SENTEK AWS

AUTOMATIC WEATHER STATION

User Reference Manual Version 1.1

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Sentek AWS Hardware Manual Rev 1.1 (2016-11-11)
iMETOS 3.3 User Reference Manual EN_06092016

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1 Welcome Sentek AWS users

Thank you for choosing a Sentek Automatic Weather Station (AWS) for monitoring soil moisture and environmental data. The Sentek AWS has been designed to monitor data with wide variety sensor sets. This product measures, logs and sends the data to the Internet. Sentek AWS systems will be mainly used for:

- Soil Moisture Monitoring with Sentek sensors
- Irrigation monitoring with flowmeter, presostat, pH and E.C.
- Rain and water level monitoring with rain gauges and pressure transducers.
- All disease models forecast with the leaf wetness sensor, rain, temperature and relative humidity, wind sensor and global radiation (depending on the configuration of the equipment)
- Microclimatic weather forecast corrected with local measurements

Among all the many new features you will find:

- Firmware update "over the air"
- Real Time Operating System (RTOS)
- Extended data and program memory
- On-board modem for GSM, CMA, UTMS
- Shelf location with on-board GPS
- Native USB port
- Access point for remote wireless sensor nodes

1 Welcome Sentek AWS users

2 Your Sentek AWS

2.1 Sentek AWS board description
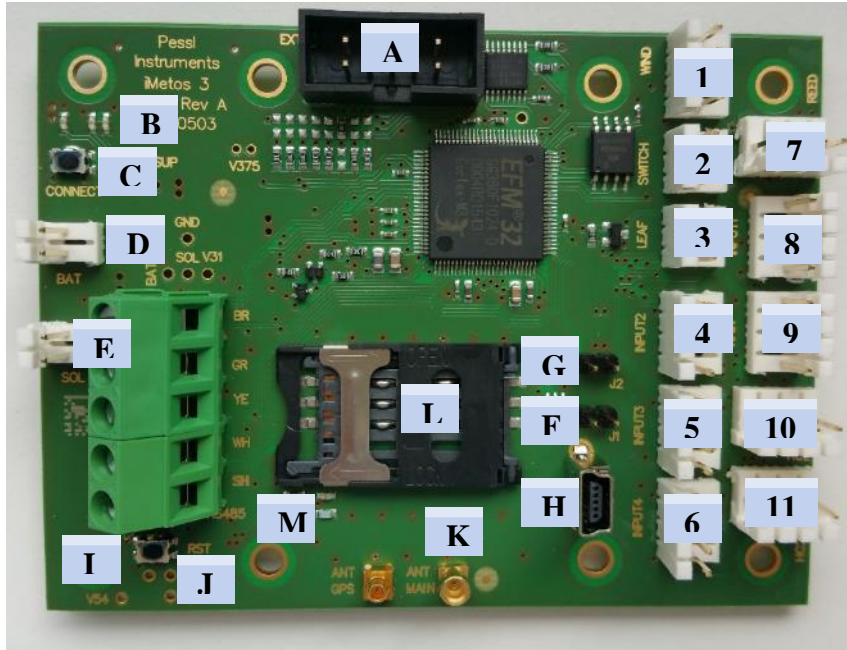
Picture 1: Sentek AWS board - interface & Inputs

Interface connectors:	Sensor inputs:
A. SDI-12 Extension board connector	1. WIND
B. LED indicators	2. SWITCH
C. Connect button	3. LEAF
D. Battery connector	4. INPUT 2
E. Solar panel connector	5. INPUT 3
F. Jumper 1	6. INPUT 4
G. Jumper 2	7. REED
H. USB connector	8. INPUT 1
I. Boot jumper	9. RAIN
J. Reset button	10. HC2 B
K. Antenna connector	11. HC2 A Dedicated chain input
L. SIM card holder	
M. Modem LED	
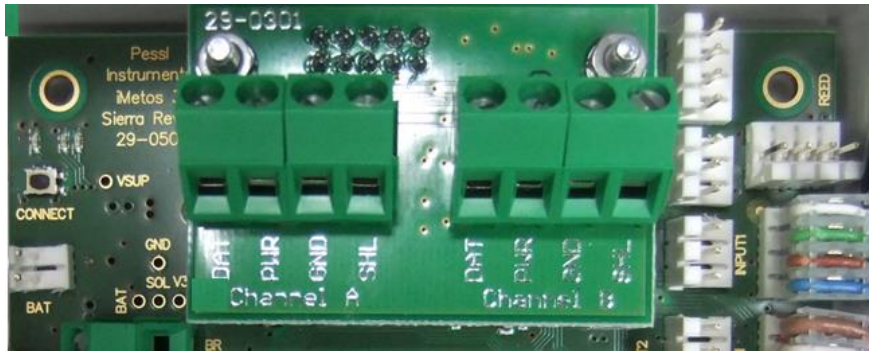
Picture 2: Sentek AWS Board with SDI-12 Extension board

SDI-12 Extension Board - Channel A:	SDI-12 Extension Board - Channel B
DAT - Data PWR - Power GND - Ground SHL - Shield	DAT - Data PWR - Power GND - Ground SHL - Shield

2.2   Processor

- 32bit ARM cortex M3 processor (Energy Micro EFM32)
- Real time operating system (RTOS)

2.3   Modem

- For GSM/GPRS/EDGE/3G
- Sierra Wireless AirPrime SL808x Series a self-contained E-GSM/DCS/GSM850/PCS-GPRS/
- EGPRS 900/1800/850/1900/ WCDMA 800/860/900/1900/2100 quad-band module. SIM cardholder.
- For CDMA/EVDO networks (U.S. of America): Cinterion PCS3. Not SIM cardholder.
- GPS included

2.4   External flash memory

- The external flash memory is an Adesto AT45DB641E (8MB).
- The memory is split into several blocks:
- 6MB reserved for weather data in Base64 format (i.e. the measured data), implemented as circulating memory (i.e. when memory is full, the oldest data is overwritten with newer data)
- 1MB reserved space for firmware update over the air
- 1MB reserved for configuration, performance and behaviour, including:
  - Station settings
  - APN tables (Access Point Names with MCC, MNC, username and password)
  - Backup (serial number and similar important settings that normally are not changed)
  - Sensor image stores the configuration of the set of sensors connected to the Sentek AWS. This info will be re-checked automatically every day at midnight so newly connected sensors will be detected and included in the logs. Manual update of this part of the memory can be done by pressing the reset button (J in Picture 1)
  - Event history (information about communication network and internal parameters, detailed description is given later on in this manual)

2.5   Power supply

The 6V-4Ah battery is connected to the Sentek AWS board in the specific connector (D), the solar panel is connected to the solar panel connector (Connectors D and E in Picture 1).

Both power inputs are monitored by the Sentek AWS in the same way as the rest of the sensors.

Note: jumper on pins between D and E connector is not needed in last board revisions.

The Sentek AWS will automatically change operational mode according with the charge level of the battery following these rules:

a) If battery drops to 6V, data logging continues, but data transmission quits until battery recovers adequate charge level supplied from the solar panel.

b) If battery recovers the voltage value of 6,1V (before reaching the threshold of 5,3V), Sentek AWS restarts data transmission without manual intervention.

c) If battery reaches the limit of 5.3V Sentek AWS enters sleep mode and also stops data logging. To escape from sleep mode manual reset will be needed after the battery recovers the proper charge level (see Picture 3).
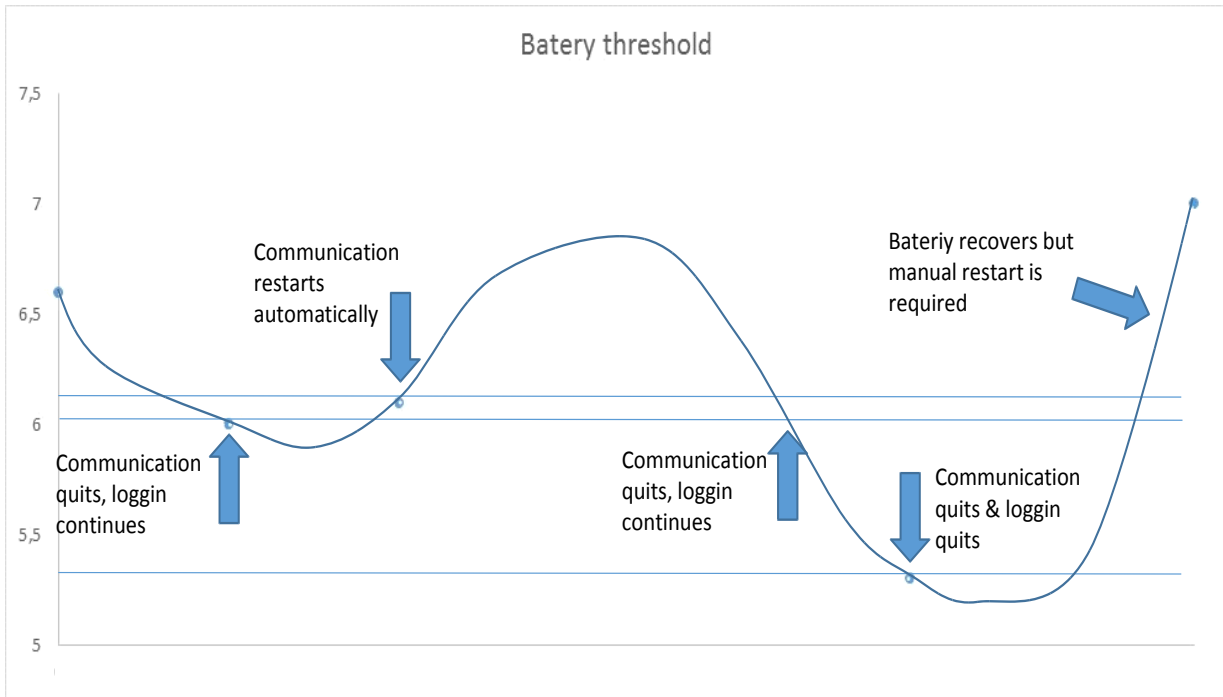
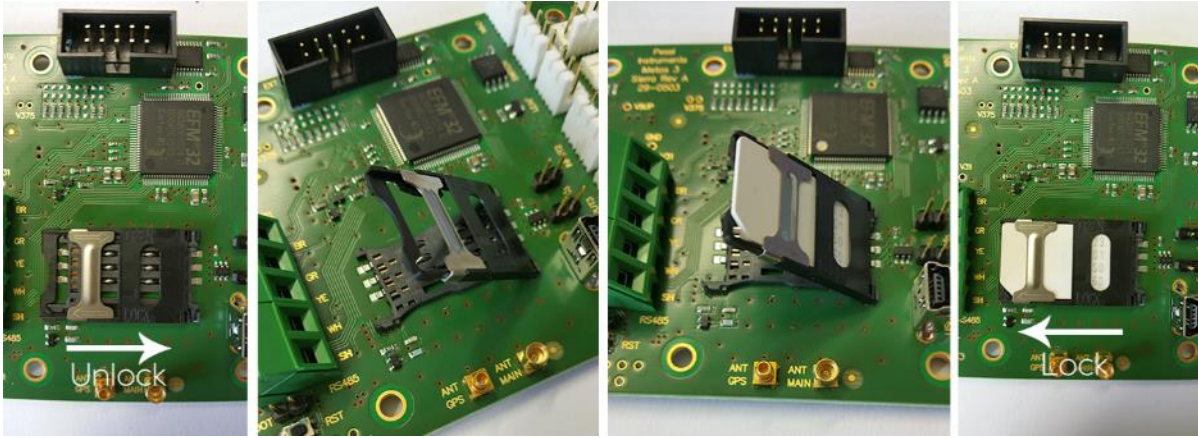Picture 3: Battery threshold

2.6   SIM card holder

In GPRS, UTMS, LTE (i.e. GSM G2, G3, G4) networks a SIM card from a provider is needed. To insert or remove a SIM card:

1. slide the metal part to the right to unlock the holder (see picture 4)
2. open the holder from the left side and insert or remove the SIM card
3. close the holder
4. lock the holder by sliding the metal to the left.

Picture 4: How to install SIM

Warning
Please always check that the PIN request for the SIM is disabled.

2.6.1 How to deactivate (disable) PIN request

This can be done using:

- a GSM handset device or
- directly with the USB<=>PC connection (from latest firmware version, this is possible to do via terminal menu)

(Find a detailed description in the section *USB communication with PC.*)

2.7 USB port
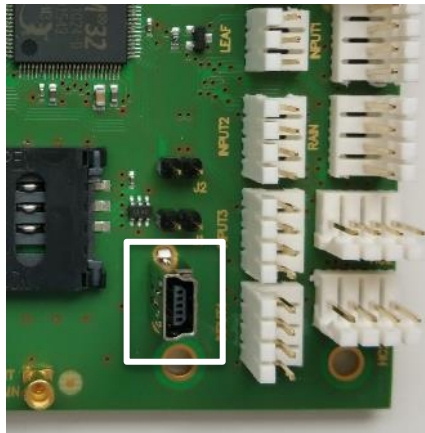
Picture 5: Mini USB port

Direct communication PC <=> Sentek AWS is possible with a standard USB/mini-USB (see Picture 5), using any terminal program.

USB driver must be installed on the PC (see the Note below) and once you have installed the driver you can use the terminal program of your preference.

Note:

For non-Windows users:

- Drivers: https://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx

For Windows users:

- Drivers and Terminal (PI FW uploader installer 1.0…xxx.zip) at:
http://www.sentek.com.au/downloads/downloads.asp
Select option Sentek AWS, then option pi-firmware-uploader

For the Sentek AWS there is a specific terminal program named *"PI Firmware uploader" -for windows OS-* that combines on site firmware updating capabilities with serial terminal connection to the Sentek AWS. (find link in the note above).

Via USB connection user can perform the following tasks on-site

1. Fully update the Sentek AWS firmware
2. Check all sensors
3. Get report and events from the unit
4. Follow detailed communication process
5. Retrieve stored data in binary form
6. Check network signal strength and unlock SIM card

A detailed description of USB communication is given in the section USB *communication with PC.*

2.8   Jumpers

There are 4 sets of open pairs of pins in the Sentek AWS mother board (see Picture 6)
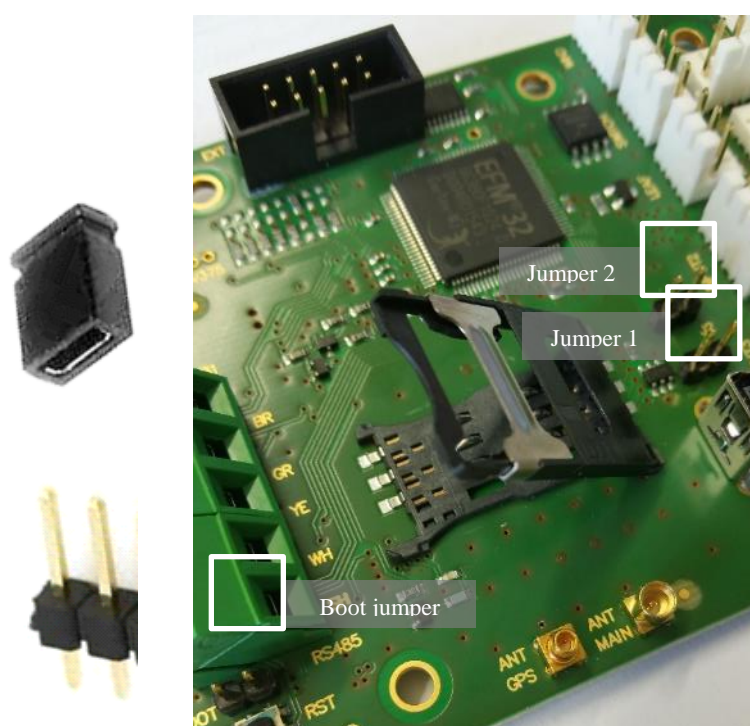
Picture 6: Jumpers

Power jumper: is not needed anymore on boards with Revision B. If you connect the battery and you do not see LED lights turn on, then try to add jumper on this pins, as some of the first boards need it.

Jumper 1: on the board it is labelled as "J1". When you put jumper on these pins, you will be able to access terminal menu of the board with your PC.

Jumper 2: on the board it is labelled as "J2". When you put jumper on this pins, you will be able to access the modem through terminal directly. This is intended for use only by Sentek AWS developers.

Boot jumper: on the board it is labelled as "BOOT". Jumper on these pins is needed when you want to manually upload new firmware to the board with PI Firmware Uploader application. More on this is available in the firmware upload manual.

Attention

Jumper 1 and 2 function only when the USB cable is connected. Without cable they are ignored. This is **not** the case of the BOOT jumper if you forget to remove this jumper the station will **not** go into normal mode of operations and you will have to return to the station and fix this inconvenience manually.

2.9   LEDs
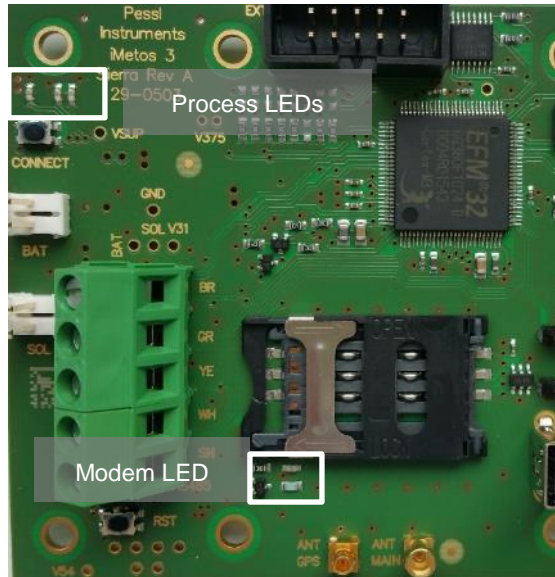
Picture 7:LEDs

Sentek AWS has a set of 3 LEDs on top left on the motherboard and an additional LED under the SIM card holder. The top left row gives information about the running processes, and the stand-alone LED indicates the operation of a modem (see Picture 7).

When the battery is plugged to the connector D (see Picture 1) the three LEDs in the top left corner turn on for an instant. After this the GPRS connection with the server starts and the LEDs give information about the different stages of this process.

Important note

Complete monitoring of the communication process should be done after every installation by connecting the PC to the Sentek AWS. How to perform this is described in detail in section *USB communication with PC.*

2.9.1 Modem LED (stand-alone LED just under SIM card holder):

- **Green LED**: *on,* during the connection process to the GSM network, blinking slowly (short *on* and long *off*) when is connected to the GSM network

2.9.2 Top left row: Processor LEDs (from left to right):

Tip

The center Yellow LED of the top left row is important. If you see the sequence of four blinks (item iv below) then you will know that the upload has been successful, if the sequence is not completed, the red LED will turn on. Take note of the last blinking mode before identifying the error.

- **Green LED (left)**: USB cable is plugged (except when in boot mode – i.e. the boot jumper I is plugged on BOOT pins)
- **Yellow LED (center)**: indicates one of the following:
  1. in boot mode (plugged jumper 1, see Picture 6): Pessl bootloader is installed
  2. in terminal mode (plugged jumper F, see Picture 6) the meaning of the LED is given on the screen of the terminal program in the PC
  3. in normal/scheduling mode (without any jumpers) :
     a) if the modem is on: modem blink code:
        i.   short *on* – long off: waiting for modem, network found, SIM card is active

on————on————on————on————on————on————on————on————on

ii. short *on* – short *on* – long *off*: connected to GSM

on-on————on-on————on-on————on-on————on-on————on-on————on-on

iii. short *on* – short *on* – short *on* – long *off*: connected to the server

on-on-on————on-on-on————on-on-on————on-on-on————on-on-on————on-on-on

iv. short *on* – short *on* – short *on* – short *on* – long *off*: data has been sent and commands from the server have been received.

on-on-on-on————on-on-on-on————on-on-on-on————on-on-on-on————on-on-on-on

b) if the modem is *off*: the measurement process is in progress, it will light a few seconds every 5 minutes.

- Red LED (right):
  - communication error (if modem is *on*)
  - serious system error (if modem is *off*)
    In both cases you will need to connect the Sentek AWS to the PC and use *PI Firmware uploader* to make the diagnostic and to extract useful information to send to your Technical Support provider.

2.10 Test points

In the Sentek AWS board there are several test points for convenience during service, they let the user access different voltages with no need to unplug or remove anything.

Picture 8: Test points

- GND: common ground
- BAT: battery voltage,
- SOL: solar panel voltage
- VSUP: internal voltage supply 6V
- V31: internal voltage supply 3.1V (processor, hygroclip sensors ...)
- V54: internal voltage supply 5.4V (sensor inputs...)

Example: if you wish to measure battery voltage, you can measure it with Voltmeter on GND and BAT test points.

The latest firmware and allows testing battery voltage using terminal commands.

2.11 Sensor inputs

There are 12 direct sensor inputs on the Sentek AWS board, supporting up to 600 sensors (see Picture 1).

Main sensors:

Some sensors have to be connected to specific inputs dedicated to them:

- **WIND**: wind speed sensor
- **LEAF**: leaf wetness sensor
- **RAIN**: rain gauge
- **HC2** (two inputs): hygroclip sensors (air temperature and relative humidity)
- **SWITCH** input: any switch-type sensor can be connected (e.g. another leaf wetness sensor,

tilt sensor, a presostat...).

- **REED** input: any reed-type sensor can be connected (e.g. another rain gauge, flow counter, tilt sensor ...)

Sensors connected to these inputs as well as the battery and solar panel voltage measurement are referred to as "main" sensors.

2.11.1 INPUT 1-4:

INPUT 1-4 can be used for connecting either

1. Individual sensors (any of the complete range of PI_duty_sensors. Global radiation, temperature, wind direction, barometric pressure, water level, weighting cells...)
2. PI_bus chains of modules with sensors.

On these inputs, the type of a connected sensor (or whether a chain is connected) is automatically recognized.

Different temperature sensors are based on the same IC and consequently the Sentek AWS does not distinguish among them. Therefore default inputs have been reserved for each of these temperature sensors as follows:

- INPUT 1: air temperature
- INPUT 2: dry bulb temperature
- INPUT 3: wet bulb temperature
- INPUT 4: soil temperature

Example

If a dry bulb temperature happened to be connected to input 4 it will receive the name of "soil temperature" but this will be only the default denomination and the user can change it later without further consequences on webserver (This is than at: your Account in the server / Sentek AWS settings / names).

Sensors connected directly to the INPUT 1-4 are referred to as "duty-cycle" sensors, because data is transmitted by means of the pulse width. Examples are temperature, global radiation, wind direction, and barometric pressure (complete list is in the APPENDIX I).

PI_bus chain is recognized by its characteristic frequency of 750 Hz. Sensors of the chain are recognized by identifiers (see section Sensor Identification). In addition to the possible chain inputs on INPUT 1-4, the Sentek AWS has one dedicated input for every chain.

Warning

To connect a chain to INPUT 1-4 a *485-to-duty-cycle* converter in needed in the connector of the bus – as in previous Sentek AWS boards. The bus cable cannot be connected directly.

2.11.2 Direct chain input

In addition to the possible chain inputs on INPUT 1-4, the Sentek AWS has one dedicated input for every chain.

Note

This PI_bus chain input has no need of any 485 to duty converter, the bus cable is connected directly.

2.11.3 Extension connector

The Sentek AWS comes supplied with an Extension board for two Sentek probes using the SDI-12 protocol (Sentek Drill and Drop and EnviroSCAN), See Picture 2.

To the extension connector –up to the date of this manual revision– the following extensions PCBs can be connected:

Extension board for two more dedicated chain inputs (chain diplexor or splitter)

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3 Firmware

3.1 Update over the air

The firmware is the application that runs on the processor of the Sentek AWS. Every time the Sentek AWS connects to the server, it checks for the latest firmware version. If it finds a newer version, the Sentek AWS automatically downloads it and updates its self.

In addition, firmware can also be uploaded manually via the USB connection. A detailed description is given in the section about USB communication.

3.2 Station working modes

The Sentek AWS can operate in three different working modes:

1. Logging and transmitting (*normal mode*)
2. Logging, not transmitting (*gathering mode*)
3. No logging, no transmitting (*sleeping mode*)

The standard working mode is the *normal mode* in which the station measures and communicates regularly.

If the battery voltage drops below a threshold (**6.1V**), the station changes to *gathering mode*. The station measures regularly, but modem communication is deactivated.

If the battery voltage falls below yet another threshold (**5.4V**), the station changes to *sleeping mode*. Both measurements and communication are deactivated.

A station in gathering mode automatically changes back to normal mode if the voltage is high enough again.

If the station is in sleeping mode, also the measurement of the battery voltage is deactivated. Therefore the station has to be activated manually by pressing the *connect button* (see Picture 9) on the board in order to change back to normal mode. First the SMS are checked, then the communication with the server is started.

Picture 9: Connect button

3.3 Events

Along with the weather data, the Sentek AWS also sends relevant info concerning previous communication, SMS readings, internal parameters and many other things.

Sentek can see these events at the server (*The server / Settings / Station info / Events details*) or the user can do so locally via USB connection.

Please refer to APPENDIX 2 for the complete list, here as an example:

Code	Description	Code	Description
1	Hard fault of the system	38	APN not found in XML APN file
2	Operation system error	39	NET is not registered => no signal
10	Power on reset	40	NET is not registered => network is not available
11	Brown-out reset	41	NET registration - BTS info is not available

4 Web-server communication

4.1   Viewing data

Data from the Sentek AWS can be accessed through the IrriMAX Live user interface at irrimaxlive.com, provided you have arranged data subscriptions with Sentek and notified Sentek that the system is operational. Sentek will endeavor to add your database to IrriMAX Live within 1 working day.

Once the database has been added to IrriMAX Live, data will be updated as per the transfer settings (see section 4.3).

Sentek suggests connecting all sensors and turning the system on at least 2 days prior to the planned installation. This will help ensure that data will be available in IrriMAX Live on the day of install. Instant testing can be achieved through use of the USB interface of the Sentek AWS.

Additionally to the sensors installed, your IrriMAX Live database will include a daily ETo value. This value is calculated using the method described in Equation #6 of Allen, R.G.; Pereira, L.S.; Raes, D.; Smith, M. Crop evapotranspiration: Guidelines for computing crop water requirements. Food and Agriculture Organisation of the United Nations: Rome, Italy, 1998.

4.2   Measurement and logging interval

The *measurement interval* defines, when a sensor does measurements. The default measurement interval is 5 minutes.

The default logging interval 30 minutes. The *logging interval* defines when the measured data is logged (meaning: measured data is combined into one block and the minimum, maximum, average,... values of each sensor within this logging interval are calculated).

Before each transfer, an additional logging event is triggered.

Each sensor chain (i.e. each input on the Sentek AWS board) may have distinct measurement and logging intervals.

4.3   Fixed transfer interval and transfer-schedule

The times when a Sentek AWS attempts to communicate with the webserver and transfer the logged data can be defined in three ways:

a user-defined data transfer schedule: the user can define transfer times at full hours on a weekly basis,

a user-defined fixed transfer interval,

a user-defined forced transfer interval, which is the same as the fixed transfer interval but limited to a certain timespan.

Default is a fixed transfer interval of 60 minutes. Web-server communication and data transfer are also started due to the following reasons:

- If the Connect button on the board is pressed.

4.4   SMS warning system

Sentek can set customized SMS alarms on order request.

Sentek can define an upper and lower threshold SMS alarm values for each sensor. If a measured value exceeds (or goes below) the established threshold, the Sentek AWS will send the SMS with a warning text (name of sensor, actual value, threshold value) to up to 30 different mobile phone numbers.

Alarm thresholds are checked every 5 minutes within each measurement. When the Sentek AWS receives the sent acknowledgment from the mobile network the Sentek AWS will disable SMS sending for 4 hours.

But if a measured value drops below the threshold in 3 consequent measurement cycles, the Sentek AWS will again enable sending of SMS and send the corresponding alarm.

Example:

Temperature sensor threshold for SMS warning is set to 30°C

Measurement 1: 9:00 value = 28°C

Measurement 2: 9:05 value = 30°C   -> a warning SMS is sent

Measurement 3: 9:10 value = 31°C   -> within a 4hour block interval -> warning SMS is not sent

Measurement 4: 9:15 value = 28°C

Measurement 5: 9:20 value = 29.5°C

Measurement 6: 9.25 value = 29°C   -> the blocking interval is cleared

Measurement 7: 9:30 value = 31°C   -> warning SMS is sent and block interval is started again

After each SMS is sent the Sentek AWS will maintain the modem "on" and establish a communication with the server to upload the complete set of stored data since the previous communication and to receive new settings –if there are any– from the user.

5 Setting communication parameters and resetting Sentek AWS via SMS

A user-defined APN can be set via SMS when the required information is not yet in the APN table of the Sentek AWS. Also a station reset via SMS is possible.

Notes:

- You need the phone number associated to the SIM card in the Sentek AWS
- Alternatively, to send the SMS to the SIM card at the Sentek AWS you can use a SIM card, which already has the configuration SMS locally stored.
- After sending the SMS described later in this section, press the connect button in the Sentek AWS so it checks for received SMS!

The following commands can be send via SMS to the Sentek AWS:

1. Set user-defined APN:
    Code: ! serial_number 0 apn,user_name,password

In which:
serial_number   is serial number of the station,
 apn   is the APN server,
 user_name   is the username of APN server,
 password   is the password of APN server.

Example: *! 00200003 0 telstra.m2m,, !*

Note: there is no space between the APN parameters but that there is one space between exclamation mark, serial number, SMS parameter, APN string and exclamation mark.

```
                       comma         comma
                         ↓             ↓
   ! serial_number 0 apn,user_name,password !

    ↑                   ↑ ↑                   ↑
  space               space                 space
```

When sending this command, the MCC and MNC numbers are taken from the SIM card. Therefore an APN set this way only works for SIM cards with the same MCC and MNC as the in SIM receiving this command. (Usually this is true for SIM cards of the same provider).
An APN sent via SMS is stored in the internal APN XML file and, if correct, is set as default.
If the APN does not work, the system will try to find another APN access from the APN table and the user-defined APN will not be used anymore with the SIM. In order to force the system to retry using a user-defined APN, change the SIM card (as this forces the system to again find a correct APN in the whole APN XML file) or send a new SMS.

To reset the user-defined APN send an SMS without parameters: *! serial_number 0 ,, !*

2. Set user-defined APN full definition:

Code: ! serial_number 3 country_name,MCC,MNC,apn,user_name,password !

In which
serial_number   is serial number of the station
country_name   is country of the provider
MCC   is MCC of the provider
MNC   is MNC of the provider
apn   is APN server
user_name   is user name of APN server
password   is password of APN server
Examples: ! 00202233 3 australia,505,1,telstra.m2m,, !
            ! argonaut 3 spain,214,07,movistar.es,movistar,movistar !

Attention

There is no space between the APN parameters, but there is one space between exclamation mark, serial number, SMS parameter APN string and exclamation mark.

```
              comma      comma      comma
                ↓          ↓ ↓         ↓
 ! serial_number 3 country_name,MCC,MNC,apn,user_name,password !
    ↑              ↑ ↑                                         ↑
 space          space                                      space
```

This command is equivalent to the command *Set user-defined APN*, except that the MCC and MNC are set manually.

3. Reset station:
   Code: ! serial_number 2 UID_station !

In which:
serial_number   is serial number of the station
UID_station   is Unique identification number of the station

You can get the UID_number by connecting the Sentek AWS to the PC via USB cable and asking for a quick report (see next section)

This command does a factory reset (exception: the APN table is kept). Custom APN may have to be

6 USB communication (PI Firmware Uploader)

Direct communication with the Sentek AWS is possible via a standard mini USB cable that is connected to the USB connector. The standard interface for communication is the "PI FW Uploader".

Requirements:

- *.NET 3.5 or higher*
- *EFM32-cdc USB drivers have to be installed*
- *PI Firmware Uploader has to be installed*

The PI Firmware Uploader and the appropriate drivers can be downloaded at:

http://www.sentek.com.au/downloads/downloads.asp

Select option Sentek AWS, then option PI Firmware Uploader

Alternatively contact your Tech Support provider

6.1   USB communication modes

Depending on the jumper configuration on the Sentek AWS board one of the following USB communication modes is active:

- Terminal mode (Jumper 1 set (G in the Picture 10)):
  In terminal mode active communication with the Sentek AWS is possible.
- Modem direct communication mode (Jumper 2 set (F in the Picture 10)):
  Direct active communication with the modem is possible.
- Boot mode (Boot jumper set (J in the Picture 10)):
  In boot mode new firmware versions can be uploaded manually.
- Spy mode (no jumper set bun USB cable is connected):
  In spy mode the Sentek AWS carries out the normal processes like measuring and communicating with the web server. Real-time information on the processes is printed to the screen and can be used for monitoring, testing and error tracing.
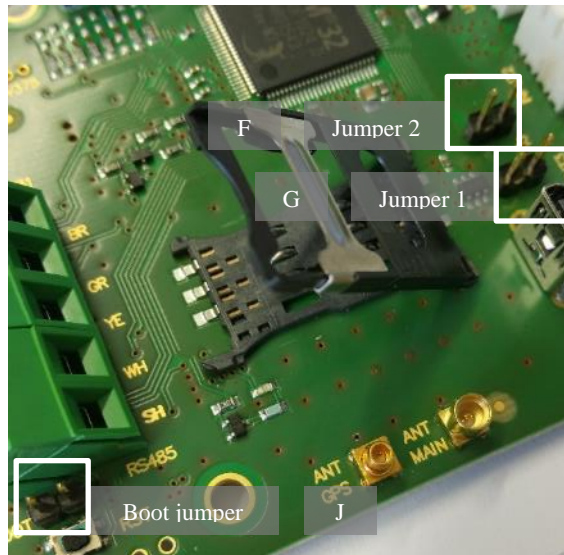
Picture 10: USB communication modes

Switching between normal mode, terminal mode and direct communication mode can be done simply by changing the jumper position.

Boot mode is only started or exited upon resetting the board. To do this, disconnect the power supply or press the Reset button. Before resetting the station always close the serial port.

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The basic communication procedure for normal, terminal and modem direct communication mode is:

1. Place the appropriate jumper and plug in the USB.
2. [If the battery is unplugged]: Plug in the battery.
3. [If station is in boot mode]: Press the Reset button on the Sentek AWS board to exit boot mode. Check if the jumper is not set on *boot* pins.
4. In PI Firmware Uploader: Click "Open Port" button.
5. Communicate with station.
6. [Optional]: Switch between normal, terminal and modem direct communication mode by changing the jumper position.
7. Click button "Close Port" when you want to end the communication.
8. Unplug USB.

The most common application of the *boot mode* is to manually upload a new firmware version (instructions are given below).

Possible reasons for the error message "COM port unavailable" or similar:

- *The board is not connected to the power supply.*
- *The board was reset while the port was open.*

Solution: Close Port and reset the board again by pressing the Reset button. If needed, try to unplug and plug back again the USB cable.

6.2   Using the terminal mode

With the battery connected to the Sentek AWS proceed as follows:

1. Plug USB cable to the Sentek AWS
2. Plug the USB cable to the PC
3. Place Jumper 1 set (G in the Picture 10)
4. Run the application PI FW Uploader
5. Click on "Open Port" button
   You will get the main menu. If not, press space bar on your keyboard
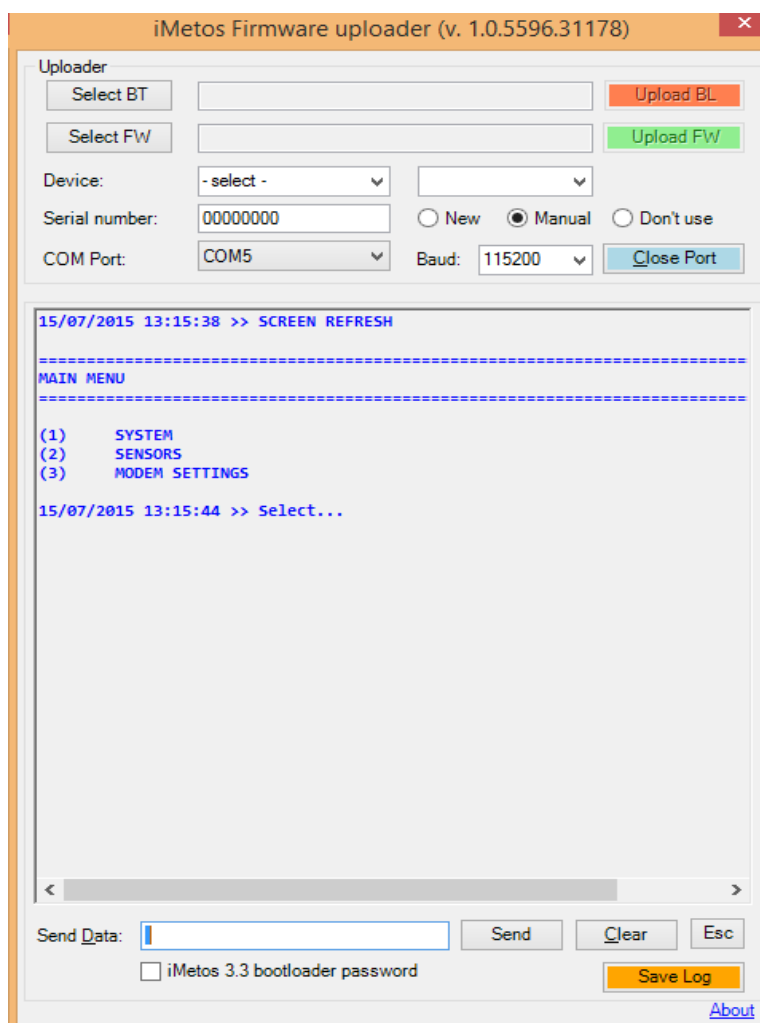
Navigation through the menus is done by pressing keys, which are specified on the screen and given below in brackets. To navigate back to the parent menu press "ESC" on your keyboard or click over the "Esc" button.

The terminal window can be cleared by clicking "Clear" or saved to a RTF file by clicking "Save Log".

```
================================================================================
MAIN MENU
================================================================================

(1)     SYSTEM
(2)     SENSORS
(3)     MODEM SETTINGS
```

6. Press 1 to go to system menu and get:

```
================================================================================
MAIN MENU > SYSTEM
================================================================================
(1)     QUICK VIEW
```
gives some basic station, modem and server information.
```
(2)     FULL REPORT
```
gives a detailed report on the station including the station settings and events.
```
(3)     FACTORY RESET
```
discards the station settings, measured data and APN table.

7. press Esc to return to main menu

8. press 2 to get sensors menu

```
================================================================================
MAIN MENU > SENSORS
================================================================================

(T)     DO SENSOR TEST
```
opens the sensor test menu (see below).

(M)   DO MEASUREMENT ONLY: prompts the Sentek AWS to start a measurement. A submenu is opened in which you can select a chain by pressing (1) - (7) or all sensors by pressing (A).

(W)   WIRELESS TEST
(P)   PRINT LAST MEASURED DATA
(S)   PRINT LIST OF SUPPORTED SENSORS
(I)   STORE MEASURED DATA
         (STORE DATA IN MEM??) prompts a logging event.
(R)   PRINT ENCODED RECORDS
         shows all stored data encoded as weather bin (data transfer format)
(D)   DISCARD SENSOR DATA BASE
         (SET DATABASE TO DEFAULT??) discards the station settings and measured data
         (the APN table is kept).
(ESC)   BACK

9. press Esc to return to main menu, press 3 to get the modem settings menu

```
================================================================================
MAIN MENU > MODEM SETTINGS
================================================================================


(1)      GET MODEM INFO
```
shows IMEI, SIM card number, type of modem
```
(2)      UNLOCK SIM CARD (PIN CODE)
```
check whether PIN number request is enabled and also provides means to disable it.
```
(3)      SIGNAL QUALITY GRAPH
```
gives a representation of the carrier signal quality
```
(4)      APN OF CUSTOMER
```
lets you directly configure the Access Point Name for the specific provider
```
(5)      SERVER REDIRECTION
```
allows you to change the URL address of the server

```
================================================================================
MAIN MENU > MODEM SETTINGS > GET MODEM INFO
================================================================================
Modem Brand:         Sierra Wireless
Modem Type:          SL6087 Product
Modem FwVersion:     R7.46
Modem IMEI:          354293068370835
Modem bearer type:   GPRS
Modem Baudrate:              115200
SIM status:          Inserted ( SIM ID: 8943015614107200408 )
SIM locking:         UNBLOCKED



================================================================================
MAIN MENU > MODEM SETTINGS > SIGNAL QUALITY GRAPH
================================================================================


        --------------------------------------------------------------------
        (Esc)  <- exit from this menu item
        --------------------------------------------------------------------


        Signal:    >||||||||||||||||||||||||||||||...<    ( RSSI: 29 / BER: 0 )

================================================================================
MAIN MENU > MODEM SETTINGS > APN OF CUSTOMER
================================================================================

CURRENT APN ACCESS DEFINED BY USER:
-----------------------------------

        -- There is not defined APN by user --

CHOOSE THE ACTION:
------------------
(I)      INSERT NEW APN ACCESS
(D)      DELETE DEFINED USER APN


================================================================================
MAIN MENU > MODEM SETTINGS > SERVER REDIRECTION
================================================================================

CURRENT SERVER SETTINGS:
-----------------------
        Domain name:         metos.at
        URL address:         /pikernel_dev/metos_upload_xml33.php
        Port:                80
```

```
CHOOSE THE ACTION:
------------------
(R)     REDIRECT SERVER
(D)     RESET SERVER REDIRECTION
```

Clue:

If there is no menu visible, press Space on your keyboard and the actual menu will be shown. With ESC parent menu will be shown

Note:

Options in the Terminal Menu can be changed with new Firmware.

6.3   Testing sensors

To test the sensors start terminal mode and navigate to the Test of sensors menu as described above. There you can select the chain to test by pressing (1) - (8) or you can test all sensors at once by pressing "A" on your keyboard. While the test measurement is in progress, the yellow LED is turned on. This may take several minutes. The output then printed on the screen has the format:

Sensor Name
Sensor Code
CH[chain nr.]/[channel nr.]
Measured Value

Measurement is automatically repeated every 15 seconds. Quit the test by pressing "q".
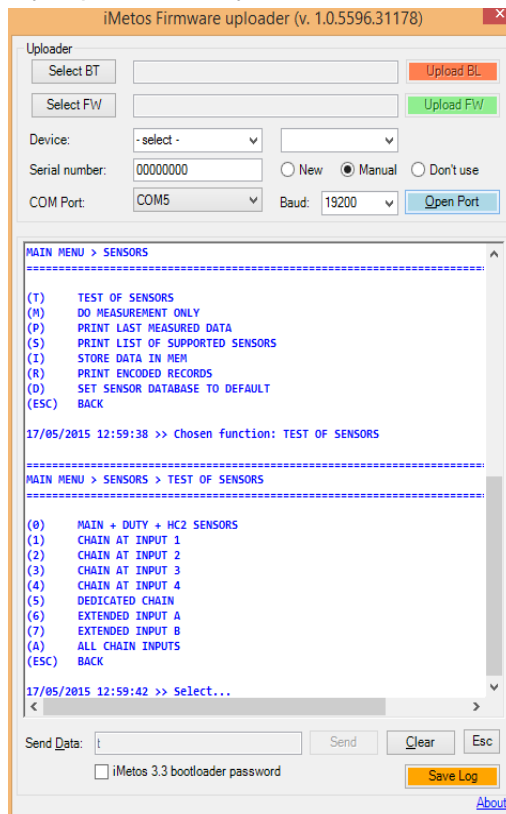
6.4   Uploading firmware

Eventually it can be necessary to manually upload firmware. To do this, follow the given steps:

1. Plug the USB and set the Boot jumper. If not done yet, insert the SIM card and connect the antenna.
2. [If the battery is unplugged]: Plug battery.
3. Check whether the station is in boot mode and the Pessl bootloader is installed: Yellow LED in the lower row is on.

4. [If the station is not in boot mode]: Press Reset button on the board.

5. In Firmware Up-loader:

    i.   Click "Select FW" and select the correct firmware binary file.

    ii. Check that Device "Sentek AWS" is selected.

    iii. Select the correct COM Port.

    iv. Click "Upload firmware".

    v.   After successful upload, the board automatically restarts, starts communication with the web-server and enters the boot menu. The boot menu is a simple version of the terminal menu and offers only limited options.

    vi. To leave the boot menu/boot mode click "Close Port", remove the Boot jumper, remove the USB cable and press reset on the board.

6.5   Changing the serial number

In order to change the serial number of a station, an *.ini file containing the new serial number is
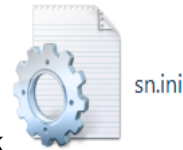
needed. *.ini files are issued by mail upon request to Sentek

If you received your *.ini file, copy it to the path where the firmware uploader application is installed and start the firmware uploader. The new serial number is recognized automatically. Follow the instructions to upload firmware given above. After the upload, the *.ini file is deleted automatically.

Important note:

Complete monitoring of the communication process should be done after every installation by connecting the PC to the Sentek AWS. Installer never should leave the site without performing sensor test and communication process log.

---

7 APPENDIX I

7.1   List of events – For Sentek use

Code	Description
1	Hard fault of the system
2	Operation system error
10	Power on reset
11	Brown-out reset
12	External reset
13	Watchdog reset
14	System reset
15	Other reset
16	Factory reset -> station settings discarded, measured data discarded, APN list discarded
17	Set to default -> station settings discarded, measured data discarded, APN list kept
20	Date and time synchronized
21	Connect button pressed
22	USB was connected
23	Extremely low-level of battery detected => station switch to sleep
24	Low battery level detected => station communication stopped
30	Turning on of modem was fault
31	Soft reset of modem
32	Hard reset of modem
33	SIM card is not inserted
34	SIM card hard fault
35	SIM card code is locked
36	SIM card code has hard fault
37	SIM card IMSI has hard fault
38	APN not found in XML APN file
39	NET is not registered => no signal
40	NET is not registered => network is not available
41	NET registration - BTS info is not available
42	SMS transmit failure
43	SMS receive failure
44	WIP stack - initialisation failure
45	WIP stack - bearer setup failure
46	WIP stack - HTTP start service failure
47	WIP stack - HTTP data transfer failure
48	Update: -- STATION SETTINGS -- [SUCCESSFUL]
49	Update: -- STATION SETTINGS -- [FAILED]
50	Update: -- APN XML file -- [SUCCESSFUL]
51	Update: -- APN XML file -- [FAILED]
52	Update: -- FIRMWARE Update Over The Air -- [SUCCESSFUL]
53	Update: -- FIRMWARE Update Over The Air -- [FAILED]
60	Measurement failure - local storage overload
61	Sensor settings was updated
62	Unknown sensor detected => missing in sensor list
63	Sensor was disconnected
64	Sensor sent invalid data
65	- sensor general error (default) + CHAIN_CHANNEL INPUT
66	sensor special error + CHAIN_CHANNEL INPUT
67	Unknown event of the storage
68	read of chain failed (broken chain) + info = chain_input
69	chain is removed + info = chain_input

Code	Description
1000	Modem turning-on process fault
1001	Modem device configuration fault
1002	Modem soft reset fault
1003	Modem hard reset fault
1020	Modem - SIM card configuration fault
1021	Modem - SIM card is not inserted
1022	Modem - SIM card hard fault
1023	Modem - SIM card is locked
1024	Modem - SIM card - code hard fault
1025	Modem - SIM card - IMSI has hard fault
1040	Modem - APN settings not found in system
1041	Modem - Network - general fault during registration
1042	Modem - Network - any signal is not detected
1043	Modem - Network - network of carrier is not accessible
1044	Modem - Network - Information about BTS is not available
1045	Modem - Network - successful activation of CDMA modem
1046	Modem - Network - fault activation of CDMA modem
1060	Modem - SMS - transmit fault
1061	Modem - SMS - receive fault
1062	Modem - SMS - warning SMS was sent successfully
1063	Modem - SMS - received settings via SMS
1064	Modem - SMS - executed settings via SMS
1065	Modem - SMS - settings via SMS was fault
1080	Modem - Internet - internat stack initialization fault
1081	Modem - Internet - internet bearer setup fault
1082	Modem - Internet - PPP access set by system
1083	Modem - Internet - PPP access set by customer
1090	Modem - Internet - fault start of TCP service
1091	Modem - Internet - fault data transfer by TCP service
1092	Modem - Internet - fault start of HTTP service
1093	Modem - Internet - fault data transfer by HTTP service
1100	Update: -- STATION SETTINGS -- [SUCCESSFUL]
1101	Update: -- STATION SETTINGS -- [FAILED]
1102	Update: -- APN XML file -- [SUCCESSFUL]
1103	Update: -- APN XML file -- [FAILED]
1104	Update: -- FIRMWARE Update Over The Air -- [SUCCESSFUL]
1105	Update: -- FIRMWARE Update Over The Air -- [FAILED]
2000	Measurement - system force-close
2001	Measurement - sensor settings was updated
2002	Measurement - Sensor - detected unknown sensor
2003	Measurement - Sensor - sensor was unconnected
2004	Measurement - Sensor - sensor returns invalid data
2005	Measurement - Sensor - sensor has general error
2006	Measurement - Sensor - sensor has special error
2007	Measurement - Storage - unknown error of local storage
2008	Sensor Database Indexing Fault
2009	Sensor not stored with defined code (in pair with code 2010)
2010	Sensor not stored at channel (in pair with code 2009)
2011	Measurement - sensor storage overflow
2020	Measurement - Chain - fault reading of chain input
2021	Measurement - Chain - chain was removed
2030	connected new board with MAC address (added new sensors related to MAC)
2031	board with MAC address was unconnected (removed old sensors related to MAC)
2032	board with MAC address was removed from database (discarded old sensors related to MAC)

Code	Description
2035	sensor with serial number was connected (added new sensors related to SN)
2036	sensor with serial number was unconnected (removed old sensors related to SN)
2037	sensor with serial number was removed from database (discarded old sensors related to SN)
2040	Measurement - Wireless system - startup fault
2041	Measurement - Wireless system - waiting time for data is to long (out of synchronization)
2042	Measurement - Wireless system - RF system has different serial number
2043	Measurement - Wireless system - fault start of measurement process by RF system
2044	Measurement - Wireless system - data not available from RF system
2060	Measurement - Sensors - Extension board was removed
2061	Measurement - Sensors - sensor was detected at input A of extension board
2062	Measurement - Sensors - sensor was removed at input A of extension board
2063	Measurement - Sensors - sensor was changed at input A of extension board
2064	Measurement - Sensors - sensor was detected at input B of extension board
2065	Measurement - Sensors - sensor was removed at input B of extension board
2066	Measurement - Sensors - sensor was changed at input B of extension board
2100	Measurement - Sensors - duty sensor was unplugged
2101	Measurement - Sensors - plugged unknown duty sensor
2120	Hygroclip2 detected at Input HC1
2121	Hygroclip2 removed from input HC1
2122	Hygroclip2 at input HC1 has data parser error
2123	Hygroclip2 detected at Input HC2
2124	Hygroclip2 removed from input HC2
2125	Hygroclip2 at input HC2 has data parser error
2160	Measurement - Sensors - Build-in GPS - captured GPS position
2161	

8 NOTES