

TELEMATICS FOR AGRICULTURE AND FARMING INDUSTRY

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Introduction

To satisfy the growing demand for farming produce and tackle many challenges affecting the agriculture industry, present-day farmers have to be more innovative, efficient, competitive, but save resources at the same time. As a result, comprehensive, affordable, and customisable agricultural machinery tracking solutions combined with process monitoring and automation are becoming not only an attractive option but rather a necessity.

Solution description

Thanks to the fast-developing IoT technologies, agriculture-specific equipment, farming implements, and/or accessories tracking and management can be successfully achieved by combining GPS devices, CAN Bus data adaptors, and Bluetooth® Low Energy 4.X (BLE) ID beacons. The ultimate choice for this matter - Teltonika ADVANCED category GPS tracker FMB140 with built-in CAN data reading feature and advanced software version supporting agriculture type vehicles (aka ALL-CAN300 option). The main advantage is the ability to receive specific agricultural vehicle data via the CAN bus via the Agricultural State Flag parameter. It is possible to obtain such special data as the position of the joystick, the position and status of hydraulic tools, the status of the grain tank and more. Also, using BLE sensors and beacons, you can get additional parameters that are not provided by standard sensors. This can be raising or lowering of the dump truck body and cab, temperature

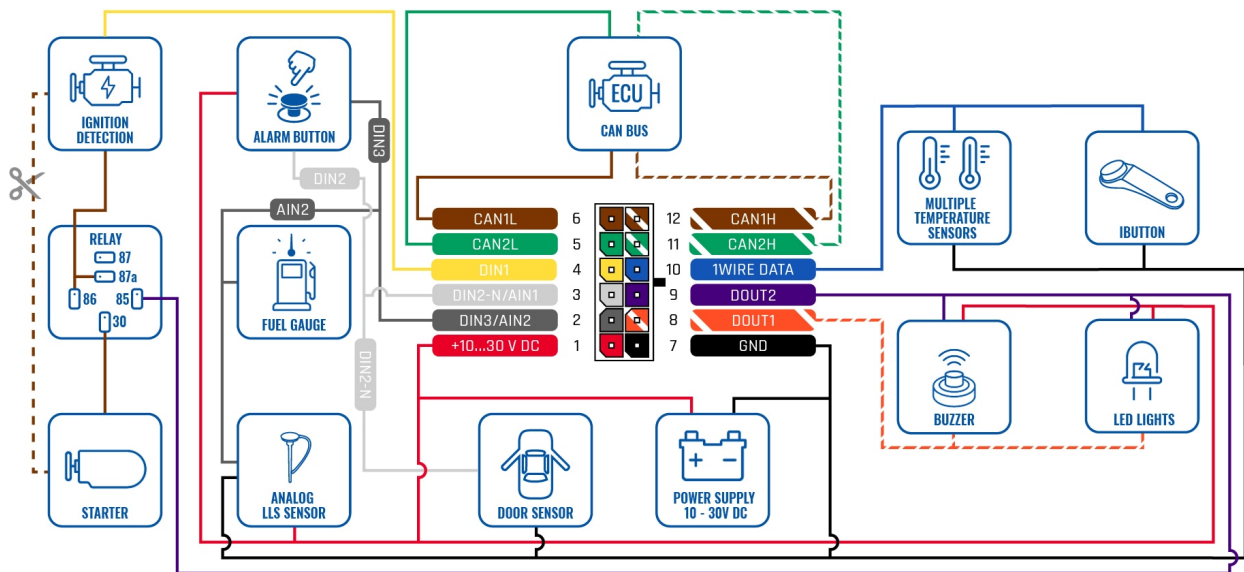
and humidity in the chamber. You can also track expensive equipment using BLE beacons.

What you need for a solution?

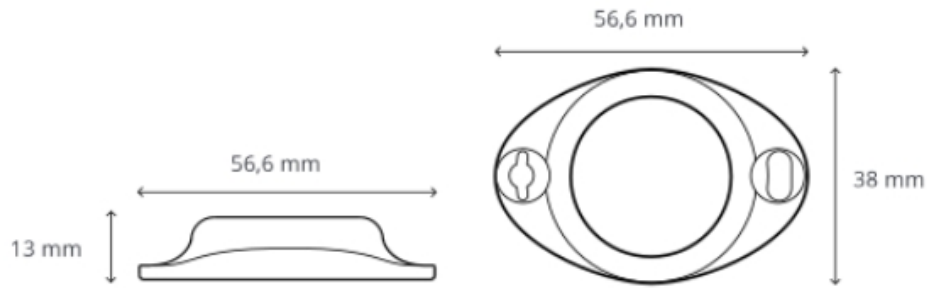
- [FMB140 device](#).
- The [SIM card](#) in order to get data to your server
- [FOTA WEB](#) to remotely send the configuration to the device.
- [BLE ID beacons and sensors](#).

Installation

FMB140 WIRING SCHEME



When installing FMB140 in a vehicle, follow the [mounting recommendations](#). When connecting to the CAN bus, you must use the diagrams provided by our technical support engineers. The diagrams indicate in detail and clearly the connection points in the vehicle wiring and the required program number. It is also possible to obtain data from the vehicle CAN bus by performing an [auto scan procedure](#). FMB140 has the function of working with wireless BLE sensors, supports connection of temperature sensors and iButton reader via 1-wire.



The installation of BLE sensors and beacons is quite simple, you need to install the sensor in a suitable place using screws or double-sided tape and install the required configuration in the tracker and sensor. This gives a huge advantage over wired sensors, since there is no need to pull wires, which means you can seriously save on the services of an electrician!

Configuration

1. Prerequisites:

1.1. Read through [start guide](#)

1.2. Understanding of possible [Sleep modes](#).



Parameter ID - Parameter name GPRS settings:

- 2001 - APN
- 2002 - APN username (if there are no APN username, empty field should be left)
- 2003 - APN password (if there are no APN password, empty field should be left)



Server settings:

- 2004 - Domain
- 2005 - Port
- 2006 - Data sending protocol (0 - TCP, 1 - UDP)

After successful GPRS/SERVER settings configuration, FMB140 device will **synchronize time** and **update records** to **the configured server**. Time intervals and default I/O elements can be changed by using [Teltonika Configurator](#) or [SMS parameters](#).



Data protocol settings:

- **113** - Data protocol (0 - Codec8, 1 - Codec8Extended)

Note: To get OEM parameters, you need to use [Codec8Extended](#).



Sleep settings:

- **102** - Sleep settings (0 - Disable, 1 - Gps sleep, 2 - Deep sleep, 3 - Online Deep sleep, 4 - Ultra sleep)

Note: This scenario will not work with [Deep Sleep](#) and [Ultra Sleep](#) modes, since they disable the device's GSM module to save power.

Program Number

CAN Adapter setting:

- **45002** - The program number that is indicated in the wiring diagram.

Send data with 0, if ignition is off

Disable

Enable

- **45001** - Send data with 0, if ignition is off(0 - Disable, 1 - Enable)

CAN Adapter

Input Name	Units	Priority			
Vehicle Speed	km/h	None	Low	High	Panic
Acceleration Pedal Position	%	None	Low	High	Panic
Fuel Consumed	ltr×10	None	Low	High	Panic
Fuel Level	ltr×10	None	Low	High	Panic
Engine RPM	rpm	None	Low	High	Panic
Total Mileage	m	None	Low	High	Panic
Fuel Level	%	None	Low	High	Panic
Door Status		None	Low	High	Panic
Program Number		None	Low	High	Panic

- **45100** - Vehicle speed, Priority "Low" (0 - Disabled 1 - Low 2 - High 3 - Panic)
- **45130** - Fuel level in ltr*10 , Priority "Low" (0 - Disabled 1 - Low 2 - High 3 - Panic)
- **45140** - Engine RPM, Priority "Low" (0 - Disabled 1 - Low 2 - High 3 - Panic)
- **45160** - Fuel level in %, Priority "Low" (0 - Disabled 1 - Low 2 - High 3 - Panic)

CAN Adapter			None	Low	High	Panic
Grain Moisture	%		None	Low	High	Panic
Harvesting Drum RPM	rpm		None	Low	High	Panic
Gap Under Harvesting Drum	mm		None	Low	High	Panic
Security State Flags			None	Low	High	Panic
Security State Flags P4			None	Low	High	Panic
Control State Flags P4			None	Low	High	Panic
Indicators State flags P4			None	Low	High	Panic
Agricultural State flags P4			None	Low	High	Panic
Utility State flags P4			None	Low	High	Panic

- **46060** - Agricultural State Flags, Priority "Low" (0 - Disabled 1 - Low 2 - High 3 - Panic)

Quickstart: From default configuration to AGRICULTURE AND FARMING INDUSTRY solution in one SMS:

```
" setparam
2001:APN;2002:APN_user;2003:APN_password;2004:Domain;2005:Port;2006:0;102:3;4
5002:Program number;45001:0; 45100:1; 45160:1; 45130:1; 45140:1; 46060:1;
113:1"
```

This SMS will set up your device to report object location to the server and possibility for read Engine RPM, Fuel level in %, Fuel level in ltr*10 and Vehicle speed parameters.

Note: Before SMS text, two space symbols should be inserted if no SMS username or password was set in SMS \ Call settings.

To use BLE sensors, use the configurator in online mode (tracker is connected) or offline (tracker is disabled). When using the configurator in offline mode, you can remotely download the configuration via FOTA WEB.

Auto Geofence

Manual Geofence

Trip \ Odometer

Bluetooth

Bluetooth 4.0

Beacon List

Authorization ID List

I/O

OBD II

CAN Adapter

BLE connectionless functionalities

Connection #1

Mode

Working mode

Disabled

TZ-BT04/05/05B sensor

Advanced

Settings

MAC

344F56FF3212

Data clear period (s)

0

1st Sensor

Type	Data Offset	Data Size	Action	IO
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None
	0	0	Match	None

Preset Selection

Select a preset from a list:

BLE TPMS x

BLE_TPMS x

efento v2.2 x

efento v4 x

efento_v2.2 x

efento_v4 x

Load

Cancel

Endianness	Multiplier	Offset
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0
Little Endian	1	0

Manual Geofence

Trip \ Odometer

Bluetooth

Bluetooth 4.0

Beacon List

Authorization ID List

I/O

OBD II

CAN Adapter

BLE Temperature #1	°C	None	Low	High	Panic
BLE Temperature #2	°C	None	Low	High	Panic
BLE Temperature #3	°C	None	Low	High	Panic
BLE Temperature #4	°C	None	Low	High	Panic
BLE Battery #1	%	None	Low	High	Panic
BLE Battery #2	%	None	Low	High	Panic
BLE Battery #3	%	None	Low	High	Panic
BLE Battery #4	%	None	Low	High	Panic
BLE Humidity #1	%RH	None	Low	High	Panic
BLE Humidity #2	%RH	None	Low	High	Panic
BLE Humidity #3	%RH	None	Low	High	Panic
BLE Humidity #4	%RH	None	Low	High	Panic
BLE 1 Custom 1		None	Low	High	Panic
BLE 1 Custom 2		None	Low	High	Panic

Parsing information

1.Prerequisites:

1.1. Open TCP/UDP port

1.2. Read Java parser [first start guide](#)

2. Parsing example:

Unparsed received data in hexadecimal stream

[illegible]

AVL Data Packet Part	HEX Code Part
Zero Bytes	00 00 00 00
Data Field Length	00 00 00 84
Codec ID	8E (Codec 8 Extended)
Number of Data 1 (Number of Total Records)	01
Timestamp	00 00 01 7C E9 B2 41 90 (04.11.2021 6:45:46)
Priority	00
Longitude	00 00 00 00
Latitude	00 00 00 00
Altitude	00 00
Angle	00 00
Satellites	00
Speed	00 00
Event IO ID	00 00
N of Total ID	00 21
N1 of One Byte IO	00 07
1'st IO ID	00 EF (AVL ID: 239, Name: Ignition)
1'st IO Value	00
2'nd IO ID	00 F0 (AVL ID: 240, Name: Movement)
2'nd IO Value	00
3'rd IO ID	00 15 (AVL ID: 21, Name: GSM Signal)
3'rd IO Value	05
4'th IO ID	00 C8 (AVL ID: 200, Sleep Mode)
4'th IO Value	00
5'th IO ID	00 45 (AVL ID: 69, GNSS Status)
5'th IO Value	02
6'th IO ID	00 51 (AVL ID: 81, Vehicle Speed)
6'th IO Value	00
7'th IO ID	00 59 (AVL ID: 89, Fuel level)
7'th IO Value	00
N2 of Two Byte IO	00 09
1'st IO ID	00 B5 (AVL ID: 181, GNSS PDOP)
1'st IO Value	00 00

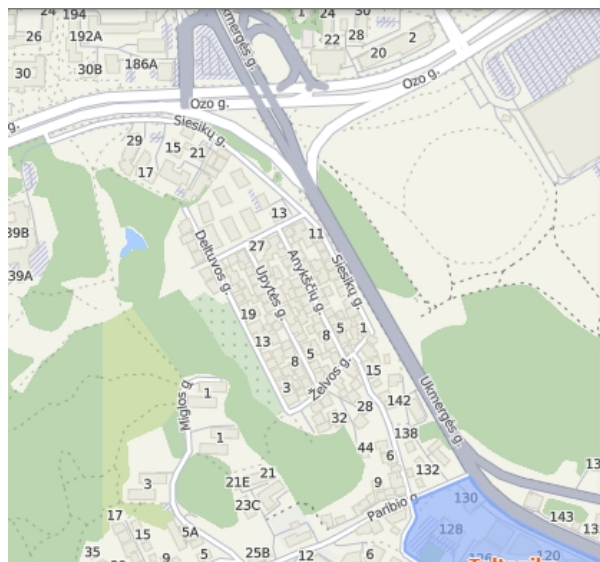
2'nd IO ID	00 B6 (AVL ID: 182, GNSS HDOP)
2'nd IO Value	00 00
3'rd IO ID	00 42 (AVL ID: 66, External Voltage)
3'rd IO Value	38 5C
4'th IO ID	00 43 (AVL ID: 67, Battery Voltage)
4'th IO Value	00 00
5'th IO ID	00 44 (AVL ID: 68, Battery Current)
5'th IO Value	00 00
6'th IO ID	00 1A (AVL ID: 26, BLE Temperature #2)
6'th IO Value	09 0E
7'th IO ID	00 68 (AVL ID: 26, BLE Humidity #2)
7'th IO Value	00 23
8'th IO ID	00 54 (AVL ID: 84, Fuel level)
8'th IO Value	00 00
9'th IO ID	00 55 (AVL ID: 85, Engine RPM)
9'th IO Value	00 00
N4 of Four Byte IO	00 04
1'st IO ID	00 F1 (AVL ID: 241, Active GSM Operator)
1'st IO Value	00 00 64 66
2'nd IO ID	00 10 (AVL ID: 16, Total Odometer)
2'nd IO Value	00 00 00 00
3'rd IO ID	01 D4 (AVL ID: 468, BLE 2 Custom #3)
3'rd IO Value	00 FD FF FF
4'th IO ID	00 57 (AVL ID:87, Total Mileage)
4'th IO Value	00 00 00 00
N8 of Eight Byte IO	00 01
1'st IO ID	02 08 (AVL ID: 520, Agricultural State Flags_P4)
1'st IO Value	00 00 00 00 00 00 00 00
Number of Data 2 (Number of Total Records)	01
CRC-16	00 00 06 47

Agricultural State Flags P4			
Byte Bit		Value Bitmasks	ALLCAN
0	0	0x01 - right joystick moved right active	✓
0	1	0x02 - right joystick moved left active	✓
0	2	0x04 - right joystick moved forward active	✓
0	3	0x08 - right joystick moved back active	✓
0	4	0x10 - left joystick moved right active	✓
0	5	0x20 - left joystick moved left active	✓
0	6	0x40 - left joystick moved forward active	✓
0	7	0x80 - left joystick moved back active	✓
1	8	0x01 - first rear hydraulic turned on	✓
1	9	0x02 - second rear hydraulic turned on	✓
1	10	0x04 - third rear hydraulic turned on	✓
1	11	0x08 - fourth rear hydraulic turned on	✓
1	12	0x10 - first front hydraulic turned on	✓
1	13	0x20 - second front hydraulic turned on	✓
1	14	0x40 - third front hydraulic turned on	✓
1	15	0x80 - fourth front hydraulic turned on	✓
2	16	0x01 - front three-point hitch turned on	✓
2	17	0x02 - rear three-point hitch turned on	✓

The Agricultural State Flag can be interpreted from this table, which can be found [here](#). Each bit carries useful information that can be obtained.

Demonstration in platform

WIALON: Open WIALON → Open Messages → Select your device → Select the date interval → Select Message (data messages) → Select execute and you will see all the information.



io_144: 0	io_178: 1
io_181: 20	io_182: 18
io_199: 0	io_200: 0
io_205: 3123	io_206: 1
io_207: 0	io_21: 4
io_216: 23956	io_217: 0
io_218: 246020101909695	io_219: 89370021
io_22: 1	io_220: 80500686
io_221: 954	io_236: 65499
io_237: 65528	io_238: 63580
io_239: 1	io_24: 0
io_240: 1	io_241: 24602
io_66: 13483	io_67: 9412
io_68: 52	io_70: 311
io_71: 3	io_76: 0
lac: 1	mcc: 246
mnc: 2	pdop: 2

