METOS Hardware options and configuration

Teraterm Application for configuring METOS hardware

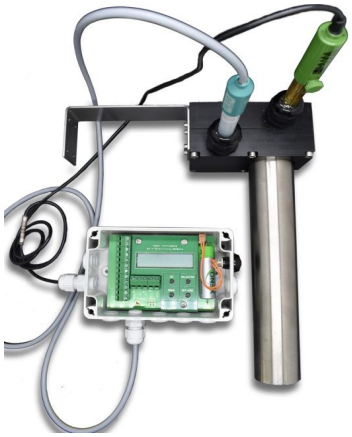
Agri-tech Client Dashboard & Charting tools

Contents

What product have you got?

1. M-Metos Soil Base - DTU with rain gauge

2. METOS ATS22 - DTU



3. pH/Ec Interface

4. LoRain—Collector

5. Lorath - Temp/RH sensor

6. Cabled Temp/RH Sensor

METOS Hardware

METOS DTU (Data Transfer Unit) pre October 2022

1 = solar panel

2 = DTU chassis

ID numbers would start 0390 pre Jan 22

ID numbers would start 0310 Jan 22 - October 2022 - Field Scale Basic October 22 onwards

METOS DTU (Data Transfer Unit) post October 2022 (Fruit Advanced System)

ID numbers would start 0021 October 22 onwards

METOS LoRath (temperature / humidity) pre March 2022

ID numbers would start 03B0

METOS LoRath (temperature / humidity) post March 2022

ID numbers would start 03B0 or 04C1

METOS Hardware - contd

METOS LoRain pictured with solar panel. NB Units pre October 2022 did not have solar panels fitted

ID numbers would start 03A0 (no solar)

04D0 with solar

METOS DTU Sensors

Sentek SDI 12 moisture probes (60cm, 30cm)

Cabled Temp/RH Sensor

pH / EC interface unit with sensors

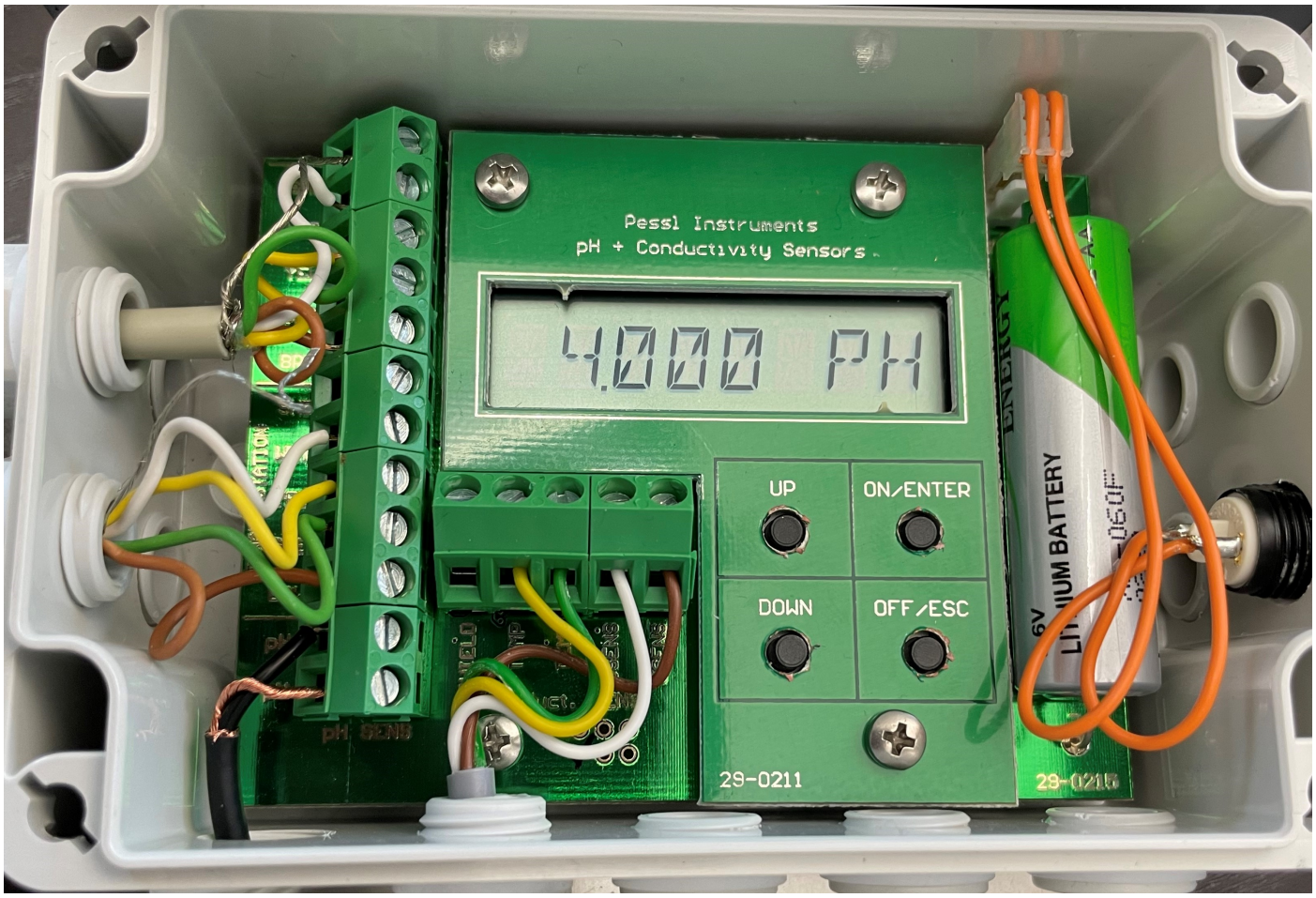
Rain Gauge

Rain Gauge with added EC / pH sensor well

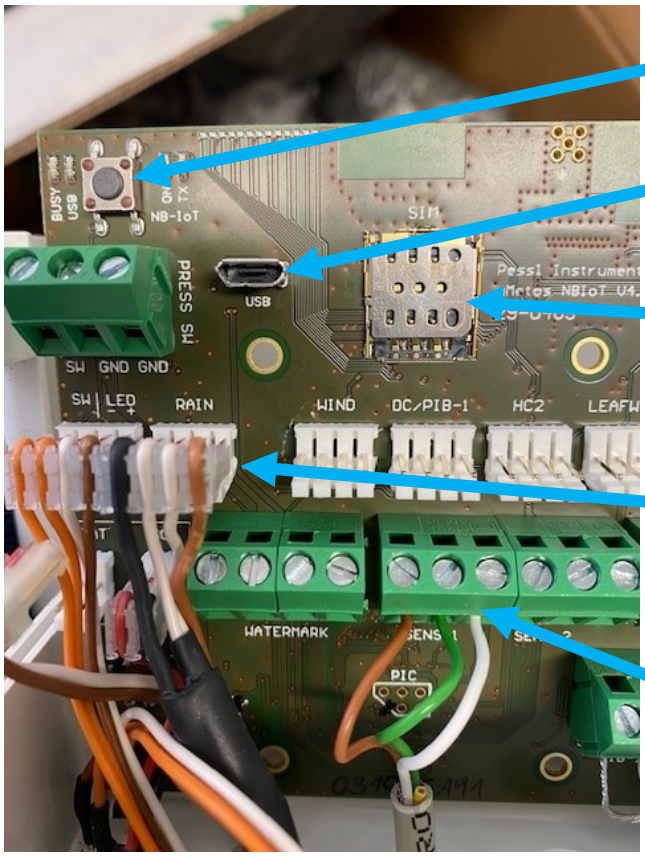
Agri-tech Auto-drain Station

Hardware consists of 1 DTU, 2 rain gauges with sensor well fitted, 2 pH / EC interfaces and 2 each of pH & EC sensors

Fully automated measurement 24/7 of your drip and drain pH / EC and run-off



Micro METOS NBIoT DTU (data transfer unit) - 0390 / 0310 units



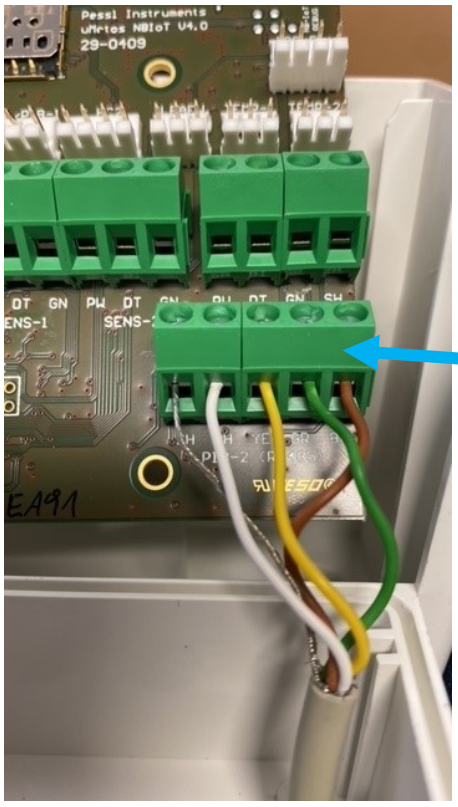
Re-set button

Micro USB for Comms cable

SIM holder

IM523 Rain Gauge plug

IM 526 Temperature / humidity Sensor wiring

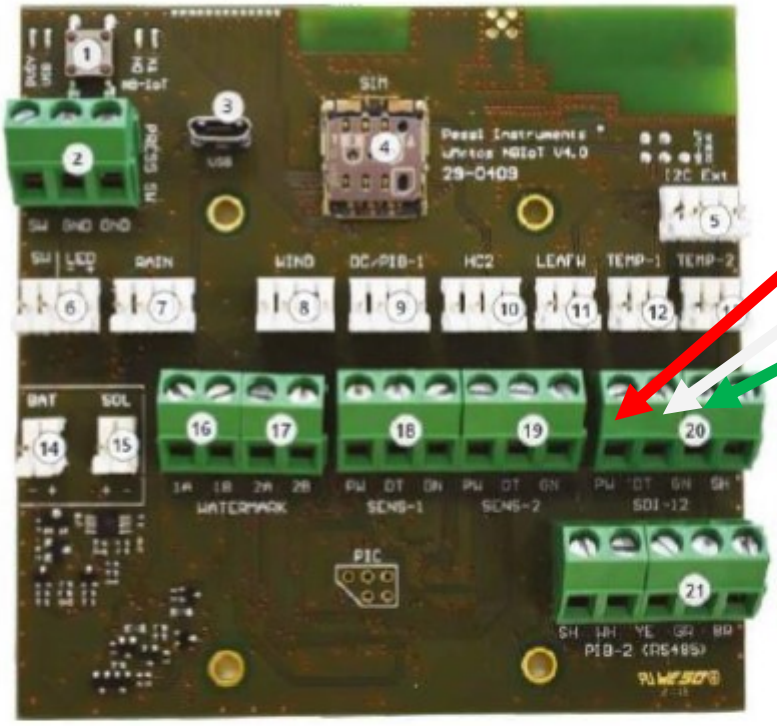


pH / EC interface wiring on to 0390 / 0310 board

Micro METOS NBIoT DTU (data transfer unit) - 0390 / 0310 units

6.1 Inputs and connectors

Front side:



Picture 4 - Front side of the µMETOS NBIoT motherboard (29-0409) with labeled elements

Number	Label	Description
1		internal connectivity test button
2	PRESS SW	Pressure switch input
3	USB	Micro-B USB port
4	SIM	Micro SIM card slot
5	I2C Ext	I2C Extension port input
6	SW|LED	External button with LED status connector
7	RAIN	Rain gauge or Water meter sensor input
8	WIND	Anemometer or Counter sensor input
9	DC/PIB-1	DC (duty cycle) for Pyranometer sensor input or PI-Bus sensor input
10	HC2	Hygroclip sensor input
11	LEAFW	Leaf wetness sensor input
12	TEMP-1	(DS18B20) - dedicated soil temperature sensor input
13	TEMP-2	(DS18B20) - dedicated air temperature sensor input
14	BAT	6V battery connector
15	SOL	Solar panel connector
16	WATERMARK 1A 1B	1st watermark sensor input
17	WATERMARK 2A 2B	2nd watermark sensor input
18	SENS-1	Decagon/METER Group sensor / PI-Bus sensor input
19	SENS-2	Decagon/METER Group sensor / PI-Bus sensor input
20	SDI-12	SDI12 sensor input
21	PIB-2 (RS485)	General PI sensor bus input

Lights on the board are as follows:

Orange LED - powering up

Red LED - Obtaining GPS position and sensor testing (takes 3-5 minutes)

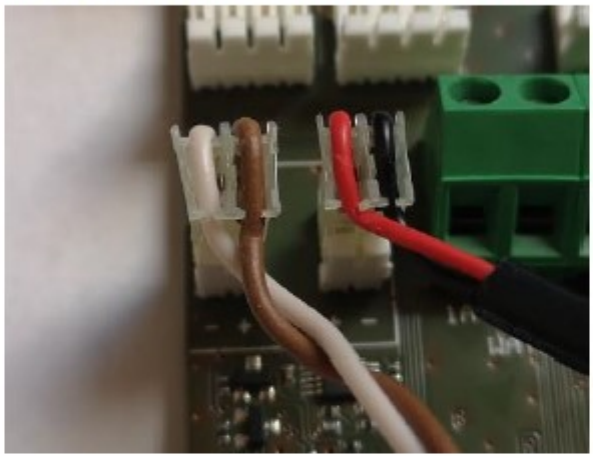
Blue LED - Modem powering up

Green LED - TX (transmission)

Power up sequence:

1. connect the battery to the BAT connector, make sure the polarity is correct, negative (-) is on the left side and positive (+) terminal is on the right side for the battery connector

2. connect the solar panel to the SOL connector, make sure the polarity is correct, negative (-) is on the right side and positive (+) terminal is on the left side for the solar connector



Picture 12 – Power inputs labeled polarity on the board

Picture 13 – Left: Battery cable, right: solar panel cable

Common color scheme:

Battery cable:

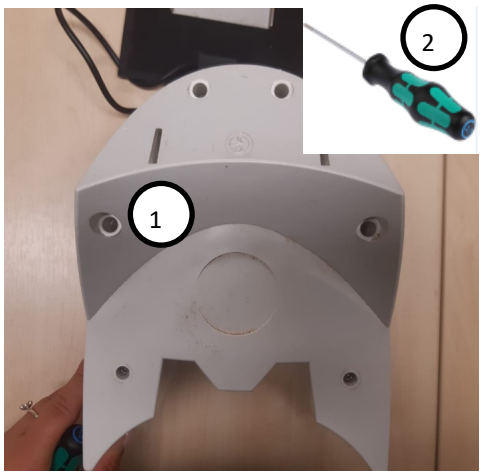
WHITE cable is negative (-), connected to the – battery terminal
BROWN cable is positive (+), connected to the + battery terminal

Solar panel cable:

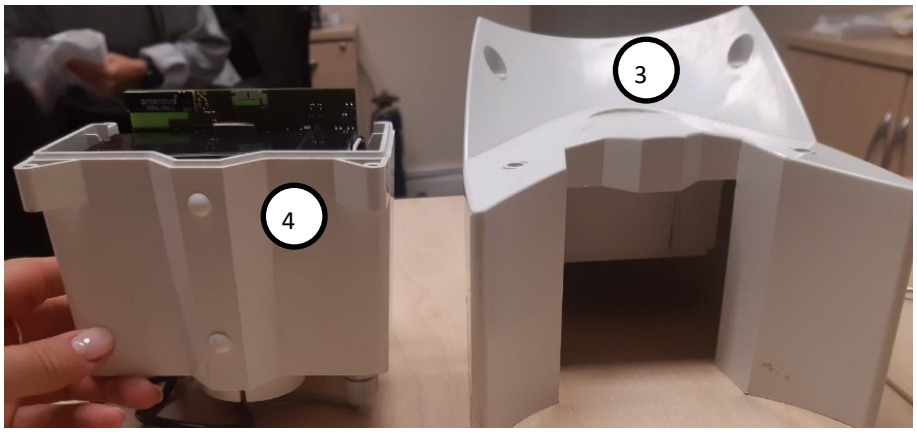
RED cable is positive (+)
BLACK cable is negative (-)

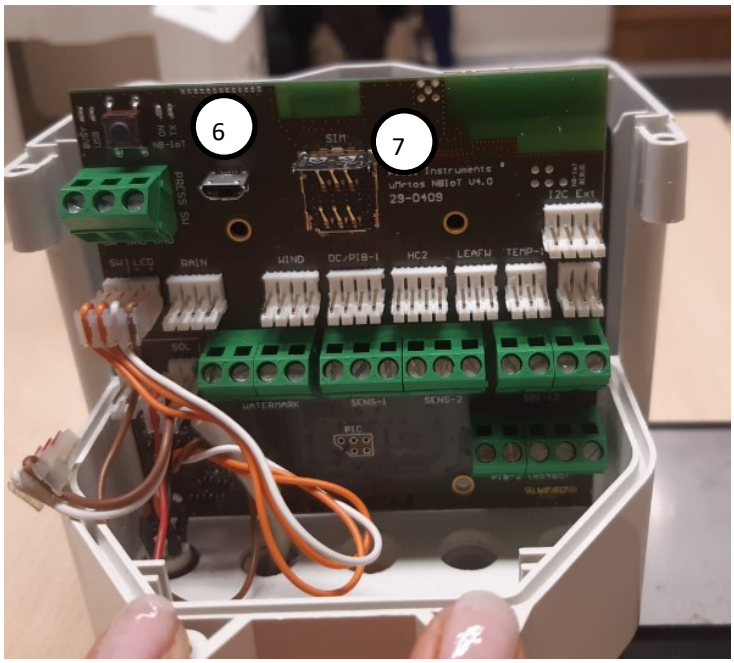
Be very careful: if you connect the wrong power source to a wrong power input or if you reverse the polarity on any power input the motherboard can have issues and possible burnout. In such case, the motherboard will have to be replaced.

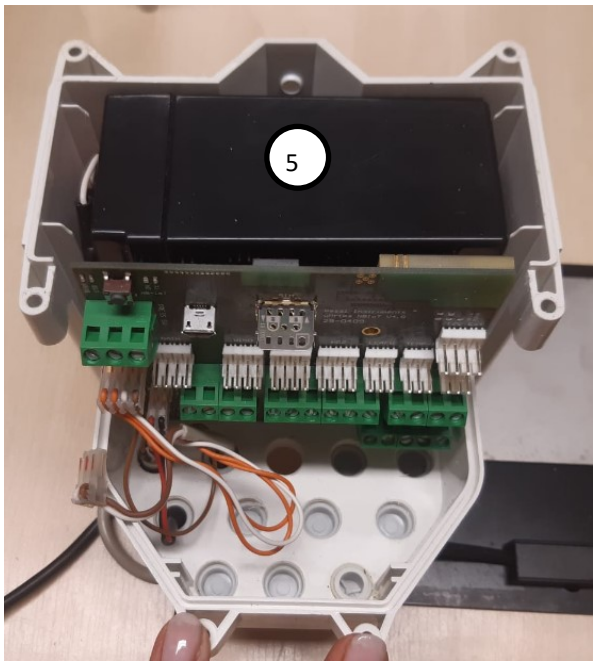
Micro METOS NBIoT DTU (data transfer unit) - 0390 / 0310 units



1) Hex securing screws (2.5mm)
2) 2.5mm Hex driver
3) Upper casing
4) Lower casing
5) Battery
6) Comm port
7) SIM holder







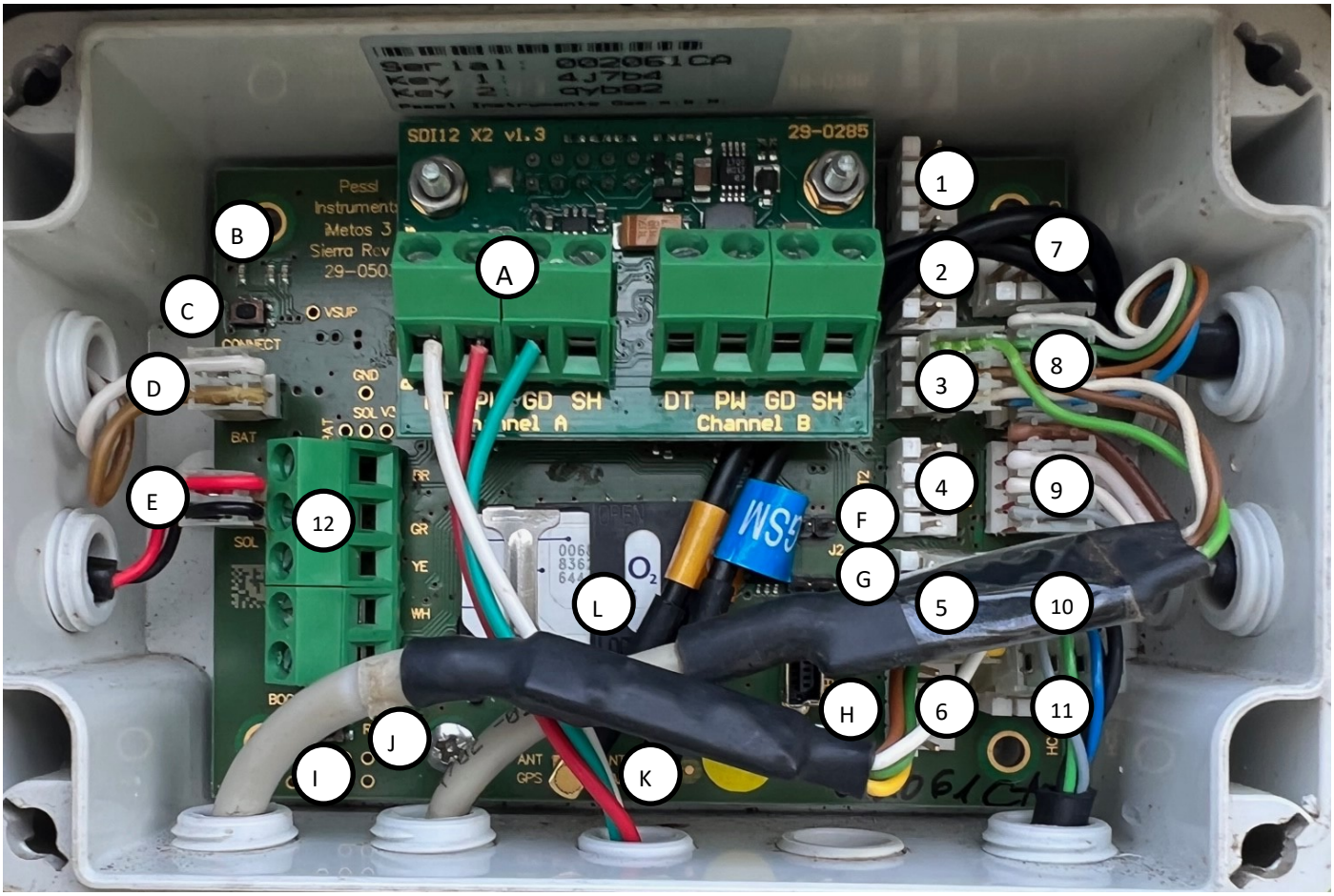
To access the battery, SIM card holder & Comm port

Remove the six hex screws using the 2.5mm hex driver and split the upper case from the lower case. On the 0390 units the six hex screws are on the lower casing of the unit, on the 0310 (pictured) they are located on the upper casing

METOS ATS22 - DTU Base PCB

DTU wiring diagram including pH/EC Interface &

SDI 12 port for Moisture Probe



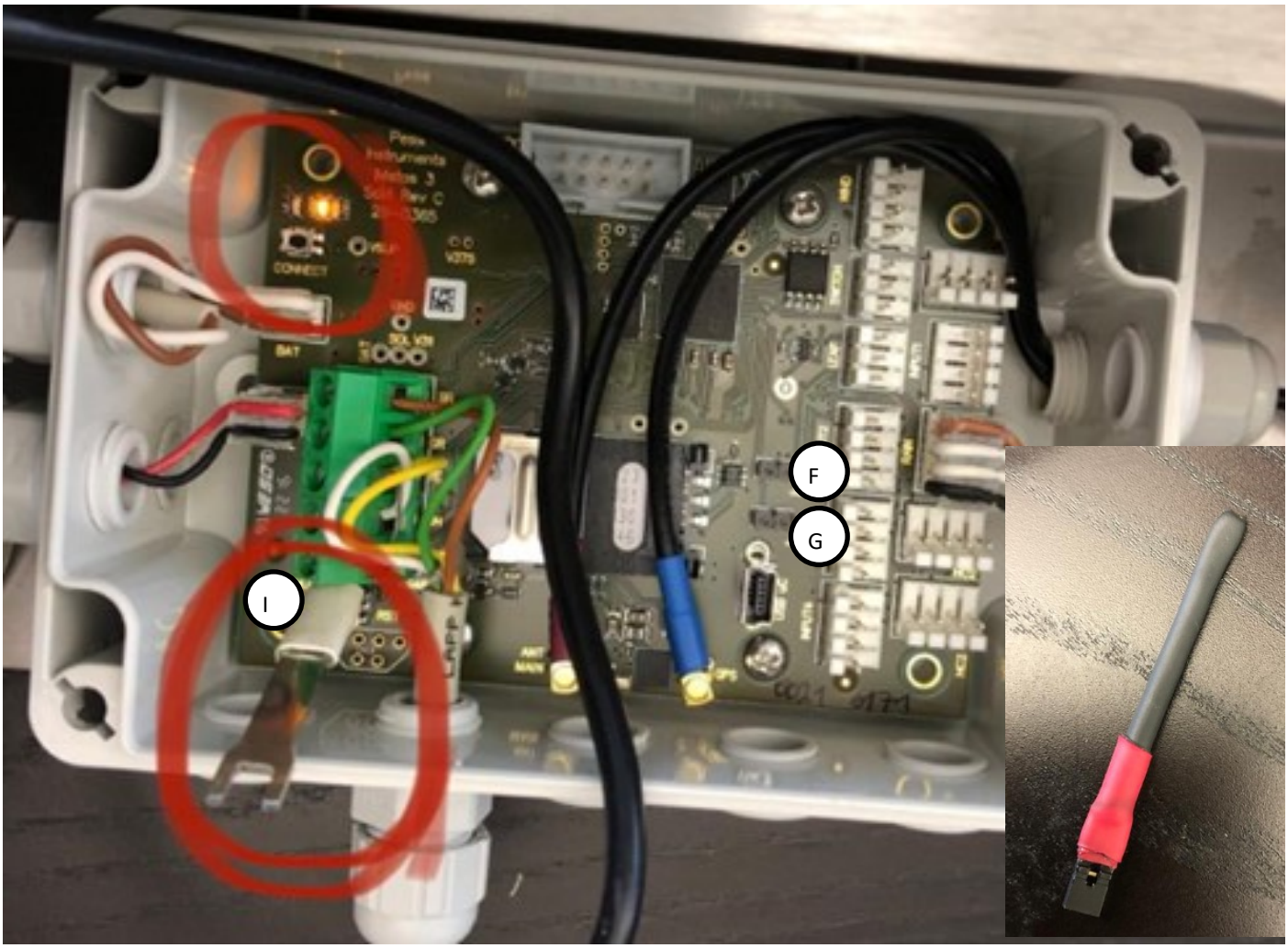
Interface:

A) SDI-12 board (Sentek moisture probe)
B) LED indicators
C) Connect button
D) Battery connector
E) Solar panel connector
F) Jumper 2
G) Jumper 1
H) USB connector - Teraterm
I) Boot jumper
J) Reset button
K) Antenna connections
L) SIM Holder

Sensor inputs:

1) WIND iMETOS® 3 2ozn
2) INPUT
3) LEAF
4) INPUT 2 (temp / rh)
5) INPUT 3
6) INPUT 4
7) Rain Gauge (Drip in)
8) INPUT 1
9) Rain Gauge (Run-off)
10) HC2 B
11) HC2 A
12) Direct PIbus (chain) input (pH / EC Interface)

METOS ATS22 - DTU Base PCB—Jumpers



BOARD JUMPER

The ATS22 board is equipped with 3 board jumpers;

BOOT Jumper— As pictured above (I) This jumper is only required when updating or replacing a firmware—**PLEASE NOTE—THE BOARD WILL CEASE TO COMMUNICATE WITH BOOT JUMPER IN PLACE—THIS MUST BE REMOVED AFTER USE**

Jumper 1— (G) Terminal Mode—For use when connected to the board via TeraTerm (Normal use)

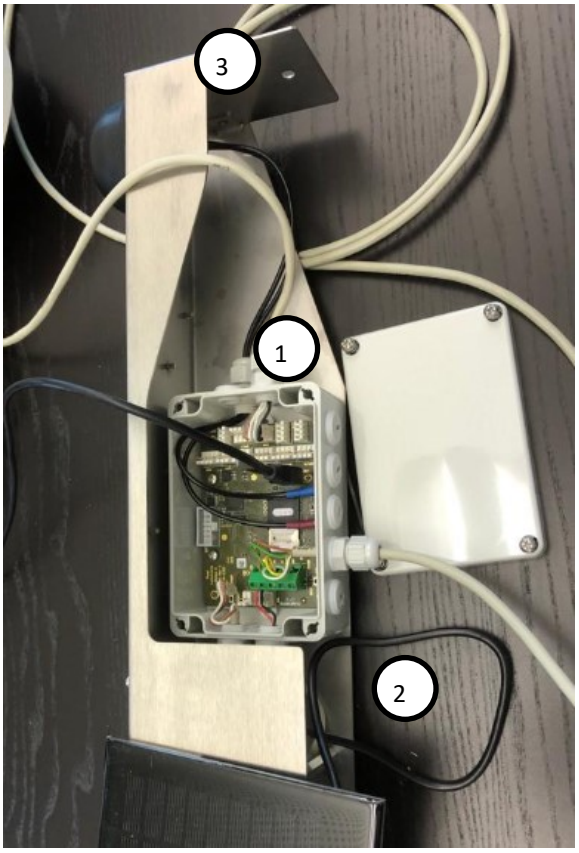
Jumper 2— (F) Modem Mode— For use when testing via external modem (Rare use)

NOTE:

It is possible to 'VIEW' the ATS22 board without any Jumpers in order to view live activities—

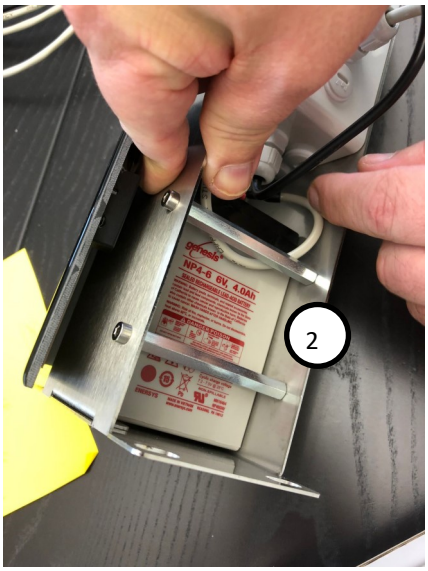
It is NOT possible to make any changes or run any commands without the correct Jumper in place

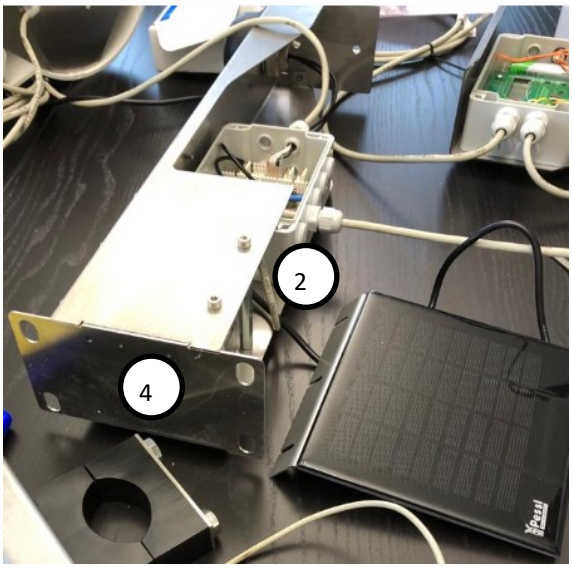
METOS ATS22 - DTU - October 22 onwards



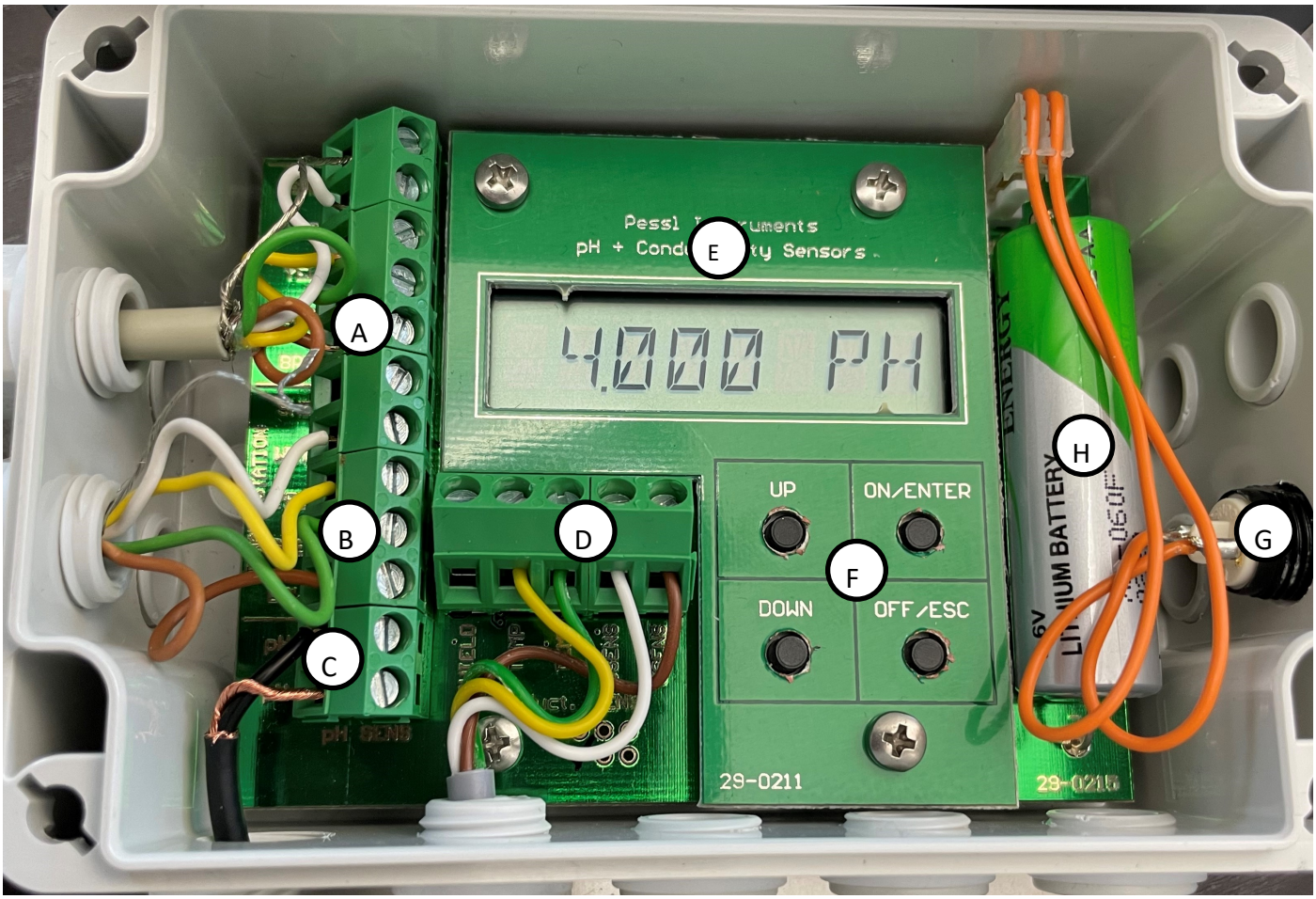
Component layout:

1) System Enclosure
2) Battery housing
3) Solar Panel mount
4) System mounting plate





pH/EC Interface Unit

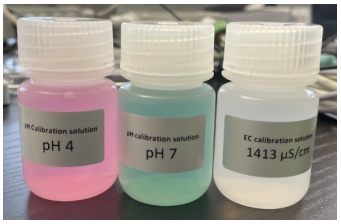


Wiring inputs:

A) Wiring to Extension board
B) Wiring to DTU Base
C) pH Sensor
D) EC Sensor
E) LCD Display
F) Configuration control buttons
G) Display mode button
H) Battery

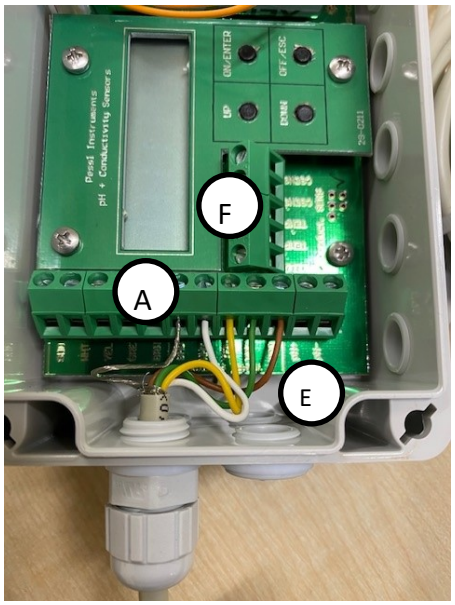
Calibration controls:

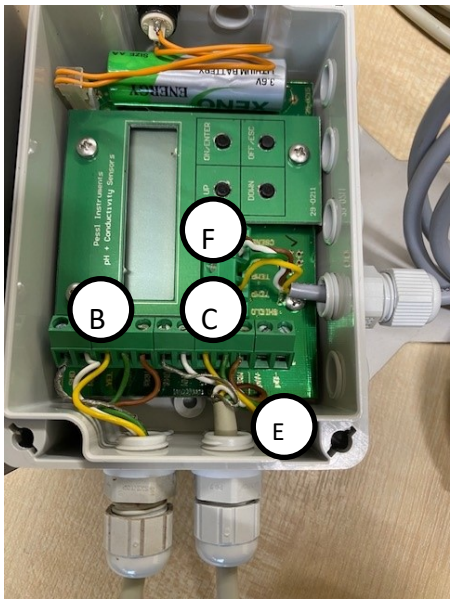
1. ON/ENTER to wake device
2. UP to select pH or EC sensor to calibrate
3. ON to start calibration process insuring sensor is submerged within the buffer liquid
4. LCD display will confirm to 'WAIT' during the calibration process
5. 'DONE' will be displayed to confirm successful inc calibrated value in either EC or pH value



Agri-tech Auto-drain Station

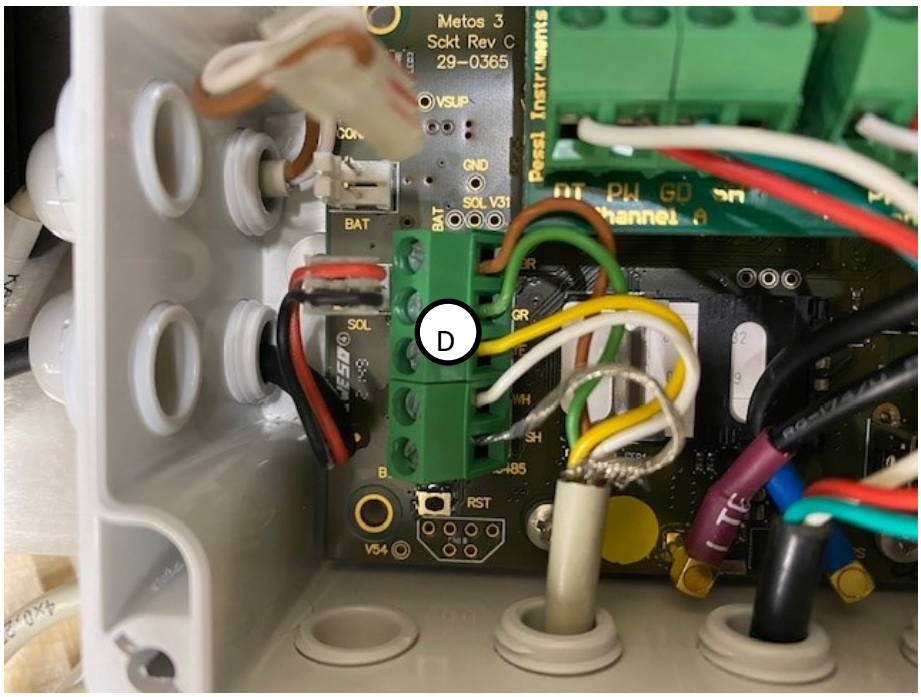
Wiring diagram of the two pH / EC interface units into the DTU for drip and drain pH / EC. For wiring the two rain gauges for run-off into the ATS22 DTU please refer to page 11



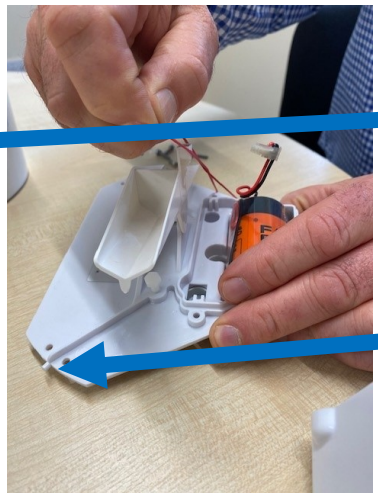


Wiring inputs:

A) pH / EC interface unit 1
B) pH / EC 1 wired into pH / EC 2
C) pH / EC unit 2 wiring
D) pH / EC unit 2 into DTU
E) pH Sensor input
F) EC sensor input



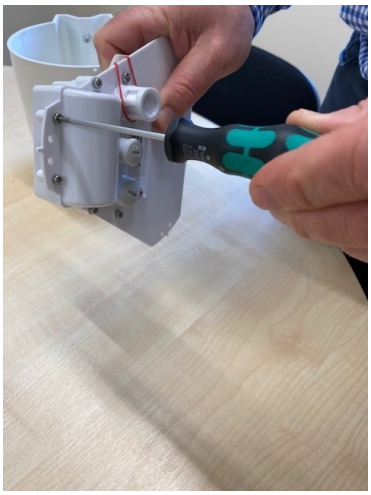
Configuring the LoRain sensor



Carefully press the outer edge of the rain collector body to release the locating peg on the rain tipper body

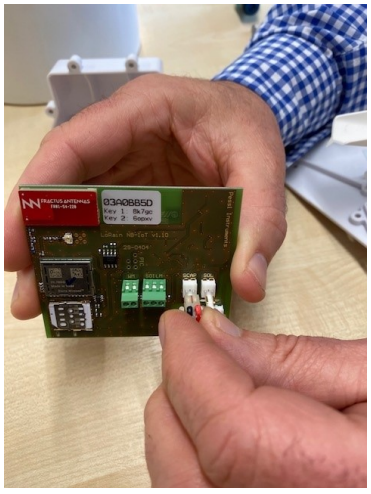
Locating peg

Once the first peg is released remove tipper unit from the rain gauge body



Use the 2.5mm Hex driver (supplied) to remove the 6 hex securing screws

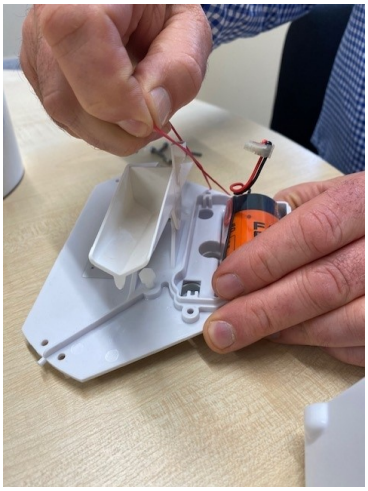
Carefully open up the battery cover



Insert the micro SIM into the SIM holder as pictured far left and slide the SIM securing holder closed

Carefully connect the battery (left) to the SCAP terminal

Configuring the LoRain sensor—contd



Remove the rubber band to free the tipper

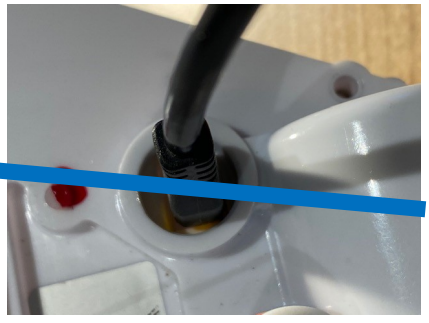
Replace the six hex screws but DO NOT overtighten these

Carefully replace the tipper into the Rain Gauge body by carefully pushing out against the body to secure

Measure the distance between the two bolts (supplied) and drill a hole in a suitable steel / stainless pole

Secure the sensor to the pole and attach the pole using strong cable ties or jubilee clips

If installing into the soil, install the mount pole before securing to the sensor to avoid damage



Please email info@agri-tech.co.uk the serial number and key 1 number found on device

The Comms cable may be required to check settings on the device - accessed by the port pictured left.

When emailing Agri-tech please state serial number, key 1 number, field name and specify run-off / or drip in. In addition please state number of drippers in the bags / pots, and number of bags / pots you are collecting run-off from.

Configuring the LoRath sensor - pre April 2022

1

2

1 LoRath Sensor measuring temperature & humidity

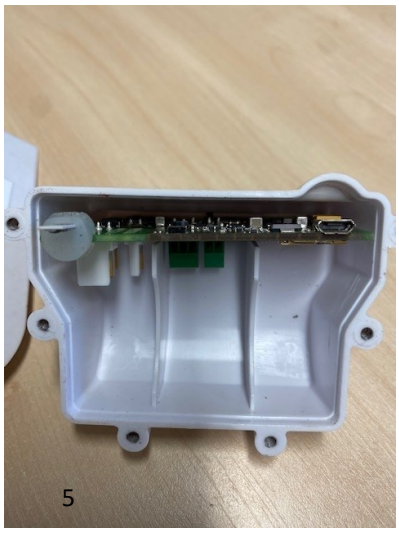
2 Dedicated serial number When emailing Agri-tech please state serial number, key 1 number, & field name

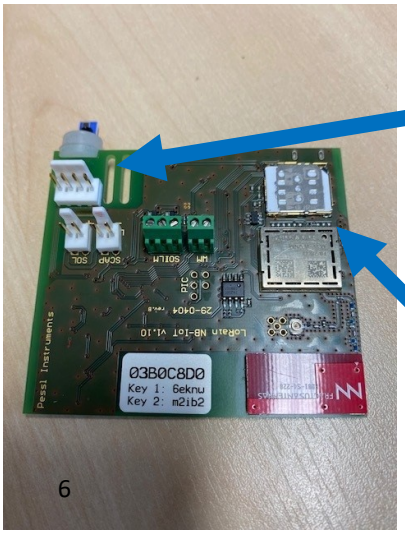
3

4

3 Use the 2.5mm Hex driver (supplied) to remove the 6 hex securing screws

4 Carefully open up the battery cover


5



6

5 PCB

Temperature / humidity sensor - take care not to touch / damage this when replacing the unit cover - avoid over tightening hex screws

6 PCB - showing SIM housing


7


8

7 Carefully connect the battery to the SCAP terminal

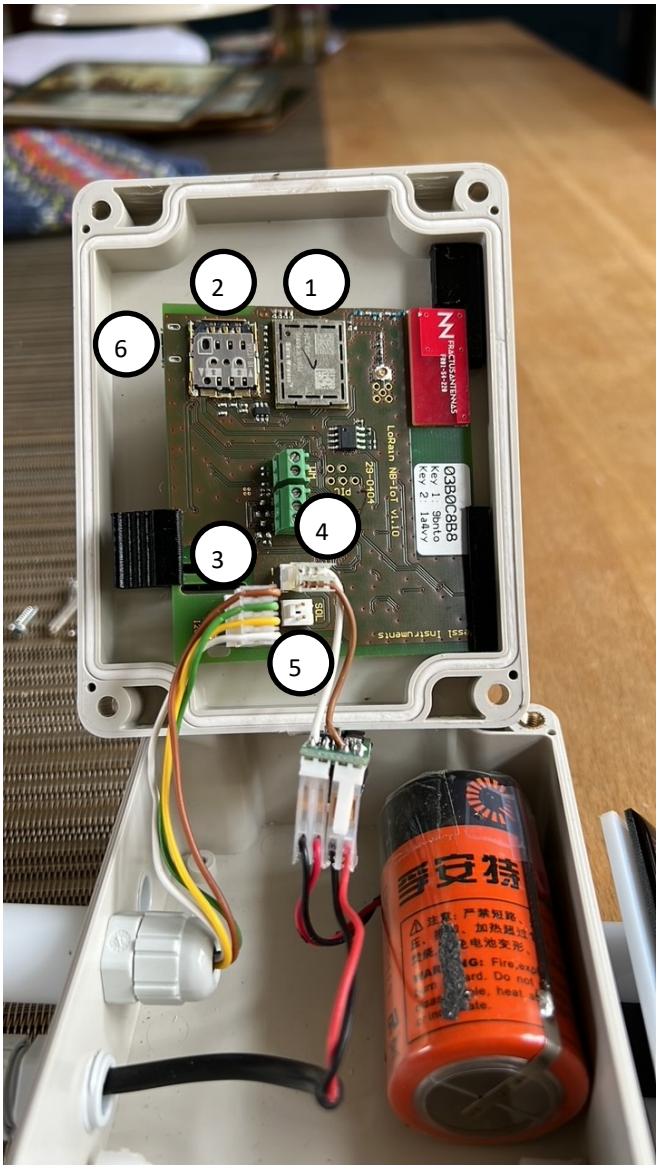
Please email info@agri-tech.co.uk the serial number and key 1 number found on device

8 The Comms cable may be required to check settings on the device - accessed by the port pictured left.

Configuring the LoRath sensor - post April 2022

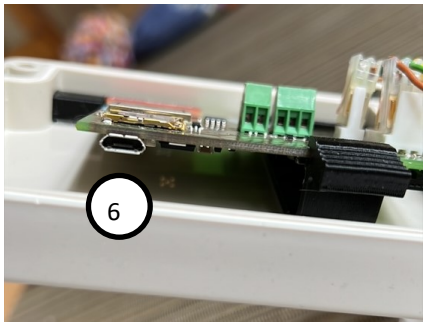
To configure the device and change / connect the battery, remove the four Phillips screws pictured on the front of the enclosure

Please email info@agri-tech.co.uk the serial number and key 1 number found on device



Component layout:

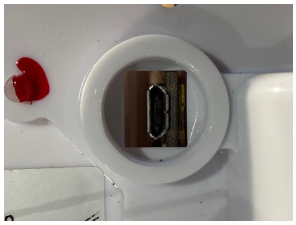
1) Modem
2) SIM card holder
3) Temperature / humidity sensor
4) Battery connector
5) Solar Panel connector
6) Comms port (underside of board)

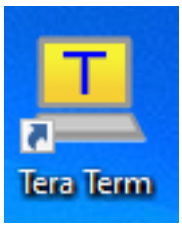


Using Tera Term to check sensor readings, signal strength & comms etc - all METOS hardware except ATS22 DTU

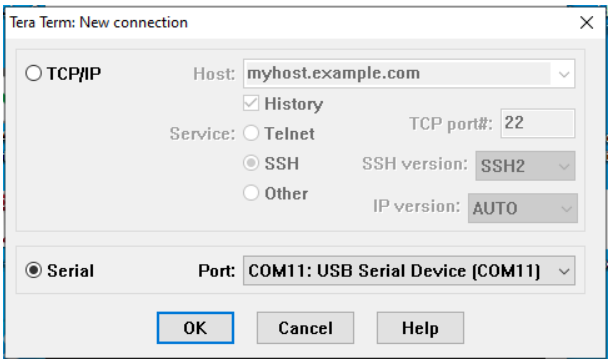
C

Click on to the Tera Term icon pictured to open up the programme. Ensure that the METOS device you are Connecting to is powered up and that you have the cable securely inserted into the unit



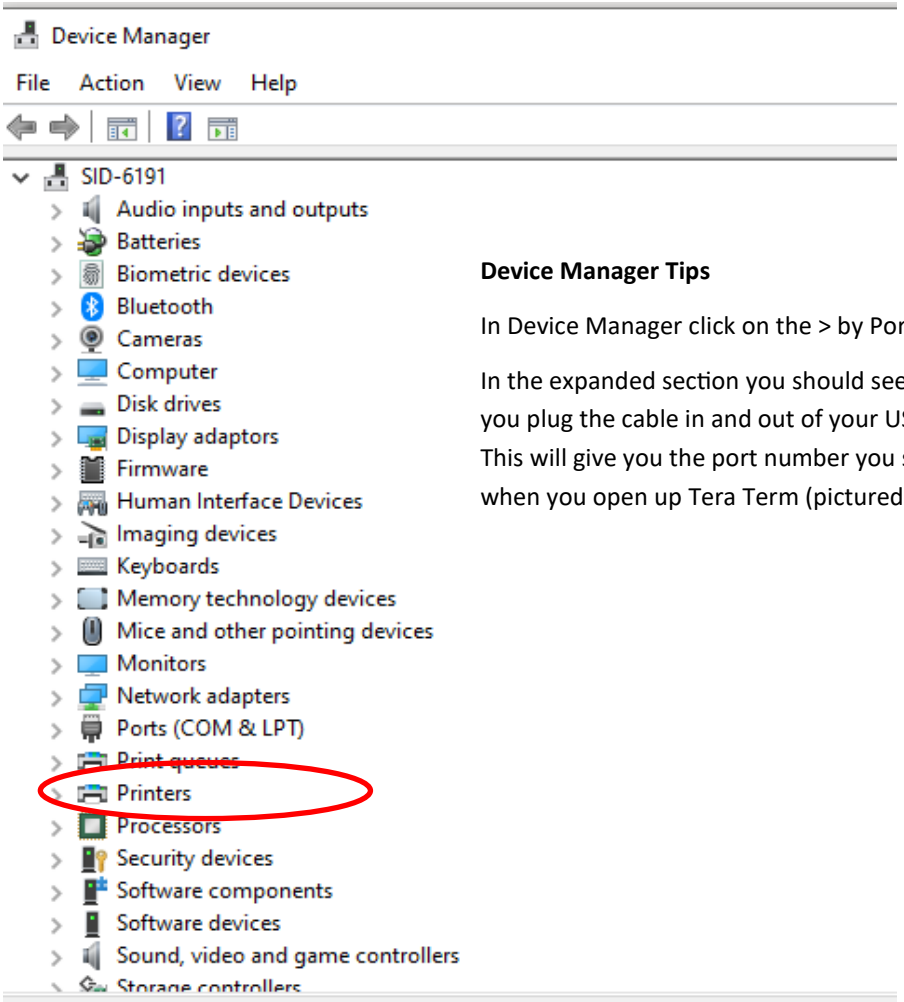


Remove the Comms cover and connect the comms cable as shown above. Not all METOS units will have port access such as is pictured above, LoRATH and LoRain units do. The probe DTU units do not but may have a flying lead as an access point.



NB See note below ref com port allocation

When Tera Term opens up - select the Serial option. If this is not being displayed you will need to go into Device Manager, go down to ports and check that the port is being allocated. To do this insert the comms cable and you should see a comm port being allocated under Device Manager if the device is recognised. For information on Device Manager see next page



Device Manager Tips

In Device Manager click on the > by Ports and expand this.

In the expanded section you should see a com port being allocated as you plug the cable in and out of your USB port on your PC / Tablet. This will give you the port number you should see available to you when you open up Tera Term (pictured on previous page)

Using Tera Term to check sensor readings, signal strength & comms

```
MAIN MENU:

1 - Print system info
2 - Print last raw data of data memory
3 - Print all raw data of data memory
4 - Print sensors configuration set
5 - Sensor testing
6 - Print all control registers of data memory
7 - Print DataFlash memory organization
8 - Make a new sensors configuration set
A - System setup
F - Enter switch-off mode

L - Print NBIoT info
P - Setup NBIoT module parameters
M - NBIoT modem bridge mode
T - Test (force) data transmission
Z - FW Upgrade
```

Main Menu

Once you have connected to the device press Escape and H to display the main menu

```
iMetos NBIoT - System info:

Hardware version:          v1.10
Hardware ID:               29-0404
Device ID:                 76
Device type:               nMETOS80
Firmware version:          v1.33
Firmware revision date:    2022-06-15 10:55:00
Device description:        LoRAIN NBIoT / nMETOS Station
Serial Number:             03B0ED2A
Current date and time:     2000-01-01 00:04:44

Status of measurement:     running
Next alarm time:           00:15:00
Measure interval [sec.]:   900
Logging interval [sec.]:   900
Transmission int. [sec.]:  3600
Max. number of data pckts: All

NBIoT stack version:       v1.14
NBIoT stack revision date: 2022-06-14 15:58:00

USB stack version:         v1.04
USB stack revision date:   2020-10-13 11:52:00

Bootloader version:        v1.05
Bootloader revision date:  2020-11-22 15:07:00
Bootloader description:    BOOT24_1024GB606

Press H for help.
```

System info

Pressing menu option 1 will display the system info.

This will highlight the device description (this example a Lorain device) and the serial number.

The serial number together with the Key 1 found on the device label is what needs to be sent to Agri-tech to set the device up in the correct monitoring block

Serial number in this example is 03B0ED2A

```
Sensor testing:

Input      Full Name Of Sensor      Short    Value       Unit     Notes
----- ------------------------------ ----- ------------ ---------- ------->
      Battery voltage               BATTR         3339 mV
      Solar Panel                   SOLPN         1182 mV
  I2C Air temperature               AIRTM        22.59 C
  I2C Relative humidity             RELH          46.4 %
      DeltaT                        DELT          6.97 C
      Dew point                     DEWPT        10.54 C
      Vapour pressure deficit       VPD           1.46 kPa

Note: Press 8 to save a new sensor configuration set.

Done.

Press H for help.
```

Sensor Test

Pressing menu option 5 will conduct a sensor test and will give a value from each sensor connected. In this example it is a LoRath (temperature and humidity logger)

Temp is 22.59 Celsius and humidity 46.4%.

When installing a moisture probe, check the readings here to make sure you have a good install - readings with values less than 10 is usually due to air gaps from a poor install. In this instance re-install to achieve improved readings

Using Tera Term to check sensor readings, signal strength & comms

Making a new sensor configuration set

```
Do you really want to make a new sensors configuration set? [Y - Yes / N - No]

New sensors configuration set:
AWS sensor config... restored!
Done.

Press H for help.
```

If you add a new sensor, it's good practice to go to menu option 8 to make a new sensor configuration set. This should ensure the sensors appear server end under sensor configuration. If they do not appear here there will be no data coming into the server for that particular sensor. Option 4 will give you the current configuration saved to check all sensors.

```
SETUP THE NBIOT MODULE PARAMETERS:

1 - IP ADDRESS                  -> 80.122.185.10
2 - REMOTE PORT                 -> 33332
3 - APN NAME                    -> zest4.com
4 - LOGIN                       -> zest4
5 - PASSWORD                    -> zest4
6 - REGISTRATION TIMEOUT        -> 240 sec.
7 - OPERATOR SELECTION          -> Automatic
8 - RADIO ACCESS TECHNOLOGY     -> GSM
9 - TRANSFER PROTOCOL           -> UDP
D - Set the default parameters
F - NBIoT FOTA
U - NBIoT Module FW Upgrade

Press ESC to return to MAIN MENU.


Press H for help.
Press ESC to return to MAIN MENU.
```

Changing from NBIoT to CAT-M or GSM

When switching between differing networks, there will be the need to connect the METOS device to Teraterm in order to set the APN for the network and configure the device for either NBIOT or CAT-M

To switch from NBIOT to CAT-M

1. . Press H to display the menu
2. Press P to get sub-menu
3. Press 3 to change APN name
4. Display will ask if you want to change the APN Y/N click Y
5. Press 3 again and type in the APN eg zest4.com
6. Press 4 for login and type zest4
7. Press 5 for password and type zest4
8. Press 8 for Radio Technology and choose CAT-M

You have now changed the device from NBIoT to CAT-M. Now conduct the test by going to the main menu and choosing T for test.

```
Current Radio Access Technology: NB1

Select new one or escape [ESC]:

1 - NB1
2 - CAT-M1
3 - GSM
4 - AUTO RAT SELECTION
```

NB Pre January 2022 systems will not have option 3 - GSM

```
Press H for help.


NBIoT module - System info:

Server IP Address:          80.122.185.10
Server Remote Port:         33332
APN name:                   None
Login:                      None
Password:                   None
Registration timeout:       240 sec.
Operator selection:         Automatic
Radio Access Technology:    NB1

Modem Model:                HL7800
Modem SW Version:           HL7800.4.4.6
Modem Revision ID:          HL7800.4.4.6.0
IMEI:                       354616090495024
SIM Card ID (ICCID):        89882390000123426317
IMSI:                       901288003969090

Last connection status:

Signal Strength:            49 %
Network type:               roaming
Network name:               DATA ONLY
Registration time:          1 sec.
```

Signal Strength Test

To test the signal strength press H for the menu followed by T. This will run through some diagnostics and assuming you have signal will give you an indication of the signal strength in the vicinity of the sensor.

Once this has finished press H again for the menu then press L to get the NBIOT system report (pictured) - the signal strength result will be displayed

Ideally the signal strength will be 30%

APN Settings for various networks

Settings for direct Vodafone cards is as follows;

1. APN = iot.comm-tech.co.uk
2. Login = none
3. Password = none

For international roaming Vodafone

1. APN = lpwa.comm-tech.co.uk
2. Login = none
3. Password = none

For indirect Vodafone SIM cards

1. APN = arkessalp.com
2. Login = arkessa
3. Password = arkessa

For 2G GSM

1. APN = internet
2. Login = web
3. Password = web

For CAT-M

1. APN = zest4.com
2. Login = zest4
3. Password = zest 4

For Telstra (Australia)

1. APN = telstra.wap
2. Login = none
3. Password = none

Telstra Australia (open SIMS)

APN = telstra.internet

Login none (ATS22 none = “”)

Password = none (ATS22 none = “”)

Configuring your METOS modem for Australia / Tasmania—Telstra

1. Open Tera Term

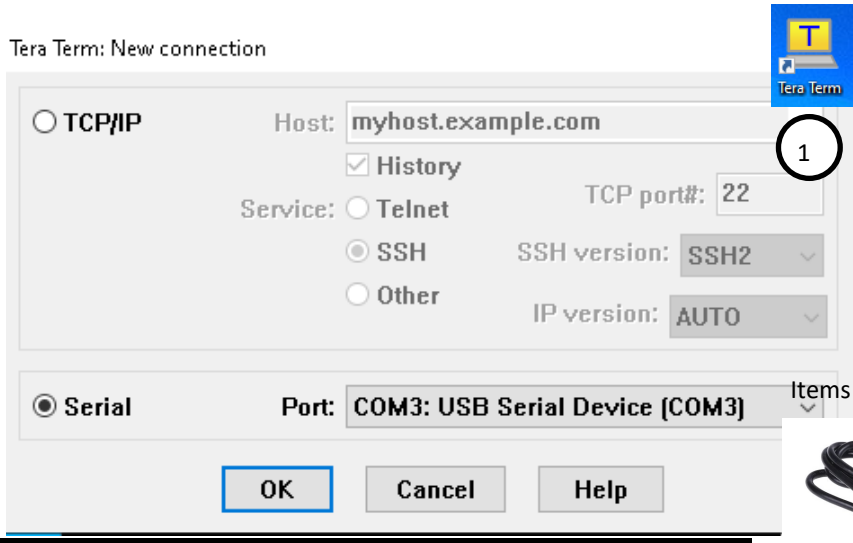
2. Press H to bring up the main menu followed by M

3. Then enter at+kcarriercfg=13

4. Press H again followed by M

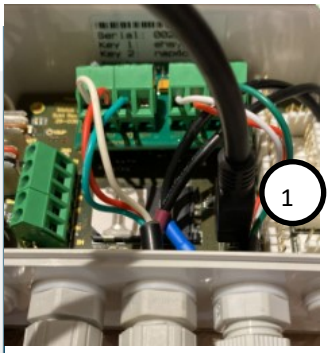
5. Enter at+kbndcfg=1,8000000 then press Enter & ESC - this is now configured for the Telstra Network

Using Tera Term to check sensor readings, signal strength & comms on the ATS22 DTU



2

1



1

Items you will need before using Teraterm

USB Comms cable

Jumper placed on port J1 of the DTU

Without the jumper you will not be able to interrogate the unit

Having installed Teraterm from the web suggest creating a short cut on the desk-top (item 1) Connect the Comms cable (1)

When opening up Teraterm the screen new connection will appear (item 2). Click on the serial button and click ok. If this fails to work use Device Manager to de-termine the correct Comm port to use, (refer to page 20 for detail)

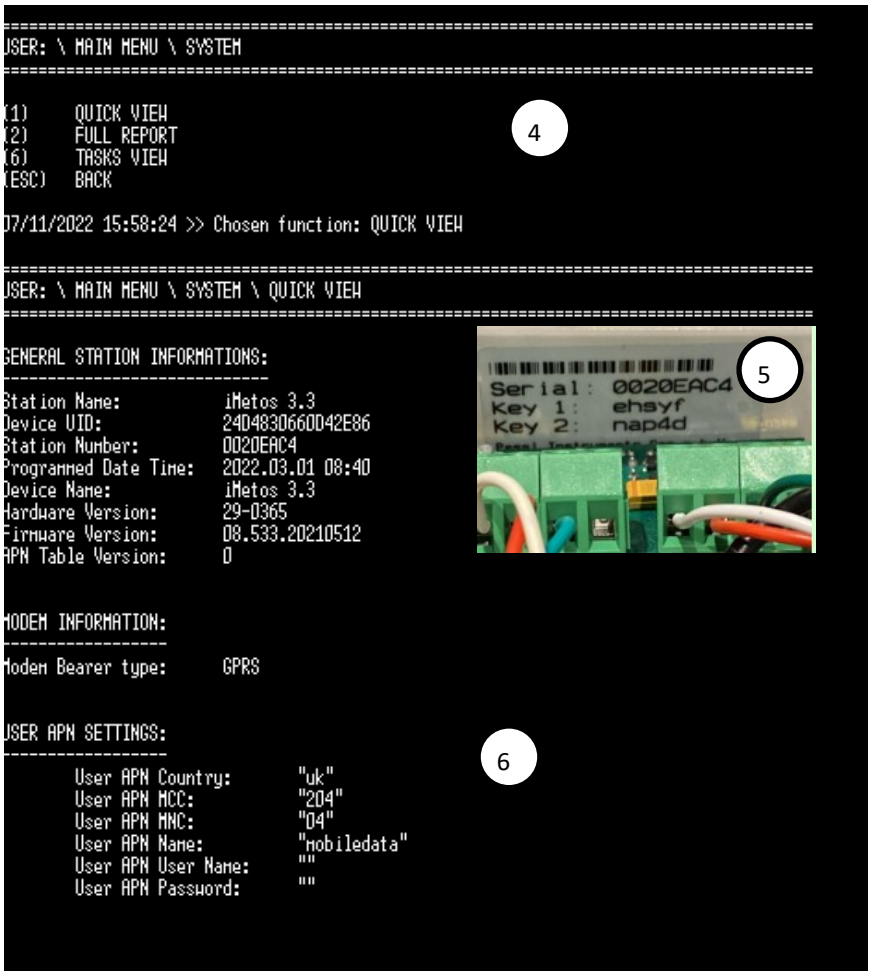
Having successfully connected you will get to the main menu (item 3), whereby you have the option od choosing system, sen-sors and modem.

For a quick view of the system click option 1 on the menu (highlighted in item 4). This will provide a quick summary of the system.

The important points here are the station number which should tally up with the sticker found inside the enclosure on the ATS22 device, (item 5)

The APN settings may also become rele-vant is you experience network issues as these are the settings for each network's SIM to communicate across the cloud. If different SIMS are used then the APN settings will need changing (item 6)

3

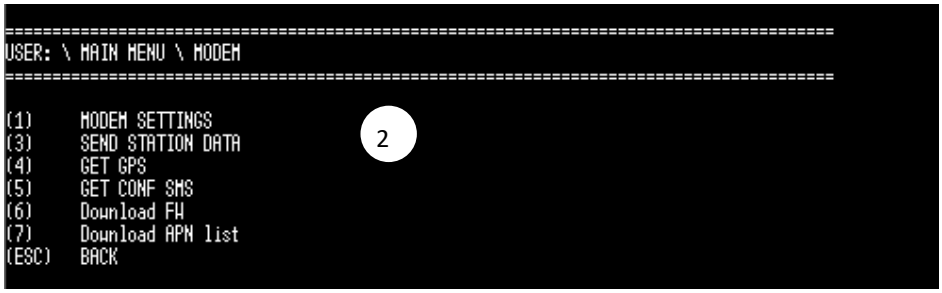


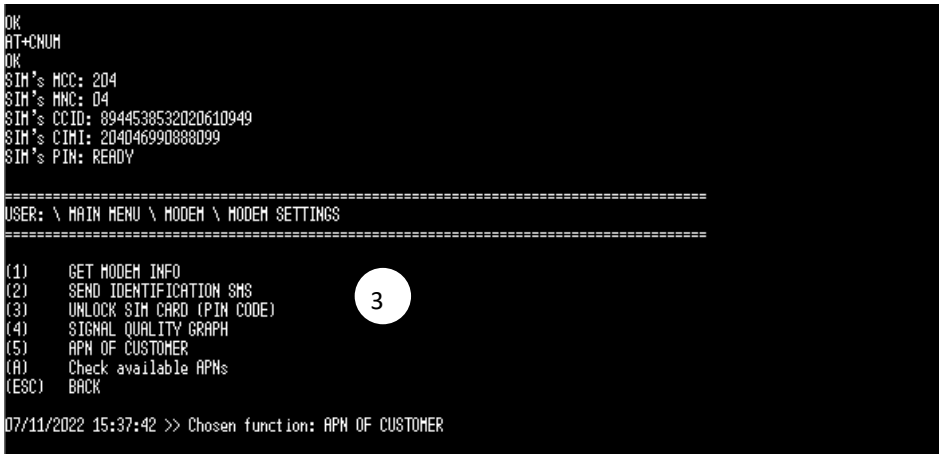
4

5

6

Changing the SIM card APN settings on the ATS22 DTU





1. From the main menu choose option 3 Modem
2. From the modem menu choose option 1 modem settings
3. Let the modem go through its settings and eventually the modem settings menu will appear. Choose option 5 APN of customer
4. The current APN settings will appear.
5. To change these from the "Choose the action" menu click D to delete defined user APN.
6. Then choose I to insert new APN access.

To enter a new APN access you will need the following

a) User APN country

b) User APN MCC

c) User APN MNC

d) User APN Name

e) User APN user name

f) User APN password

Once this has been entered choose ESC to go back. Pressing ESC enough times will take you back to the main menu eg System, Sensors, Modem

To determine the SIM MCC, and SIM MNC put the SIM card into the SIM holder and power up the device. The start up process will interrogate the SIM and will automatically display the SIM MCC and MNC which can then be entered into the APN settings. The APN, user name and password will also be required as supplied by the SIM provider.

a. User APN country is free text so enter country name in here eg UK

b. User APN MCC is the mobile country code (UK is 234)

c. User APN MNC is the mobile network code (Vodafone is 15)

d. User APN name is the APN of the network (Vodafone is internet)

e. User APN user name and password - some APN's have user names and passwords, if both are none then the "" represents none

Some APN settings for a number of networks can be found on page 23 login an passwords that are none = "" on the ATS22

Testing Sensors connected to the ATS22 DTU

```
================================================================================
USER: \ MAIN MENU
================================================================================

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

07/11/2022 16:00:19 >> Chosen function: SENSORS

================================================================================
USER: \ MAIN MENU \ SENSORS
================================================================================

(B)     BATTERY STATUS
(T)     DO SENSOR TEST
(W)     WIRELESS SYSTEM
(I)     ACCEPT CONFIGURATION + DO RECORD
(P)     PRINT LAST MEASURED DATA
(S)     PRINT LIST OF SUPPORTED SENSORS
(E)     PRINT ENCODED RECORDS
(C)     DELETE SENSOR CONFIGURATION
(R)     DELETE ALL RECORDS
(D)     DELETE CONFIGURATION + RECORDS
(Y)     SET ULTRASONIC ZERO WITH CURRENT HEIGHT
(Z)     SET ULTRASONIC ZERO WITH 2 METERS
(O)     SDI12
(1)     Assign type of temperature sensors to inputs 1 to 3
(2)     Select Leaf wetness or pressure switch for the LW input
(ESC)   BACK
```

When installing a new system, or re-installing a moisture probe for example it's important to conduct a sensor test to ensure the readings are valid

1. To conduct a sensor test from the main menu choose option 2 sensors
2. The sensor menu will now appear. From this menu choose T do sensor test
3. The Do sensor test menu will now appear.
4. For the main sensors connected to the DTU choose 0, Main+Duty+HC2 sensors. These will include the solar panel, temperature / humidity and various other sensors
5. For the SDI 12 Sentek moisture probe choose option 7 Extended Input B
6. For the pH / EC unit choose option 5 Dedicated chain
7. Press ESC to go back
8. If ESC fails press Q (quit)

```
================================================================================
USER: \ MAIN MENU \ SENSORS \ DO SENSOR TEST
================================================================================

(0)     MAIN + DUTY + HC2 SENSORS
(1)     CHAIN AT INPUT 1
(2)     CHAIN AT INPUT 2
(3)     CHAIN AT INPUT 3
(4)     CHAIN AT INPUT 4
(5)     DEDICATED CHAIN
(6)     EXTENDED INPUT A
(7)     EXTENDED INPUT B
(8)     WIRELESS CHAIN
(A)     ALL SENSORS
(ESC)   BACK

07/11/2022 16:02:50 >> Select...
```

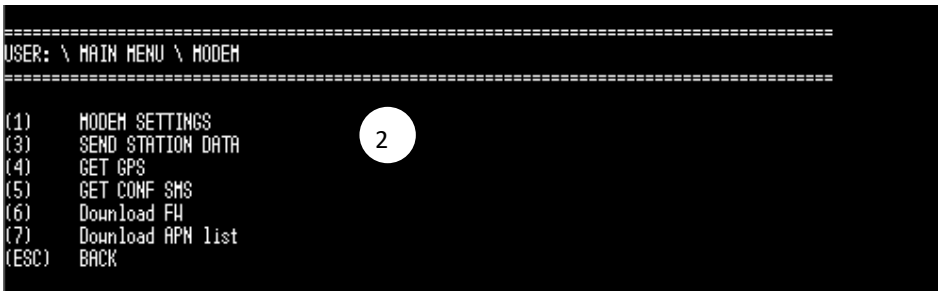
```
> Chosen function: EXTENDED INPUT B

================================================================================
USER: \ MAIN MENU \ SENSORS \ DO SENSOR TEST \ EXTENDED INPUT B
================================================================================

  Sensors automatic test in progress
  Yellow LED indicate active measurement
  Press 'Q' for quit

@SSN        @SMST       @SMST       @SMST       @SSDD       @SSDD       @SSDD       @SOIT       @SOIT       @SOIT
33809       19969       19969       19969       20228       20228       20228       17153       17153       17153
CH0/7       CH1/7       CH2/7       CH3/7       CH4/7       CH5/7       CH6/7       CH7/7       CH8/7       CH9/7
4024        0.02        0.00        0.00        238.8467    237.1041    156.1103    19.9        19.9        20.1
4024        0.02        0.00        0.00        238.8467    237.3328    155.7241    20.0        19.8        20.1
4024        0.02        0.00        0.00        239.3272    237.1041    155.9172    19.9        19.9        20.1
                1           2           3

================================================================================
```

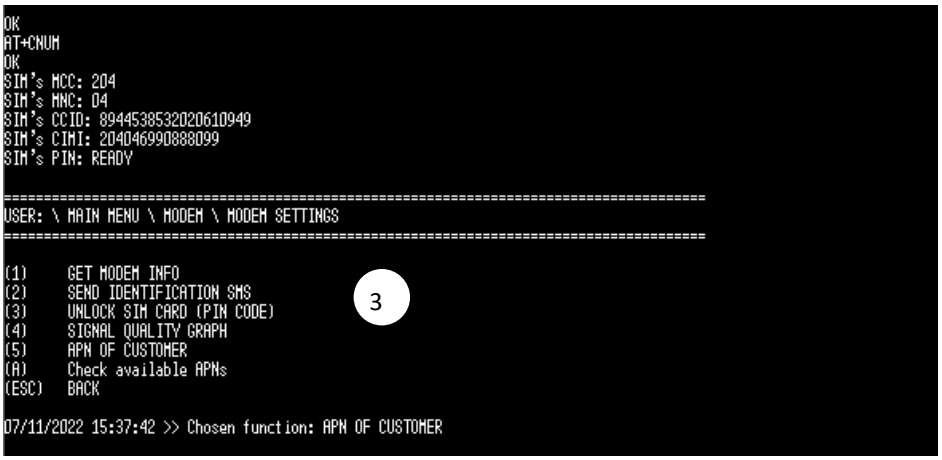
1. Soil Moisture - 30cm probe
2. Conductivity
3. Soil temperature

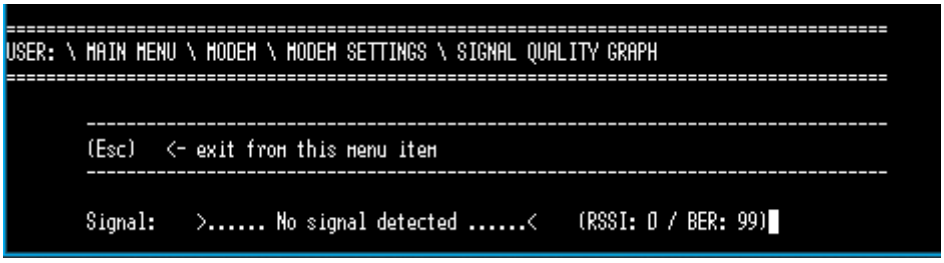
```
> Chosen function: DEDICATED CHAIN

================================================================================
USER: \ MAIN MENU \ SENSORS \ DO SENSOR TEST \ DEDICATED CHAIN
================================================================================

  Sensors automatic test in progress
  Yellow LED indicate active measurement
  Press 'Q' for quit

@PH         @SOIT       @COND       @PHBT       @PH         @SOIT       @COND       @PHBT
32769       17153       32770       32771       32769       17153       32770       32771
CH0/5       CH1/5       CH2/5       CH3/5       CH4/5       CH5/5       CH6/5       CH7/5
8.463       19.7        3.88        3680        8.497       19.8        4.01        3680
8.463       19.7        3.88        3680        8.497       19.8        4.00        3680
8.463       19.7        3.88        3680        8.497       19.8        4.00        3680
8.463       19.7        3.88        3680        8.497       19.8        4.01        3680
8.463       19.7        3.89        3680        8.497       19.8        4.00        3680
    1           2           3

--------------------------------------------------------------------------------
```

1. pH - Interface unit
2. Temperature
3. EC (conductivity)

Conducting a signal strength test on the ATS22 DTU







1. From the main menu choose option 3 Modem
2. From the modem menu choose option 1 modem settings
3. Let the modem go through its settings and eventually the modem settings menu will appear. Choose option 4 signal quality graph
4. The signal quality graph will give a readout of signal status (see details below)

The signal quality graph is interpreted using the following principles;

1. RSSI is the measure of the signal quality ranging from 0 - 31
2. RSSI 31 = perfect signal quality
3. RSSI 30 - 7 = signal quality okay and system will operate
4. RSSI 6 and lower = poor signal (not ideal for reliable communication)
5. BER means how often data packets have to be transmitted
6. BER 99 = not known or not detectable
7. When the message “No signal detected” as in the illustration above ideally search for another location for your system

Agri-tech Client Dashboard and Charting

NB: Client Login can be accessed from the Login button on the Agri-tech home page or from https://dashboard.agri-tech.co.uk/

ATS Substrate Dashboard

Moisture, EC and temp from the probes

Drip and drain EC, pH and run-off via the app OR new auto drain station

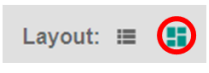
Climate sensor data

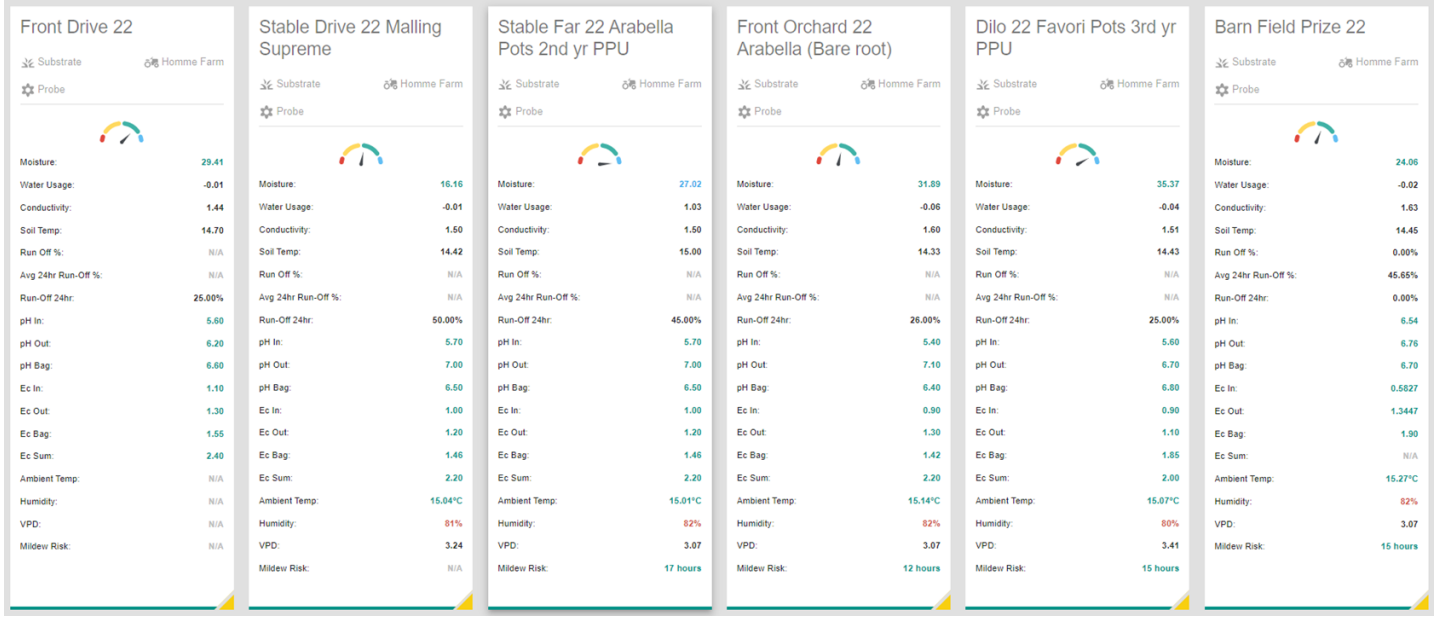
Drummond Fruit substrate Fields

Name	Moisture	Water Usage	Conductivity	Soil Temp	Run Off %	Avg 24hr Run-Off %	Run-Off 24hr	pH In	pH Out	pH Bag	Ec In	Ec Out	Ec Bag	Ec Sum	Ambient Temp	Humidity	VPD	Mildew Risk
FRONT DRIVE 22	29.46	0.01	1.44	14.83	N/A	N/A	25.00%	5.60	6.20	6.60	1.10	1.30	1.55	2.40	N/A	N/A	N/A	N/A
STABLE DRIVE 22 MALLING SUPREME	16.23	-0.01	1.50	14.50	N/A	N/A	50.00%	5.70	7.00	6.50	1.00	1.20	1.46	2.20	14.10°C	84%	2.56	N/A
STABLE FAR 22 ARABELLA POTS 2ND YR PPU	21.62	-0.04	1.56	15.08	N/A	N/A	45.00%	5.70	7.00	6.50	1.00	1.20	1.46	2.20	14.26°C	80%	3.20	17 hours
FRONT ORCHARD 22 ARABELLA (BARE ROOT)	32.01	-0.02	1.61	14.53	N/A	N/A	26.00%	5.40	7.10	6.40	0.90	1.30	1.42	2.20	14.23°C	82%	2.88	12 hours
DILO 22 FAVORI POTS 3RD YR PPU	35.48	-0.02	1.51	14.42	N/A	N/A	25.00%	5.60	6.70	6.80	0.90	1.10	1.85	2.00	14.27°C	88%	1.92	15 hours

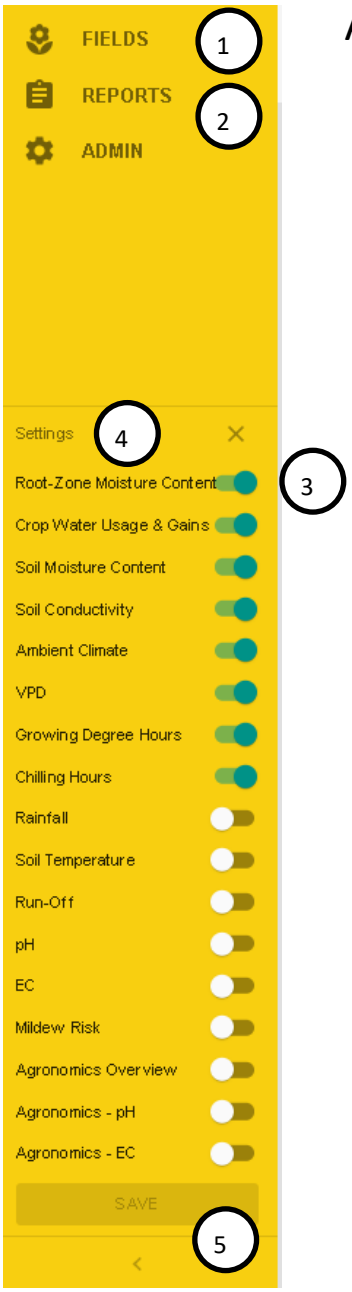
5 rows 1-5 of 6

ATS Substrate Dashboard – Phone view option on dashboard
Available on both substrate and soil dashboard views





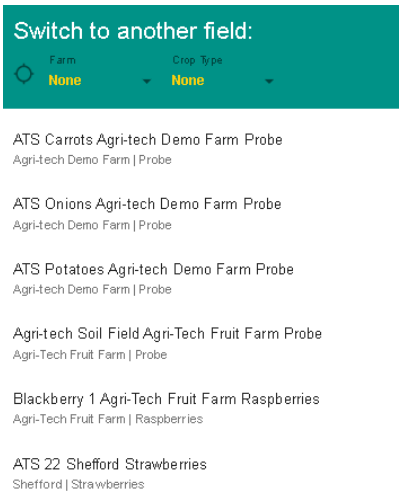
Agri-tech Client Dashboard and Charting Tools



Dashboard Menus

The Fields option 1 is the option to choose to get back to the dash-board list of all fields.

Hitting the Name of the block you are in at the top of the charts will bring up the "Switch to another field" box from where you can quickly choose the next field's charts without the need to return to the dashbobaord Field List



Menu:

1) Takes you back to the dashboard
2) Meeting reports where applicable
3) Switch charts on / off as appropriate
4) Click and drag charts to re-order you charts
5) Hide menu / reveal menu

NB The same menu layout will appear to the left of the field list on the main dashboard - features 3-6 will have the same functionality - hide or reveal field list and re-order the list

In chart view mode - choose your selected date range – default 10 days

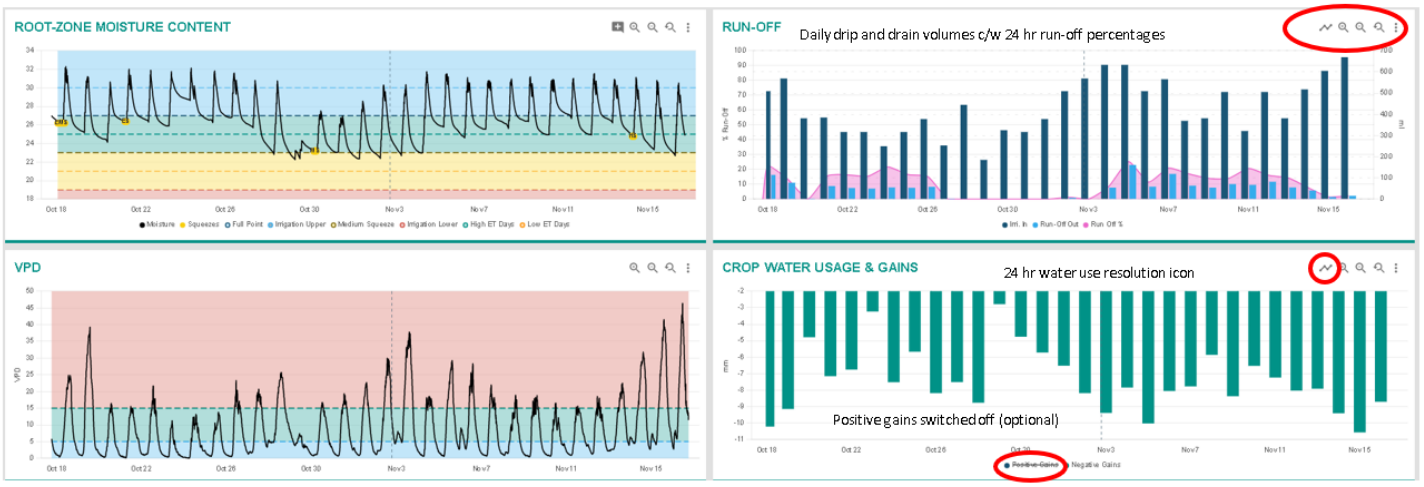
Click on the timer icon to reveal timer and date range at the bottom of the screen highlighted

Agri-tech Client Dashboard and Charting Tools (substrate)

Substrate charts

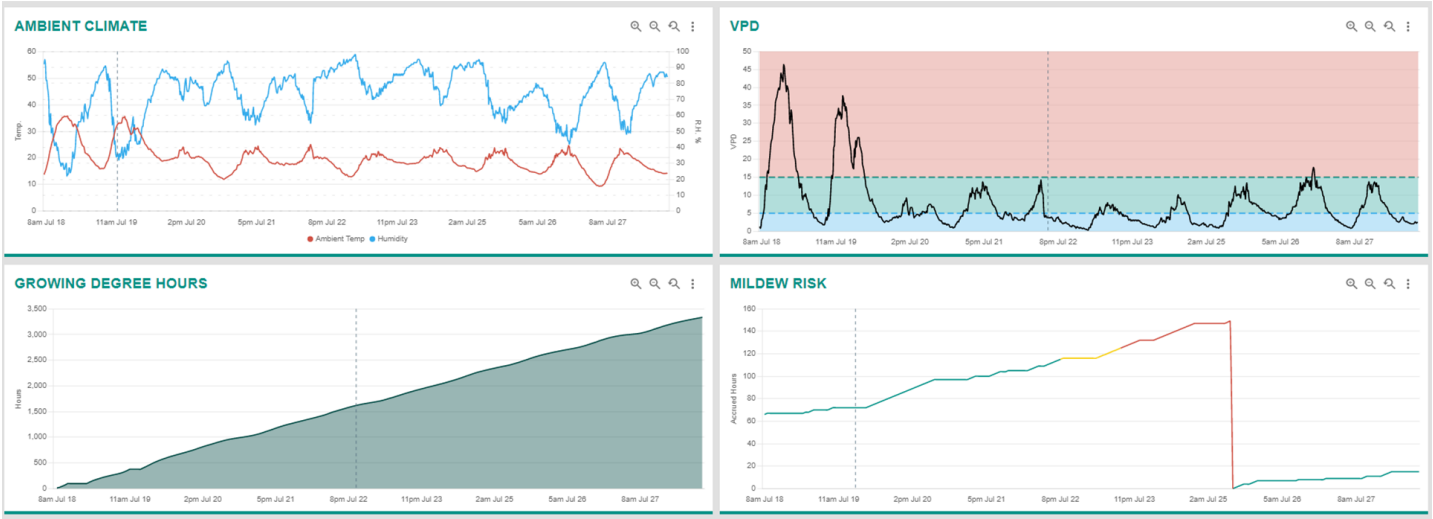
- Rootzone moisture content chart indicating moisture parameters, squeeze test references, crop growth stages and any additional comments
- Run-off chart displaying individual irrigations applied, run-off from each event and percentage run-off from each event – now with the new 24 hr resolution option to display daily summaries of drip / drain volumes & % run-off
- Soil moisture content chart in bag / pot indicating uniformity
- New - Crop water usage chart indicating crop daily water use in mm – new icon circled in red indicating how to switch on 24hr resolution of water use

Zoom in / out / re-set & menu options



Substrate climate sensor charts

- Ambient temperature and humidity chart
- Vapour Pressure Deficit (VPD) chart
- Growing Degree Hour (GDH) chart
- Chill chart (not displayed)
- Optional - Strawberry Powdery Mildew prediction system



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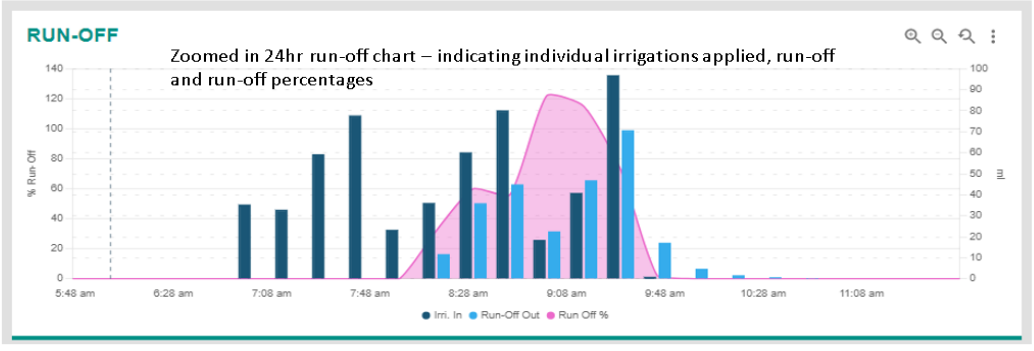
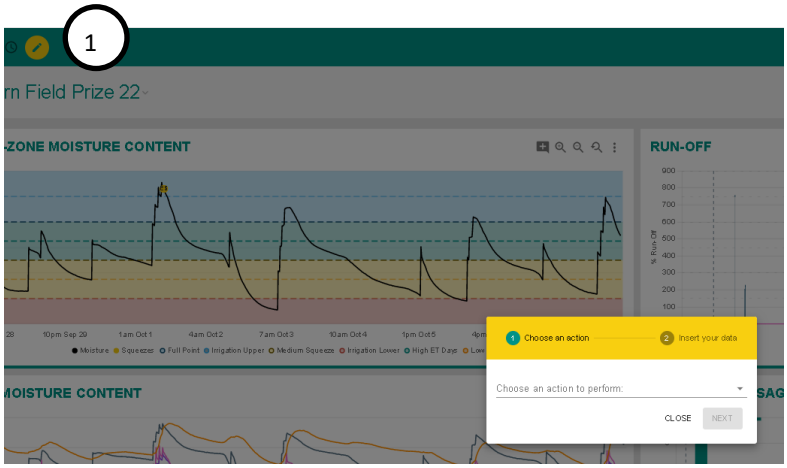
Substrate charts

Zoomed run-off chart clearly indicating when the drain occurred, with dashboard view of 24hr drain readings

Name		Moisture	Water Usage	Conductivity	Soil Temp	Run Off %	Avg 24hr Run-Off %	Run-Off 24hr	pH In	pH Out	pH Bag	Ec In	Ec Out	Ec Bag	Ec Sum	Ambient Temp	Humidity	VPD	Mildew Risk
BARN FIELD PRIZE 22		24.14	-0.02	1.64	14.52	0.00%	45.65%	0.00%	6.54	6.77	6.70	0.5843	1.3507	1.90	N/A	14.31°C	84%	2.56	15 hours



Agri-tech Client Dashboard and Charting Tools

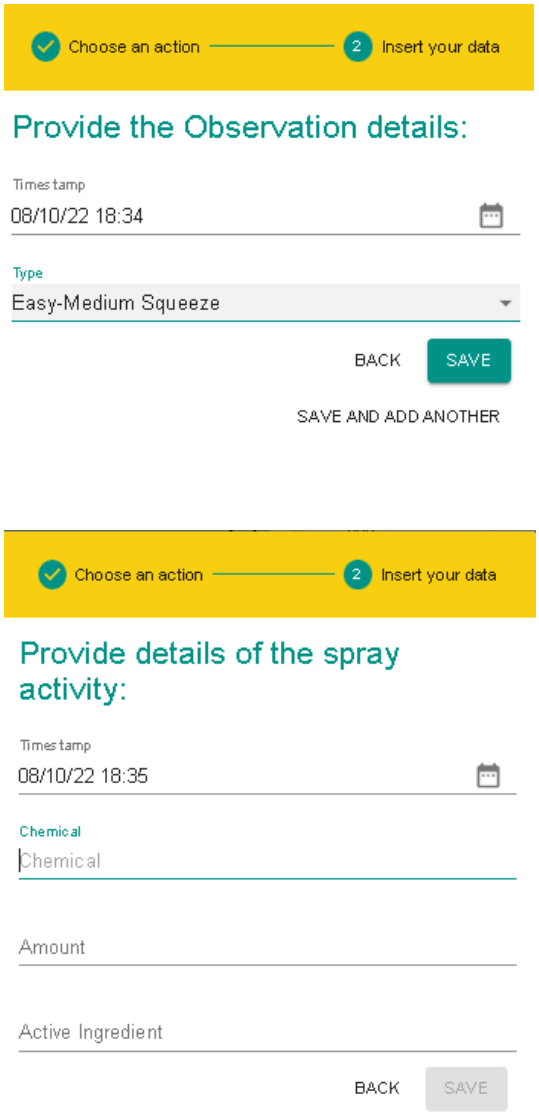


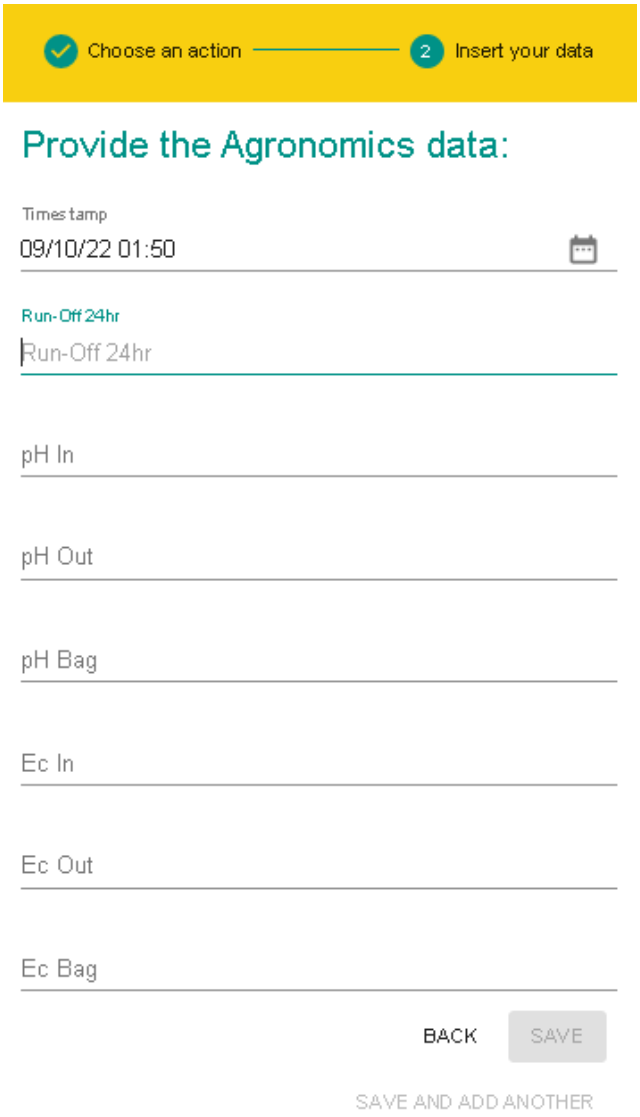
Adding data

By clicking on to the yellow pencil icon - see 1 above gives the option to add data

1

Choose either Fungicide spray activity / Record Agronomics / Record Observation





Agri-tech Client Dashboard and Charting Tools (soil)

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ATS Soil Dashboard

"Fuel gauge" indicating moisture status, SMD displayed in mm, and previous 24 hr water use in mm

Irrigation trigger and predicted irrigation date based on the previous 24hr water use

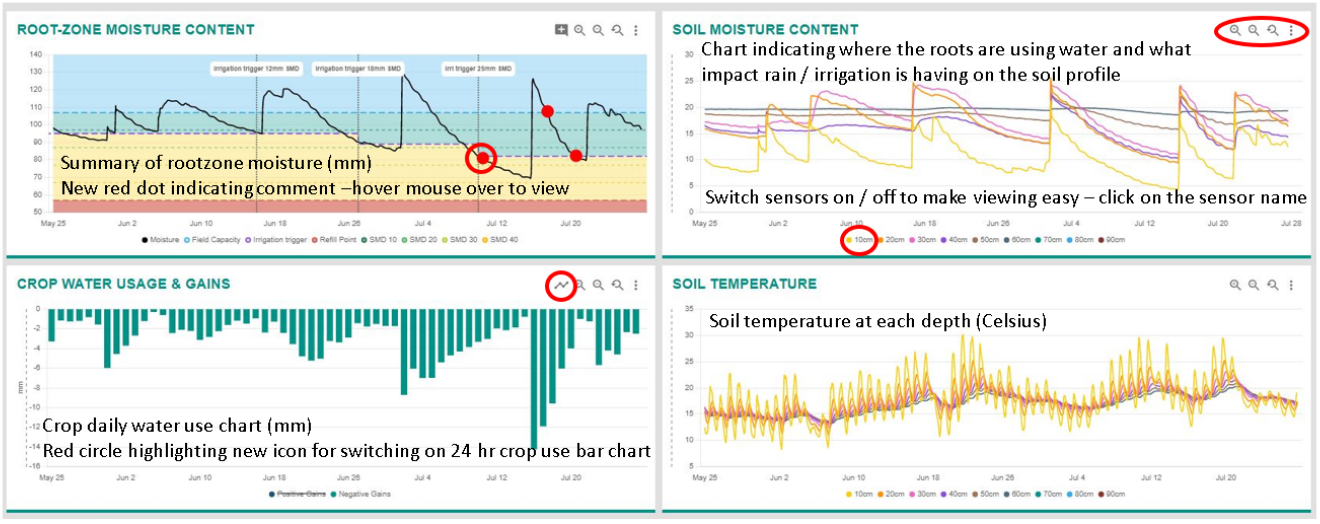
Additional sensor options such as a rain gauge, temperature and humidity sensor

Farming Services & solutions to Agriculture & Horticulture

Soil charts for data evaluation

Soil conductivity chart also available – indicative of nutrient status of each soil zone

Zoom in / out / re-set & menu options



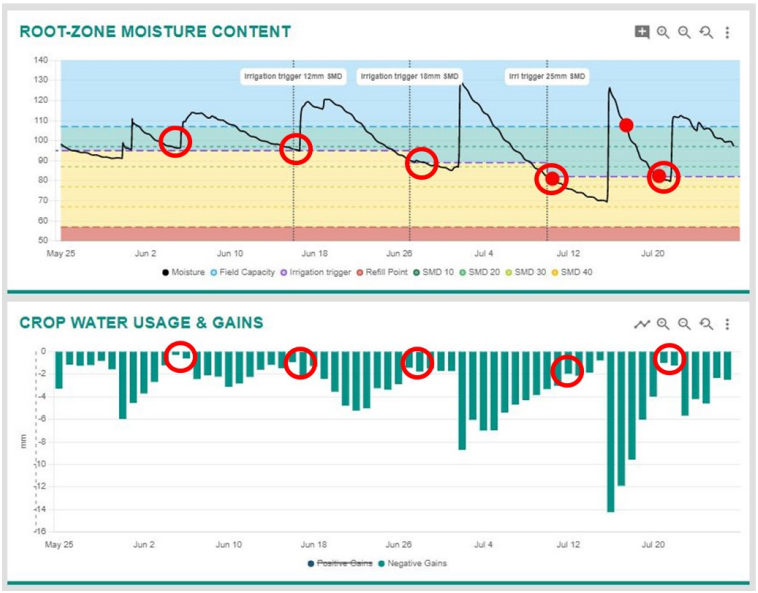
Agri-tech Client Dashboard and Charting Tools (soil)

Using rootzone water content chart and crop water use to determine irrigation trigger – drilled onions

Optimum crop water use declines at differing stages through the growing season as the rootzone develops (highlighted red circles)

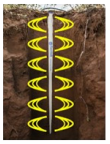
The irrigation trigger will alter accordingly, therefore ensuring optimum moisture is provided for the plant to utilise at any given point in time

The new crop daily water use chart providing key data for precision irrigation scheduling



SMART sensor data – updating every ¼ hr via the cloud directly into the client dashboard

Up to date data at your fingertips to enable decisions and precise scheduling to take place



Soil charts for data evaluation

Soil conductivity chart also available – indicative of nutrient status of each soil zone

Zoom in / out / re-set & menu options