



***RTU RF SDI G5
Installation instructions
& Quick User manual***



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SDI Plug-In firmware version 2.16 and up.

SDI Plug-In Programmer PC software V 1.0.0.81

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TABLE OF CONTENT

Table of content.....	2
Introduction.....	3
1 SDI-12 Sensor	5
2 RTU RF SDI G5 - Installation INSTRUCTIONS	7
3 Preparing to READ or Program the SDI UNIT	8
4 Programming mode	9
5 READ the SETTINGS OF the SDI UNIT	11
6 READ an SDI SENSOR.....	11
7 PrograMming the SDI unit.....	15
STEP 1- INITIAL DEFINITIONS:.....	15
STEP 2- SETTINGS.....	16
MEASURED VALUES	17
STEP 3- CONNECT SENSORS	19
8 Reading the measured values	21
9 Adding Analog sensors to the controller IMAGE	23
10 Constants of Analog sensors	23
11 Monitoring Analog sensors	24
11.1 Monitoring Analog sensors via the DREAM CONTROLLER.	24
11.2 Monitoring Analog sensors via DreamConsole PC software.	24
11.3 Monitoring Analog sensors via the DreamSpot smartphone app.	25
12 Analog sensors on ROW data screen.....	26
3. Technical details.....	27

INTRODUCTION

Talgil Computing and Control Ltd thanks you for purchasing the RTU RF SDI G5 product. The RTU RF SDI G5 presents you with innovative styling, new technology design of hardware, flexibility, additions, and professional properties.

The SDI UNIT uses an **SDI-12** communication protocol to read SDI-12 sensors. The SDI Unit is a programable unit. The Installer should define the SDI-12 sensor Model, the Desired Measurements to read, their INPUTS, and the Sampling rate (How often the SDI unit will read the SDI sensors). The SDI unit sends the analog values to the Master G5 unit. The Irrigation controller receives the values and sends them to the server. In this way, the user can read, monitor, take conclusions, or even schedule irrigation according to the measured values.

SDI-12 sensors can include several measurements. At every sampling rate, the SDI Unit reads all the measurements. In old RF generation (G3, G4, and Regular G5), it is limited to reading up to 4 measurements from SDI-12 sensors. On the other hand, **Interface SDI** that is connected to the Dream, **RTU RF Modular G5 FAST + SDI LIN Card**, and **RTU SDI G5 FAST** can read up to 64 values from 10 SDI sensors.

There are different SDI Plug-in boards for different uses such as RTU RF G4, G5, LIN, and Interface SDI (Direct connection to the Dream 2 or Sapir 2 controllers).

The programming process is done by the **SDI programmer** PC software.

Before the installation, please read this quick user manual carefully and follow the instructions.



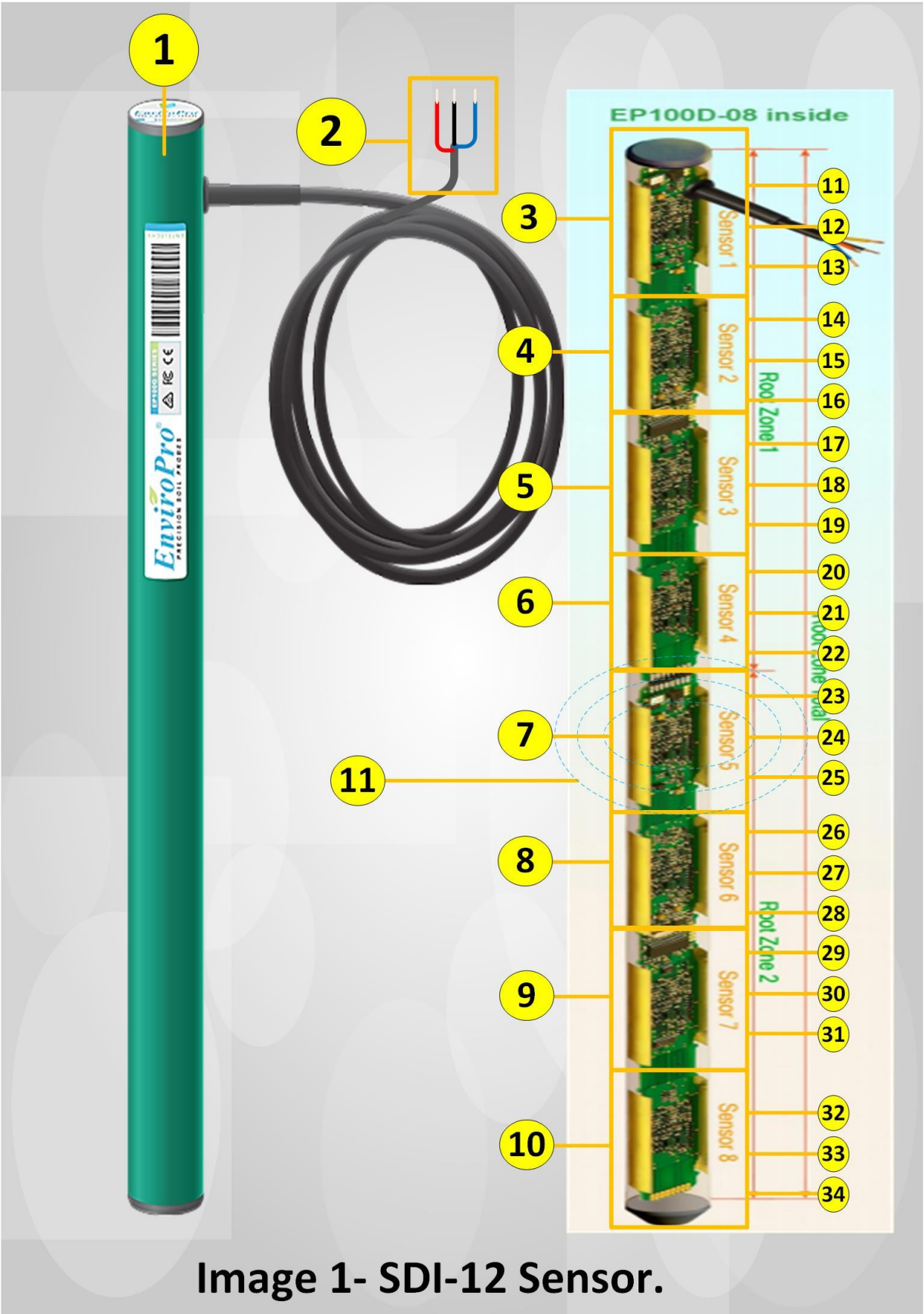


Image 1- SDI-12 Sensor.

1 SDI-12 SENSOR

SDI-12 SENSOR is an intelligent sensor that monitors environmental data. The SDI-12 sensor usually communicates with a data logger or other data acquisition device. To communicate, they use the **SDI-12** communication protocol. SDI-12 sensors are typically low-power (12 volts), and used at remote locations.

Communication: SDI-12 (Serial Digital Interface at 1200 baud) is an asynchronous serial communications protocol. The protocol follows a client-server configuration whereby a data logger (SDI-12 recorder) requests data from the intelligent sensors (SDI-12 sensors), each identified with a unique address.

Wiring: All SDI-12 sensors would have just three wires: A 12V DC Power line, a Ground line, and a Serial data line.

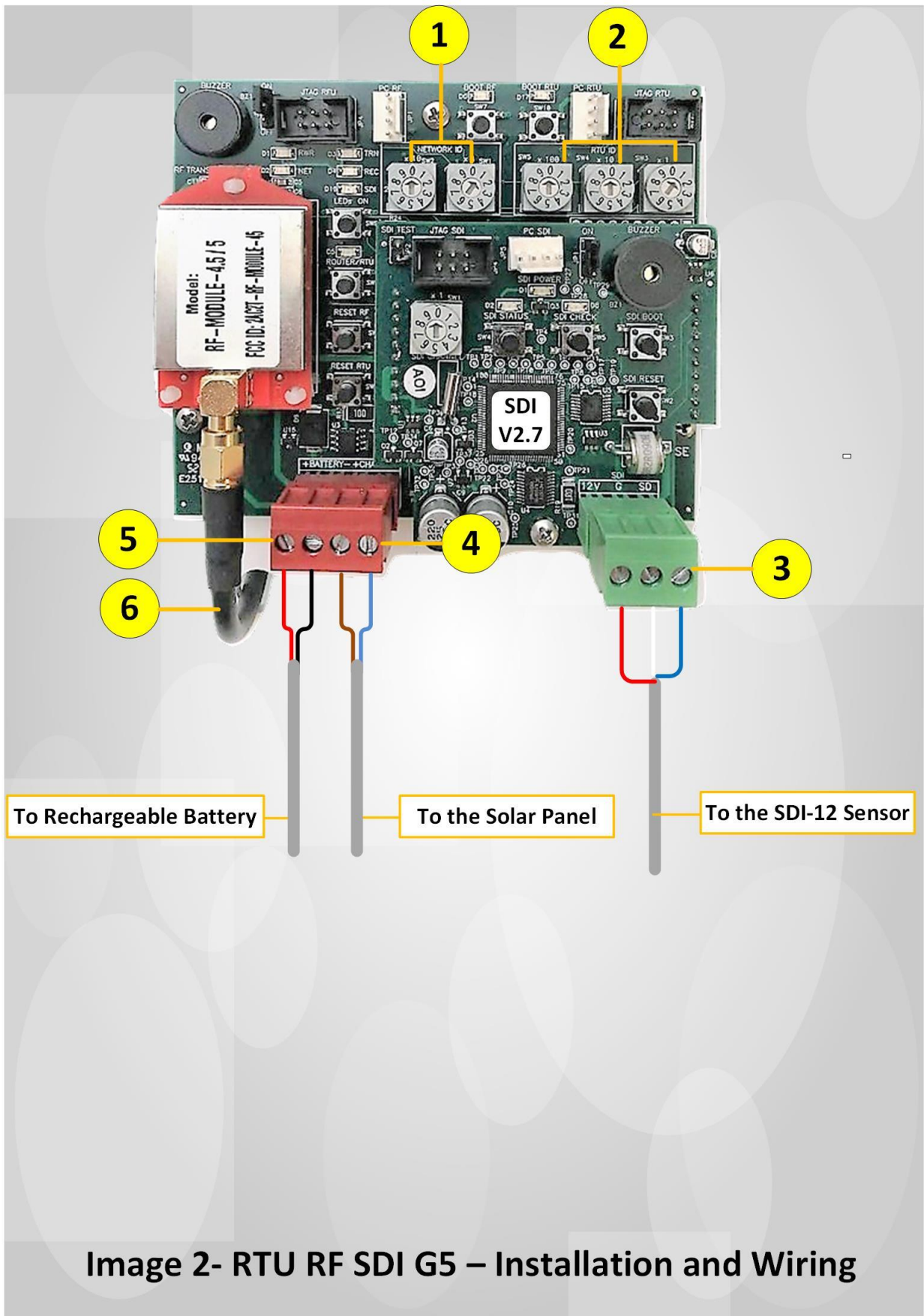
Address: Every SDI-12 sensor has a default address. All the sensors are initially set to address "0" (zero) by the manufacturer for use in single-sensor systems. When using a multi-sensor system, it is necessary to change the address of the SDI-12 sensors.

Internal Structure: Inside the SDI-12 sensor, can be a single sensor or several sensors. A sensor can include a single measurement or several measurements. Usually, the measurements are environmental data.

For example, **Image 1** describes an **ENVIROPRO SDI-12** sensor (**Pointer 1**). A cable with 3 wires is connected to the SDI sensor (**2**).

ENVIROPRO model **EP100G-08** length is 80 cm and divided into **8 layers**. In every layer, there is one sensor. There are 8 sensors inside at different depths (**Pointers 3 to 10**).

In this model, every sensor can read **3 Measurements** also called **Parameters** or **Values**. The **Measurements** are **Soil Moisture**, **Soil Temperature**, and **Soil Salinity (Soil EC)**. There are 8 Sensors, every sensor reads 3 **Measurements** so there are totally 24 Measurements (**Pointers 11 to 34**).



2 RTU RF SDI G5 - INSTALLATION INSTRUCTIONS

1. First, define the **Network ID** (Also called System ID) (**Pointer 1 Image 2**) of your RF G5 system. The Network ID of the RTU RF SDI G5 should be identical to the Network ID of the **Master unit**.
2. Define the **RTU Address (2)**. The RTU Address should be unique. Do not use the same RTU address for different RTUs. This RTU address should be defined in the Controller image (Also called Configuration).
3. Connect **SDI-12 sensor/SDI-12 sensors** to the **SDI socket (3)**. Pay attention, the SDI socket includes three inputs. **+12V DC, Ground, and SDI**. Connect the correct wires according to the manufacturer's instructions. For example:
Acclima TDR 315 using the Red wire for **+12V DC**, White wire **G (Ground or Common)**, and Blue wire for **Data** (Communication).
ENVIROPRO model **EP100G-08** using the Red wire for **+12V DC**, Black wire **G (Ground or Common)**, and Blue wire for **Data** (Communication).
4. Connect the Charging source to the **Charge socket (4)**. The charging source can be a Solar panel or **18V DC** power supply. When the power supply voltage is lower than 16V, connect the power supply wires in parallel to the Rechargeable battery wires to the **Battery socket (5)**.
5. Connect a 12V DC rechargeable battery to the **Battery socket (5)**.
6. Connect the **RF Antenna** and install it in a high place. Make sure that there is a line of sight between the RTU RF SDI G5 Antenna and the Master unit or to a Router unit. Use the Antenna holder and tight the RF Antenna to it.



Pay attention, the SDI socket includes three inputs. **+12V DC, Ground, and SDI**. Connect the correct wires according to the manufacturer's instructions. Wrong wiring can damage the SDI-12 sensor.

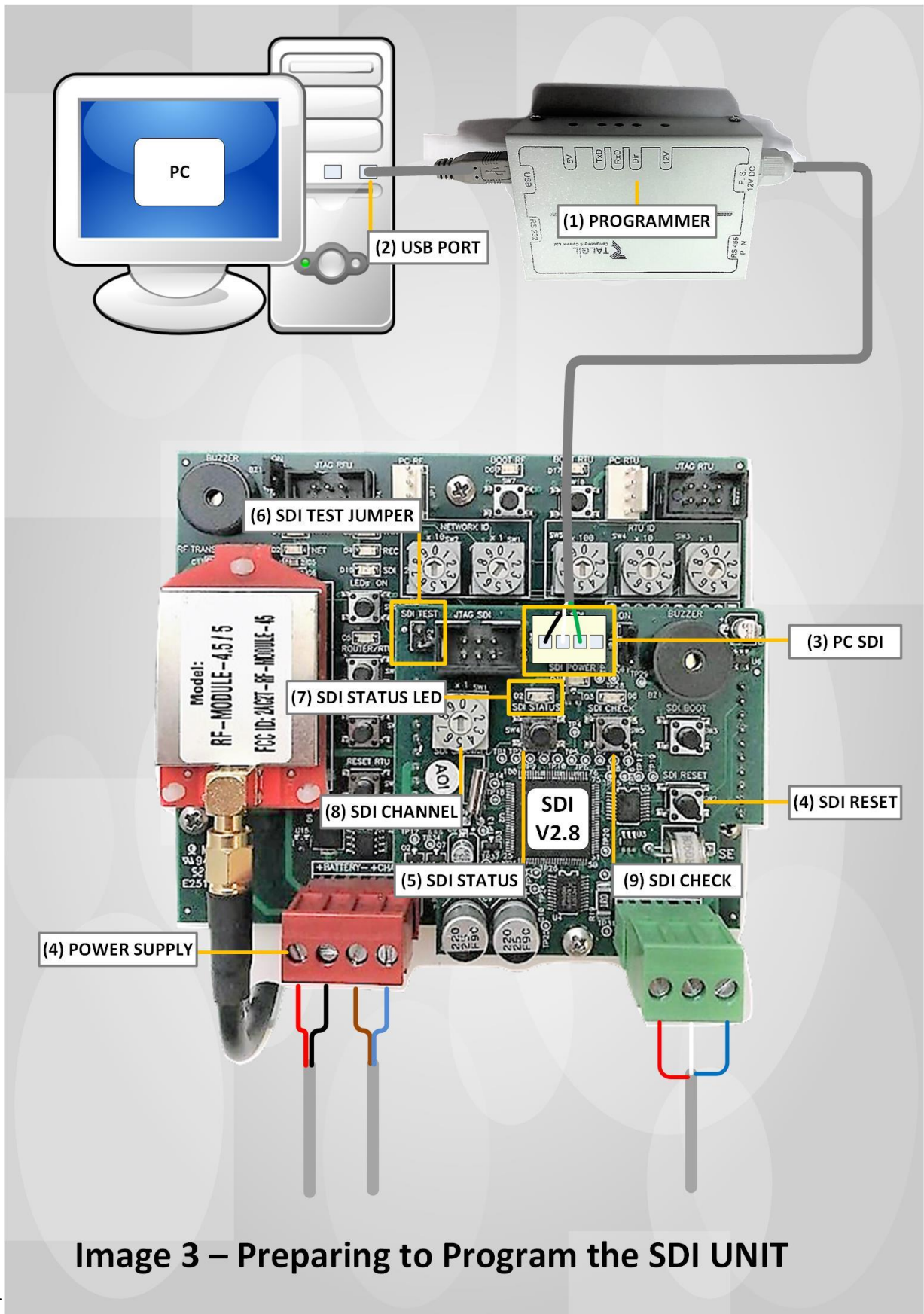


Image 3 – Preparing to Program the SDI UNIT

1

SDI

Socket (3) on the SDI UNIT board as described in Image 3.

2. Connect the **Power supply plug (4)** to the **RTU RF SDI G5** hardware.

4 PROGRAMMING MODE

To save energy, when nobody presses the buttons of the SDI UNIT or No software communicates with the SDI UNIT for 20 seconds, the SDI UNIT goes to Sleep mode. To communicate with the SDI UNIT, change the Mode to Programming mode. It is important to specify that after the programming process, you need to reset the SDI unit to exit from the Programming mode.

To force the unit to stay in Programming mode, connect a Jumper to the **SDI TEST** pins **(6)**. On Programming mode, the **SDI TEST LED (7)** turns ON.

To decrease the current consumption, when you finish programming the SDI UNIT, remove the SDI TEST Jumper. You can put the Jumper on one pin.

**** SDI version 2.16 enters Programming mode automatically. No need to use the Jumper SDI TEST.**

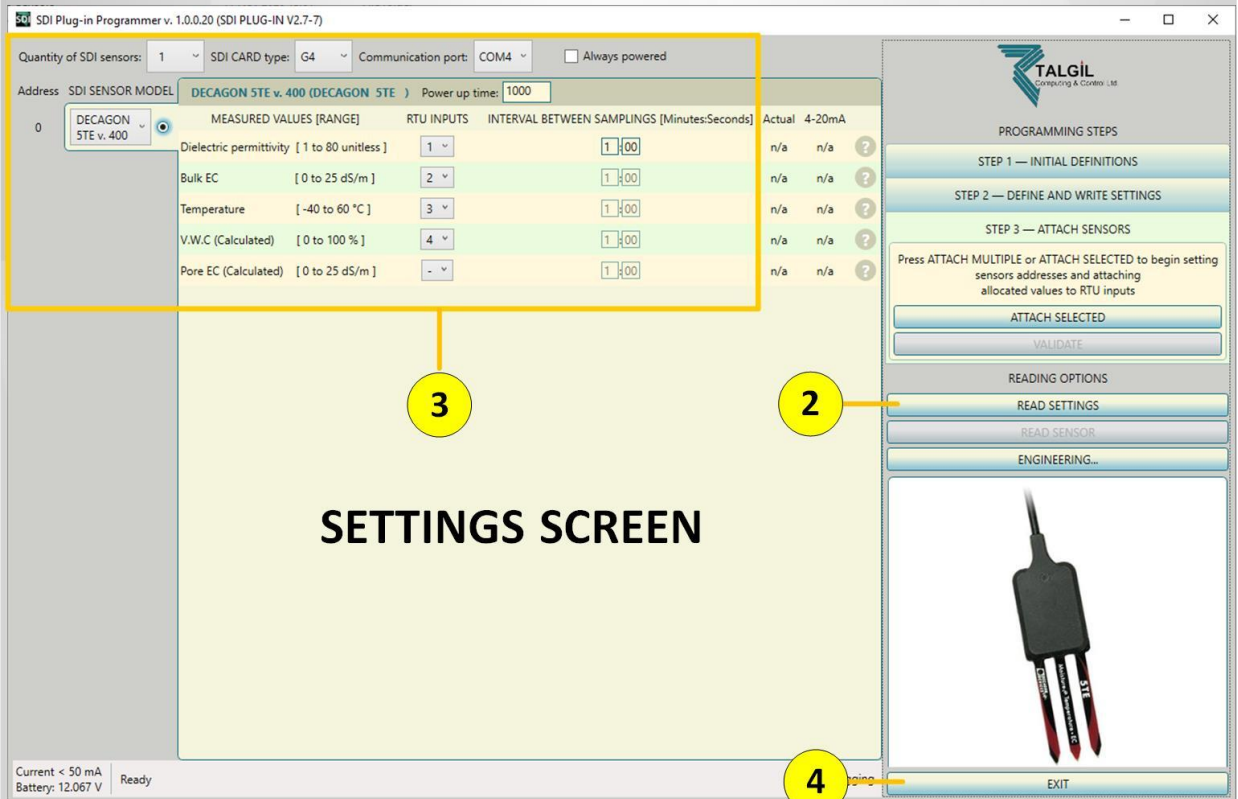
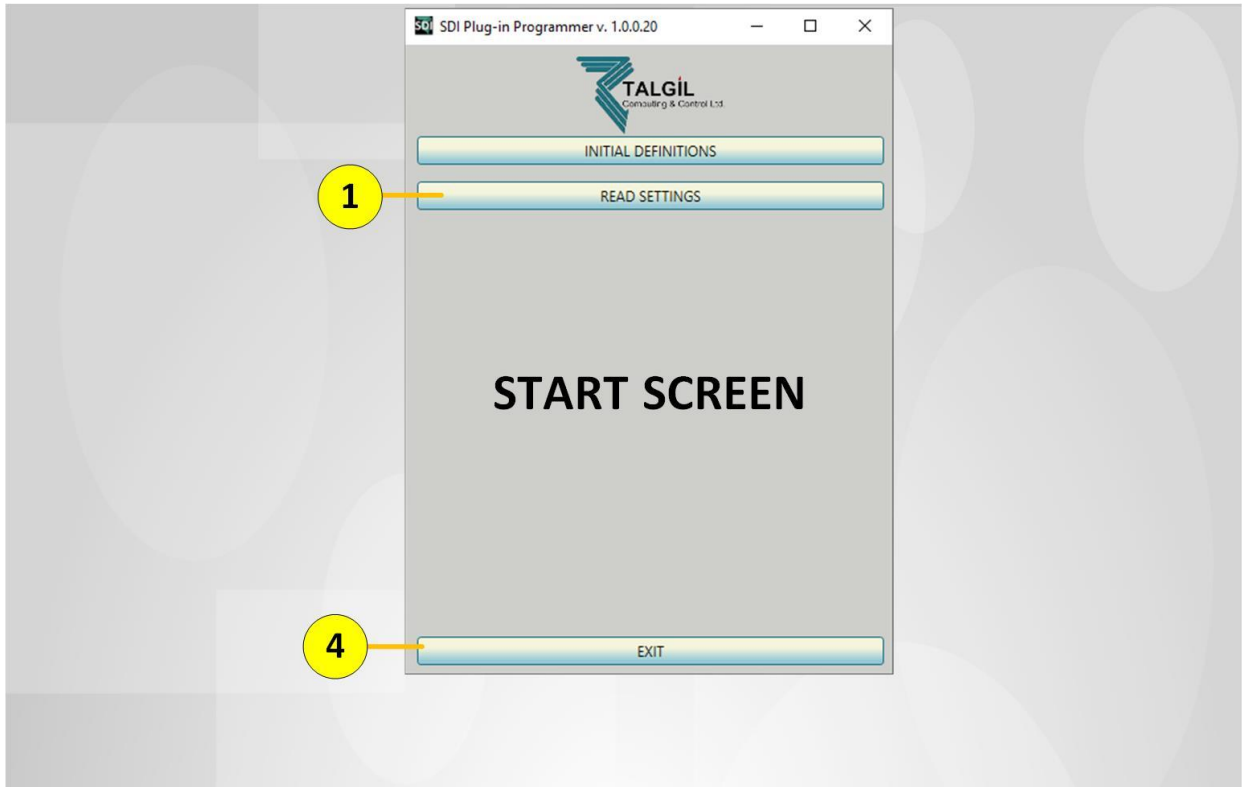


Image 4 – READ the SETTINGS of the SDI UNIT

5 READ THE SETTINGS OF THE SDI UNIT

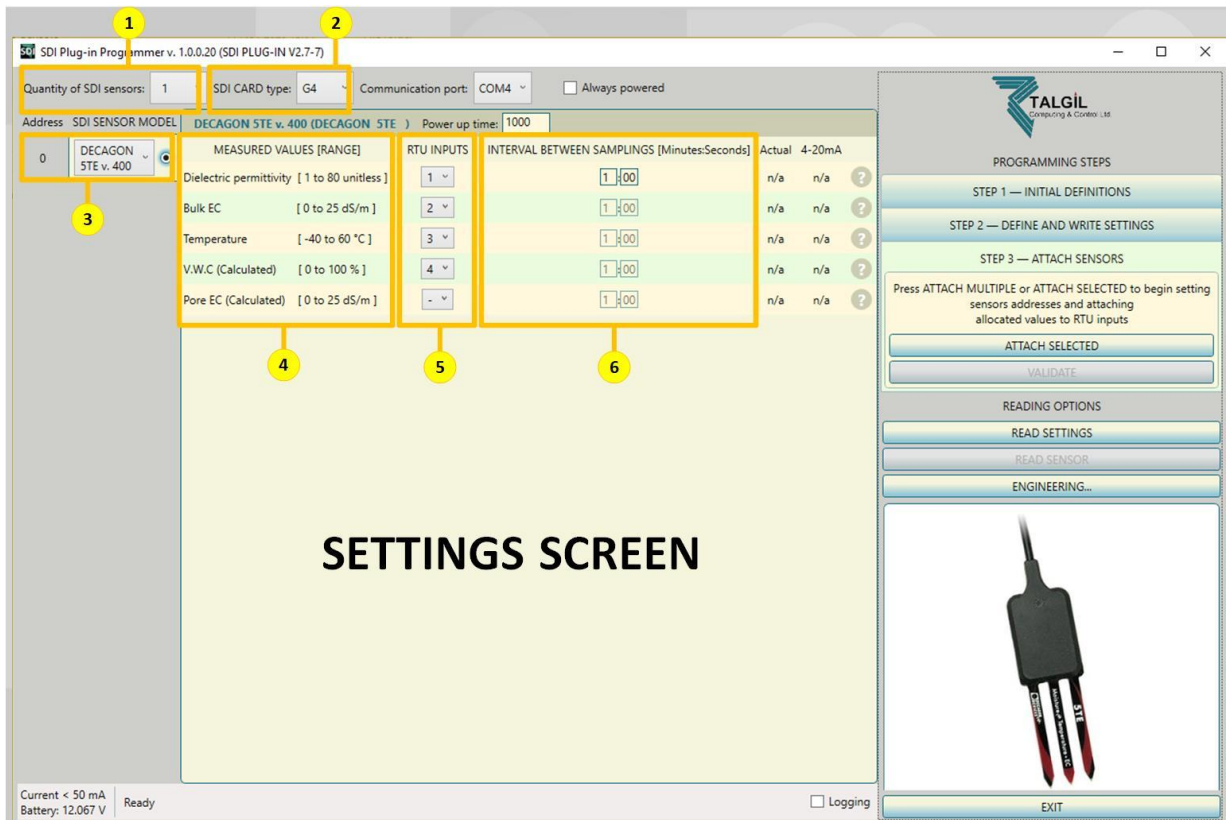
1. To **READ** or **EDIT** a predefined Setting of an SDI UNIT, connect a **PROGRAMMER** device to the **SDI PC** port.
2. Start the **SDI PROGRAMMER** software (download it [here](https://drive.google.com/drive/folders/1OyjAIJ1yalZWu-SgBF6pM4hMou3JJNYg?usp=sharing): <https://drive.google.com/drive/folders/1OyjAIJ1yalZWu-SgBF6pM4hMou3JJNYg?usp=sharing>).
3. To change the **SDI UNIT** mode to **Programming Mode**, connect a Jumper to the **SDI TEST** pins (See page 9 [Programming mode](#)).
4. In the **START** screen, click **READ SETTINGS (Pointer 1- Image 4)**, a message with instructions will appear on the screen. Click **OK** to close the message.
5. In the **SETTINGS** screen click **READ SETTINGS (2)**. The **SDI PROGRAMMER** software will read the settings from the **SDI UNIT**. The results will appear on the **SETTINGS** screen **(3)**. The **SETTINGS** include Quantity of SDI-12 sensors, SDI Card type, SDI-12 Sensor Model, Sensor address, Measured values name, RTU Inputs, Interval between samplings, and Power-up time.
6. The user can **EDIT** the **SETTINGS** and save the last changes.
The power-up time is read-only.
Image 5 describes the results of the **SETTINGS** screen.

6 READ AN SDI SENSOR

To read an SDI-12 sensor, click the **READ SENSOR** button (**Pointer 1 Image 6**). When the SDI-12 sensor receives the **READ SENSOR** command, it returns the measured values. The measured values appear in the **ACTUAL** column **(2)**. The conversion to **4-20mA** of these measured values appears in the **4-20mA** column **(3)**.



If the **READ SENSOR** button is disabled, skip to **STEP 3** called **ATTACH SENSORS**, and follow the instructions.

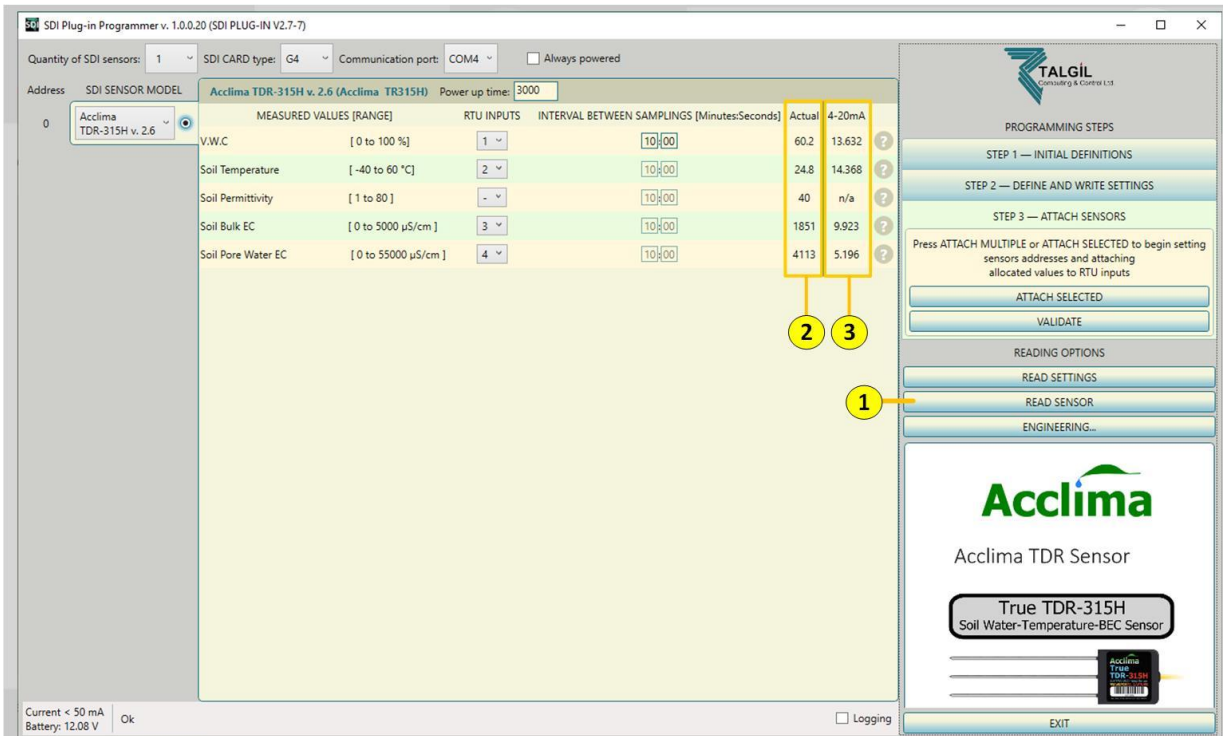


SETTINGS SCREEN

Description:

- Quantity of SDI sensors-** The total number of SDI Sensors that are going to be connected to the SDI UNIT.
- SDI card type-** The mode of the SDI UNIT. The Modes are: **G3/G4, G5, and G5 LIN** (Limited to read up to 4 measurements), **Interface SDI, G5 FAST, and G5 FAST LIN** (Limited to read up to 64 measurements).
- SDI SENSOR MODEL-** The model of the SDI sensor. Includes the Manufacturer, sensor model, and sensor version (Vendor ID, Product ID, and Product version).
- MEASURED VALUES-** A list of measurements (Sensors) included in the SDI sensor. When the SDI Unit reads the SDI-12 sensor, the SDI-12 sensor returns the measured values.
- RTU INPUTS-** A list of available analog input in this RTU which represent the analog value of the selected Measured value.
- INTERVAL BETWEEN SAMPLINGS-** Specifies the sampling rate. How often to read the SDI sensor and send the preferred measured values to the RTU.
- POWER UP TIME-** Specifies the excitation time. How many milliseconds to power the SDI-12 sensor before reading it (Read only).

Image 5 – Description of SETTINGS screen



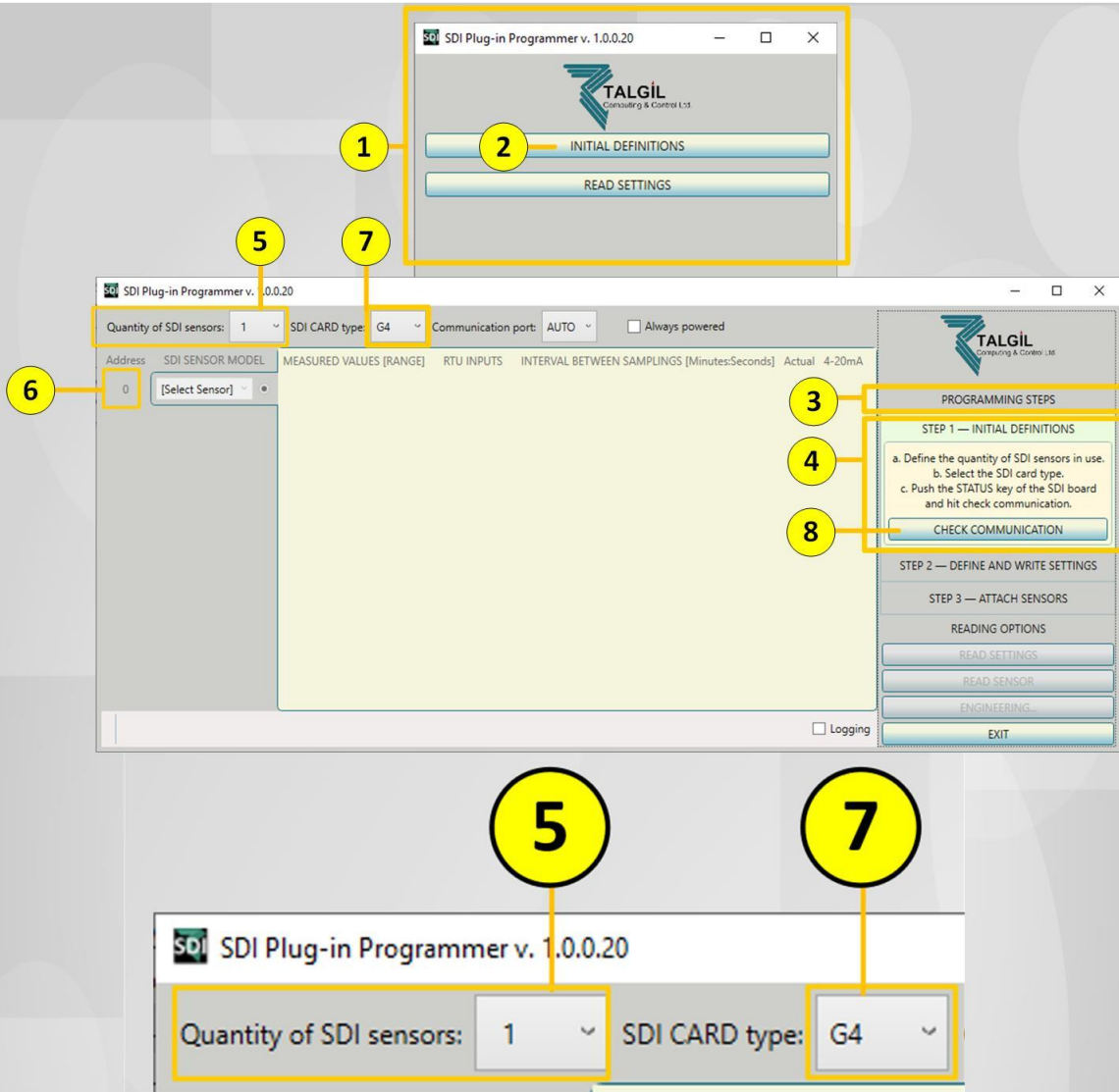
Description:

1. **READ SENSOR button**- Enables to read the SDI-12 sensor. The READ SENSOR button is available only after Step 3 called Attach sensor.
2. **ACTUAL**- A list of all the measured values that have been read by the SDI sensor. For example, the measured value of the V.W.C is 60.2 %.
3. **4-20mA**- The conversion of the measured values to 4 to 20 mA. These converted values are being transmitted to the RTU RF SDI. The RTU RF SDI sends these 4-20 mA values to the Master. The Master sends these values to the controller. For example, the conversion to 4-20mA of measurement 1 called V.W.C is 13.632 mA.

Actual	4-20mA
60.2	13.632
24.8	14.368
40	n/a
1851	9.923
4113	5.196

2
3

Image 6 – Reading the SDI SENSOR



1. **Quantity of SDI sensors**- The total number of SDI Sensors that are going to be connected to the SDI UNIT. The address of each SDI sensor appears on the left side of the SDI sensor Model.

2. **SDI card type**- The mode of the SDI UNIT. The Mode are: RTU RF SDI G4 (Limited to read up to 4 measurements), RTU RF SDI G5 (Limited to read up to 64 measurements), and SDI Dream (Limited to read up to 64 measurements).

Image 7 – Programming the SDI UNIT: STEP 1

7 PROGRAMMING THE SDI UNIT

To program a new SDI UNIT, in the START screen (**Pointer 1 Image 7**), click **INITIAL DEFINITIONS (2)**. A Wizard with Programming steps will appear (**3**). The wizard specifies the steps that have to be done (**4**).

STEP 1- INITIAL DEFINITIONS:

- **1.a** Select the Quantity of the **SDI-12** sensors (**5**) that you are going to connect to the **SDI Unit**. The Maximum number of SDI SENSORS is described in the table below:

SDI card TYPE	Max SDI-12 Sensors	*Max Returned Values	Max Values to read
G4 / G5 / G5 LIN	4	120	4
Interface SDI	10	120	64
G5 Fast / G5 Fast LIN	10	120	64

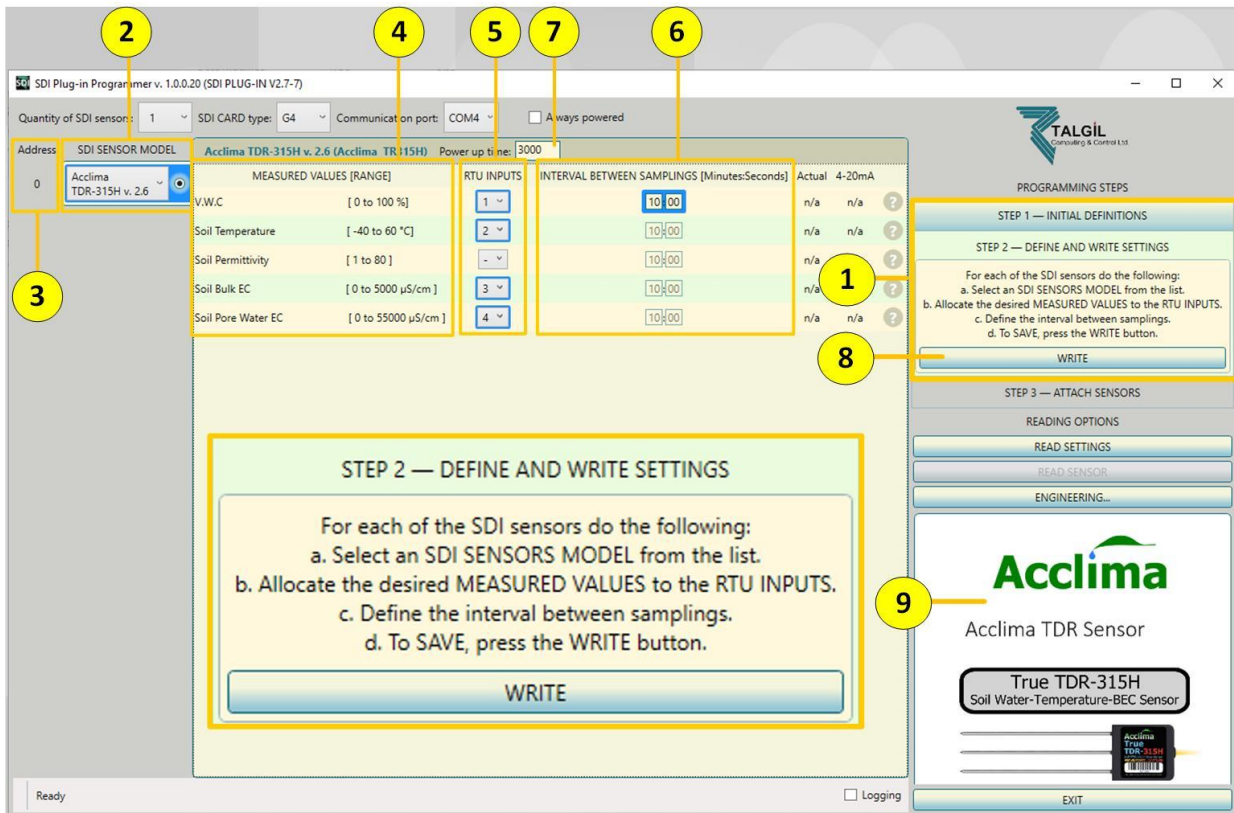
***In SDI version 2.16 and below, the Maximum returned values is 90.**

***In SDI version 2.18 and up, the Maximum returned values is 120.**

The SDI address of every SDI-12 sensor will appear close to the **SDI-12 SENSOR MODEL (6)**.

- **1.b** Select the **SDI CARD TYPE (7)**. The Types are **G3/G4, G5, G5 LIN, Interface SDI, G5 Fast, and G5 Fast LIN**.
- **1.c** On the SDI UNIT board, connect a Jumper to the **SDI TEST** pins. This action will change the SDI UNIT mode to Programming mode.
To proceed, Click **CHECK COMMUNICATION (8)**. The SDI Programmer software will try to communicate with the SDI unit. If the communication passes successfully, the wizard will skip to **STEP 2- DEFINE AND WRITE SETTINGS**.

If the communication fails, repeat step 1.c.



2. **SDI SENSOR MODEL**- The model of the SDI sensor. Includes the Manufacturer name, Sensor type, and Sensor’s firmware version (Vendor ID, Product ID, and Product version).
3. **SDI SENSOR ADDRESS**- A unique address that the SDI UNIT grants to the SDI sensors which are going to be connected to the SDI UNIT.
4. **MEASURED VALUES**- A list of measurements included in the SDI sensor.
5. **RTU INPUTS**- A list of available analog inputs numbers which represent the Measured value.
6. **INTERVAL BETWEEN SAMPLINGS**- Specifies the sampling rate. How often to read the SDI sensor and send the preferred measured values to the RTU.
7. **POWER UP TIME**- Specifies the excitation time. How many milliseconds to power the sensor before reading it (Read only).

Image 8 – Programming the SDI UNIT: STEP 2

STEP 2- SETTINGS

Step 2 (**Pointer 1 Image 8**) defines the SDI-12 Sensor Model, the connection between the **Measurements** and the Analog Input of this RTU, and the Sampling rate. Follow the instructions in STEP 2.

- **2.a** For every SDI-12 sensor, select the **SDI-12 SENSOR MODEL (2)** that you are going to connect to the **SDI UNIT**. The **SDI-12 SENSOR MODEL** includes the manufacturer name, Sensor type, and Sensor's firmware version. The SDI address will appear on the left side (**3**). Also, a picture of the selected **SDI-12 SENSOR MODEL** will appear in the lower right corner (**9**). Every SDI-12 sensor has a unique address. The first address is 0. The addresses range is 0-9, a-z, and A-Z. The address definition is done in STEP 3 called **ATTACH SENSORS**.

MEASURED VALUES

A sensor can include a single measurement or several measurements. Usually, the measurement is environmental data. The measurement types can be Soil Moisture, V.W.C, Salinity, Temperature, Dielectric permittivity, Voltage, Pore EC, Bulk EC, and so on. The measured values can be located in different depths (Layers) according to the SDI-12 sensor structure. The Sampling rate is defined per layer. To see the measurements list of a specific SDI sensor, Select the **SDI-12 SENSOR Model (2)**. The **MEASUREMENTS** list and their **RANGES** will appear on the screen (**4**).

- **2.b** Allocate the **MEASUREMENTS (4)** to the Analog Inputs that they are going to be associated with (**5**).

For example, the **MEASUREMENT** called **V.W.C** of SDI-12 sensor model **ACCLIMA TDT315H V2.6** is associated with analog input number 1. If you do not want to read some

measurements, select “-” (Minus). The SDI unit will send the measured values to the RTU RF SDI.

- **2.c** Define the **INTERVAL BETWEEN SAMPLINGS (6)**. The **INTERVAL BETWEEN SAMPLINGS** means, how often the **SDI UNIT** will read the SDI-12 sensor. This interval is also called the “**Sampling rate**”. The **Power-up time**, which is **READ-ONLY**, is the excitation time of the selected SDI-12 sensor (**7**). To Proceed, click the **WRITE** button (**8**).

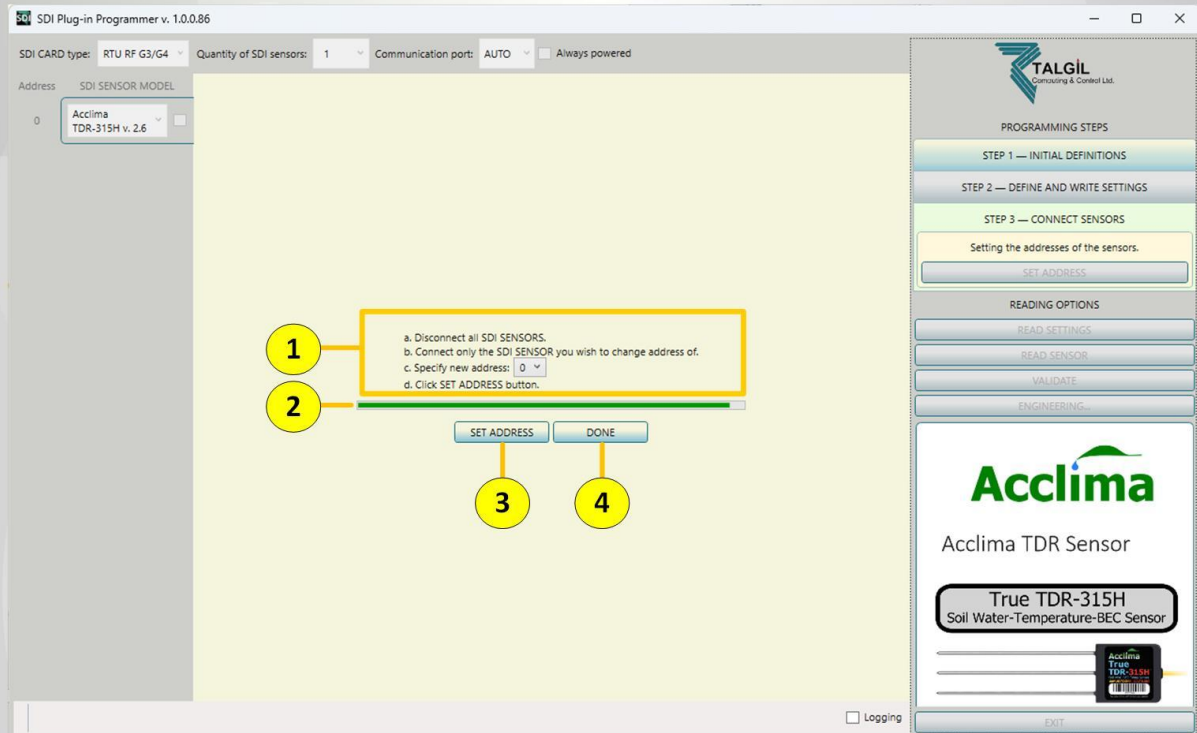
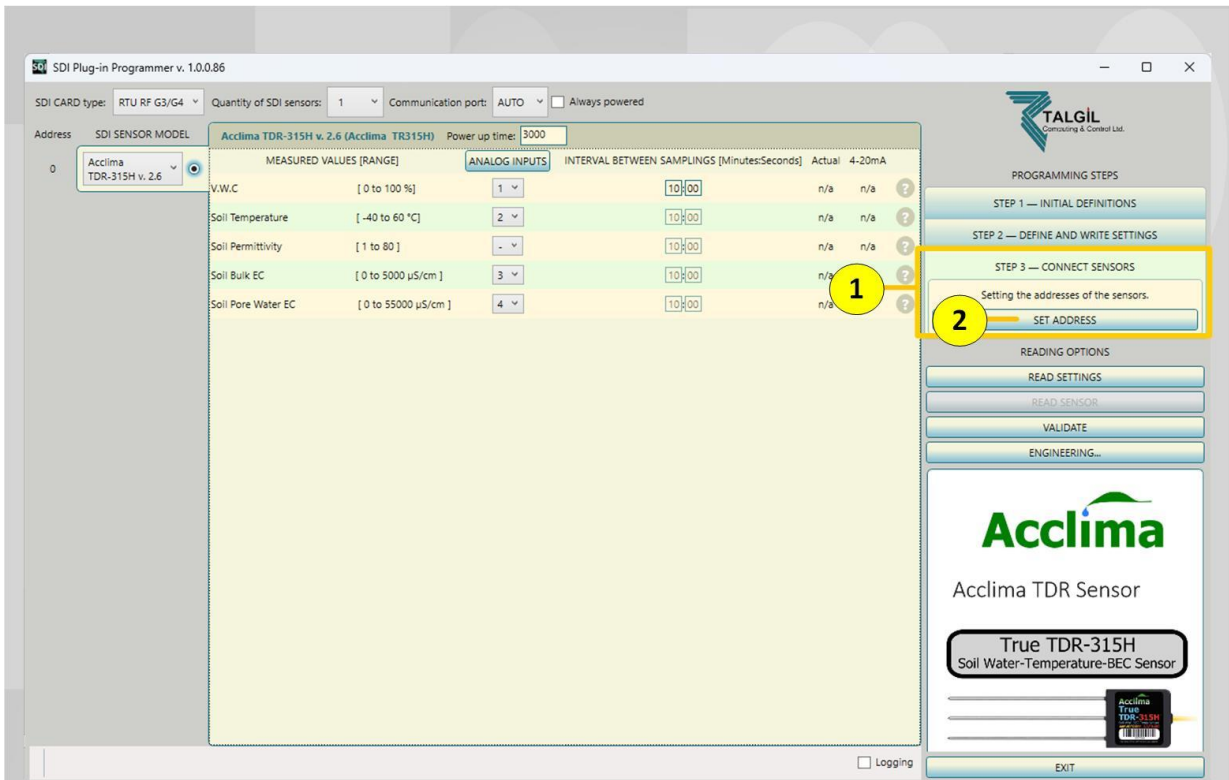


Image 9 – SET ADDRESS

STEP 3- CONNECT SENSORS

Use **Step 3** to set the addresses of your SDI sensors according to settings in STEP 2. To proceed, click **SET ADDRESS** (Pointer 2- Image 9).



It is impossible to **READ** the values without passing Step 3.

To set the address of the SDI SENSORS, follow the instructions (**Pointer 1- Image 9**):

1. Connect the first SDI-12 SENSOR (SDI sensor with ADDRESS 0) to the SDI Socket (Image 2 pointer 3).
2. For the first SDI sensor, select Address 0 and click **SET ADDRESS**.
A progress bar will appear (Pointer 2 Image 9).

When the **SET ADDRESS** passed successfully, the SDI UNIT sounds a single beep.

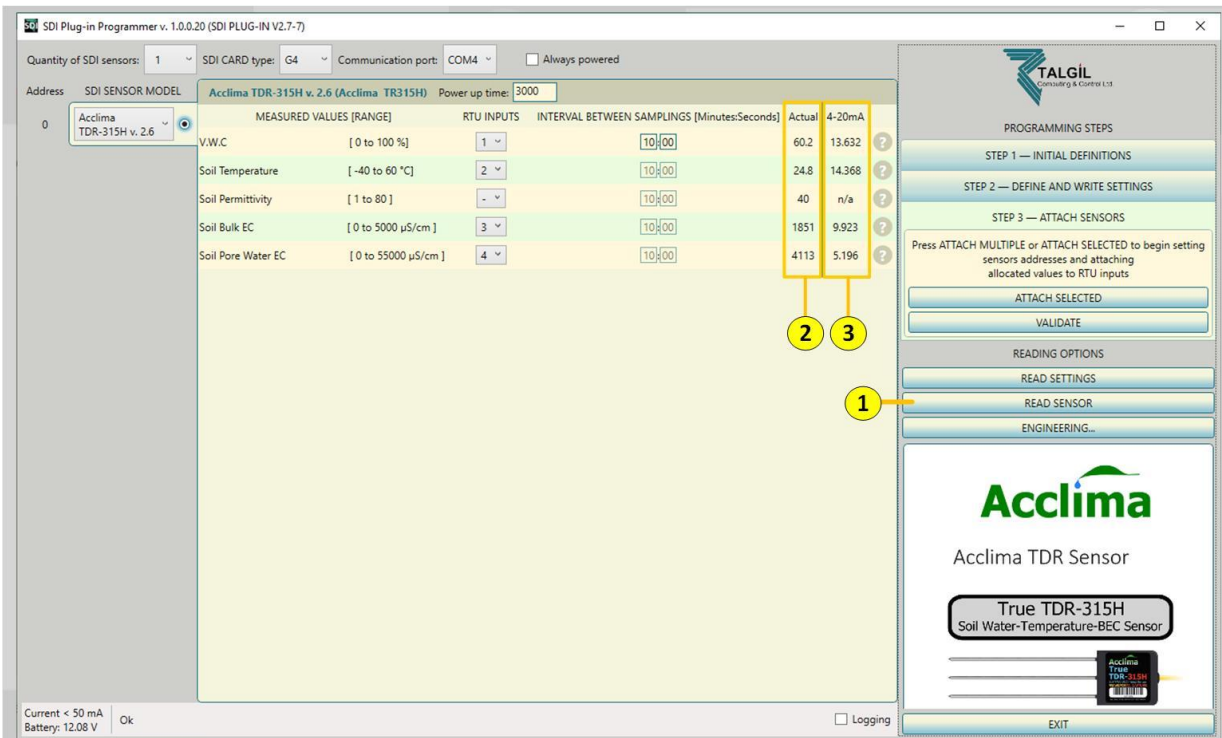
If you have several SDI SENSORS, set the address of every **SDI SENSOR**.

For **SDI-12 SENSOR** number 2 set the **SDI ADDRESS** to 1.

For **SDI-12 SENSOR** number 3 set the **SDI ADDRESS** to 2.

For **SDI-12 SENSOR** number 4 set the **SDI ADDRESS** to 3 and so on.

When you finish to set the addresses, click **DONE**.



Description:

1. **READ SENSOR button**- Enables to read the SDI-12 sensor. The READ SENSOR button is available only after Step 3 called Attach sensor.
2. **ACTUAL**- A list of all the measured values that have been read by the SDI sensor. For example, the measured value of the V.W.C is 60.2 %.
3. **4-20mA**- The conversion of the measured values to 4 to 20 mA. These converted values are being transmitted to the RTU RF SDI. The RTU RF SDI sends these 4-20 mA values to the Master. The Master sends these values to the controller. For example, the conversion to 4-20mA of measurement 1 called V.W.C is 13.632 mA.

Actual	4-20mA
60.2	13.632
24.8	14.368
40	n/a
1851	9.923
4113	5.196

2 3

Image 6 – Reading the SDI SENSOR

8 READING THE MEASURED VALUES

When Steps 1,2, and 3 pass successfully, it is possible to read the measured values of every SDI sensor. To read the current measured values of a specific SDI Sensor, click the preferred sensor then click **READ SENSOR** (Pointer 1 Image 5). The **SDI PROGRAMMER software** will display the following values:

1. The actual MEASURED VALUES (Pointer 2).
2. The conversion to 4-20mA of these MEASURED VALUES (Pointer 3).

The RTU RF SDI G5 sends the 4-20mA values to the Master unit. The irrigation controller receives these 4-20mA values and sends them to the server.

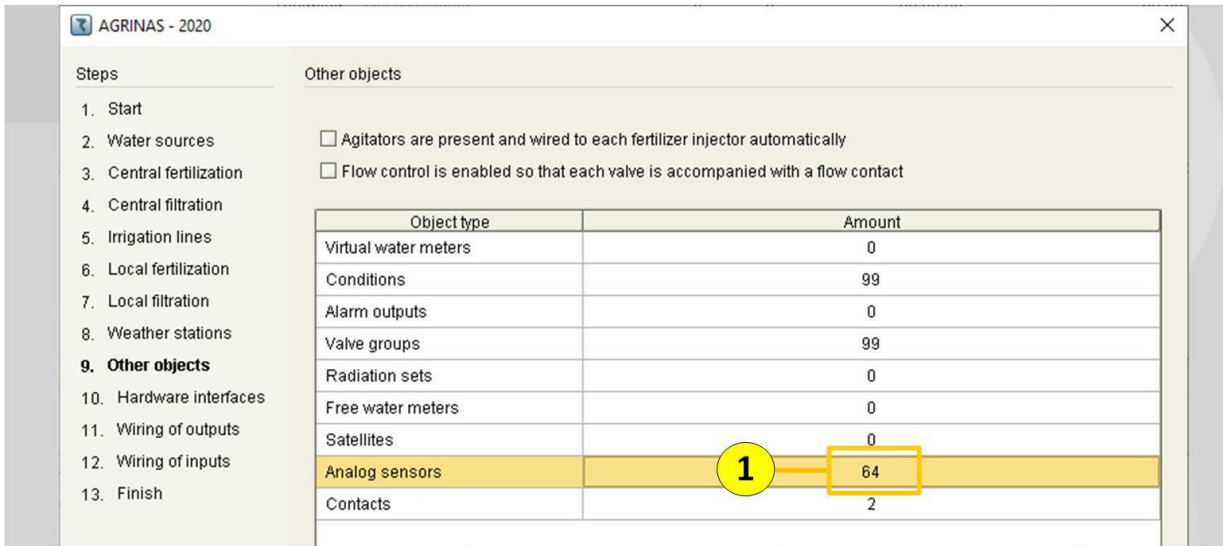
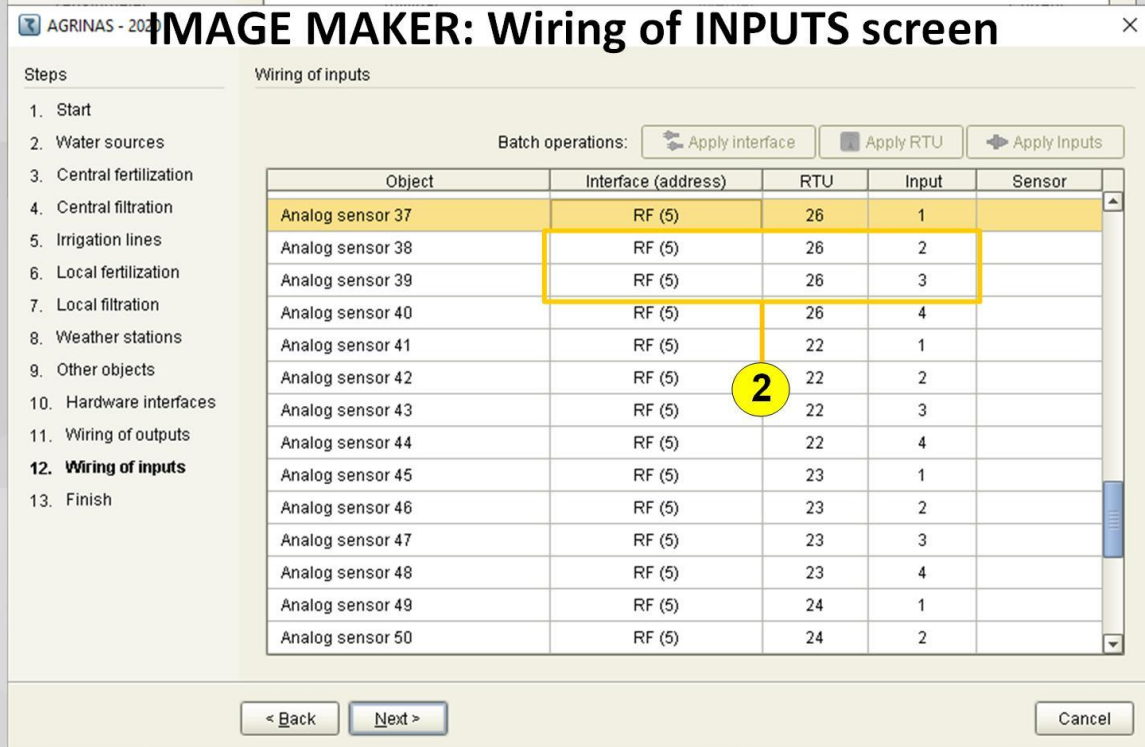


IMAGE MAKER: Wiring of INPUTS screen



CONSTANTS of ANALOG SENSORS



Image 10 – IMAGE MAKER: Other object screen

9 ADDING ANALOG SENSORS TO THE CONTROLLER IMAGE

Start the DreamConsole PC software. Connect the irrigation controller that includes the RTU RF SDI G5. Navigate to **TOOLS/Image Maker**. Download the current Image (Also called Configuration). Skip to **Other Objects** and add Analog sensors to the Irrigation controller (**Pointer 1-Image 10**). The number of the Analog sensors is the total number of the MEASUREMENTS that the SDI unit is going to read.

In the WIRING OF INPUTS screen, define the appropriate **INTERFACE ADDRESS** and type, **RTU ADDRESS**, and **ANALOG INPUT (2)**. The analog input number is the Analog Input that was defined in **STEP 2 (Pointer 5 Image 7)**. When you finish defining the wiring of the inputs screen of each Measurement, skip to the **FINISH** screen and click **DEPLOY**.

10 CONSTANTS OF ANALOG SENSORS

On the **Config/Constants/Analog sensors** screen, select the appropriate **Sensor name**, **Sensor Type**, **Unit of measurement**, **Base**, **Minimum**, and **Maximum** range according to the **measurement values Name, Types, Units of Measurement values**, and their **ranges (3)**.

For example, the **V.W.C** of SDI-12 sensor model **ACCLIMA TDT315H V2.6** is associated with analog input number 1. The Sensor name can be: "**V.W.C ACCLIMA TDT315H**", Sensor type is **V.W.C**, the **Units** are "%", and the **Base** is **Current**. The range of the **V.W.C** is 0 (4 mA) to 100 (20 mA). The **V.W.C** is associated with analog input number 1.

11 MONITORING ANALOG SENSORS

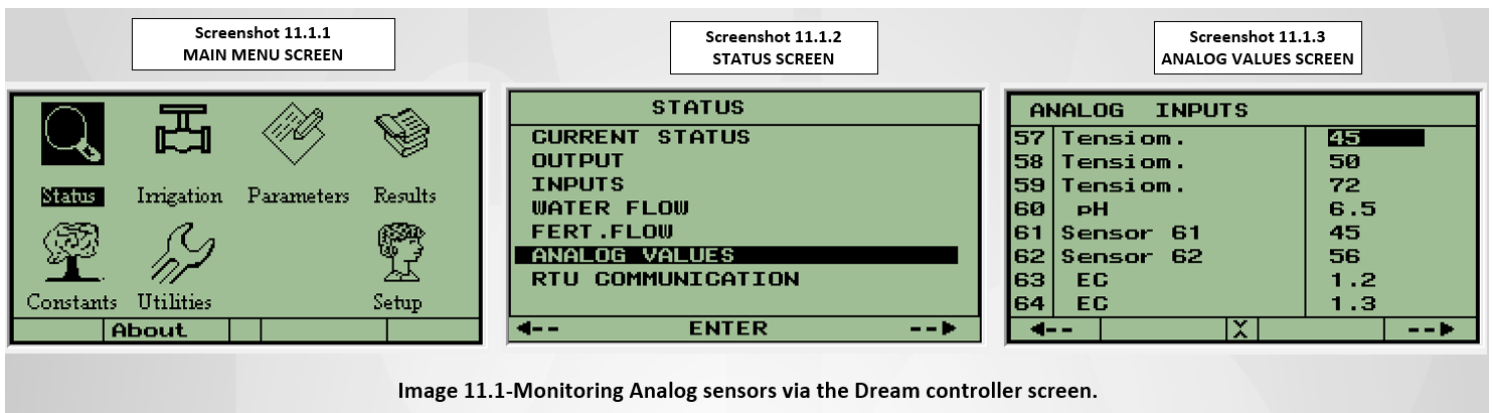
There are three options to monitor the Analog sensors:

1. On the DreamConsole PC software.
2. On DreamSpot smartphone app.
3. On Dream 2 controller.

11.1 Monitoring Analog sensors via the DREAM CONTROLLER.

To monitor the analog sensor via the Dream 2 controller, on the **MAIN MENU**, navigate to the **STATUS (Image 11.1.1)** screen and select **ANALOG VALUES (Image 11.1.2)**.

A list of all the **Analog sensors** will appear on the screen (Image 11.1.3).



11.2 Monitoring Analog sensors via DreamConsole PC software.

To monitor analog sensors via the DreamConsole PC software, navigate to **Analyze/Analog Sensors (Image 11.2 Pointer 1)**, and select Analog Sensors from the **Analog Sensors list (2)**.

On **Calendar (3)**, select the time range. To select multiple days, use the left mouse click on the first day, Press and hold the Shift button, and use the left mouse click on the last day.

Select the number of **Layouts (4)** to display the Analog sensors graphs.

Drag and drop the Analog sensors from the Sensors list to the **Layout (5)**.

To watch the analog values on a specific time and date, hold the cursor on the time and date. A Tooltip with the Analog sensors and their values will appear on the screen.

Use the Shift button together with the mouse wheel to Zoom in or Zoom out the Time and Date.

Use the Cntl button together with the Mouse wheel to Zoom in or Zoom out the Analog sensor's Graphs.

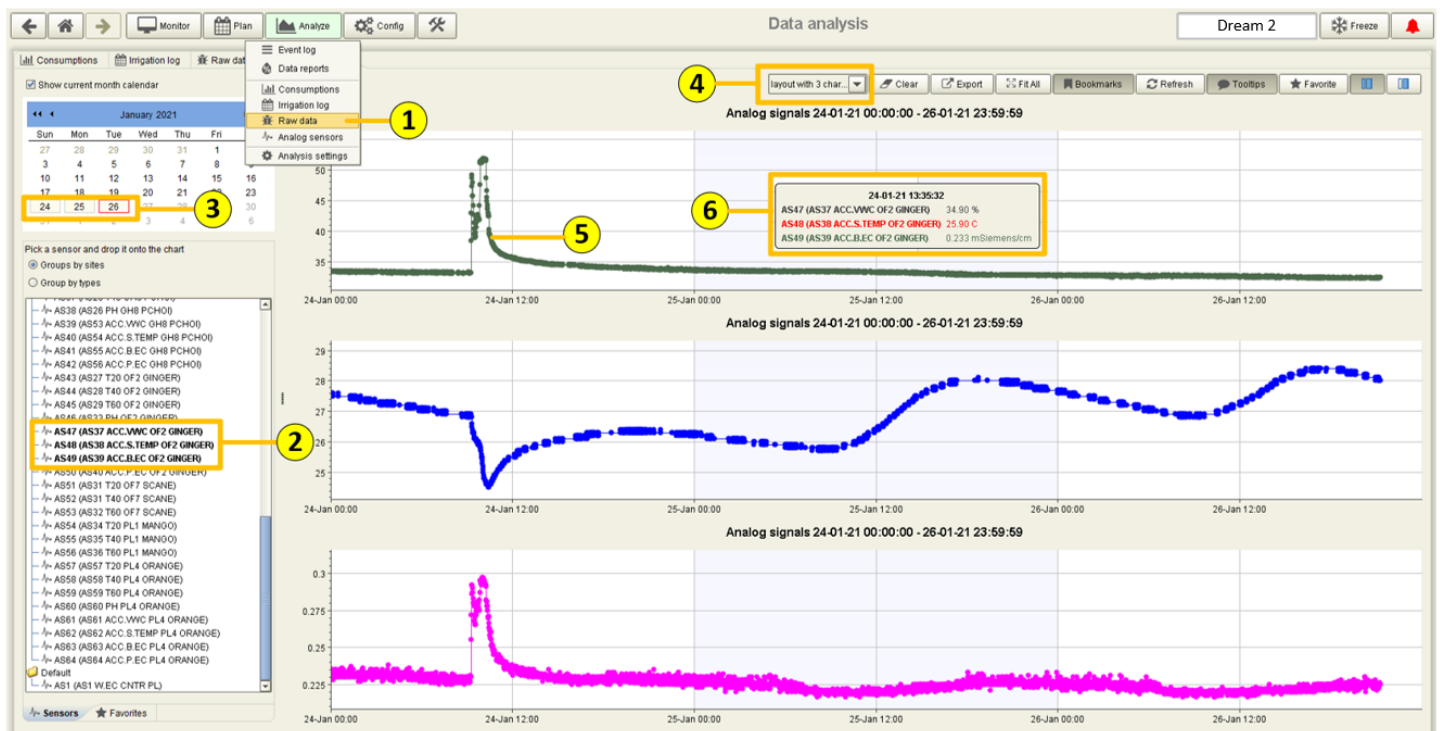


Image 11.2-Monitoring Analog sensors via the DreamConsole PC Software.

To monitor Analog sensors via the DreamSpot smartphone app, log in to the DreamSpot app. Connect to the irrigation controller. On the Home, screen tap the **Sensors (image 11.3**

screenshot 1). A sensors list will appear. Select the Analog sensor to monitor (**Screenshot 11.3.2**). In the upper right corner, select the range of time to monitor (**Screenshot 11.3.3**). To select the range of time, the Left mouse click on the first day then the Left mouse click on the last day to monitor. The DreamSpot will display the Analog sensor values during the selected range of time (**Screenshot 11.3.4**).

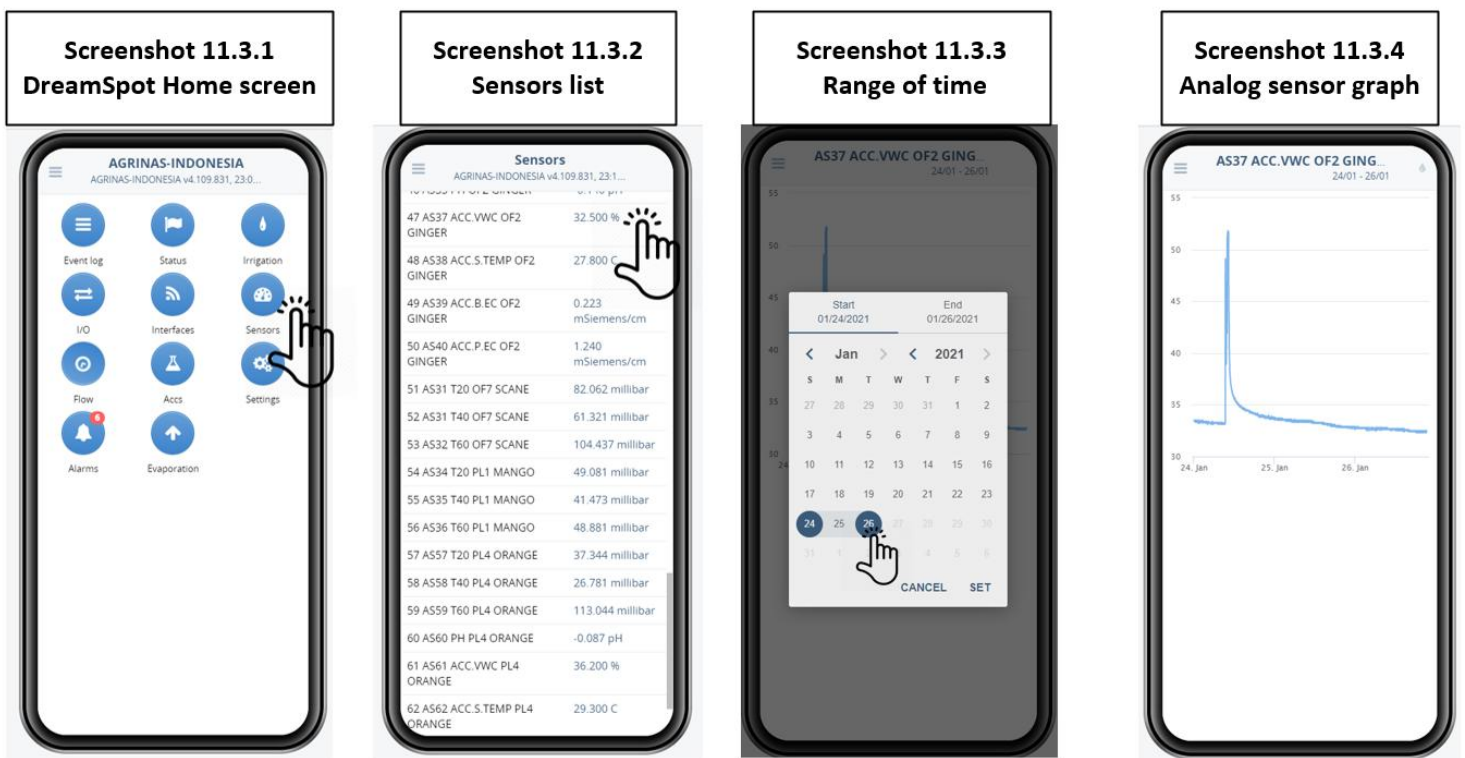


Image 11.3-Monitoring Analog sensors via the DreamSpot smartphone app.

The DreamConsole PC software offers a professional tool that helps to analyze the data.

The tool is called **Row data**. The **Row data** enables the display of Irrigation programs, start and stop time, Outputs and Inputs state, and Analog sensors graph.

For example, Image 12 describes an Irrigation program activity according to the V.W.C Analog values. When the V.W.C (Volumetric water content) is lower than a specific value (**Image 12 pointer 1**), the irrigation program starts by condition (**2**).

When the V.W.C value is higher than a specific value (**3**), the irrigation Program stops by condition (**4**).

DSS (Decision Support System) companies use the information to schedule the irrigation according to the results to reach maximum productivity and minimum investment.

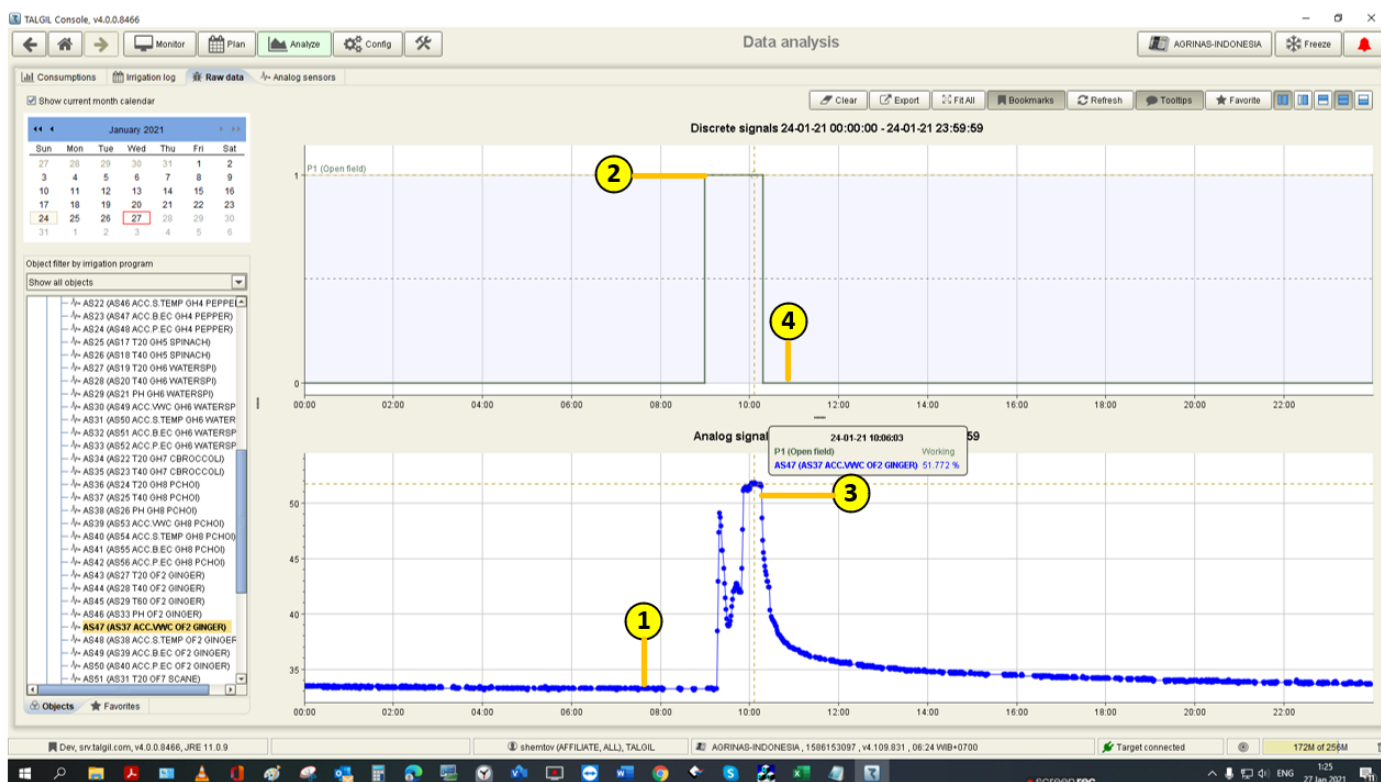


Image 12- Analog sensors on ROW DATA screen.

When connected to RTU RF:

Power supply: 12V DC supplied by RTU RF.

Inputs: Up to 4 SDI-12 sensors on RTU RF SDI G5 / RTU RF G3/G4/G4.5.

Up to 10 SDI-12 sensors on RTU RF SDI G5 Fast.

Up to 10 SDI-12 sensors on Interface SDI mode.

Output: Sending the measurements of the SDI-12 sensor to RTU RF G3/G4/G5 as 4-20mA.
RTU RF G5 FAST sends the values as is.

Temperature and humidity: 0-60°C , 0-90%.

Current consumption:

RTU RF SDI G5 0.7 mA.

Interface SDI 7.5 mA.