Aerobits

Subsystems for the
UAS intergration into
the airspace

E-identification idME Pro

Data sheet & User manual

Introduction

idME Pro is designed to meet requirements of remote drone identification and localization in **ASTM/ASD-STAN standard**. Using the BLE broadcast and WiFi Nan, Beacon frames technology the device provides surveillance and drone operator identification capability based on anymodern mobile devices such as smartphone or tablet.

It is equipped with a high quality multi-GNSS receiver and a barometric altitude sensor.

For more information please contact: support@aerobits.pl.

Main features

- Capability to work with MAVLINK devices
- WiFi Nan and Beacon frames
- BLE broadcast technology compliant with ASTM and ASD-STAN
- Interfaces: UART, USB
- Supports Bluetooth 4.0 and 5.2
- Free Android application available on Google Play OpenDroneID OSM
- Integrated GNSS source and pressure sensor
- Simple plug&play integration

Contents

1 Technical parameters

1.1 Basic technical information

Parameter	Description	Typ.	Unit
Frequency	Bluetooth	2.402 - 2.480	GHz
Max. output	Maximum output power	+18	dBm
Frequency	Wi-Fi	2.4 - 2.485	GHz
Max. output	Maximum output power	+20	dBm
ESD protection	All connectors		-
Interface baud	Configuraton or MAVLink	115200	bps
Main connector	SM06B-GHS-TB(LF)(SN)		-
Antenna connector	2x RF-IPX125-1G-AU		-
Temperature range	Operating temperature	-30 to +85	°C
Storage temperature	Optimal storage temperature	-5 to +40	°C
Dimension		32.0 x 16.7 x 7.5	mm
Weight (with antenna)		5	grams

Table 1: General technical parameters.

1.2 Electrical specification

1.2.1 Basic electrical parameters

Parameter	Value
Input voltage	5 V
Current consumption	130 mA

Table 2: General electrical parameters.

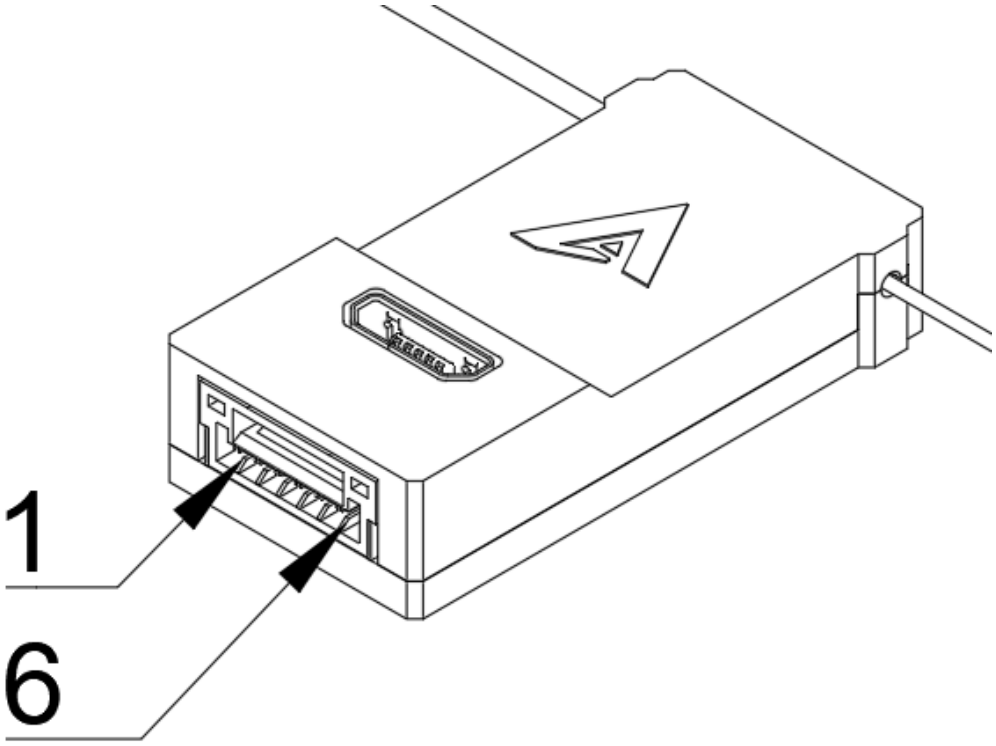


Figure 1: Appendant drawing of E-identification idME Pro .

1.2.2 PIN definition

PIN	Color	Name	Function
1	-	+5 V	Power supply
2	-	RX	MAVLink, AERO RXD
3	-	TX	MAVLink, AERO TXD
4	-	NC	Not connected
5	-	NC	Not connected
6	-	GND	Ground

Table 3: Pin definition.

1.2.3 LED indicators

LED	Color	Function
POWER	White	Power supply indicator
STATUS	White	Device operation status

Table 4: LED indicators.

1.3 Mechanical specification

1.3.1 Mechanical parameters

Parameter	Value
Dimensions	32.0 x 16.7 x 7.5mm
Weight	5 g

Table 5: Mechanical parameters of E-identification idME Pro

1.3.2 Dimensions

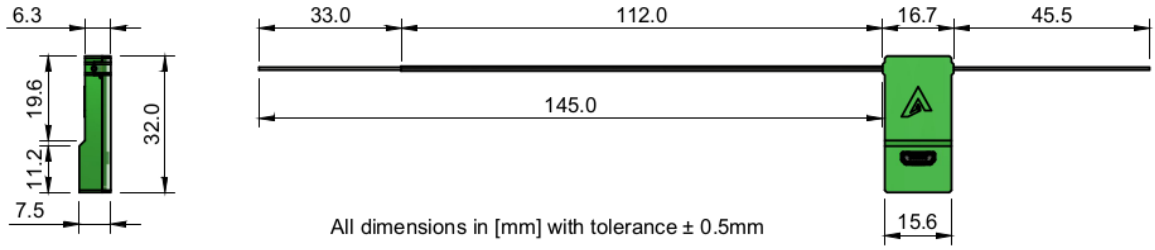


Figure 2: Dimensions of E-identification idME Pro

1.3.3 Connectors

Connector	Type	Example
Main	Installed on board	SM06B-GHS-TB(LF)(SN)
	Mating connector	GHR-06V-S
	Pins	SSHL-002T-P0.2
Antenna 1	Installed on board	RF-IPX125-1G-AU
	Mating connector	GSM-IPX or GSM-IPX/SMA-1G-150
Antenna 2	Installed on board	RF-IPX125-1G-AU
	Mating connector	GSM-IPX or GSM-IPX/SMA-1G-150

Table 6: Connectors

2 Principle of operation

During work module goes through multiple states. In each state operation of the module is different. Each state and each transition is described in paragraphs below.

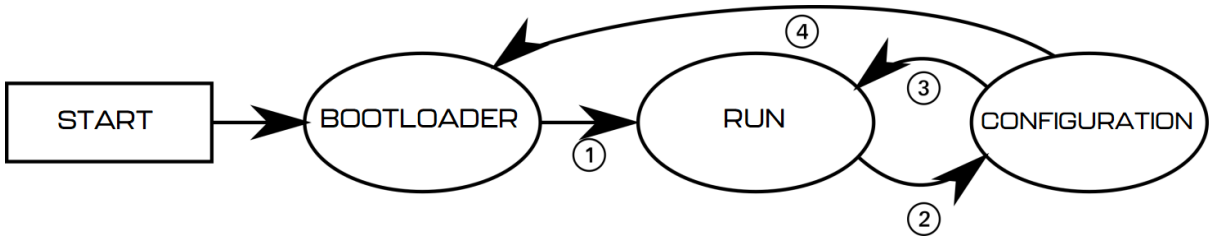


Figure 3: State machine of E-identification idME Pro

2.1 States of operation

2.1.1 BOOTLOADER state

This is an initial state of E-identification idME Pro after restart. Firmware update is possible here. Typically module transits automatically to RUN state. It is possible to lock module in this state (prevent transition to RUN state) using one of BOOTLOADER triggers. UART baud is constant and is set to 115200bps. After powering up module, it stays in this state for up to 3 seconds. If no BOOTLOADER trigger is present, module will transit to RUN state. Firmware upgrade is possible using Micro ADS-B App software. For automated firmware upgrading scenarios, aerobits_updater software is available. To acquire this program please contact: support@aerobits.pl.

2.1.2 RUN state

In this state module is broadcasting drone identification data.

2.1.3 CONFIGURATION state

In this mode change of stored settings is possible. Operation of the module is stopped and baud is set to fixed 115200bps. Change of settings is done by using AT-commands. Changes to settings are stored in non-volatile memory on exiting this state. Additional set of commands is also available in this state, allowing to e.g. reboot module into BOOTLOADER state, check serial number and firmware version. It is possible to lock module in this state (similarly to BOOTLOADER) using suitable command.

2.2 Transitions between states

For each of state transitions, different conditions must be met, which are described below. Generally, the only stable state is RUN. Module always tends to transit into this state. Moving to other states requires host to take some action.

2.2.1 BOOTLOADER to RUN transition

BOOTLOADER state is semi-stable: the module requires additional action to stay in BOOTLOADER state. The transition to RUN state will occur automatically after short period of time if no action will be taken. To prevent transition from BOOTLOADER state, one of following actions must be processed:

- Send `AT+LOCK=1` command while device is in BOOTLOADER state (always after power on for up to 3s)
- Send `AT+REBOOT_BOOTLOADER` command in CONFIGURATION state. This will move to BOOTLOADER state and will lock module in this state.

If none of above conditions are met, the module will try to transit into RUN state. Firstly it will check firmware integrity. When firmware integrity is confirmed, module will transit into RUN state, if not, it will stay in BOOTLOADER state.

To transit into RUN state:

- If module is locked, send `AT+LOCK=0` command

When module enters RUN mode it will send `AT+RUN_START` command.

2.2.2 RUN to CONFIGURATION transition

To transit from RUN into CONFIGURATION state, host should do one of the following:

- Send `AT+CONFIG=1` (using current baud).

When module leaves RUN state it sends `AT+RUN_END` message, then `AT+CONFIG_START` message on entering CONFIGURATION state. The former is sent using baud from settings, the latter always uses 115200bps baud.

2.2.3 CONFIGURATION to RUN transition

To transit from CONFIGURATION into RUN state, host should do one of the following:

- Send `AT+CONFIG=0` command.

When module leaves CONFIGURATION state it sends `AT+CONFIG_END` message, then `AT+RUN_START` message on entering RUN state. The former is always sent using 115200bps baud, the latter uses baud from settings.

2.2.4 CONFIGURATION to BOOTLOADER transition

To transit from CONFIGURATION into BOOTLOADER state, host should do one of the following:

- Send `AT+REBOOT_BOOTLOADER` command.
- Send `AT+REBOOT` and when module enters BOOTLOADER state, prevent transition to RUN state.

When entering the bootloader state, the module sends `AT+BOOTLOADER_START` .

3 UART configuration

Communication between module and host device is done using UART interface.

In CONFIGURATION and BOOTLOADER state transmission baud is fixed at 115200bps.

The UART interface uses settings as described in table 7.

UART Settings				
Parameter	Min.	Typ.	Max	Unit
Baud	57600	115200	3000000	bps
Stop Bits Number	-	1	-	-
Flow Control	-	None	-	-
Parity Bit	-	None	-	-

Table 7: UART settings.

4 Settings

In RUN state, operation of the module is determined based on stored settings. Settings can be changed in CONFIGURATION state using AT-commands. Settings can be written and read.

NOTE: New values of settings are saved in non-volatile memory when transitioning from CONFIGURATION to RUN state.

Settings are restored from non-volatile memory during transition from BOOT do RUN state. If settings become corrupted due to memory fault, power loss during save, or any other kind of failure, the settings restoration will fail, loading default values and displaying the `AT+ERROR (Settings missing, loaded default)` message as a result. This behavior will occur for each device boot until new settings are written by the user.

4.1 Write settings

After writing a new valid value to a setting, an `AT+OK` response is always sent.

`AT+SETTING=VALUE`
For example `AT+PROTOCOL=1`
Response: `AT+OK`

4.2 Read settings

`AT+SETTING?`
For example: `AT+PROTOCOL?`
Response: `AT+PROTOCOL=1`

4.3 Settings description

`AT+SETTING=?`
For example: `AT+PROTOCOL=?`
Response:

```
Setting: PROTOCOL
       Description: Selected protocol (0: NONE, 2: CSV, 3: MAVLINK)
       Type: Integer decimal
       Range (min.): 0
       Range (max.): 5
       Is preserved: 1
       Is restart needed: 0
```

4.4 Errors

Errors are reported using following structure:
`AT+ERROR (DESCRIPTION)`
DESCRIPTION is optional and contains information about error.

4.5 Command endings

Every command must be ended with one of the following character sequences: “\n”, “\r” or “\r\n”. Commands without suitable ending will be ignored.

4.6 Uppercase and lowercase

All characters (except preceding `AT+`) used in command can be both uppercase and lowercase, so following commands are equal:

```
AT+PROTOCOL?
AT+pRoToCoL?
```

NOTE: This statement is true in configuration state, not in bootloader state. in bootloader state all letters must be uppercase.

4.7 Available settings

Setting	Min	Max	Def	Comment
BAUDRATE	0	2	0	Baudrate in RUN state 0 - 115200bps 1 - 921600bps 2 - 3000000bps
GNSS_LOG	0	2	0	GNSS NMEA forwarding 0 - No forwarding 1 - RMC Messages only 2 - All
DRONE_ID_BASIC_BROADCAST_PERIOD	100	3000	2900	Basic frame broadcast period in [ms]
DRONE_ID_LOCALIZATION_BROADCAST_PERIOD	100	1000	900	Localization frame broadcast period in [ms]
DRONE_ID_BROADCAST_BLUETOOTH	0	1	1	Enable Bluetooth messages broadcast
DRONE_ID_BROADCAST_WIFI_NAN_BEACON	0	1	1	Enable WiFi NaN Beacon broadcast
DRONE_ID_BROADCAST_WIFI_BEACON	0	1	1	Enable WiFi Standard Beacon broadcast
DRONE_ID_ADVERTISING_ENABLE	0	1	1	Enable messages advertising
DRONE_ID_SCAN_ENABLE	0	1	0	Enable Ble/WiFi messages scan
DRONE_ID_HEIGHT_TYPE	0	1	0	Device Height type 0 - Above Takeoff 1 - AGL
DRONE_ID_MAVLINK_CONNECTION_TIMEOUT	0	30	5	Mavlink connection timeout in seconds
DRONE_ID_OPERATOR_ID	-	-	-	Operator ID (20 bytes)
DRONE_ID_OPERATOR_ID_TYPE	0	255	0	Operator ID type 0 - Operator ID 201-255 - Available for private use
DRONE_ID_OPERATIONAL_STATUS	0	2	0	Operation status 0 - Undeclared 1 - Ground 2 - Airborne
DRONE_ID_SELF_ID	-	-	-	Self ID (20 bytes)

DRONE_ID_SELF_ID_TYPE	0	255	0	Self ID type 0 - Text Description 201-255 - Available for private use
DRONE_ID_MODE	0	2	1	Determines mavlink receiption 0 - Full mavlink support 1 - Ignore all mavlink messages 2 - Ignore only location messages
DRONE_ID_TYPE	0	3	1	UAS ID type 0 - None 1 - Serial Number 2 - CAA Assigned Registration ID 3 - UTM Assigned UUID
DRONE_ID_UAS_TYPE	0	15	0	Specification of the type of UAS 0 - None 1 - Aeroplane 2 - Helicopter or Multirotor 3 - Gyroplane 4 - Hybrid Lift 5 - Ornithopter 6 - Glider 7 - Kite 8 - Free Balloon 9 - Captive Balloon 10 - Airship 11 - Free Fall 12 - Rocket 13 - Tethered Powered Aircraft 14 - Ground Obstacle 15 - Other
DRONE_ID_UAS_ID	-	-	Device serial number	UAS ID (20 bytes)
PRESSURE_LOG	0	1	0	Show barometer log

Table 8: Settings

4.8 Example

As an example, to set parameter DRONE_ID_SCAN_ENABLE for E-identification idME Pro device, one should send following commands. “<<” indicates command sent to module, “>>” is a response.

```
<< AT+CONFIG=1\r\n
>> AT+OK\r\n
<< AT+DRONE_ID_SCAN_ENABLE=1\r\n
>> AT+OK\r\n
>> AT+OK\r\n
<< AT+CONFIG=0\r\n
```

5 Commands

Apart from settings, module supports set of additional commands. Format of this commands are similar to those used for settings, but they do not affect operation of module in RUN state.

5.1 Commands in BOOTLOADER and CONFIGURATION state

5.1.1 AT+LOCK

`AT+LOCK=1` - Set lock to enforce staying in BOOTLOADER or CONFIGURATION state
`AT+LOCK=0` - Remove lock
`AT+LOCK?` - Check if lock is set

5.1.2 AT+BOOT

`AT+BOOT?` - Check if module is in BOOTLOADER state

Response:

`AT+BOOT=0` - module in CONFIGURATION state
`AT+BOOT=1` - module in BOOTLOADER state

5.2 Commands in CONFIGURATION state

5.2.1 AT+CONFIG

`AT+CONFIG=0` - Transition to RUN state.
`AT+CONFIG?` - Check if module is in CONFIGURATION state.

Response:

`AT+CONFIG=0` - module in RUN state
`AT+CONFIG=1` - module in CONFIGURATION state (baudrate 115200)
`AT+CONFIG=2` - module in CONFIGURATION state (baudrate as set)

5.2.2 AT+SETTINGS?

`AT+SETTINGS?` - List all settings. Example output:

```
AT+PROTOCOL=2
AT+SUBPROTOCOL=0
AT+BAUDRATE=0
```

5.2.3 AT+HELP

`AT+HELP` - Show all settings and commands with descriptions. Example output:

```
SETTINGS:
AT+PROTOCOL=2         [Selected protocol (0: NONE, 2: CSV, 3: MAVLINK)]
AT+SUBPROTOCOL=0      [Subprotocol of selected protocol]
COMMANDS:
AT+HELP               [Show this help]
AT+TEST               [Responds "AT+OK"]
AT+SETTINGS_DEFAULT   [Load default settings]
AT+REBOOT             [Reboot system]
```

5.2.4 AT+SETTINGS_DEFAULT

`AT+SETTINGS_DEFAULT` - Set all settings to their default value.

5.2.5 AT+SERIAL_NUMBER

`AT+SERIAL_NUMBER?` - Read serial number of module.

Response:

```
AT+SERIAL_NUMBER=07-0001337
```

5.2.6 AT+FIRMWARE_VERSION

`AT+FIRMWARE_VERSION?` - Read firmware version of module.

Response:

```
AT+FIRMWARE_VERSION=10101017(May 11 2018)
```

5.2.7 AT+REBOOT

`AT+REBOOT` - Restart module.

5.2.8 AT+REBOOT_BOOTLOADER

`AT+REBOOT_BOOTLOADER` - Restart module to BOOTLOADER state.

NOTE: This command also sets lock.

5.3 Commands in RUN state

`AT+CONFIG=1` - transition to CONFIGURATION state (baudrate 115200).
`AT+CONFIG=2` - transition to CONFIGURATION state (baudrate as set).

NOTE: This command also sets lock.

6 Protocols

6.1 CSV protocol (REMOTE)

CSV protocol is simple text protocol, that allows fast integration and analysis of tracked aircrafts. CSV messages start with '#' character and ends with "\r\n" characters. There are following types of messages:

NOTE: In future versions, additional comma-separated fields may be introduced to any CSV protocol message, just before CRC field, which is guaranteed to be at the end of message. All prior fields are guaranteed to remain in same order.

6.1.1 CRC

Each CSV message includes CRC value for consistency check. CRC value is calculated using standard CRC16 algorithm and its value is based on every character in frame starting from '#' to last comma ',' (excluding last comma). After calculation, value is appended to frame using hexadecimal coding. Example function for calculating CRC is shown below.

```
uint16_t crc16(const uint8_t* data_p, uint32_t length){
    uint8_t x;
    uint16_t crc = 0xFFFF;
    while (length--){
        x = crc>>8 ^ *data_p++;
        x ^= x>>4;
         crc = (crc<<8) ^ ((uint16_t)(x<<12)) ^ ((uint16_t)(x<<5)) ^ ((uint16_t)x);
    }
    return swap16(crc);
}
```

6.1.2 RemoteID Aircraft message

This message describes state vector of aircraft determined from remoteID messages and is sent once per second. The message format is as follows:

```
#B4\B5\WN\WB :UAS_ID,ID_TYPE,UAS_TYPE,LAT,LON,HEIGHT,ALT_GEO,ALT_BARO,TRACK,VELH,
     VELV,STATUS_FLAG,OPERATOR_ID,OPERATOR_ID_TYPE,OPERATOR_LAT,OPERATOR_LON
                    ,OPERATOR_LOC_TYPE,TIMES,RSSI,CRC\r\n
```

#B4\B5\WN\WB	Aircraft message start indicator	Example value
UAS_ID	aircraft ID	18099300000132
ID_TYPE	Flags bitfield, see table 12	1
UAS_TYPE	Callsign of aircraft, see table 13	2
LAT	Latitude, in degrees, accuracy 0.6 degree	57.57634
LON	Longitude, in degrees, accuracy 0.6 degree	17.59554
HEIGHT	Height based on start up altitude, in meters	0.5
ALT_GEO	Geometric altitude, in meters	50
ALT_BARO	Barometric altitude, in meters	50
TRACK	Track of aircraft, in degrees [0,360)	35
VELH	Horizontal velocity of aircraft, in m/s, accuracy 0.1 m/s	464
VELV	Vertical velocity of aircraft, in m/s, accuracy 0.1 m/s	-1344
STATUS_FLAG	Operation status	0
OPERATOR_ID	The operator number from local FAA department	AAABBBBBBBBBBBC-DDD
OPERATOR_ID_TYPE	Specific type of Operator ID	5
OPERATOR_LAT	The operator latitude in degrees, accuracy 0.6 degree	57.52614
OPERATOR_LON	The operator longitude in degrees, accuracy 0.6 degree	17.60154
OPERATOR_LOC_TYPE	The operator location type	0
TIMES	Timestamp of the sent frame expressed in seconds since current hour, accuracy 0.1 s-1.5 s	408.5
RSSI	Signal strength, in dBm	-92
SELF_ID_TYPE	Self id type 10	0
SELF_ID	Self id	
FTYPE_TYPE	Frame type 11	15
MAC	MAC address	df:a5:c3:84:78:66
CRC	CRC16 (described in CRC section)	2D3E

Table 9: Descriptions of RemoteID message fields.

Whereby the following prefixes mean:

- #B4 - Bluetooth 4.0(Legacy) frame
- #B5 - Bluetooth 5.0 frame
- #WN - Wi-Fi NaN frame
- #WB - Wi-Fi becon frame

NOTE: Referring to the ASD-STAN prEN 4709-002 standard, our product displays all the required information (ASD-STAN prEN 4709-002 Table 1 - Data Dictionary), optional data is only available upon special request.

Below is a list off self Id types returned in Self Id value field.

Self Id Type value	Description
0	Text Description.
1	Emergency Description.
2	Extended Status Description.
3–200	Reserved.
201–255	Available for private use.

Table 10: RemoteID UAS Self Id type in CSV protocol.

Below is a list off frame types returned in Frame Type value field.

Id Type value	Description
0	Basic ID.
1	Location.
3	Self ID.
4	System.
5	Operator ID.
15	Packed all in one.

Table 11: RemoteID UAS ID Frame type in CSV protocol.

Below is a list of ID types returned in ID Type value field.

Id Type value	Description
0	None.
1	Serial Number.
2	CAA Assigned Registration ID.
3	UTM Assigned UUID.

Table 12: RemoteID UAS ID Type category values in CSV protocol.

Below is a list of emitter category values returned in ECAT value field.

ECAT value	Description
0	None.
1	Aeroplane.
2	Helicopter or Multirotor.
3	Gyroplane.
4	Hybrid Lift.
5	Ornithopter.
6	Glider.
7	Kite.
8	Free Balloon.
9	Captive Balloon.
10	Airship.
11	Free Fall.
12	Rocket.
13	Tethered Powered Aircraft.
14	Ground Obstacle.
15	Other.

Table 13: RemoteID ID Type category values in CSV protocol.

If data of any field of frame is not available, then it is transmitted as empty. For example:

```
#B5:18099300000170,1,0,53.3960175,14.6283543,-0.5,58.0,86.5,0,0.0,0.0,
 0,,0,0.0000000,0.0000000,0,103.7,-46,0,,15,84:f7:03:28:e3:1a,420C\r\n
#B5:18099300000170,1,0,53.3960175,14.6283543,-0.5,58.0,86.5,0,0.0,0.0,
 0,,0,0.0000000,0.0000000,0,103.7,-46,0,,15,84:f7:03:28:e3:1a,420C\r\n
```

NOTE: RSSI is measured based on analog RF signal.

6.1.3 Statistics message

This message contains some useful statistics about operation of module. Format of that frame is shown below:

```
#SR:FPS,FPB4_0S,FPB4_1S,FPB4_3S,FPB4_4S,FPB4_5S,FPB5S,FPNS,FPBS,CRC
```

#SR	Statistics message start indicator	Example
FPS	Number of frame received in last second %	1
FPB4_0S	Number of frame received in last second %	1
FPB4_1S	Number of legacy basic ID Bluetooth 4.0 frame send in last second	1
FPB4_3S	Number of legacy location Bluetooth 4.0 frame send in last second	1
FPB4_4S	Number of legacy self ID Bluetooth 4.0 frame send in last second	1
FPB4_5S	Number of legacy system Bluetooth 4.0 frame send in last second	1
FPB5S	Number of packed all in one Bluetooth 5.0 frame send in last second	1
FPNS	Number of packed all in one Wi-Fi NaN frame send in last second	1
FPBS	Number of packed all in one Wi-Fi beacon frame send in last second	1
CRC	CRC16 (described in CRC section)	2D3E

Table 14: Statistics message fields.

7 Quick start

7.1 Configuration

1. configure the device settings and assign an operator number using Micro ADS-B software via USB or UART interface.

2. mount the device on the drone.

3. connect the power supply through the JST connector directory of the flight controller or MicroUSB.

4. observe the LED indicating that the device is ready for flight - the LED blinks slowly

NOTE: Baro Altitude is computed based on pressure measured when IdMe+ is started up.

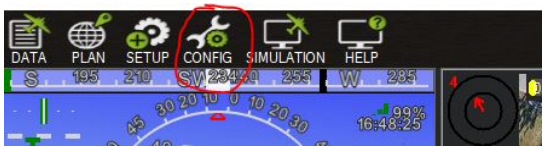
Integration with mavlink

1 .Connect IdMe PRO to device supports Mavlink V2 protocol. In this example IdMe+ will be connected to Pixhawk TELEM1 port using JST connectors with not crossed wire(TX and RX are not swiched).

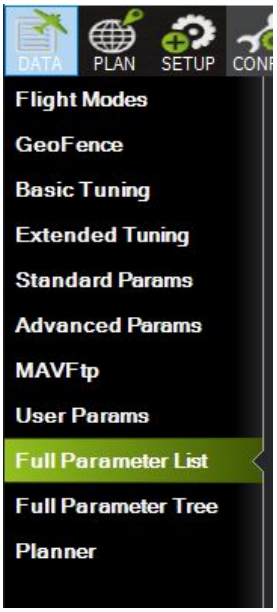
2. Using Mission Planner software enable Mavlink V2 protocol on TELEM 1 port.

3. Connect Pixhawk to Mission Planner.

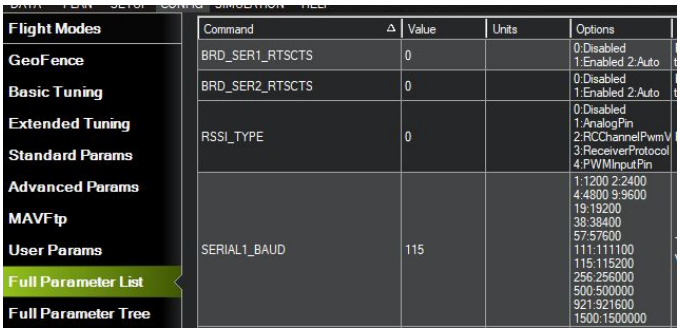
4. Select CONFIG tab.



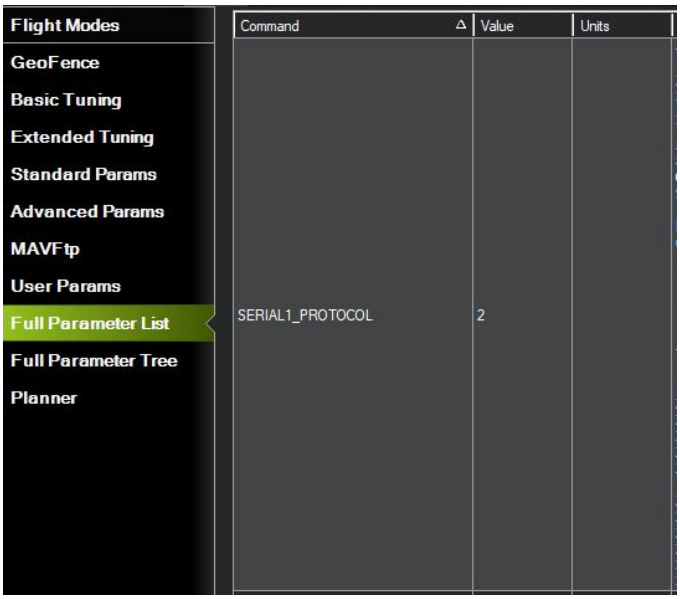
5. Select Full Parameter List.



6. Find SERIAL1_BAUD parameter and set a value to 115.



7. Find SERIAL1_PROTOCOL parameter and set a value to 2.



8. Reboot Pixhawk.

After configuration device is ready to work when status led starts blinking slowly (once every second). For more information visit: Mission Planner documentation

7.1.1 Supported Mavlink

Add-on does not need any messages from the flight controller to work. idMe provides heartbeat messages and can be used to read the device's status.

Heartbeat

The device delivers heartbeat messages about once a second, describing the status of the device.

HEARTBEAT (#0)	
type	MAV_TYPE_ODID
system_status	MAV_STATE_CALIBRATING
	MAV_STATE_ACTIVE
	MAV_STATE_EMERGENCY

MAV_STATE_CALIBRATING - idMe awaits first GNSS fix and on-board sensor calibration

MAV_STATE_ACTIVE - idMe is running, waiting for launch or the device is in the air

MAV_STATE_EMERGENCY - idMe has infernal error (e.g., GNSS fix lost after launch detection)

8 General information

IdMe is an add-on device. This means that it does not need any additional components to work, it is equipped with a high-quality multi-GNSS receiver and a barometric altitude sensor. Using BLE and WiFi transmission technology, the device provides surveillance and the ability to identify the drone operator based on any modern mobile device such as a smartphone or tablet.

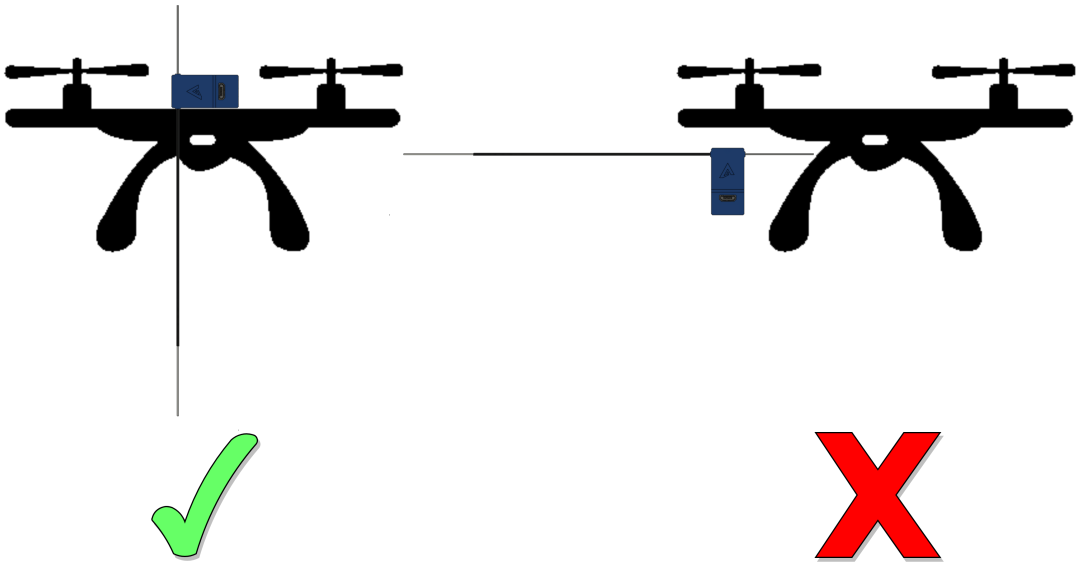
The device automatically detects the drone's start and immediately starts transmitting a broadcast until the drone is turned off.

Its small size and low power consumption allow it to be used in ultralight drones. AT commands provide the ability to configure the messages to be transmitted, such as the drone's identification number, aircraft type, etc. Additional authentication mechanisms are also available.

8.1 How to mount the device

The device should be mounted as far as possible from devices that generate RF interference, such as built-in antennas, speed controllers and motors. Pay attention to moving parts, as well as propellers or the camera. Since the device is lightweight, you can attach it with tape or glue. It is a good idea to leave room to access the device for software updates or configuration.

The device should be mounted in such an orientation that the antenna from the GPS(the shorter one) is vertically up, while the transmitting antenna is vertically down. This configuration allows you to get the best omnidirectional transmission, and reduce the time you have to wait for the GNSS position to be determined.



8.2 Operator number

The operator number can be obtained from the country's state registration system. This number must be entered into the device using the AT command or the Micro ADS-B software. The writing process requires 3 additional extra digits used to check integrity or provide temperament.

OPERATOR NUMBER	SEPARATOR	SECURE CHARACTERS
AAABBBBBBBBBBBC	-	DDD

Example command: AT+DRONE_ID_OPERATOR_ID=AAABBBBBBBBBBBC-DDD

If the Operator ID contains any error, the message '"Operator ID not correct!"' will appear.

By default, the device broadcasts the serial number assigned to the device in the manufacturing process, this number cannot be overwritten.

8.3 Status Led

When the device is in boolader or configuration mode the led diode lights up continuously. In boot mode or when the device has an error the led blinks very fast. If the device is ready to fly the led blinks slowly, once per second.

DEVICE STATUS	STATUS LED	POWER LED
boot	light	light
configuration	light	light
error or calibration	blink fast	light
ready to fly, airborne	blink slowly	light

8.4 Device status indicator

If an error occurs, it can be easily detected by observing the STATUS LED. The device automatically changes its Remote ID status to emergency. Additional information is described in the SelfID message, which can be easily identified by other airspace users.

8.5 Troubleshooting

8.5.1 Range problem

Most coverage problems occur when the device is mounted in the wrong place or with the wrong orientation.

- check the antenna and ufl connector
- change the position and orientation of the device

8.5.2 Low Frame rate

In long range or radio interference environments, some frames may be missing.

- decrease period between broadcasts using DRONE_ID_BASIC_BROADCAST_PERIOD and DRONE_ID_LOCALIZATION_BROADCAST_PERIOD parameters in configuration mode

8.5.3 IdMe still blinking fast

In most cases, the problem is the lack of a GNSS fix.

- Check GNSS antenna (the shorter one) is well connected to ufl connector.
- Device is placed in wrong orientation
- Device is placed in heavy noisy environment

8.5.4 After start no message are sending

The device does not receive GNSS corrections before launch. It is very important to wait until the device is ready for launch.

- Reset the module and wait for the GNSS position to be fixed, then start again.

8.6 FCC Statement

8.6.1 FCC Compliance Statement

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

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

8.6.2 FCC Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, 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 and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, 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 correct the interference by one of the following measures:

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

8.6.3 FCC Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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