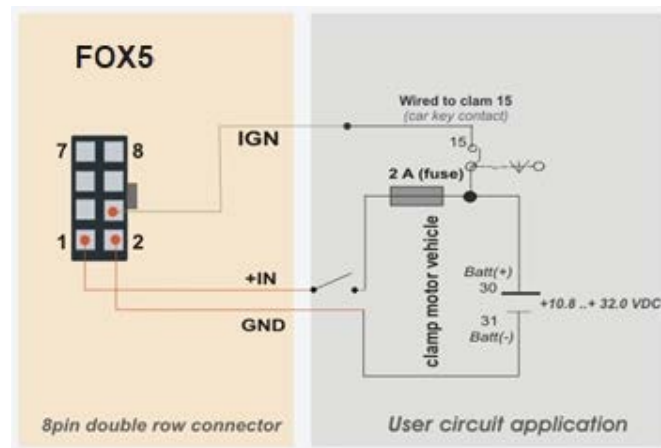


Figure 3-8 Monitoring vehicle starter by IGN line

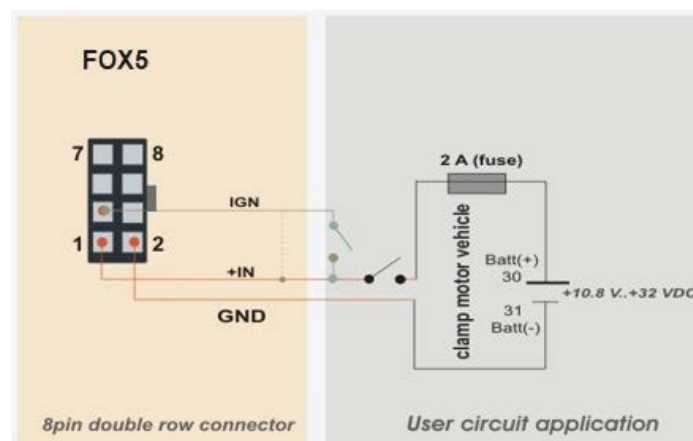


Figure 3-9 Use IGN line to wake up FOX5 device from IGN-Sleep

Serial Port 0 - Serial communication signals (RxA and TxA)

FOX5 devices incorporate a full duplex serial channel which allows two devices to communicate directly with each other via the RS232 serial port. All supported variable baud rates are software controlled. It is recommended to use the FOX5 Telematic Eval Kit to communicate with the FOX5 devices. The signals on these pins are obtained to RS232 compatible signal levels. The serial port supports the following communication signals:

- ◆ RxA_0 - Main channel used to receive software commands to the board from any software (e.g., HyperTerminal). Moreover, firmware update can also be done through this serial port.
- ◆ TxA_0 - Main channel used to send navigation, measurement, response, and system data to any software (e.g., HyperTerminal, Workbench).

Accessory Port (6 pin)



Figure 3-10 Pin Assignment of 6-pin Accessory Port

Accessory Port Pinout

The table below lists the accessory port pinout for SKUs that provide RS485 communication:

Table 3-3 Accessory Port Pinout

Pin	Name	Direction	Description	Level
1	1-Wire	Input /Output	1-Wire master interface - For Driver ID, temperature, and humidity sensors.	VOUT = +2.8 .. +5.0 V
2	GND	-	Ground Reference.	0 V

Pin	Name	Direction	Description	Level
3	-	-	The pin is software configurable. It can be used for RS232 and RS485 communication.	-
	RS232 (Rx)	Input	Serial Port 1 - Serial port (receive data) for direct connection to the host PC (configuration, evaluation, firmware). If not used leave it open.	-15 V .. +15 V
	RS485 (B)	Input/Output	RS485 uses half-duplex communication. The direction is controlled with PFAL command	-7 V .. + 12 V
4	-	-	The pin is software configurable. It can be use used RS232 and RS485 communication.	-
	RS232 (Tx)	Output	Serial Port 1 - Serial port (transmit data) for direct connection to the host PC (transmitting history data, GPS protocols and others). If not used leave it open.	-15 V .. +15 V
	RS485 (A)	Input/Output	RS485 uses half-duplex communication. The direction is controlled with PFAL command.	-7 V .. + 12 V
5	I2C (SCL)	Output	I2C bus interface (Serial Clock line) – The signal used to synchronize communication between the master and the slave.	-
6	I2C (SDA)	Input/Output	I2C bus interface (Serial Data line) – The signal used to transfer data between the transmitter and the receiver.	-

1-Wire Interface

A 1-Wire bus uses only one wire for signaling and power. One or several 1-Wire devices can be connected to the bus at the same time. Only one master should be connected to the bus.

Driver identification, temperature, and humidity sensors are quite often used on vehicle applications. The integration of 1-wire interface into the FOX5 devices, allows the system integrators for telematics, fleet management, and intelligent transportation system to be economical and time efficient in their work, due to the use of extra external devices which are not integrated into the in-vehicle computers. You can use the 1-Wire interface to know which drivers are in which vehicles and at the same time monitor the temperature and humidity of their refrigerated trucks. This allows shippers to use their server to record the transportation and delivery state of their temperature-sensitive loads.

How it works:

A 1-Wire network consists of a master controller which is connected to one or many slave devices. The 1-Wire interface on FOX5 device is a master controller. All the actual monitoring devices (lightning detector, moisture meter, motion detector, barometer, etc.) are slave devices. FOX5 devices communicate with temperature and iButton devices via 1-Wire protocol developed by Dallas Semiconductor, sending and receiving signals over a single data line plus ground reference. The 1-Wire protocol synchronizes the monitoring devices to the FOX5 devices, which

initiates and requests all activities on the 1-Wire network. One key feature of the Dallas system is that every 1-Wire slave device has a guaranteed unique address saved on-chip ROM (Read Only Memory). This enables the master to recognize individually each of your slave devices and you can have multiple devices of the same type on the same network without conflict.

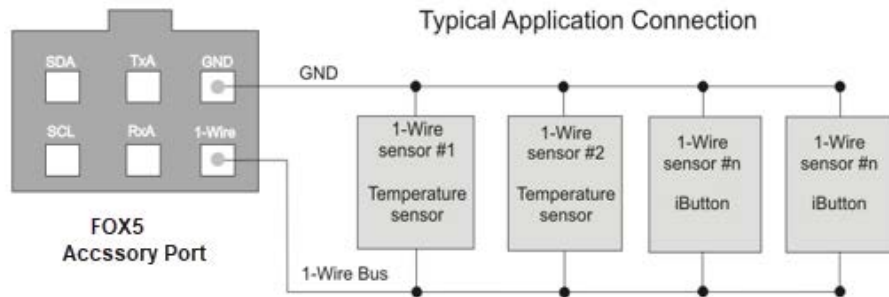


Figure 3-11 Typical Application Connection

1-Wire is a system of devices such as temperature, iButton etc. that are connected through the 1-Wire data line plus ground reference to the FOX5 devices. You can use and connect to the FOX5 device 1-Wire line, only sensors that require power supply between 2.9 V and 5.0 V. FOX5 devices receive on demand the unique address of the temperature and iButton IDs and other information they deliver. This information can then be sent via alarms to the remote server.

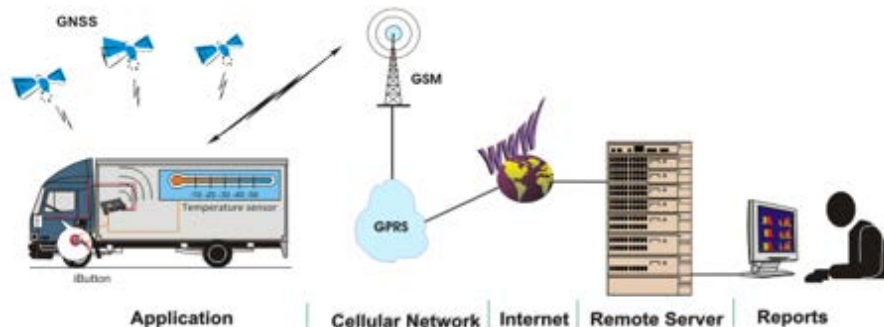


Figure 3-12 Typical Application using 1-wire single line

For details about the 1-Wire interface, see *App Note: Getting started with 1-Wire Devices*.

Serial Port 1 - Serial Communication

The FOX5 device accessory port provides the following types of serial communication:

- ◆ RS232
- ◆ RS485

The device supports either RS232 and RS485 communication on pin 3 and pin 4. Pins 3 and 4 are software configurable.

RS232

The FOX5 device provides a full duplex serial channel in the accessory port which allows two devices to communicate directly via RS232 serial ports. Pin 3 - RS232 (Rx) and pin 4 - RS232 (Tx) are used for RS232 communication. All supported baud rates are controlled by PFAL commands. To communicate with the FOX5 devices, it is recommended to use the FOX5 Series Promotion Kit since it provides all the requirements you need for your evaluation. The signals on these pins are obtained to RS232 compatible signal levels.

Rx - Receive channel and can be used for executing commands and firmware update.

Tx - Output channel for responses and system data to any software (e.g., HyperTerminal, Workbench).

RS485

Pin 3 - RS485 (B) and pin 4 - RS485 (A) are used for RS485 communication. RS485 uses half-duplex communication. The direction is controlled with PFAL command.

I2C Communication

The device supports Inter-Integrated Circuit (I2C) communication, a synchronous two-wire serial interface using Serial Clock Line (SCL) and Serial Data Line (SDA). It supports communication with multiple slave devices over a shared bus using device addressing. The SCL is used to synchronize communication between the master and the slave. The SDL is used to transfer data between the transmitter and the receiver.

Mini USB Port (10-pin)

The 10-pin mini USB port supports a SPI and a USB 2.0 interface. It can be used to connect the IOBOX-MINI to the FOX5 device, which is offered as an accessory.



Figure 3-13 Pin Assignment 10-pin mini USB Port

Table 3-4 10-pin mini USB Port Pinout

Pin	Name	Direction	Description	Level
1	MOSI	Output	Master output, slave input	-

Pin	Name	Direction	Description	Level
2	USB_V+	Input / Output	Power supply for IO-BOX	+ 3.6 V ... + 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)	$V_{+IN} = + 10.8 \text{ V} \dots + 60.0 \text{ V}$; $I_{max} \leq 1 \text{ A}$
9	CS	Output	Chip select	-
10	GND	-	Ground	-

LED Indicators

The actual state of the FOX5 devices is displayed by three LEDs on the front panel of the unit. These programmable and accessible LEDs can be interfaced with the built-in components to show their state. For information about customizing the device configuration, refer to *PFAL Command Reference* (see [Additional Documentation](#)).



Figure 3-14 LED Indicators

To turn on these LEDs, use the following commands:

\$PFAL,IO11.Set=high	//11=LED Yellow
\$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

External Antenna Connectors

The FOX5 device comes with internal antennas and is also fitted with two external antenna connectors. External antennas may be used in applications where the unit is installed without a line-of-sight connection to external networks, such as inside a metal box.

The two male SMB FAKRA external antenna connectors accept a wide variety of Cellular/GNSS antenna styles.

Note: The external antenna is not included in the standard delivery and must be ordered separately.

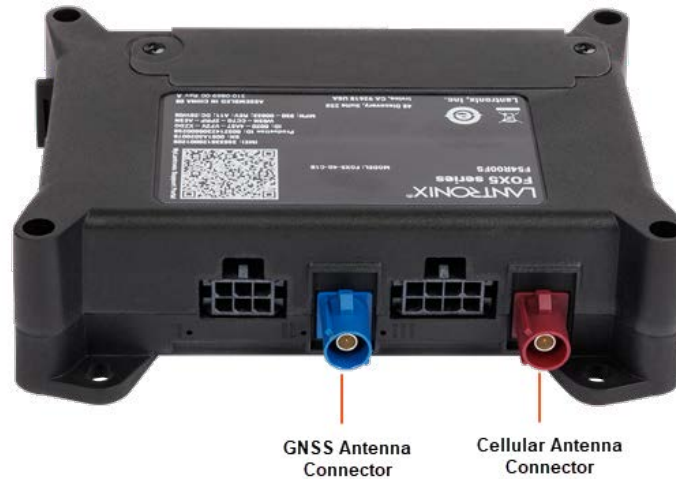


Figure 3-15 FOX5 Device Cellular/GNSS/Wi-Fi Antenna Connectors

SIM Holders



Figure 3-16 SIM Holders

FOX5 devices have a Cellular modem that requires a SIM to access mobile network services. The FOX5 device has two 4FF (nano) SIM card holders. You can purchase a pre-activated SIM from a network operator. The network operator provides you an APN (with username and password) and a 4-digit PIN, if applicable. Once you insert the SIM card in the SIM card holder, enter the APN details and PIN to register the SIM on the cellular network and establish network connectivity. For instructions, refer to [SIM Card Installation](#).

Battery Port

A 1000 mAh rechargeable battery is supplied with the FOX5 device. A port is available next to the SIM area to connect the battery.



Figure 3-17 Battery Port

Housing

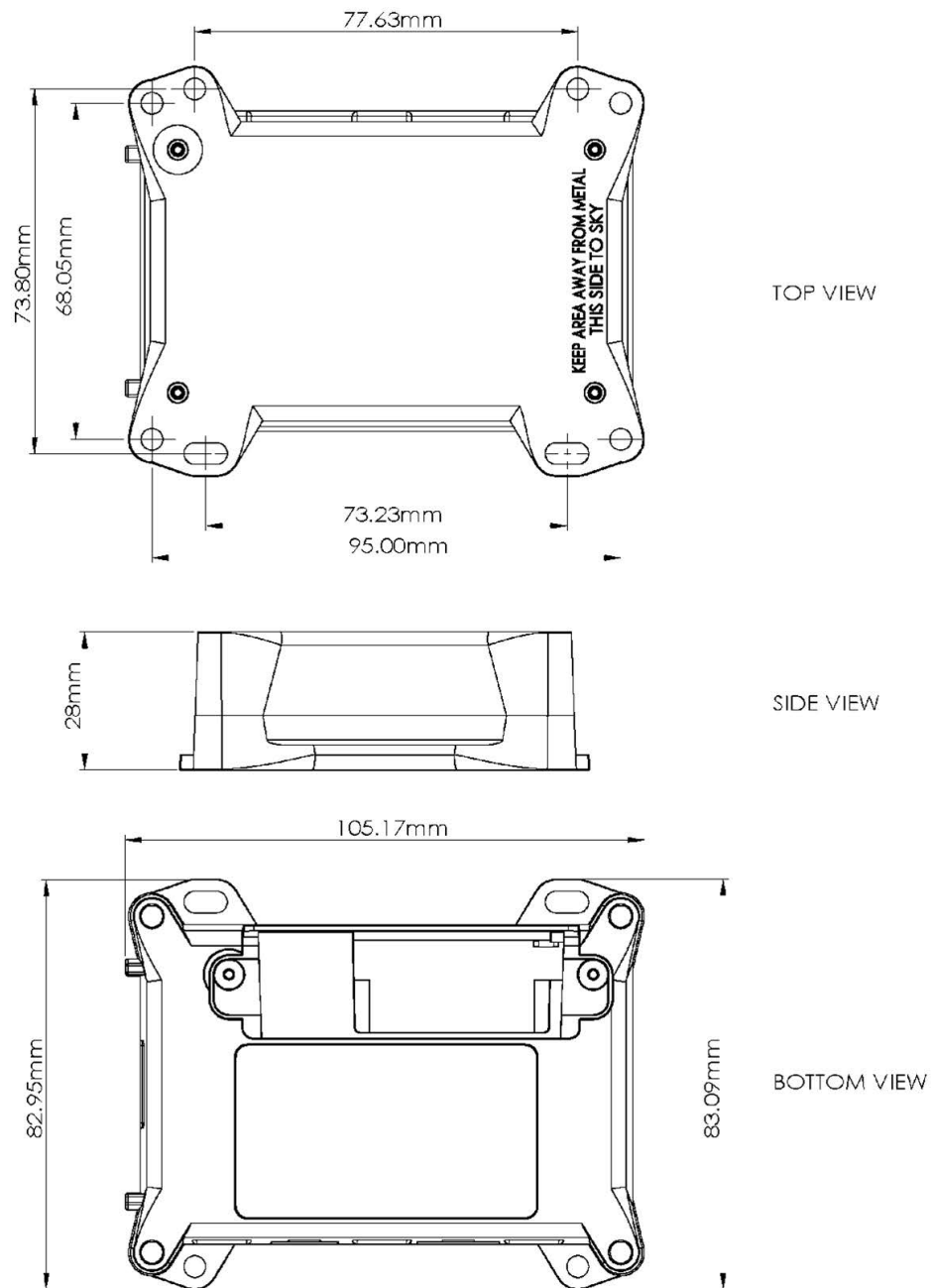


Figure 3-18 FOX5 Device Housing

Power Supply

The power supply for the FOX5 devices must be a single voltage source of $V_{+IN} = +10.8 \text{ V} \dots +60.0 \text{ V DC}$. The operating voltage (V_{+IN}) must be applied permanently to the FOX5 devices and provide sufficient current of up to 1.5 A (pulse).

The operating voltage (V_{+IN} and GND) is protected against voltage spikes and reverse polarity, but not protected against continuous over-voltage.

Note: Operating voltage range must never be exceeded; care must be taken to fulfill min/max voltage requirements.

Power Supply Pins (1 and 2) on the 8-pin Connector

One +IN pin on the main 8-pin port is dedicated to supply voltage connection, and the GND pin for ground connection.

Both +IN and GND pins serve to power the FOX5 devices. The FOX5 device has an auto power-on when external power is applied. The power supply for the device ranges from $V_{+IN} = +10.8 \text{ V} \dots +60.0 \text{ V DC}$ allowing direct connection to vehicle power system.

Automatic Shutdown

Automatic shutdown takes effect if under voltage is detected.

Power Saving

SLEEP mode reduces the functionality of the FOX5 devices to a minimum, and thus minimizes the current consumption. The FOX5 device can be set into the sleep mode using the command **\$PFAL,Sys.Device.Sleep[ChargeSleep,Doze]** with one or more parameters, as shown in the example below.

Example:

\$PFAL,Sys.Device.Sleep=IGN+Ring+Timer=1:20:00

\$PFAL,Sys.Device.ChargeSleep=IGN

\$PFAL,Sys.Device.Doze=Ign+Wakeup=23:20:00

The table below lists the SLEEP modes supported by the FOX5 devices:

Table 3-5 FOX5 Device SLEEP Modes

Mode	Description
IGN	Device wakes up when a rising edge (Low to High signal) is detected on the IGN pin.
Ring	Device wakes up on incoming voice call or SMS.
Wakeup=15:30:00	Device wakes up at the set wake up time.
Timer=1:20:00	Device wakes up when timeout has expired.
ExtPwrDetect	Device wakes up when external power connection is detected.
ExtPwrDrop	Device wakes up when external power disconnection is detected.
GPS	Sets the GPS receiver into the Hibernate state.

Mode	Description
CAN	Device wakes up when activities on the CAN bus interface are detected. This wakeup condition is supported only with \$PFAL,Sys.Device.Doze .

Note: The sleep and wake-up procedures differ depending on the selected sleep mode. Note that the power saving with Ring works properly only when the PIN authentication has been done and the device is already registered on the Cellular network. If you attempt to activate power saving while the device is not registered on the Cellular network, the SIM card is not inserted or the PIN not correctly entered, the device responds with error **ring shutdown aborted due to bad GSM coverage** and the power saving does not take place.

Power Consumption

The table below provides the average power consumption of the FOX5 device @ 12 V input for different device states.

Table 3-6 FOX5 Device Average Power Consumption @12 V

	Device State			F54R00FS (Global)		F54R000S (NA)	
	Cellular	GNSS	BLE	Current Consumption (mA)	Power Consumption (mW)	Current Consumption (mA)	Power Consumption (mW)
Boot	ON	ON	ON	61.39	736.68	61.47	737.64
Sleep	OFF	OFF	OFF	2.02	24.24	2.05	24.6
CPU Always ON	ON	OFF	OFF	27.18	326.16	27.17	326.04
	ON	OFF	ON	29.16	349.92	29.30	351.6
	ON	ON	OFF	61.22	734.64	60.79	729.48
	ON	ON	ON	62.51	750.12	62.95	755.4
	OFF	OFF	OFF	23.86	286.32	23.95	287.4
	OFF	OFF	ON	25.98	311.76	25.85	310.2
	OFF	ON	OFF	57.14	685.68	57.56	690.72
	OFF	ON	ON	59.59	715.08	59.81	717.72

Temperature Ranges

Table 3-7 Temperature ranges for FOX5 device

Parameter	Value
Operating temperature range	-30 °C ~ 85 °C
Storage temperature range	-30 °C ~ 85 °C
Discharging operating temperature range (battery-operated)	-20 °C ~ 60 °C

Parameter	Value
Charging operating temperature range (battery-operated)	0 °C ~ 30 °C

Battery Operating Temperature

Charging: 0 °C ~ 55 °C

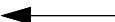
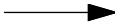
Discharging: -20 °C ~ 80 °C

Determining the External Equipment Type

You need to determine if the external hardware serial ports are configured as DTE (Data Terminal Equipment) or DCE (Data Communications Equipment) before you connect the serial port pins of the FOX5 devices to an external equipment.

FOX5 devices are designed for use as DCE devices. Based on the conventions for DCE-DTE connections, it communicates with the customer application (DTE) using the following signals:

Table 3-8 Signaling Definitions between DTE and DCE

FOX5 Device Terminal (DCE)	To	Application (DTE)
RxA		TxD
TxA		RxD
GND	-	GND

NMEA Data Messages

FOX5 devices deliver data in the NMEA-0183 format and Lantronix's own format. The table below lists the NMEA, and Lantronix supported protocols and gives a brief description for each of them. For further description about these protocols, refer to *PFAL Command Reference* (see [Additional Documentation](#)).

These protocols can be sent via SMS, TCP, UDP, serial port, e-mail or stored inside the device using the corresponding PFAL Commands. For example, the PFAL command **PFAL,GSM.Send.TCP...** allows you to send protocols via TCP to a remote server. These protocols contain information such as current device location, GPS state, UTC time, date, speed, course over ground etc. This information can be used for graphical representation of the device location. Installing such a device in a vehicle, lets you know where your vehicle is, what is the status of your vehicle, whether your vehicle has been moved without authorization from a park area, real time updates regarding vehicle movement and more. The remote server developed by Lantronix called Percepixon allows you to monitor and manage your vehicle, fleet, assets, and Lantronix devices.

Table 3-9 NMEA Protocol Output Messages

NMEA Protocol	Description
GPGGA	It contains GPS time, position, and fix type data.

NMEA Protocol	Description
GPGLL	It contains GPS latitude, longitude, UTC time of position fix and status.
GPGLSA	It contains satellites used in the GPS position solution and DOP values.
GPVTG	It contains the number of GPS satellites in view, satellite ID numbers, elevation, azimuth, and SNR values.
GPGLSV	It contains the number of GPS satellites in view, satellite ID numbers, elevation, azimuth, and SNR values.
GPRMC	It contains GPS time, date, position, course, and speed data.
GLGSA	It contains the GNSS DOP, and Active Satellites (if GLONASS activated)
GLGSV	It contains the GNSS satellites in view (if GLONASS activated).

Table 3-10 Lantronix Supported Protocol Output Messages

Lantronix Supported Protocol	Description
GPIOP	It contains the status of digital/analog input and output ports.
GP GSM	It contains the GSM operator, reception, registration status, GSM field strength, area code and cell ID.
GPAREA	It contains the state (entered or left the area/geofence) of 32 areas and 100 geofences - such as territory management, route verification, prohibited locations, parking area and more
GP3DP	It contains the state values of the motion sensor.
BIN	The user protocol contains GPS time, date, position, course, and speed data in binary format (small sized - only 21 characters).

4: Installation

Package Contents

FOX5 device packages are shipped with the following contents:

- ◆ FOX5-4G device
- ◆ 1000 mAh rechargeable battery
- ◆ Battery Cover and 2 screws
- ◆ SIM cover
- ◆ Mounting instructions

FOX5 device requires a SIM to access mobile data services. The device supports dual SIM operation and allows you to install two 4FF (nano) SIM cards. You can purchase a SIM from a mobile network operator.

Accessories and Premium Features

Order accessories and premium features separately.

For accessories and premium features visit <https://www.lantronix.com/products/fox5-series/>.

To order, contact Lantronix sales at <https://www.lantronix.com/about-us/contact/>.

Mounting Instructions

The FOX5 device provides 8 holes (2 sets of 4 holes) for mounting it, as shown in the image below. You can use either set of holes to mount the device, depending on the installation location. Hexagon head fasteners with collar self-drilling screws DIN 7504 K, ST3.5x32 mm or ST3.5x12 mm can be used depending on the set of holes used for mounting. There are no screws included in the delivery pack. For instructions to install the device in a vehicle, refer to *App Note: In-Vehicle Installation Guidelines for FOX3-2G/3G/4G and Bolero 40 Series* (see [Additional Documentation](#)).

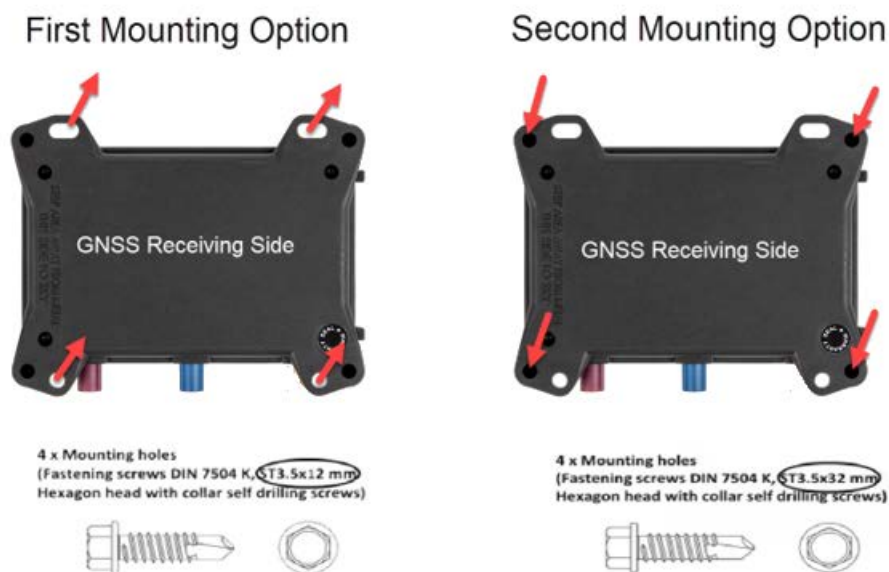


Figure 4-1 Mounting Options

You have the option to connect an external Cellular/GNSS antenna such as ANT-14 to your FOX5 device for better reception. Use the two connectors on the device to connect the antenna. The instructions to properly mount the device with and without an external antenna are provided below:

- ◆ **Mounting FOX5 device without external antenna** – Make sure the back side of device with the text **THIS SIDE TO SKY** is facing up to the sky. It is recommended to mount the device without any metal objects directly above or below it. The metal objects can degrade GNSS signal reception.
- ◆ **Mounting FOX5 device with external antenna connected** – Make sure the receiving side of the antenna with the text **THIS SIDE FACES THE SKY** is facing up to the sky. It is recommended to mount the device without any metal objects directly above or under the antenna and the device case. The metal objects can degrade GNSS signal reception.

FOX5 devices are not waterproof or sealed devices. Care must be taken to ensure the devices are kept away from water or any other liquids.

SIM Card Installation

Before you install the SIM card, remove the power supply and all other connections from your FOX5 device. SIM1 is the default active SIM. You can switch SIMs using PFAL commands. Refer to *PFAL Command Reference* for details (see [Additional Documentation](#)).

To insert the SIM card:

1. Locate the SIM card holders in the SIM area of the device.



Figure 4-2 SIM Card Holders

2. Select the required SIM card holder and slide the clip in the direction marked **OPEN** to release it, then flip it up.
3. Place the SIM card in the SIM card holder with the contact side of the SIM card touching the pins and align the edges correctly.
4. Flip the clip back down, hold it pressed, and slide it in the direction marked **LOCK** until it locks in place.

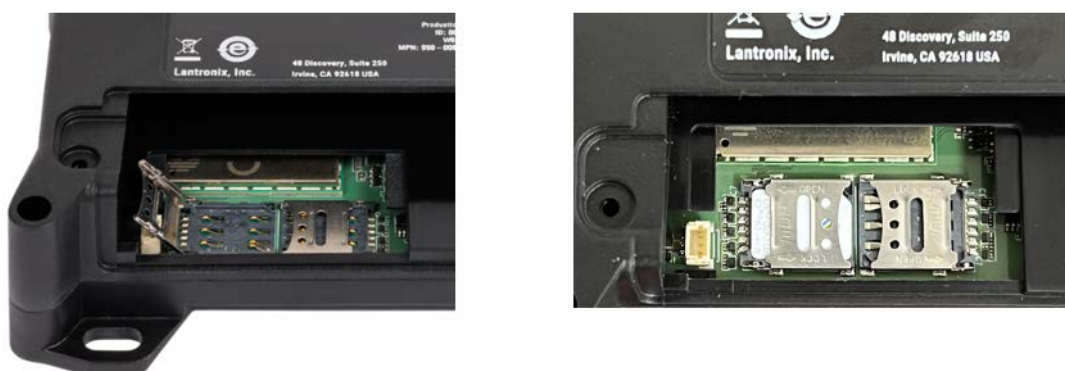


Figure 4-3 Placing SIM Card In SIM Card Holder

5. Insert the SIM cover in the bracket over the SIM area and push it into place.
6. Put the battery cover in place and screw it down.



Figure 4-4 Inserting SIM Cover and placing Battery Cover

If your network operator provides you a 4 digit PIN with the SIM, enter the PIN to enable cellular data services. For instructions to connect to the device and enter the PIN refer to *Workbench User Guide* (see [Workbench](#)).

Battery Installation

Before you install the battery, remove the power supply and all other connections from your FOX5 device. To connect the battery to the FOX5 device:

1. Locate the battery port next to the SIM area.
2. Plug the battery connector into the battery port and the place the battery in the space above the SIM cover.



Figure 4-5 Connecting Battery to the Device

3. Put the battery cover in place and screw it down.

Replacing Battery

To replace the battery:

1. Remove the power supply and all other connections from your FOX5 device.
2. Unscrew and remove the battery cover.
3. Unplug the battery connector from the port and carefully remove battery.
4. Connect a new battery. For instructions see [Battery Installation](#).

Caution: *Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.*

Connecting Antennas

Lantronix offers a combined 2G/3G/4G cellular and GNSS antenna, part number 60168 for the FOX5 device.



Figure 4-6 Combined Cellular/GNSS External Antenna, 60168

To connect the antenna to the FOX5 device:

- ◆ Plug the Bordeaux Violet colored connector of the antenna to the dark Bordeaux Violet connector of the device.
- ◆ Plug the Blue colored connector of the antenna to the Blue colored connector of the device.



Figure 4-7 Cellular/GNSS External Antenna connected to FOX5 Device

Caution: *To comply with RF exposure requirements, install the antenna so that a minimum distance 20 cm can be maintained between the antenna and persons.*

To remove the 60168 antenna from the FOX5 device, press down the latches on the antenna connectors and then pull the antennas.

FOX5 device generates events when the external GNSS antenna is connected or disconnected.

Use PFAL commands to configure the device to automatically switch from internal to external Cellular/GNSS antenna and vice versa depending on the events generated when the external GNSS antenna is connected or disconnected. For PFAL commands, refer to *PFAL Command Reference* (see [Additional Documentation](#)).

In the case of theft, if an intruder cuts off the GNSS antenna cable, an event is generated which can be used to trigger alarm notifications to the user.

5: Initial Setup

The FOX5 device ships with the latest firmware version installed and preloaded with sample configuration, which is a set of PFAL commands. Once you power on the device the sample configuration takes effect. The device tries to register to the Cellular network and attach to the GNSS network. The connection state of the GNSS and TCP services will be shown by the generated events **GSM.GPRS.eConnected** and **TCP.Client.eConnected**, which informs you whether the device is connected to the GNSS/TCP server. These events are displayed in the Terminal of the Workbench tool. The sample configuration with description is available in [Appendix C: Sample Configuration](#). To call this configuration use either the command **\$PFAL,Cnf.Show** or use the button **Read current device configuration** in the Editor of the Workbench tool.

Powering on the Device

To power on the device use the Telematic Eval Kit and the 15 V power supply provided in the FOX5 Series Promotion Kit. Follow the below instructions:

1. Set the **+IN** and **IGN** switches on the Telematic Eval Kit to **OFF** position before starting any operation.
2. Plug in the 8-pin (2x4) connector of the Telematic Eval Kit to the 8-pin main port on the FOX5 device.
3. Plug the 6-pin (2x3) connector of the Telematic Eval Kit to the 6-pin accessory port on the FOX5 device.
4. Insert the power supply into the input socket on the Telematic Eval Kit marked **INPUT 15.0 V ...32.0 V DC**. Then plug the AC adapter into the wall socket of your 110 V mains.
5. Set the **+IN** and **IGN** switches on the Telematic Eval Kit to **ON** position and apply power.

Note: **+IN** switch supplies power to the FOX5 device and the Telematic Eval Kit. **IGN** switch wakes up the FOX5 device from **IGN** sleep mode.

You can configure any one of the three LEDs on the device to display power status (see [LED Indicators](#)). The red LED is the default configured LED to display the power status (see [Appendix C: Sample Configuration](#)).

Configuring the Device

To configure the FOX5 device as per your requirements you must connect the device to your PC and install the Workbench tool. The Workbench tool acts as an interface between your PC and FOX5 device and allows you to connect to the device, send PFAL commands, configure the device, and perform various functions related to the device.

To connect the FOX5 device to your PC use the USB extension cable and the USB to serial converter provided in the FOX5 Series Promotion Kit.

For instructions on how to install and use Workbench refer to *Workbench User Guide* (see [Workbench](#)).

6: Safety Information

This chapter contains important information for the safe and reliable use of the FOX5 devices. Please read this chapter carefully before using your device.

General Information

Your FOX5 devices utilize the Cellular/GNSS standard for cellular technology. Cellular is a newer radio frequency (RF) technology than the current FM technology that has been used for radio communications for decades. The Cellular standard has been established for use in the European community and elsewhere. Your FOX5 device is a low power radio transmitter and receiver. They send out and receive radio frequency energy. When you use your modem, the cellular system handling your calls, controls both the radio frequency and the power level of your cellular modem.

SIM cards are required to use the devices. The SIM cards can be acquired from specific providers. Additional costs can result from the use of the SIM cards which are to be borne by the purchaser (client) of the devices. The seller does not cover the extra costs for the use of the devices. The seller gives no recommendation for the use of specific SIM cards and is not liable for the fact that the devices are usable with all available SIM cards. The seller is also not liable for any other costs incurred by the application of the customer in connection with this device.

Exposure to RF Energy

There has been some public concern about possible health effects of using Cellular modems. Although research on health effects from RF energy has focused for many years on the current RF technology, scientists have begun research regarding newer radio technologies, such as Cellular. After existing research had been reviewed, and after compliance with all applicable safety standards had been tested, it has been concluded that the product is fit for use.

If you are concerned about exposure to RF energy, you can minimize exposure by limiting the duration of your calls and operating your cellular modem efficiently by following the guidelines in below topics.

Driving

Check the laws and regulations on the use of cellular devices in the area where you drive. Always obey them. Also, when using your FOX5 device while driving, please pay full attention to driving, pull off the road and park before making or answering a call if driving conditions so require. When applications are prepared for mobile use, they should fulfill road safety instructions of the current law. Install this unit in the car passenger compartment. Placement should not impede driver's view. When sticking the combined antenna to the windshield, ensure it is positioned outside the driver's primary line of sight. Maintaining an unobstructed view of the road for the driver is mandatory.

Electronic Devices

Most electronic equipment, for example in hospitals and motor vehicles is shielded from RF energy. However, RF energy may affect some malfunctioning or improperly shielded electronic equipment.

Vehicle Electronic Equipment

Check with your vehicle manufacturer's representative to determine if any on board electronic equipment is adequately shielded from RF energy.

Medical Electronic Equipment

Consult the manufacturer of any personal medical devices (such as pacemakers, hearing aids, etc.) to determine if they are adequately shielded from external RF energy.

Turn off your FOX5 devices in health care facilities when any regulations posted in the area instruct you to do so. Hospitals or health care facilities may be using RF monitoring equipment.

Aircraft

Turn off your FOX5 device before boarding any aircraft. Use them on the ground only with crew permission. Do not use them in the air.

To prevent possible interference with aircraft systems, Federal Aviation Administration (FAA) regulations require you to have permission from a crew member to use your modems while the plane is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using your modems whilst airborne.

Children

Do not allow children to play with your FOX5 devices. Children could hurt themselves or others, damage the modems or make calls that increase your modem bills.

Blasting Areas

To avoid interfering with blasting operations, turn your device off when in a blasting area or in areas posted: **Turn off two-way radio**. Construction crew often uses remote control RF devices to set off explosives.

Potentially Explosive Atmospheres

Turn off your FOX5 devices when in any area with a potentially explosive atmosphere. It is rare, but your modems or their accessories could generate sparks. Sparks in such areas could cause

an explosion or fire resulting in bodily injury or even death. Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fueling areas such as petrol stations, below decks on boat, fuel or chemical transfer or storage facilities etc., and areas where the air contains chemicals or particles such as grain, dust, or metal powders. Do not transport or store flammable gas, liquid, or explosives, in the compartment of your vehicle which contains your modem or accessories.

Before using your modems in a vehicle powered by liquefied petroleum gas (such as propane or butane) ensure that the vehicle complies with the relevant fire and safety regulations of the country in which the vehicle is to be used.

Non-ionizing Radiation

The FOX5 devices come with internal and external Cellular/GNSS antennas. Therefore, care should be taken to install the devices/antennas in such a position that no part of the human body will normally rest within 20 cm of any part of the antennas for more than a few minutes whilst the equipment is in use. It is also recommended not to use the devices close to medical devices such as hearing aids and pacemakers.

A: Compliance Information

(According to ISO/IEC Guide and EN 45014)

Manufacturer's Name & Address:

Lantronix, Inc. 48 Discovery, Suite 250, Irvine, CA 92618 USA

Product Family:

FOX5-4G

Conforms to the following standards or other normative documents:

Table A-1 Regional Certifications

Country	Specification
USA - FCC	FCC ID: RI7LE910Q1SF FCC ID: R68FOX5BT
Canada - IC	IC: 5131A-LE910Q1SF IC: 3867A-R68FOX5BT
Europe - CE	See Figure A-1
UK - UKCA	See Figure A-2
Australia - RCM	Supplier's declaration of conformity
e-Mark	©24 10R-06 8205
Japan - Telec	003-250194
Safety	UL/CB
Carrier Approval	PTCRB, AT&T (TRENDi, FirstNet), and Verizon

FCC Statements

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.

If not installed and used in accordance with the instructions, may cause harmful interference to radio communications. There 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 to 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.

FCC Caution

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

FCC RF Exposure Statement

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

ISED Notice

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

- ◆ This device may not cause interference.
- ◆ 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.

ISED RF Exposure Information

This device complies with ISED radiation exposure limits set forth for an uncontrolled environment. To avoid the possibility of exceeding the ISED radio frequency exposure limits, human proximity to the antenna shall not be less than 20 cm (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.

EU Declaration of Conformity




EU DECLARATION OF CONFORMITY

Manufacturer's Name: LANTRONIX, INC.
Manufacturer's Address: 48 Discovery, Suite 250, Irvine, CA 92618 US
Model Number: FOX5-4G-C1B

Manufacturer's Quality System:
Perry Johnson Registrars, Inc.
ISO 9001:2015 Certificate No.: C2025 04976

Applicable EU Directives:

Low Voltage Directive (2014/35/EU)

- EN IEC 62368-1:2018

EMC Directive (2014/30/EU)

- EN55032: 2015 + A11: 2020 (Class A)
- EN55035: 2017 + A11: 2020
- EN 301 489-1 V2.2.3
- EN 301 489-17 V3.3.1
- EN 301 489-19 V2.2.1
- EN 301 489-52 V1.3.1

RF Radio Directive (2014 / 53 / EU)

- EN 300 328 V2.2.2
- EN 303 413 V1.2.1
- EN 301 511 V12.5.1
- EN 301 908-1 V15.2.1
- EN 301 908-13 V13.3.1
- EN IEC 62311:2020
- EN 50665:2017

EU Directive 2011/65/EU for Restriction of Hazardous Substance (RoHS2) with exemption 7(c)-I

- EN IEC 63000:2018

Statement of Conformity: The product specified above complies with applicable EU directive referenced, including the application of sound engineering practice.

Radio Equipment Directive 2014/53/EU (RED) article 3.3 (d, e, f) essential requirements for cybersecurity

- EN 18031-1:2024 (Article 3.3(d))

Signature: _____ Date: __10 September 2026__
Name: Steve Burrington Title: Vice President, Global R&D

Figure A-1 EU Declaration of Conformity

EU Statements

Table A-2 EU Statements

Code	Language	Statement
bg	Bulgarian	Lantronix, Inc., декларира, че този FOX5-4G device отговаря на основните изисквания и други приложими разпоредби на Директива 2014/53 / ЕС. Пълният текст на декларацията на ЕС за съответствие е достъпен на следния интернет адрес: https://www.lantronix.com/products/fox5-series/ Известие на ЕС за ограничения при употреба: Това устройство е ограничено само за вътрешна употреба. Може да не се работи на открито.
cs	Česky [Czech]	Lantronix, Inc. tímto prohlašuje, že tento FOX5-4G device je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 2014/53/EU. Úplné znění ES prohlášení o shodě je k dispozici na této internetové adrese: https://www.lantronix.com/products/fox5-series/ Oznámení EU o omezení používání: Toto zařízení je omezeno pouze na použití uvnitř. Nesmí být provozován venku.
da	Dansk [Danish]	Undertegnede Lantronix, Inc. erklærer herved, at følgende udstyr FOX5-4G device overholder de væsentlige krav og øvrige relevante krav i direktiv 2014/53/EU. Den fulde tekst til EU-overensstemmelseserklæringen er tilgængelig på følgende internetadresse: https://www.lantronix.com/products/fox5-series/ EU-meddelelse om begrænsninger i brug: Denne enhed er kun begrænset til indendørs brug. Det betjenes måske ikke udendørs.
de	Deutsch [German]	Hiermit erklärt Lantronix, Inc., dass sich das Gerät FOX5-4G device in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 2014/53/EU befindet. Der vollständige Text der EU-Konformitätserklärung ist unter folgender Internetadresse abrufbar: https://www.lantronix.com/products/fox5-series/ EU-Hinweis zu Nutzungsbeschränkungen: Dieses Gerät darf nur in Innenräumen verwendet werden. Es darf nicht im Freien betrieben werden.

Code	Language	Statement
et	Eesti [Estonian]	Käesolevaga kinnitab Lantronix, Inc. seadme FOX5-4G device vastavust direktiivi 2014/53/EU põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele. EL-i vastavusdeklaratsiooni täielik tekst on saadaval järgmisel Interneti-aadressil: https://www.lantronix.com/products/fox5-series/ EL-i teade kasutuspiirangute kohta: seda seadet saab kasutada ainult siseruumides. Seda ei tohi õues kasutada.
en	English	Hereby, Lantronix, Inc., declares that this FOX5-4G device is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: https://www.lantronix.com/products/fox5-series/ EU Notice of Restrictions on Use: This device is limited to indoor use only. It may not be operated outdoors.
es	Español [Spanish]	Por medio de la presente Lantronix, Inc. declara que el FOX5-4G device module cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 2014/53/EU. El texto completo de la declaración de conformidad de la UE está disponible en la siguiente dirección de Internet: https://www.lantronix.com/products/fox5-series/ Aviso de restricciones de uso de la UE: este dispositivo está limitado solo para uso en interiores. No puede ser operado al aire libre.
el	Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ Lantronix, Inc. ΔΗΛΩΝΕΙ ΟΤΙ FOX5-4G device ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 2014/53/EU. Το πλήρες κείμενο της δήλωσης συμμόρφωσης της ΕΕ διατίθεται στην ακόλουθη διεύθυνση διαδικτύου: https://www.lantronix.com/products/fox5-series/ Ειδοποίηση της ΕΕ για περιορισμούς χρήσης: Η συσκευή αυτή περιορίζεται μόνο σε εσωτερικούς χώρους χρήσης. Μπορεί να μην λειτουργεί σε εξωτερικούς χώρους.

Code	Language	Statement
fr	Français [French]	Par la présente Lantronix, Inc. déclare que l'appareil FOX5-4G device est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 2014/53/EU. Le texte complet de la déclaration de conformité UE est disponible à l'adresse Internet suivante : https://www.lantronix.com/products/fox5-series/ Avis de restrictions d'utilisation de l'UE: Cet appareil est limité à une utilisation en intérieur uniquement. Il ne doit pas être utilisé à l'extérieur.
is	Icelandic	Hér með lýsir Lantronix, Inc. því yfir að FOX5-4G device sé í samræmi við grunnkröfur og önnur viðeigandi ákvæði tilskipunar 2014/53 / ESB. Í heildartexta ESB-samræmisýfirlýsingarinnar er að finna á eftirfarandi internetfangi: https://www.lantronix.com/products/fox5-series/ Tilkynning ESB um takmarkanir á notkun: Þetta tæki er eingöngu takmarkað við notkun innanhúss. Það má ekki nota það úti.
it	Italiano [Italian]	Con la presente Lantronix, Inc. dichiara che questo FOX5-4G device è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 2014/53/EU. Il testo completo della dichiarazione di conformità UE è disponibile al seguente indirizzo Internet: https://www.lantronix.com/products/fox5-series/ Avviso di restrizioni d'uso dell'UE: questo dispositivo è limitato esclusivamente all'uso in interni. Potrebbe non essere utilizzato all'aperto.
lv	Latviski [Latvian]	Ar šo Lantronix, Inc. deklarē, ka FOX5-4G device atbilst Direktīvas 2014/53/EU būtiskajām prasībām un citiem ar to saistītajiem noteikumiem. Pilns ES atbilstības deklarācijas teksts ir pieejams šādā tīmekļa vietnē: https://www.lantronix.com/products/fox5-series/ ES paziņojums par lietošanas ierobežojumiem: šo ierīci var izmantot tikai iekšējās. To nedrīkst darbināt ārpus telpām.
lt	Lietuvių [Lithuanian]	Šiuo Lantronix, Inc. deklaruoja, kad šis FOX5-4G device atitinka esminius reikalavimus ir kitas 2014/53/EU Direktyvos nuostatas. Visą ES atitikties deklaracijos tekstą galite rasti šiuo interneto adresu: https://www.lantronix.com/products/fox5-series/ ES pranešimas apie naudojimo apribojimus: Šis prietaisas skirtas naudoti tik patalpose. Jo negalima naudoti lauke.

Code	Language	Statement
nl	Nederlands [Dutch]	Hierbij verklaart Lantronix, Inc. dat het toestel FOX5-4G device overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 2014/53/EU. De volledige tekst van de EU-conformiteitsverklaring is beschikbaar op het volgende internetadres: https://www.lantronix.com/products/fox5-series/ EU kennisgeving van gebruiksbeperkingen: dit apparaat is beperkt tot gebruik binnenshuis. Het mag niet buitenshuis worden gebruikt.
mt	Malti [Maltese]	Hawnhekk, Lantronix, Inc., jiddikjara li dan FOX5-4G device jikkonforma malhtigijiet essenzjali u ma provvedimenti oħrajn rilevanti li hemm fid-Dirrettiva 2014/53/EU. It-test sħiħ tad-dikjarazzjoni ta 'konformità tal-UE huwa disponibbli fl-indirizz tal-internet li ġej: https://www.lantronix.com/products/fox5-series/ Avviż tal-UE dwar Restrizzjonijiet fuq l-Użu: Dan l-apparat huwa limitat għal użu ġewwa biss. Ma jistax jiġihaddem barra.
hu	Magyar [Hungarian]	Alulírott, Lantronix, Inc. nyilatkozom, hogy a FOX5-4G device megfelel a vonatkozó alapvető követelményeknek és az 2014/53/EU irányelv egyéb előírásainak. Az EU-megfelelőségi nyilatkozat teljes szövege a következő internetes címen érhető el: https://www.lantronix.com/products/fox5-series/ EU értesítés a korlátozásokról: Ez az eszköz csak beltéri használatra korlátozódik. Lehet, hogy szabadban nem üzemeltethető.
no	Norwegian	Lantronix, Inc. erklærer herved at denne FOX5-4G device er i samsvar med de grunnleggende kravene og andre relevante bestemmelser i direktiv 2014/53 / EU. Den fullstendige teksten til EU-samsvarserklæringen er tilgjengelig på følgende internettadresse: https://www.lantronix.com/products/fox5-series/ EUs merknad om bruksbegrensninger: Denne enheten er bare begrenset til innendørs bruk. Det kan hende at den ikke brukes utendørs.

Code	Language	Statement
pl	Polski [Polish]	Niniejszym Lantronix, Inc. oświadcza, że FOX5-4G device jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 2014/53/EU. Pełny tekst deklaracji zgodności UE jest dostępny pod następującym adresem internetowym: https://www.lantronix.com/products/fox5-series/ Zawiadomienie UE o ograniczeniach użytkowania: To urządzenie jest przeznaczone wyłącznie do użytku w pomieszczeniach. Nie można go obsługiwać na zewnątrz.
pt	Português [Portuguese]	Lantronix, Inc. declara que este FOX5-4G device está conforme com os requisitos essenciais e outras disposições da Directiva 2014/53/EU. O texto completo da declaração UE de conformidade está disponível no seguinte endereço na Internet: https://www.lantronix.com/products/fox5-series/ Aviso da UE de restrições de uso: Este dispositivo está limitado apenas ao uso interno. Não pode ser operado ao ar livre.
ro	Romanian	Prin prezenta, Lantronix, Inc., declară că acest FOX5-4G device respectă cerințele esențiale și alte dispoziții relevante din Directiva 2014/53 / UE. Textul complet al declarației de conformitate a UE este disponibil la următoarea adresă de internet: https://www.lantronix.com/products/fox5-series/ Notificarea UE privind restricțiile de utilizare: Acest dispozitiv este limitat numai la uz interior. Este posibil să nu funcționeze în aer liber.
sr	Serbian	Овиме, Лантроник, Инц., изјављује да је овај FOX5-4G device у складу са суштинским захтевима и осталим релевантним одредбама Директиве 2014/53 / ЕУ. Комплетан текст ЕУ изјаве о усаглашености доступан је на следећој Интернет адреси: https://www.lantronix.com/products/fox5-series/ Обавештење ЕУ о ограничењима употребе: Овај уређај је ограничен само на унутрашњу употребу. Можда се не користи на отвореном.
sl	Slovensko [Slovenian]	Lantronix, Inc. izjavlja, da je ta FOX5-4G device v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 2014/53/EU. Celotno besedilo izjave EU o skladnosti je na voljo na naslednjem spletnem naslovu: https://www.lantronix.com/products/fox5-series/ Obvestilo EU o omejitvah uporabe: Ta naprava je omejena samo na notranjo uporabo. Morda ga ne uporabljate na prostem.

Code	Language	Statement
sk	Slovensky [Slovak]	Lantronix, Inc. týmto vyhlasuje, že FOX5-4G device module spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 2014/53/EU. Úplné znenie EÚ vyhlásenia o zhode je k dispozícii na tejto internetovej adrese: https://www.lantronix.com/products/fox5-series/ Oznámenie EÚ o obmedzeniach pri používaní: Toto zariadenie je obmedzené iba na použitie v interiéri. Nesmie sa používať vonku.
fi	Suomi [Finnish]	Lantronix, Inc. vakuuttaa täten että FOX5-4G device tyyppinen laite on direktiivin 2014/53/EU oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen. EU-vaatimustenmukaisuusvakuutuksen koko teksti on saatavana seuraavassa Internet-osoitteessa: https://www.lantronix.com/products/fox5-series/ EU: n ilmoitus käyttörajoituksista: Tämä laite on rajoitettu vain sisäkäyttöön. Sitä ei saa käyttää ulkona.
sv	Svenska [Swedish]	Härmed intygar Lantronix, Inc. att denna FOX5-4G device står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 2014/53/EU. Den fullständiga texten till EU-försäkran om överensstämmelse finns på följande internetadress: https://www.lantronix.com/products/fox5-series/ EU-meddelande om begränsningar för användning: Den här enheten är endast begränsad till inomhusbruk. Det får inte användas utomhus.

UK Declaration of Conformity




UK DECLARATION OF CONFORMITY

Manufacturer's Name: LANTRONIX, INC.
Manufacturer's Address: 48 Discovery, Suite 250, Irvine, CA 92618 US
Model Number: FOX5-4G-C1B

Manufacturer's Quality System:
Perry Johnson Registrars, Inc.
ISO 9001:2015 Certificate No.: C2025 04976

Applicable EU Directives:

Electrical Equipment (Safety) Regulations 2016

- EN IEC 62368-1:2018

Electromagnetic Compatibility Regulations 2016

- EN55032: 2015 + A11: 2020 (Class A)
- EN55035: 2017 + A11: 2020
- EN 301 489-1 V2.2.3
- EN 301 489-17 V3.3.1
- EN 301 489-19 V2.2.1
- EN 301 489-52 V1.3.1

Radio Equipment Regulations 2017

- EN 300 328 V2.2.2
- EN 303 413 V1.2.1
- EN 301 511 V12.5.1
- EN 301 908-1 V15.2.1
- EN 301 908-13 V13.3.1
- EN IEC 62311:2020
- EN 50665:2017

UK SI 2012 No. 3032 for Restriction of Hazardous Substance (RoHS2) with exemption 7(c)-I and 6(c).

- 1) 2011/65/EU Restriction of the use of Hazardous Substances in EEE (RoHS)
- 2) 2015/863/EU Change of Annex II from 2011/65/EU
- 3) Directive 2018/736/EU[7(c)-I] and 2018/741/EU[6(c)]

BS EN IEC 63000 : 2018

Statement of Conformity: The product specified above complies with applicable EU directive referenced, including the application of sound engineering practice.

Signature:  Date: __10 September 2026__

Name: Steve Burrington Title: Vice President, Global R&D

Figure A-2 UK Declaration of Conformity

B: Vehicle Installation

You can install the FOX5 device in your vehicle to track and locate the vehicle and receive notifications when any disagreements with your stored configuration in the device occur. As per your requirements, you can program the digital outputs to activate a relay, buzzer, turn on an LED, etc. The digital inputs can be individually configured, for example, to detect something when its is opened or closed. Changes on digital inputs can trigger an output to be activated, such as a relay or buzzer. The IGN line can be connected to the vehicle ignition key to monitor its ON/OFF position. Figure below illustrates a common schematic to install the FOX5 devices in the vehicle. For instructions on how to install and use a FOX5 device in a vehicle, and information about accessories required, refer to *App Note: In-Vehicle Installation Guidelines for FOX3-2G/3G/4G and Bolero40 Series* (see [Additional Documentation](#)).

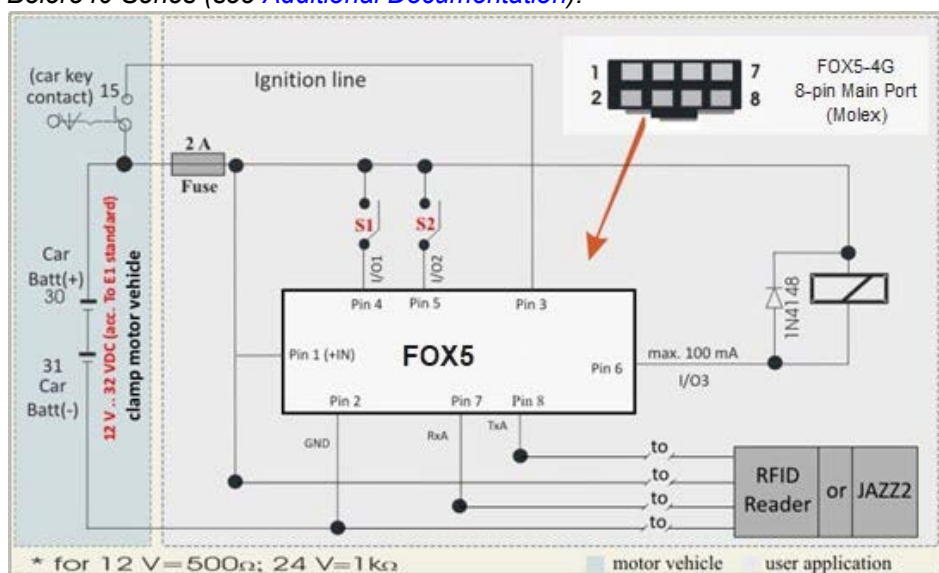


Figure B-1 Schematic for FOX5 Device Vehicle Installation

Caution:

- ◆ **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 FOX5 device from the vehicle body. Do not connect power from a different system to the device.**
- ◆ **The outputs of the FOX5 device must be supplied with the same voltage applied to the (+IN) pin. The operating voltage MUST never exceed its range as the device is not protected against continuous over-voltage. For security reasons, it is recommended to integrate an external 2A fuse between the positive wire of the device (+IN) and D.C. power source.**
- ◆ **You can mount the external antenna on the dash or on the windshield of the vehicle with the GPS side facing the sky. When sticking the combined antenna to the windshield, ensure it is positioned outside the driver's primary line of sight. Maintaining an unobstructed view of the road for the driver is mandatory. For security purposes, to prevent theft, it is advisable to mount the antenna under the dashboard.**
- ◆ **Apply power to the FOX5 device 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 device.**

Safety Information

Follow the safety instructions listed below while installing and operating a FOX5 device in vehicle environment:

1. The unit must be installed after a UL listed Fuse for Automobile use which complies with UL 275 (CCN FHXT) and rated 2 A. For example, COOPER BUSSMANN LLC model ATC-2.
2. All power wiring must be done with the supplied power cable and comply with intended applications of Society of Automotive Engineers (SAE J1292 or/and SAE J1939 or/and SAE J1128) specifications with suitable ratings of electrical, temperature exposure, and flammability.
3. The installation of the equipment to the vehicle power system should be done by a professional (skilled person), in accordance with SAE specifications.
4. Instructions caution the correct installation so as not to overload a particular vehicle system i.e., following vehicle information so you do not overload a particular circuit when adding an aftermarket device.
5. Install this unit in the car passenger compartment. Placement should not impede driver's view.

C: Sample Configuration

Your FOX5 device ships with preloaded sample configuration provided in [Table C-1](#) below. The sample configuration takes effect once you power on the device.

Table C-1 FOX5 Sample Configuration

Function	Description and Configuration
Device Name	Default Device Name
	The device name FOX5-1234 is set by default. "1234" represents the last 4 digits of the serial number
Protocol Settings	Define which Protocol you want to see on the Terminal.
	\$PFAL,CNF.Set,PROT.START.BIN=\$! \$PFAL,CNF.Set,PROT.RMC=1 \$PFAL,CNF.Set,PROT.IOP=1 \$PFAL,CNF.Set,PROT.GSM=1 \$PFAL,CNF.Set,PROT.GSA=1 \$PFAL,CNF.Set,PROT.GSV=1 \$PFAL,CNF.Set,PROT.NET=1
Alias	Define all needed aliases to make the configuration better readable.
Common Alias	\$PFAL,CNF.Set,ALIAS.SYS=System \$PFAL,CNF.Set,ALIAS.CNF=Config
Alias for Timers	\$PFAL,CNF.Set,ALIAS.SYS.TIMER0=_20SEC \$PFAL,CNF.Set,ALIAS.SYS.TIMER1=_TRIP_START_STOP \$PFAL,CNF.Set,ALIAS.SYS.TIMER2=_GO_SLEEP \$PFAL,CNF.Set,ALIAS.SYS.TIMER3=_GO_DOZE \$PFAL,CNF.Set,ALIAS.SYS.TIMER4=_BLE_SCAN
Alias for Triggers	\$PFAL,Cnf.set,ALIAS.SYS.TRIGGER0=_POWERSAVE \$PFAL,Cnf.set,ALIAS.SYS.TRIGGER1=_ARM \$PFAL,Cnf.set,ALIAS.SYS.TRIGGER2=_TRIP \$PFAL,Cnf.set,ALIAS.SYS.TRIGGER3=_TRIPTYPE
Alias for IOs	\$PFAL,CNF.Set,ALIAS.IO0=_ANA0 \$PFAL,CNF.Set,ALIAS.IO1=_ANA1 \$PFAL,CNF.Set,ALIAS.IO2=_ANA2 \$PFAL,CNF.Set,ALIAS.IO4=_OUT0 \$PFAL,CNF.Set,ALIAS.IO5=_OUT1 \$PFAL,CNF.Set,ALIAS.IO6=_OUT2 \$PFAL,CNF.Set,ALIAS.IO7=_RESET_BIOS \$PFAL,CNF.Set,ALIAS.IO8=_IGN

Function	Description and Configuration
Alias for LEDs	//Yellow LED – To indicate TCP/MQTT/REST/PercepXion Connection Status \$PFAL,CNF.Set,ALIAS.IO11=_LEDY //Green LED - To indicate GNSS Fix Status \$PFAL,CNF.Set,ALIAS.IO12=_LEDG //Red LED - To indicate Power Supply Status \$PFAL,CNF.Set,ALIAS.IO13=_LEDR
Power Modes	Setup all needed Device Power Modes.
	\$PFAL,CNF.Set,DEVICE.IGNTIMEOUT=60000
Battery Modes	Setup all needed Device Battery Modes.
	\$PFAL,Sys.Bat.chargemode=eco \$PFAL,Sys.Bat.mode=auto
GNSS	Setup GNSS
	\$PFAL,GPS.NAV.GNSS=GPS,BEIDOU,GALILEO
Cellular	Setup Cellular Connection
	//The user needs to configure APN, if required by the network operator \$PFAL,CNF.Set,GPRS.APN=<APN> \$PFAL,CNF.Set,PPP.USERNAME=<APN_USERNAME> \$PFAL,CNF.Set,PPP.PASSWORD=<APN_PASSWORD>
Network	Automatic Network Startup
	\$PFAL,CNF.Set,GPRS.AUTOSTART=1
Buffer Data	Non-volatile buffered data
	\$PFAL,CNF.Set,TCP.CLIENT.SENDMODE=2
PercepXion	Setup PercepXion Connection
	\$PFAL,CNF.Set,PX.CLIENT.CONNECT=1,api.percepXion.ai \$PFAL,CNF.Set,PX.CLIENT.DEVICE_NAME=FOX5 \$PFAL,CNF.Set,PX.CLIENT.DEVICE_DESCRIPTION=Default profile \$PFAL,CNF.Set,PX.CLIENT.STATUS_UPDATE_INTERVAL=2 \$PFAL,CNF.Set,PX.CLIENT.CONTENT_CHECK_INTERVAL=1 \$PFAL,CNF.Set,PX.CLIENT.AUDITLOGS=1
Modbus	Activate Modbus Reading on Accessory Serial Port
	// Serial settings: 9600, 8N1 baudrate // Modbus demo registers: 400100 U32 and 400102 U32 \$PFAL,SYS.ModBus.Enable,Serial1,9600 \$PFAL,SYS.ModBus.Poll="1:LE,400100:U32:10,400102:U32:10"
BLE	Activate BLE Scanning
	// Run an automatic BLE scan every 2min \$PFAL,CNF.Set,DEVICE.BLE.STARTUP=on \$PFAL,CNF.Set,AL20=SYS.Timer.e_BLE_SCAN:SYS.BLE.Scan,120
PercepXion Telemetry Data reporting	Send Modbus and BLE reading to PercepXion Telemetry

Function	Description and Configuration
	//Timer is defined on Percepxion. <pre>\$PFAL,CNF.Set,PX.CLIENT.GROUPS_CAP_EXCHANGE_DATA={"name":"demo","record_name":"Modbus and BLE data","record_category":"Data","record_description":"Modbus and BLE data","record_subcategory":"Modbus and BLE data"} \$PFAL,CNF.Set,PX.CLIENT.GROUPS_CAP_SELECTION_DATA={"name":"demo","record_description":"Modbus and BLE data","detail":[{"name":"register1","record_name":"Holding Register 400100","record_type":"string","record_length":50},{"name":"register2","record_name":"Holding Register 400200","record_type":"string","record_length":50},{"name":"ble_mac","record_name":"List of BLE MAC address","record_type":"string","record_length":50}], "record_name":"Modbus and BLE data"} \$PFAL,CNF.Set,PX.CLIENT.GROUPS_TELEMETRY_DATA={"name":"demo","detail":[{"name":"register1","value":"&(ModBus:400100)"}, {"name":"register2","value":"&(ModBus:400102)"}, {"name":"ble_mac","value":"&(BLE.List)"}]} \$PFAL,CNF.Set,PX.CLIENT.GROUPS_SENDETELEMETRY=1</pre>
Starting with PFAL Script	Startup the device and setup main Timer.
	<pre>\$PFAL,CNF.Set,AL0=SYS.Device.eStart:GPS.Nav.Position0=load0&SYS.TIME R_20SEC.start=cyclic,20000&SYS.TIMER_BLE_SCAN.start=cyclic,60000&SYS.Lua.Start</pre>
Shutdown Handling	Setup Shutdown Handling.
	Start 30s timer after loss of external power, go to Doze Mode to reduce power consumption. <pre>\$PFAL,CNF.Set,AL1=SYS.Power.eDropped:Sys.Timer_GO_DOZE.Start=single,180000</pre> Start 30s timer after IGN line is down, go to Doze Mode to reduce power consumption.
	<pre>\$PFAL,CNF.Set,AL2=IO.e_IGN=fedge:Sys.Timer_GO_DOZE.Start=single,180000</pre> Stop the Timer to go to Doze mode when IGN is High again. <pre>\$PFAL,CNF.Set,AL3=IO.e_IGN=redge:Sys.Timer_GO_SLEEP.Stop</pre> Stop the Timer to go to Doze mode when ext Power is High again. <pre>PFAL,CNF.Set,AL4=Sys.Power.eDetected:Sys.Timer_GO_SLEEP.Stop</pre> Go to Doze mode Mode after the 30sec timer execution and start new timer for 24h to go to (Deep) Sleep mode. <pre>\$PFAL,CNF.Set,AL5=SYS.Timer.e_GO_DOZE:Sys.Device.Doze=Ign+Wakeup=23:20:00&Sys.Timer_GO_SLEEP.Start=single,86400000</pre> Finally go to Sleep mode. <pre>\$PFAL,CNF.Set,AL6=SYS.Timer.e_GO_SLEEP:GPS.Nav.Position0=save0&Sys.device.sleep=Ign+ExtPwrDrop+GPS+Motion=200</pre>
LED Handling	Setup LED Handling

Function	Description and Configuration
	Let Green LED blink when no GNSS fix but searching.
	PFAL,CNF.Set,AL7=GPS.Nav.sFix=invalid:IO_LEDG.Set=cyclic,200,200
	Let Green LED on when have valid GNSS Fix
	\$PFAL,CNF.Set,AL8=GPS.Nav.sFix=valid:IO_LEDG.Set=hpulse,1200
	Blink Red LED when device running on Battery or on insufficient ext. Power
	\$PFAL,CNF.Set,AL9=Sys.Power.sVoltage<9:IO_LEDR.Set=cyclic,200,200
	Set Red LED to on when good ext. Power.
	\$PFAL,CNF.Set,AL10=Sys.Power.sVoltage>9:IO_LEDR.Set=hpulse,1200
	Set Yellow LED off when no Cellular Network.
	\$PFAL,CNF.Set,AL11=GSM.eOplost:IO_LEDY.Set=low
	Set Yellow LED fast blinking when Cellular network attached.
	\$PFAL,CNF.Set,AL12=GSM.eOpfound:IO_LEDY.Set=cyclic,200,200
	Set Yellow LED slower blinking when Cellular Data attached.
	\$PFAL,CNF.Set,AL13=GSM.GPRS.eConnected:IO_LEDY.Set=cyclic,400,400
	Set Yellow LED to high when Connected to backend, use when new Percepixon CMD Integrated
	\$PFAL,CNF.Set,AL14=GSM.sOpValid&TCP.Client.sConnected:IO_LEDY.Set=hpulse,1200
	Set Yellow LED to go back to slow blinking when backend connection lost but Cellular Network attached.
	\$PFAL,CNF.Set,AL15=TCP.Client.eDisconnected&GSM.sOpValid:IO_LEDY.Set=cyclic,400,400
	Set Yellow LED to go back to fast blinking when backend connection lost but Cellular Data lost.
	\$PFAL,CNF.Set,AL16=GSM.GPRS.eDisconnected&GSM.sOpValid:IO_LEDY.Set=cyclic,200,200
Tracking	Setup Basic Tracking
	Enable GPS AUTOCORRECT with base values.
	\$PFAL,CNF.Set,DEVICE.GPS.AUTOCORRECT=on,8.0,127,30,10
	Check position every 20 seconds if the distance is > 200m, set Data Point to CF.
	\$PFAL,CNF.Set,AL17=SYS.TIMER.e_20SEC&GPS.Nav.Position.s0>200&GPS.Nav.sSpeed>2:GPS.Nav.Position0=current
	Check position Heading changes more than 15° after last position sent and speed higher than 2m/s to prevent non moving data.
	\$PFAL,CNF.Set,DEVICE.GPS.Heading=15 \$PFAL,CNF.Set,AL18=GPS.Nav.eChangeHeading&GPS.Nav.sSpeed>2:GPS.Nav.Position0=current
Antenna	Antenna swapping in./ext.
	\$PFAL,CNF.Set,AL50=GPS.eExtAntPlugged:GSM.SetExternalAntenna \$PFAL,CNF.Set,AL51=GPS.eExtAntUnplugged:GSM.SetInternalAntenna
	As there is no GNSS antenna detection support, antenna needs to be selected manually

Function	Description and Configuration
	\$PFAL,GSM.SetInternalAntenna \$PFAL,GSM.SetExternalAntenna

D: Third Party Applications Disclaimer

Disclaimer concerning any application the customer may develop with FOX5 devices:

1. Due to the variety of applications supported by FOX5 devices, we are not able to test all such types of applications.
2. The customer is solely responsible for proper use of the products and for a long-term test of the developed applications.
3. All applications are highly influenced by environmental conditions, correct handling, installation, and device configuration/programming. We don't assume any responsibility for proper working of customer applications and any damage or loss caused by non-working applications.
4. We are not responsible for and disclaim all warranties with respect to third-party products, and any damages caused by use of the third-party products in any combination with our devices. We do not assure that third-party products in use with our products will operate technically trouble free.
5. We recommend performing a reasonable test of your application before deploying into the field. The test should be also performed on any modification of configuration/programming, firmware update, and any other changes made to the connected devices or peripherals before deploying them into the field. The environmental conditions and the duration of these tests should reflect the conditions of the real use case/installation.

E: Lantronix Technical Support

Lantronix offers many resources to support our customers and products at <http://www.lantronix.com/technical-support/>.

For example, you can browse the knowledge base, open a support issue, find firmware downloads, view tutorials, and more. At this site you can also find FAQs, product bulletins, warranty information, extended support services, and product documentation.

To submit a support request, please use the Lantronix Technical Support portal at <https://ltrxdev.atlassian.net/wiki/spaces/LTRXTS/overview> (registration required).

To contact Lantronix Sales, look up your local office at <https://www.lantronix.com/about-us/contact/>.