# LANTRONIX®

# Application Note

## How to use IOBOX-WLAN with a FOX3-3G/4G series device

## Intellectual Property

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## Disclaimer

# Revision History

| Date | Rev. | Comments |
|------|------|----------|
| March 2017 | 1.0.0 | Initial version |
| August 2017 | 1.0.1 | Added event SYS.WLAN.eConnecting. Document throughout updated. |
| October 2019 | A | Initial Lantronix document. Added Lantronix document part number, logo, contact information, and links. |

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

# Table of Contents

# 1. INTRODUCTION

This guide provides a quick overview on how to configure your FOX3-3G/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.

## 1.1   What is a Wireless Local Area Network (WLAN)?

A wireless local area network (WLAN) is a wireless distribution method for two or more devices that use high-frequency radio waves and often include an access point to the Internet. A WLAN allows users to move around the coverage area, often a home or small office, while maintaining a network connection. There are two categories of WLAN: access points (APs) and clients. APs transmit and receive radio frequency signals with devices able to receive transmitted signals; they normally function as routers. Clients may include a variety of devices such as desktop computers, workstations, laptop computers, IP phones and other cell phones and Smartphones. The IOBOX-WLAN is a WLAN client device.

## 1.2   General about IOBOX-WLAN

IOBOX-WLAN is a WLAN high-quality accessory with a 2.4GHz ISM band for the FOX3-3G/4G Series that connects to a WLAN access point after applying relevant WLAN settings into the FOX3-3G/4G Series and delivers the real-time data from the FOX3-3G/4G Series device via WLAN to your remote server. The IOBOX-WLAN works independently from the cellular network on the FOX3-3G/4G Series. The AVL firmware offers, by means of the PFAL commands, the possibility to configure the WLAN as the primary communication interface and cellular as an automated fallback if there is no WLAN connection available.

In addition to the WLAN functionality, the IOBOX-WLAN offers the same functions of the IOBOX-CAN such as several programmable inputs and outputs for almost every application within the automobile industry, a second CAN interface and a D8 interface for reading the live data from a digital tachograph (VDO and Stoneridge). For more details about the CAN-Bus and D8, refer to the chapter 3.1. The IOBOX-WLAN device contains a 16pin I/O connector, a FAKRA connector for connection to an external WLAN antenna (FAL-ANT-15) and a mini-USB connector used for direct connection to the FOX3-3G/4G Series. For more details about IOs and connection to FOX3-3G/4G refer to the chapter 3.1 "*FOX3_3G_4G_HardwareManual.pdf*"

## 1.3   Hardware Requirements

- WLAN access point (e.g. WLAN router at your home or facility)
- IOBOX-WLAN device
- FAL-ANT-15 – WLAN external antenna
- FOX3-3G/4G series with firmware 3.0.0 or higher
- CA68 - Installation and power supply cable for FOX3 series device
- CA38 - Connection cable for using I/Os of IOBOX-WLAN (if required)
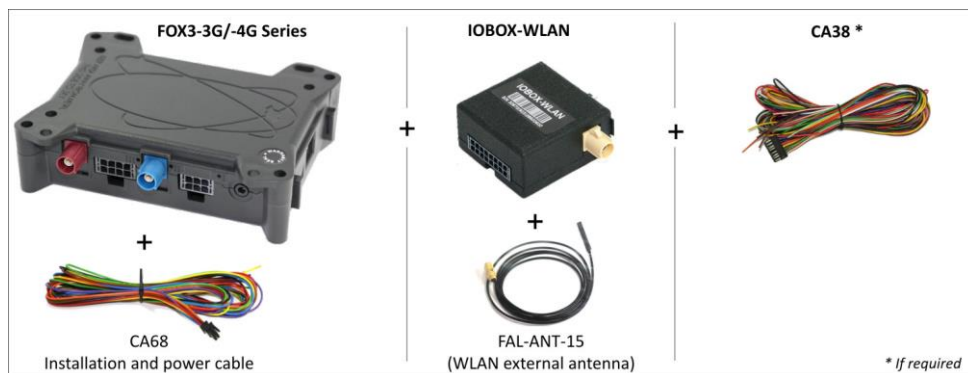


**Fig. 1**: Requirements for using IOBOX-WLAN with FOX3-3G/-4G

# 2. SENDING DATA OVER WLAN

## 2.1 Device configuration

To send data over WLAN to your remote server with IOBOX-WLAN and FOX3-3G/4G devices, you have to first configure your FOX3-3G/4G device by sending/storing the following PFAL script into the FOX3-3G/4G device using the Workbench software.

The Workbench software can be downloaded from the Lantronix website (see chapter 3.1). After you have installed it on your PC, load the PFAL script below into your FOX3-3G/4G device and restart it. More information on how to download the Workbench software, install it and load the PFAL script can be found in the hardware manual of the device you are using (see chapter 3.1).

| |
|---|
| **To be able to setup the WLAN parameters in the FOX3 device while no IOBOX-WLAN is connected, you have to use the $PFAL,CNF.Write instead of $PFAL,CNF.Set. You can setup up to 5 WLAN networks, however it is not mandatory. If you only have one WLAN network, use index 0. To use WLAN connectivity, set your settings and load them into FOX3-3G/4G.** |

$PFAL,CNF.Write,WLAN.NET0.IP=<remote server ip in format xxx.xxx.xxx.xxx >

$PFAL,CNF.Write,WLAN.NET0.PORT=<server port in format yyyy>

$PFAL,CNF.Write,WLAN.NET0.PSK=<Password>

$PFAL,CNF.Write,WLAN.NET0.SECURITY=<WLAN security WPA|WPA2|WPA2mixed|WEP|NONE>

$PFAL,CNF.Write,WLAN.NET0.SSID=<NameOfNetwork>

$PFAL,CNF.Write,WLAN.RSSIMIN=20

$PFAL,CNF.Set,DEVICE.WLAN.STARTUP=on,60000,60000

| |
|---|
| **To use GPRS/TCP connectivity as fallback communication, set your settings and load them into FOX3-3G/4G** |

$PFAL,CNF.Set,TCP.CLIENT.CONNECT=1,<remote server ip in format xxx.xxx.xxx.xxx>,<server port in format yyyy>

$PFAL,CNF.Set,PPP.PASSWORD=<enter PPP password>

$PFAL,CNF.Set,PPP.USERNAME=<enter PPP username>

$PFAL,CNF.Set,GPRS.APN=<enter your operator's APN>

$PFAL,CNF.Set,GPRS.AUTOSTART=0

| |
|---|
| **To switch between WLAN and mobile network and send data to your remote server, load the alarms below into FOX3-3G/4G and restart your device with $PFAL,Sys.Device.Reset.** <br> **If you use the alarms below, your FOX3-3G/4G behaves after restart as follows:** <br> **It will use first GPRS connection and disconnect automatically from GPRS services once there is WLAN network available. If the device is out of WLAN coverage, it will use automatically GPRS connection. The data is then send if you turn ON (+12V) and OFF (GND) the ignition line (PIN 3 on the main port).** |

$PFAL,CNF.Set,AL0=Sys.Device.eStart:GSM.GPRS.Connect

$PFAL,CNF.Set,AL1=SYS.WLAN.TCP.eConnected:GSM.GPRS.Disconnect&Sys.Trigger0=high

$PFAL,CNF.Set,AL2=IO.e8=edges&Sys.Trigger.s0=high:WLAN.Send,8,"Data over WLAN, IGN=&(IO8)"

$PFAL,CNF.Set,AL3=SYS.WLAN.TCP.eDisconnected?SYS.WLAN.eDisconnected:Sys.Trigger0=low&GSM.GPRS.Connect

$PFAL,CNF.Set,AL4= IO.e8=edges&TCP.Client.sConnected:TCP.Client.Send,8,"Data over TCP, IGN=&(IO8)"

## 2.2 WLAN configuration settings in AVL firmware 3.0.0

The following configuration parameters are implemented for the IOBOX-WLAN. For saving the WLAN configuration settings, use the command below and write directly after the comma "," without spaces the configuration parameter you want to set:

| Command | Description |
|---|---|
| $PFAL,CNF.Write, | Set the configuration setting with this command, if the IOBOX-WLAN is connected or not to the FOX3-3G/4G. E.g: *$PFAL,CNF.Write,WLAN.CLIENT.LOGIN=1* |
| $PFAL,CNF.Set, | Set the configuration setting with this command, if the OBOX-WLAN is already connected to the FOX3-3G/4G only. E.*g: $PFAL,CNF.Set,WLAN.CLIENT.LOGIN=1* |

The table below shows the configuration parameters implemented for the IOBOX-WLAN.

| Configuration Settings | Description |
|---|---|
| DEVICE.WLAN.STARTUP= <state>,<auto_reconnect>,<tcp_timeout> | If set to on, the module is running and ready to scan for networks. If set to off, the module will shut down after initialization.<br><br><state> = **On**, **Off**<br><br><auto_reconnect> = off=**0**\| on in ms [≥ **60000**)<br><br><tcp_timeout> in ms [≥ **60000**) |
| The following parameters are used to initialize a "known networks list". All of the five parameters must be set for a specific index. If one of the parameters is missing, the configuration for this network will be initialized as invalid. If an entry is changed at runtime the internal list is updated. If all entries for one network get valid, the network will be used at a network scan. Max. 5 networks can be configured (ids range from 0 to 4). | |
| WLAN.CLIENT.LOGIN=<mode> | Enables/disables sending of ServerLogin if the connection to the TCP server is established. <mode> can be set to:<br><br>**0** = Disables login<br><br>**1** = Enables login |
| WLAN.NET<id>.SSID=<ssid> | Sets the <SSID> of the access points to which the IOBOX-WLAN can be connected (max. 32 characters) |
| WLAN.NET<id>.PSK=<psk> | Sets the password of the Hotspot to connect (max. 63 characters) |
| WLAN.NET<id>.SECURITY=<WPA\|WPA2\|WPA2mixed\|WEP\|NONE> | Sets the encryption method of data transmission between IOBOX-WLAN and Hotspot. |
| WLAN.NET<id>.IP=<ip> | Sets the IP address (in dotted-four-byte format) of the remote server to connect to after connecting to the WLAN network. |
| WLAN.NET<id>.PORT=<port> | Sets the TCP port of the remote server to connect to after connecting to the WLAN network. |
| WLAN.RSSIMIN=<level> | Scans for networks with RSSI (Received Signal Strength Indicator) levels greater than the user defined value <level>. |

## 2.3   WLAN PFAL commands in AVL firmware 3.0.0

The table below shows the PFAL commands implemented for the IOBOX-WLAN.

| Commands | Description |
|---|---|
| SYS.WLAN.Enable | Enables and boot WLAN module |
| SYS.WLAN.Disable | Disables and shutdown WLAN module |
| WLAN.Send,<protocol>,<text> | Sends data over WLAN to the connected server. If WLAN interface is disabled or it is not connected to the network this command returns an error. |
| WLAN.Scan | Starts a scan for WLAN networks.<br><br>After the scan is finished, the WLAN module will be configured for the first network that matches a network in the "known networks list". After successful configuration for a network, the module will try to connect automatically.<br><br>If the connection cannot be established (authentication failed or network is lost while connecting), the software will enter unconnected state and a new scan can be started. This command returns an error if WLAN is disabled, already connected or the module is not ready |
| Wlan.Client.Disconnect | Disconnects IOBOX-WLAN from remote server. The IOBOX-WLAN starts immediately an auto reconnect. |
| Wlan.Disconnect | Disconnects IOBOX-WLAN from WLAN network; The IOBOX-WLAN starts to reconnect after auto_reconnect timer runs out and if auto_reconnect >= 60000. |

## 2.4   WLAN events & states in AVL firmware 3.0.0

The table below shows the events and states implemented for the IOBOX-WLAN.

| WLAN Events/States | Description |
|---|---|
| SYS.WLAN.eConnecting | Occurs when the device starts a connection to an access point. This is done after the end of scan and a scanned SSID was found in WLAN configuration. |
| SYS.WLAN.eConnected[=<ssid>] | Occurs when a connection to an access point is established.<br><br>The SSID of the connected network is given as a parameter, but is optional in an alarm configuration. If no SSID is given in an alarm configuration, the event will trigger for all networks. |
| SYS.WLAN.eDisconnected | Occurs when a connection to an access point is lost. In the current implementation, the module will not try to reconnect. To reconnect, the "WLAN.Scan" command must be executed. |
| SYS.WLAN.sConnected[=<ssid>] | It works the same as WLAN.eConnected, but it generates this state every second. |
| SYS.WLAN.TCP.eConnected | Occurs when the socket connection is established. |
| SYS.WLAN.TCP.eDisconnected | Occurs when the socket connection is closed. |
| SYS.WLAN.TCP.sConnected | The same as WLAN.TCP.eConnected, but it generates this state every second until the TCP connection over WLAN is closed. |
| SYS.WLAN.eReceived[=" text "] | The <text> parameter is optional. If not specified, this event occurs whenever something terminated with CRLF over WLAN is received. |

# 3. DOCUMENTATION

## 3.1 Additional documentation & software tools

If this application note does not cover all the information you need to setup, refer to the additional documents listed below, which can be found on the *Product Index* or *Application Notes* pages.

| Filename | Description |
|---|---|
| AVL_PFAL_Configuration_Command_Set.pdf | Lists and describes all PFAL commands supported by the AVL devices. |
| FOX3_3G_4G_HardwareManual.pdf | Contains instructions for safety and operation of the FOX3/-3G device. |
| AppNotes_AVL_Installation_Guide.pdf | Provides all the necessary information about installing the Lantronix products properly and safely. |
| AppNote_IOBOX-CAN_D8_Interface_HowTo.pdf | Provides information on how to configure your FOX3 series devices in combination with the accessory box IOBOX-CAN/WLAN, connect the IOBOX-CAN/WLAN to D8 connector of the digital tachograph, read real time data from this interface and transfer them to your platform server. |
| AppNotesForCANBusApplication.pdf | Provides information how to connect your device with CAN interface directly to a CAN bus and read the data. |
| AppNote_CAN_FMS_CAN_OBDII_Howto.pdf | Describes how to get CAN-Bus information from a vehicle using Lantronix AVL devices with CAN-Bus. |
| **Workbench Software** | **Description** |
| Lantronix Workbench | Lantronix Workbench configuration tool (Windows XP, Windows Vista, Windows 7) |