IM500-SM500 – IoT Module

2021.03.09 [D017-0025-200-02]

User's Guide

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www.SystemsWithIntelligence.com

Note: Please read this manual thoroughly before operating this unit and retain it for future reference.

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Disclaimer of Liability

We have checked the contents of this manual against the hardware and software described. However, deviations from the description cannot be completely ruled out.

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The information given in this document is reviewed regularly and any necessary corrections will be included in subsequent editions. We appreciate any suggested improvements. We reserve the right to make technical improvements without notice.

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Federal Communications Commission Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference on his own expense.

CAUTION

This product contains no user-serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void. Changes or modifications not expressly approved by Systems With Intelligence Inc. could void the user's authority to operate the equipment. Should this device require service please contact Systems With Intelligence.

1 Table of Contents

2 Terminology

These are terms and abbreviations used in this document:

Alarm	• The detection of a state change is recording a new entry in the log. E.g. Digital Input wired to door contact is changing state from closed to open; the average temperature is above threshold value.
Event	• Repetitive action based on a time schedule; E.g. snapshots every one hour. • A one-time action triggered by an Alarm. E.g. turn on buzzer when Door opens.
Digital Input/ Output (DI/O)	• A Digital Input (DI) monitors the state of a contact and the output is passed to the processing application as a binary signal 1 or 0. E.g. A door open is '0' and a door closed is binary '1'. • The Digital Output (DO) executes a binary command by operating a relay. E.g. the relay output is closed to turn the lights on.
DNP3	• Distribute Network Protocol v3: Real-time communication protocol (Ethernet or Serial) used by the SCADA systems.
Modbus	• Simple industrial communication protocol used for communication between PLC/RTU/Controllers and SCADA.
SCADA	• Supervisory Control and Data Acquisition: a control system for supervisory management of electric utilities and processing plants.
Web browser	• A web browser is a software application for accessing information on the World Wide Web. Currently supported Chrome and Firefox.
LAN / WAN	• Local Area Network / Wide Area Network
RS485	• Serial communication using 2 or 4 wires that allows daisy-chaining multiple electronic devices.

3 Read Me First

This chapter describes how the guide is organized and how to use it. The document is divided into sections ordered chronological and frequency of use.

Section 5 - One-time configuration

This section will guide you through the user registration process.

Section 6 – Administration tasks

This section contains administration instructions required to maintain your organization.

Section 7 - Everyday operation

You will learn how to do the everyday tasks and use all the features of the system.

Section 8 – IM500 Configuration

Instructions for configuring the IM500 for temperature measurements and thermal alarm reporting.

Section 9 – SM500 Configuration

Step-by-step instructions to configure the SM500 to monitor and report measurements from your installation.

Section 10 – Data Visualization

Instruction for building a customized Dashboard for viewing your data.

Throughout this manual you will find two distinctive paragraphs:
Best practice – recommendations based on FAE experience and customer feedback.
Troubleshooting - tests and solutions for most common situations.

4 Introduction – IM500 and SM500 Overview

The IM500 Industrial IoT Module monitors and collects asset health data from remote sites. Thermal monitoring mitigates the risks of failure from overheating assets and connection points. Analytics detect anomalies and provide automatic warnings. The visual camera provides situational awareness in remote locations.

The SM500 IoT Module is a data concentrator and protocol converter equipped with a wireless communication that collects data from remote sensors and makes it available for online viewing and SCADA integration.

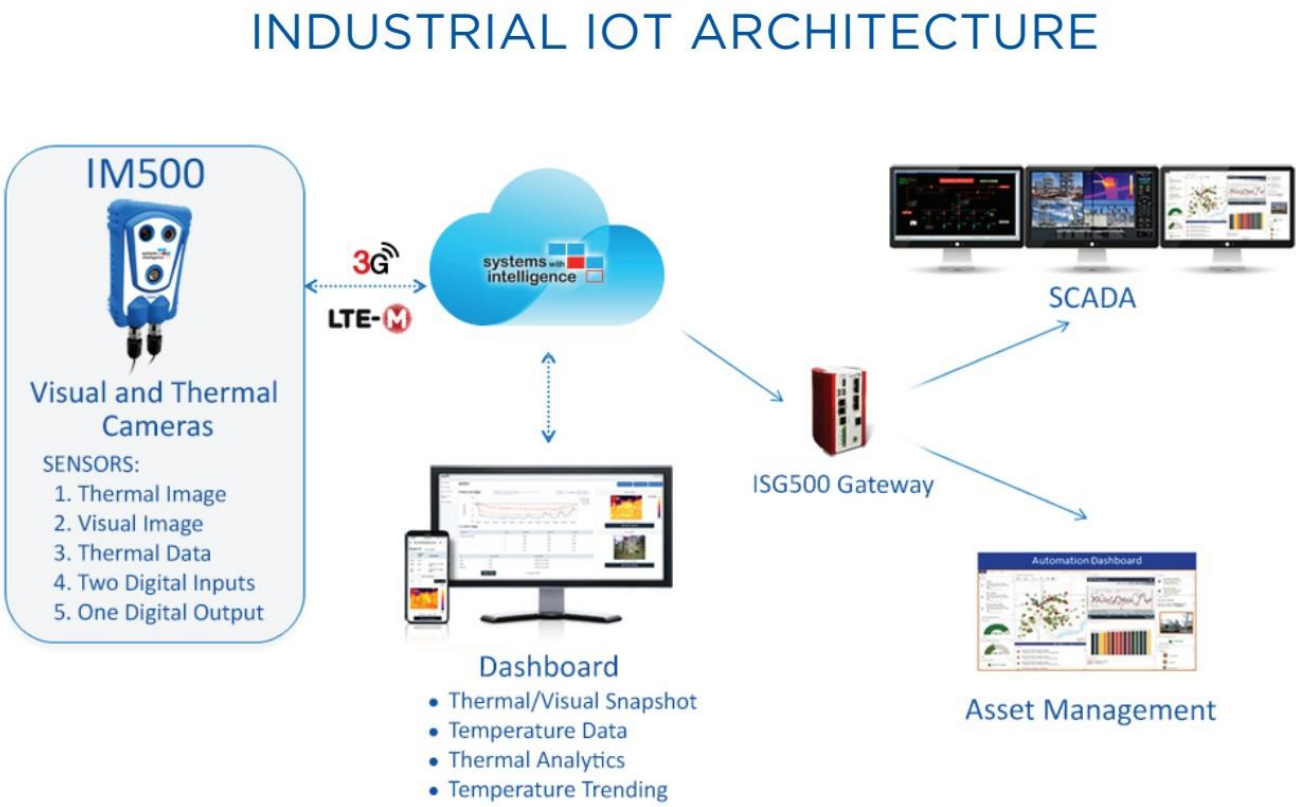

Figure 4-1 Industrial IoT Architecture

The Figure 4-1 presents the IoT architecture and how data is collected, processed and visualized.

IM500 and SM500 Digital Input/ Output Interface

- IM500 has two digital inputs and one output.
- Digital inputs are wet contact (12VDC input to activate).
- Digital output is rated to maximum 500mA at 30VDC.
- SM500 only: RS485 serial communication with Modbus protocol.

DASHBOARD – Data Visualization

- Monitor the site and control remote sensor module.
- Thermal trending of monitored assets.

- Thermal and visual snapshots
- Configure thermal analytics and alarms.

WIRELESS COMMUNICATION

- LTE-M or 3G wireless communications.
- Secure encrypted connection to SWI Application Cloud.
- Bi-directional data flow.

INTEGRATION

- Data collected by IM500 and SM500 can be integrated with a SCADA system or other asset monitoring software, by using the optional ISG500 (Intelligent Sensor Gateway).

UTILITY GRADE

- Designed for the harsh conditions found in electric power environments.
- Immune to the effects of EMI, ESD and voltage surges.

5 First Time Setup

This setup is required only once by each member of your organization. This chapter will guide you through the first time setup and registration. The "SWI Dashboard" grants access two types of accounts:

- Administrator – this account is for adding new devices and new users to organization.
- Operator – this account is for day-to-day operation: view and configuration.

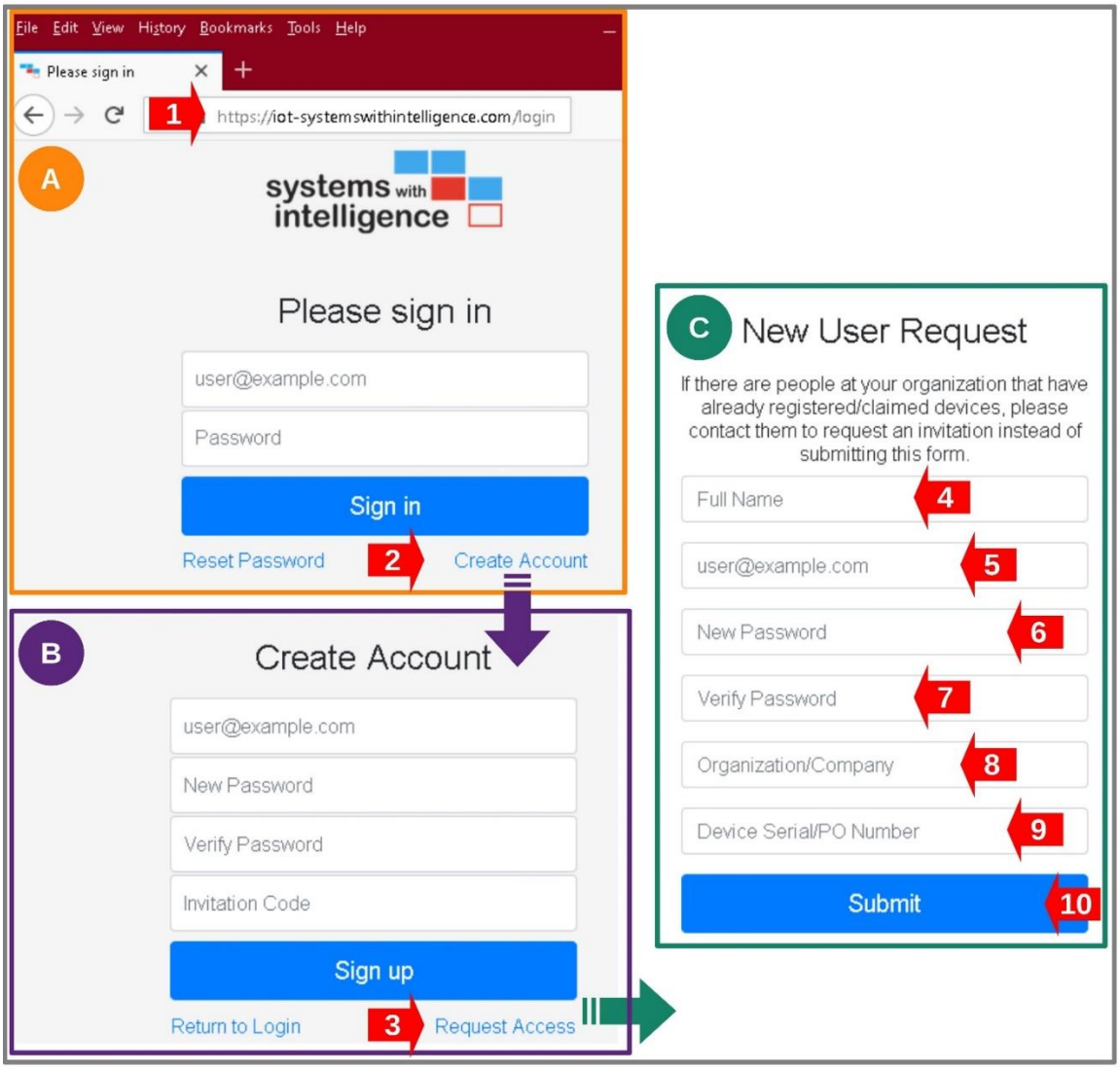

Figure 5-1 First Time Administrator

5.1 Initial Administrator

The initial organization creation request is done through the dashboard (https://iot-systemswithintelligence.com/login/request, this URL may change in the future), not by sending an email. The person who submits this request would be the initial administrator and is responsible for adding new Administrator and Operator accounts. There can be multiple administrators.

To complete this task you must have internet access via WI-FI, Cell or Ethernet. Follow the instructions below (5.3) and then proceed to section 6:

1. Using your preferred web browser go In https://iot-systemswithintelligence.com/ .
2. Click "Create Account".
3. Click "Request Account".
4. Type in your name.
5. Type in your e-mail address.
6. Type a new password.
7. Type the same password for verification.
8. Enter the name of your company.
9. Enter the Device Serial (ID) if you have access to any device or type in the P.O. Number.
10. Press the "Submit" button.

5.2 Setup Operator

The Operator account has full access to configuration and data but cannot add new users. An Administrator of your IoT Dashboard organization must send you an invitation then follow the instructions below.

5.3 Registration

You register after you receive the e-mail from noreply@iot-systemswithintelligence.com – see Figure 5-2. The e-mail contains an invitation code and a website link – arrow 2. Click the link and your web browser will open the "New user log-in" page as seen in Figure 5-3.

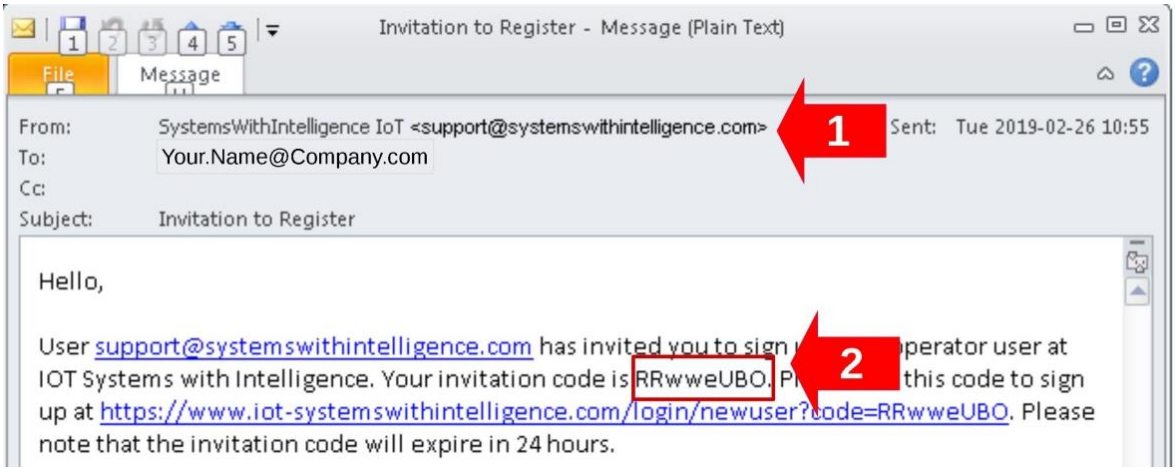

Figure 5-2 Registration e-mail

Create account instructions – follow Figure 5-3:

1. Type your e-mail address
2. Type a password; must be at least 8 characters long.
3. Retype the password.
4. Copy and paste the invitation code from the e-mail if not already filled.

Figure 5-3 New user log-in

Click the "Sign in" button. You will receive a registration confirmation e-mail.

Troubleshooting: If you do not receive the invitation e-mail in the next 24 hours please contact SWI for assistance. Also check your "Spam" folder; the e-mail may be filtered out.

6 Administration Tasks

The Administrator is responsible for activating new IM500/ SM500 IoT units and for adding new users to the organization. The instructions in this section can be performed only by an Administrator.

6.1 Add New Device via ID

One of the first task of an Administrator is to add new devices to the Dashboard. The first method to add a IoT unit is to use the ID of the device which is located on the back label of the enclosure. You could do this setup with the unit powered off. The second method requires the use of the built-in video camera and is described in section 6.2.

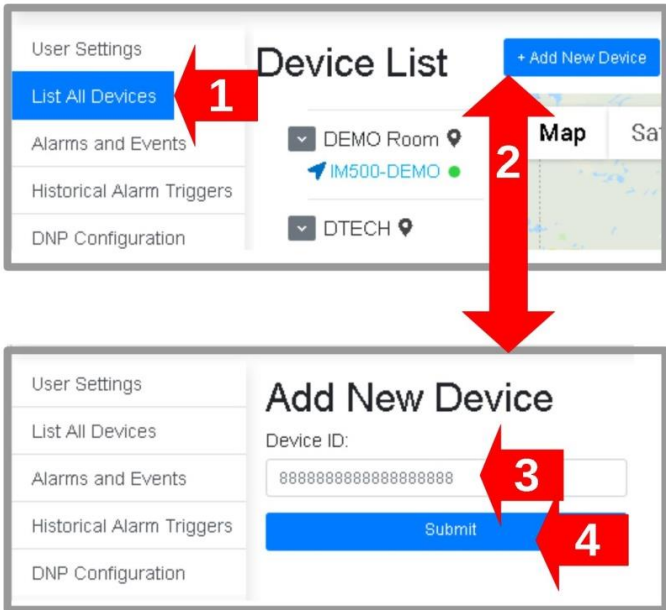

Figure 6-1 Add New Device

You must have internet access via WI-FI, Cell or Ethernet. Using your preferred web browser go to https://iot-systemswithintelligence.com/login and log-in using the Administrator credentials. Press the "List All Devices" in the menu then follow the instructions in Figure 6-1:

1. Click "List All Devices" in the menu.
2. Click the "Add New Device" button located on the top-right of the window.
3. Type the "Device ID" in the new window or copy and paste from the e-mail. This info is provided by SWI. Also, this information is on the label on the back of the device.
4. Press the "Submit" button and a confirmation message is displayed at the bottom of the page.
5. Press "List All Devices" and verify that the device is listed.

Once you complete this task the device is shown on the "List All Devices" page and you could proceed to configuration.

6.2 Add New Device via Camera Scanning

The second method to add a device is to scan the label on the unit using the built-in video camera of a smart phone or a laptop; also PC with external video camera. You could do this setup with the unit powered off. If you don't have a functioning video camera use the method in section 6.1.

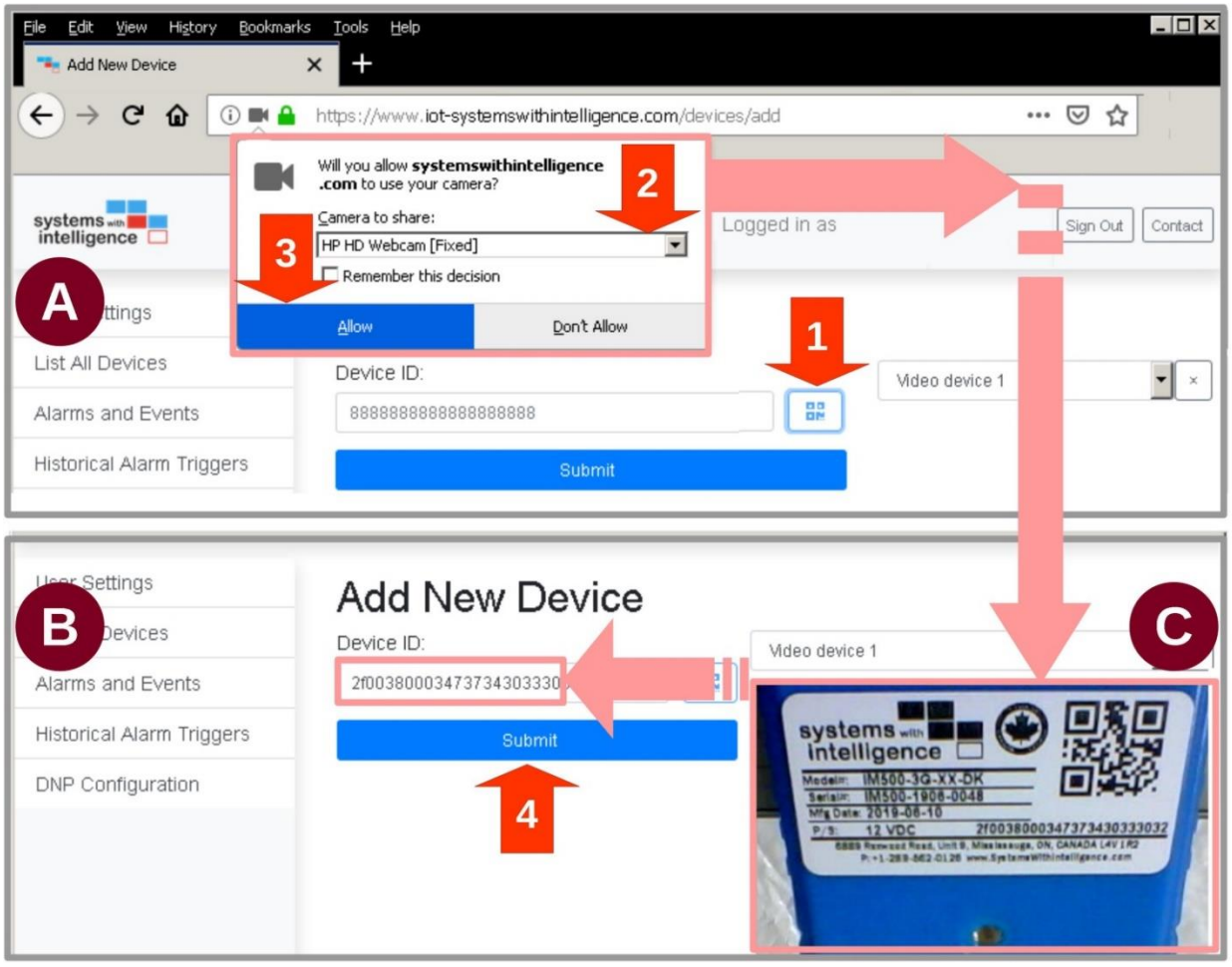

Figure 6-2 Scan New Device

You must have internet access via WI-FI, Cell or Ethernet. Using your preferred web browser go to https://iot-systemswithintelligence.com/login and log-in using the Administrator credentials. Press the "Add New Device" and the window shown in Figure 6-1 (A) will be displayed. Follow the instructions in Figure 6-2.

1. Click the icon-button to the right of the "Device ID" field and a pop-up dialog box will ask for permission to use the camera.
2. In the drop-down list select the video camera that will be used for scanning.
3. Press the "Allow" button and the pop-up dialog box will close. The video stream will be displayed at the right of the window under the "Video device 1" drop-down.

4. Place the IM500/SM500 unit with the label facing the camera and held it until the image is in focus. After a successful scan the video stream stops and the ID is placed in the "Device ID" field. Press the "Submit" button".

Once you complete this task the device is shown on the "List All Devices" page and you could proceed to configuration.

6.3 User Profile – Operator Page

You access your "User Profile" by clicking the "User Setting" button in the left menu. From this page the Operator can change password and leave the organization.

6.4 User Profile – Administrator Page

You access your "User Profile" by clicking the "User Setting" button in the left menu. As the Administrator you manage your organization accounts performing these actions:

- Add new users: Administrators and Operators.
- Promote Operators to Administrators roles.
- Delete Operators account. You cannot delete Administrators accounts.
- Monitor users.
- Change your password.
- Leave Organization (delete account).

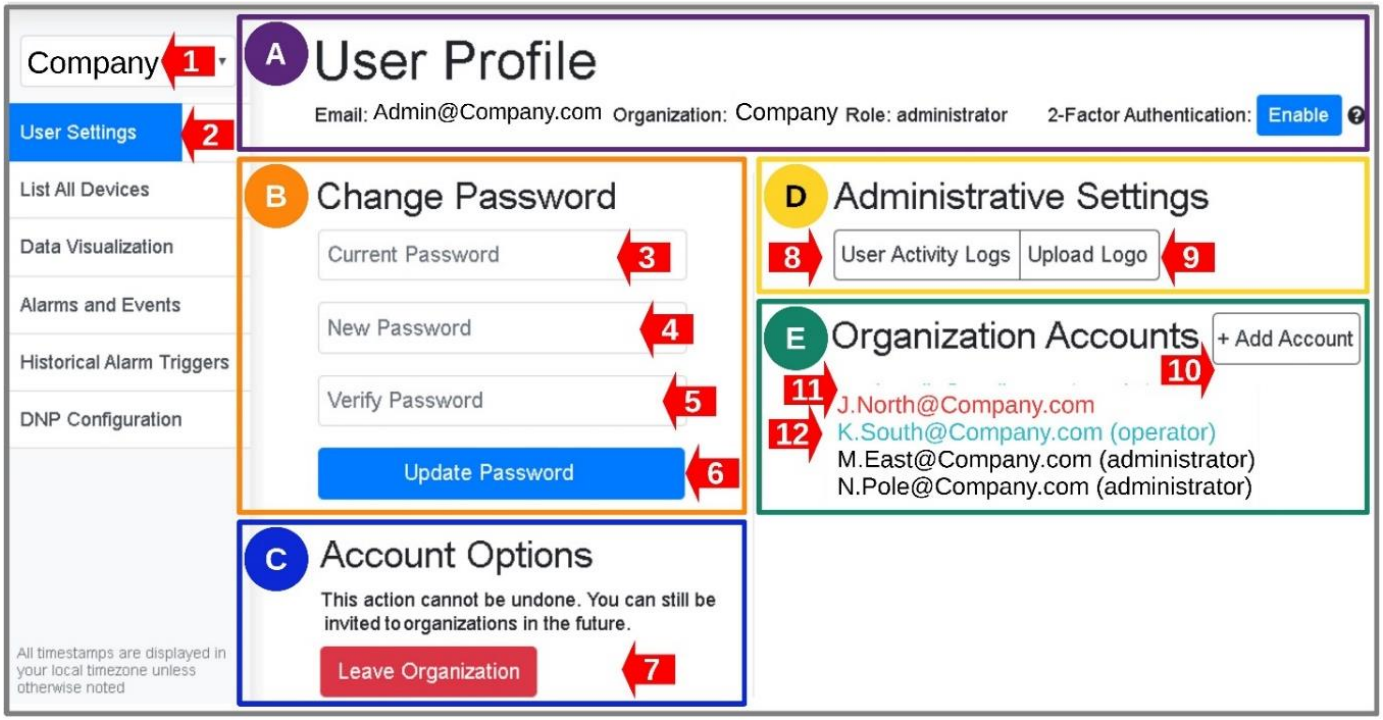

Figure 6-3 User Profile – Administrator Page

To access the Administrator settings log-in using the Administrator credentials. The "User Profile" window is shown in Figure 6-3 and these are the elements:

1. Top-left shows the name of your organization.
2. Press the "User Settings" in the left menu.
3. (B) Change password: enter your current password.
4. Type your new password.
5. Retype the new password for verification.
6. Press the "Update Password" to complete the change.
7. Press the "Leave Organization" to remove your account from this organization. Once logged out you will not be able to log-in. To get access to the Dashboard another Administrator must send you and invitations.
8. Press the "User Activity Logs" button to see user activity – details in section 6.10.
9. Press the "Upload Logo" button to change to logo – details in section 6.9.
10. Press the "Add Account" button to create new accounts – details in section 6.5.
11. Press on the account link (red) to configure or cancel invitation – details in section 6.6.
12. Press on the account link (blue) to configure permissions – details in section 6.7.

6.5 Add New Users

To perform this task, log-in using the Administrator credentials and press the "User Settings" menu. Press "Add Account" button (Figure 6-3 arrow 10) and the window shown if Figure 6-4 will be displayed.

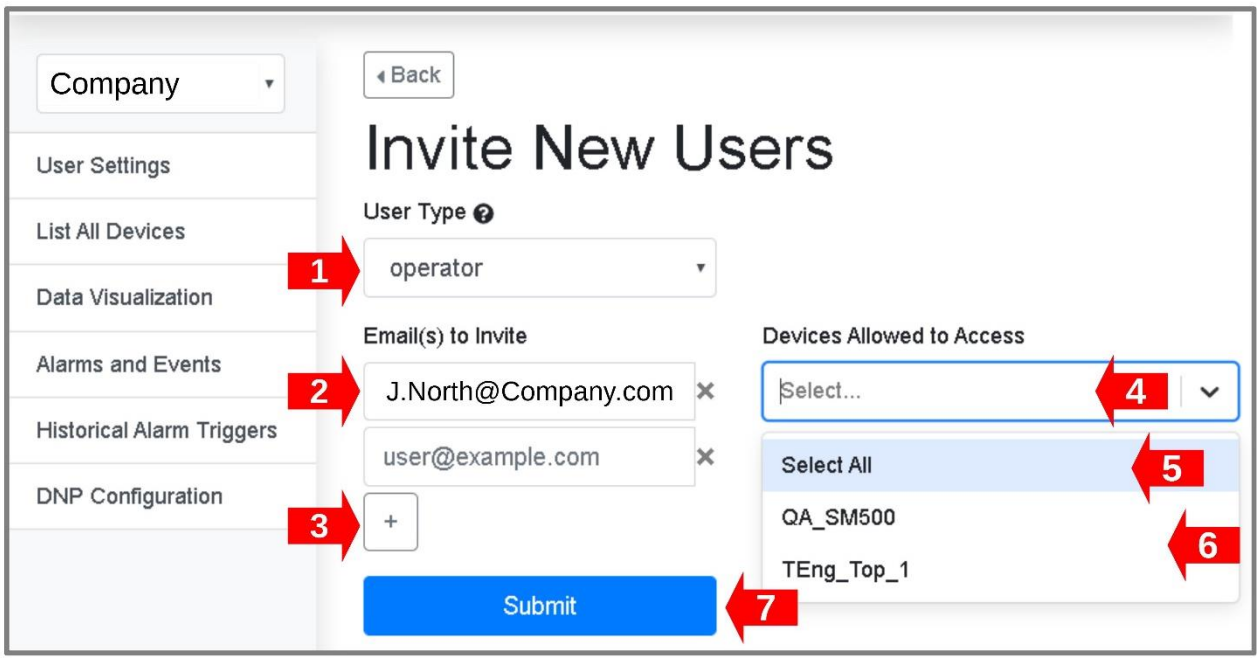

Figure 6-4 Add New Users

Instructions – follow the steps in Figure 6-4:

1. Click on the "User Type" drop-down list and select the "administrator" or "operator". Select "administrator" to add a new administrator; all units are accessible by default. Select "operator" to customize which devices are accessible. For future devices you need to update the list following the "Account Permission" described below in Figure 6-6.
2. Click in the edit box and type the user's e-mail address.
3. Press the "**+**" sign to add a new e-mail field. Repeat 2 and 3 for all new users.
4. Operator only - click on the "Devices" drop-down list to display available units.
5. Operator only - click on the "Select All" to make available all units.
6. Press the "Submit" button and an invitation is sent to these e-mail addresses. Each user will have to register following the instructions in section 5.

Note: Press the "**x**" to remove this e-mail field and no invitations is sent. An invitation can be canceled later using the instructions in section 6.6.

6.6 Pending Invitation: Update or Delete

You can delete a pending invitation before the account is created. A pending invitation is listed in red and has to user type in brackets; see Figure 6-3 arrow 11. Click on the account name (red) and the window shown in Figure 6-5 will be displayed.

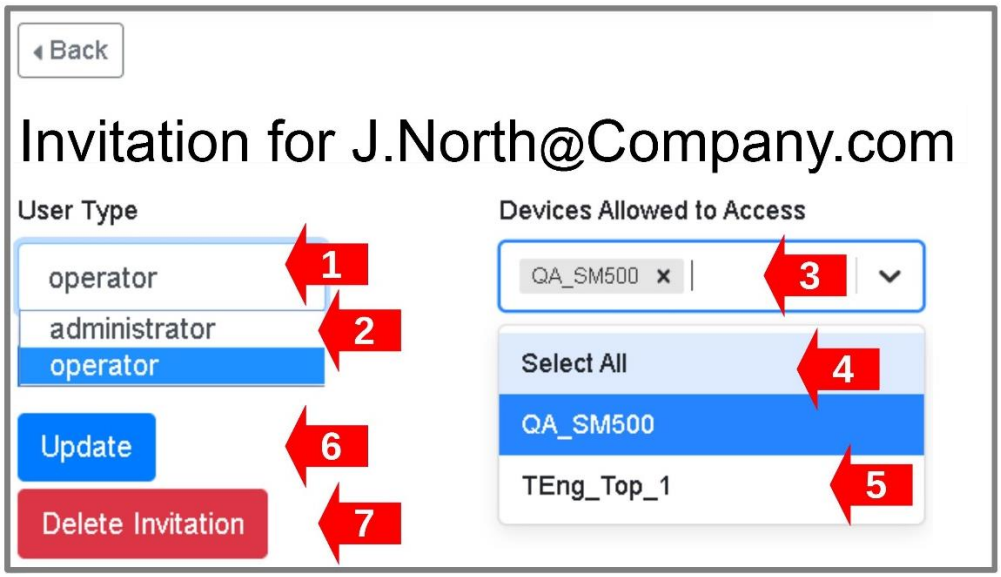

Figure 6-5 Delete Invitation

Update invitation - follow steps 1 to 6 as shown in Figure 6-5:

1. Click on the "User Type" drop-down list if you want to change the account type.
2. Select "administrator" if you want to upgrade from "operator" or vice-versa.
3. "Operator" only – click on the "Device" drop-down list to see the units available.
4. "Operator" only – click on the "Select All" for full access.
5. "Operator" only – click on individual units to select from the list.
6. Press the "Update" button for the new settings to take effect.

Delete invitation - Figure 6-5 (arrow 7) press the "Delete Invitation" button to cancel the creation of the account.

Press the "Back" button to return to "User Settings" page.

6.7 Operator Account Management

The "operator" type is listed in brackets after each account in blue; see Figure 6-3 arrow 12. Click on the account name (blue) and the window shown in Figure 6-6 is displayed. On this page you can configure access permissions, delete the user or promote to administrator.

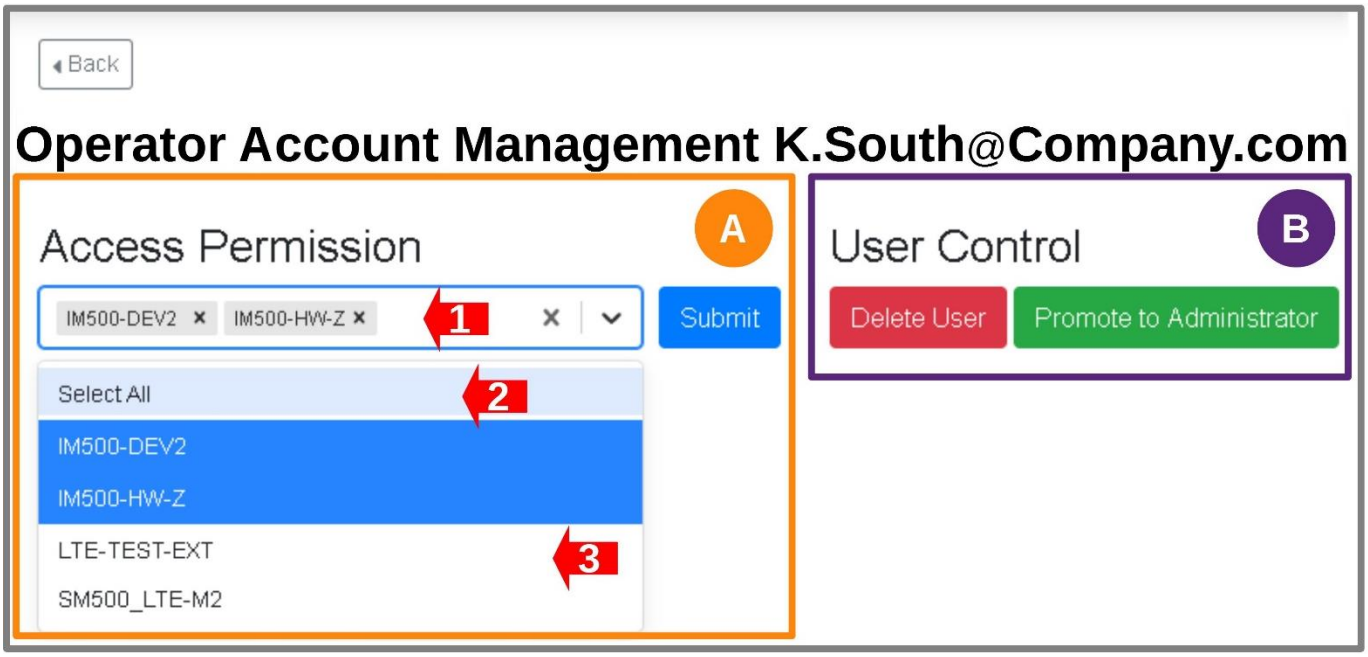

Figure 6-6 Configure Operator Account Permission

6.7.1 Configure Access Permission

Select the use and follow the instructions in Figure 6-6, Area A:

1. Click on the "Access Permission" drop-down list to view the available devices.
2. Click on the "Select All" to grant full access to this user.
3. Optional – click on each individual unit to grant selective access.
4. Press the "Submit" button to update the user's account.
5. Press the "Back" button to return to "Users Settings" window.

6.7.2 Delete User or Promote to Administrator

Please note that the following operations cannot be undone. In Figure 6-6 Area B, there are two special functions:

- "Delete User" - press this button to remove this account.
- "Promote to Administrator"- press this button to grant administrator rights to this account.

6.8 Accept Invitation

This is a rare situation: you have your own organization and get invited into another organization. E.g. you belong to the electric utility which shares a yard with the water utility that has its own organization. In Figure 6-7 is shown the Administrator's page and where the pending invitation is located. Click "Accept" button to be part of the organization listed to the right (arrow 2). Click the "Reject" button to deny the invitation.

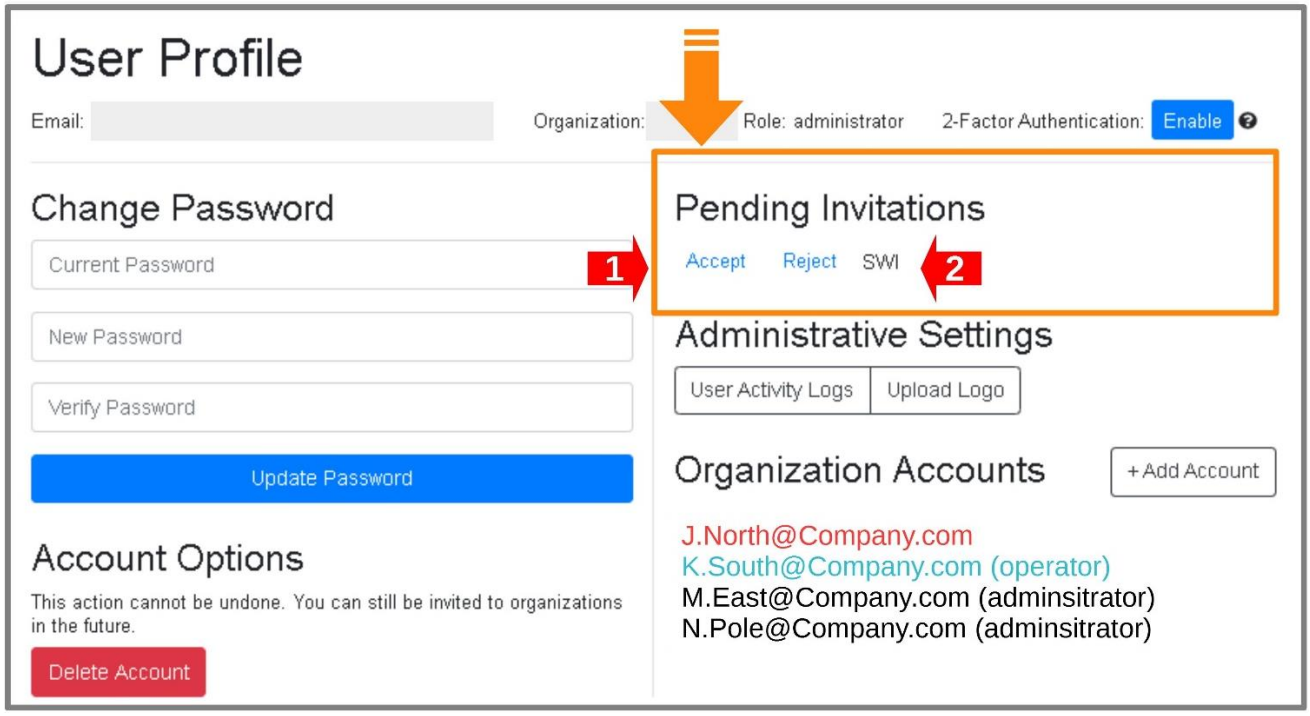

Figure 6-7 Accept Invitation

6.9 User Activity Logs

As Administrator you can view Dashboard activities of all users. Log-in using the Administrator credentials, click on the "User Settings" menu and then click the "User Activity Logs" button located at the bottom of the page (Figure 6-3 Area D). The window shown in Figure 6-8 will be displayed.

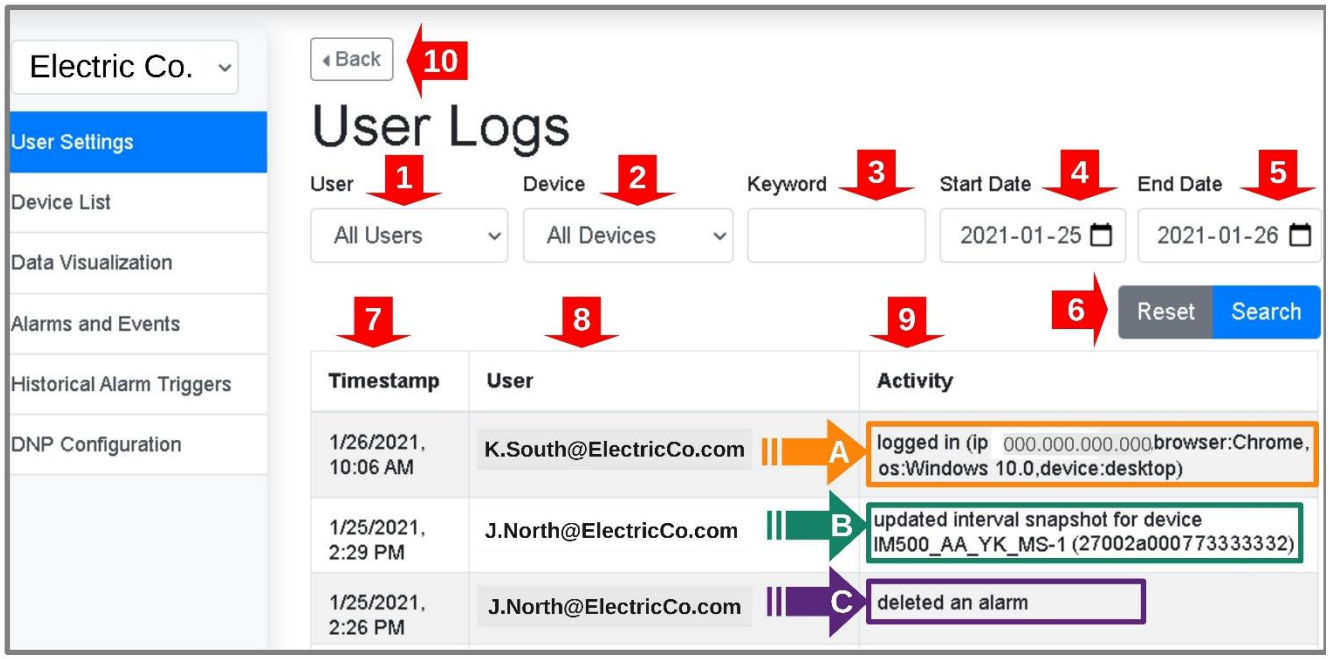

Figure 6-8 View User Activities

Navigation: see Figure 6-8. Optional: follow steps 1 to 6 to perform an advanced search.

1. Select a specific "User"; default: "All Users".
2. Select a specific "Device"; default: "All Devices".
3. Enter a Keyword to search in the log.
4. Start Date – default: today.
5. End Date – default: yesterday.
6. Press the "Search" button to display the results. Press the "Reset" button to return to default values.
7. Timestamp when the event occurred.
8. User - identifies the user by the e-mail address.
9. Activity – displays details of the specific activity. Typical activities include:
    A. Logged in/ out.
    B. Update settings.
    C. Delete alarms.
10. Press the "Back" button to return to main window.

6.10 Set Logo

This section is optional. Here you will learn how to customize the Dashboard by loading your company logo on the top-left of the web page.

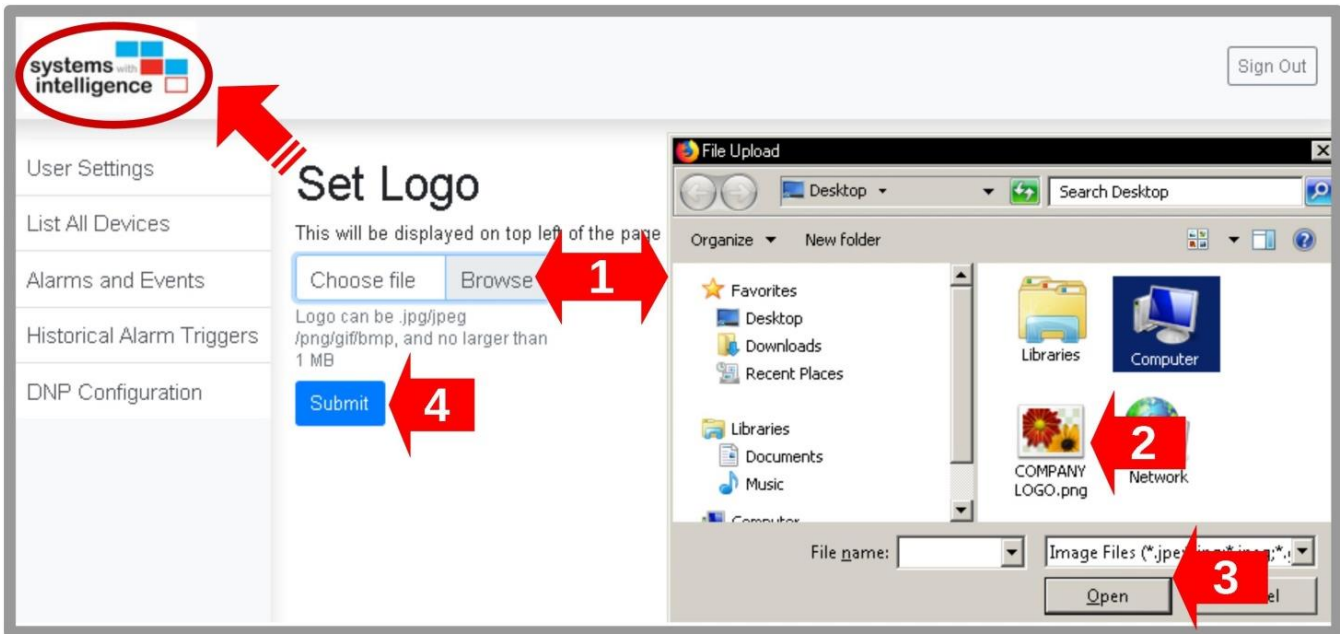

Figure 6-9 Set Logo

Log-in as Administrator, click on the "User Settings" in the left-menu and click the "Set Logo" button at the bottom of the page and the window shown in Figure 6-9 will be displayed. Follow the instructions in Figure 6-9:

1. Click on the "Browse" button and the explorer dialog box will open. You have to browse to the location of the file.
2. Select the "Company Logo.png" file. The picture must no larger than 1 Mbyte and be in format jpg, jpeg, png or bmp.
3. Press the "Open" button and you the dialog box will close.
4. Press the "Submit" button and the web page will update.

6.11 Enable 2-Factor Authentication

The single factor of authentication is your password and used in conjunction with your username to log-in and access the Dashboard. Two-factor authentication (2FA) adds an extra step to your basic log-in procedure. The second factor makes your account more secure by requiring you to enter an access code that is e-mailed to you.

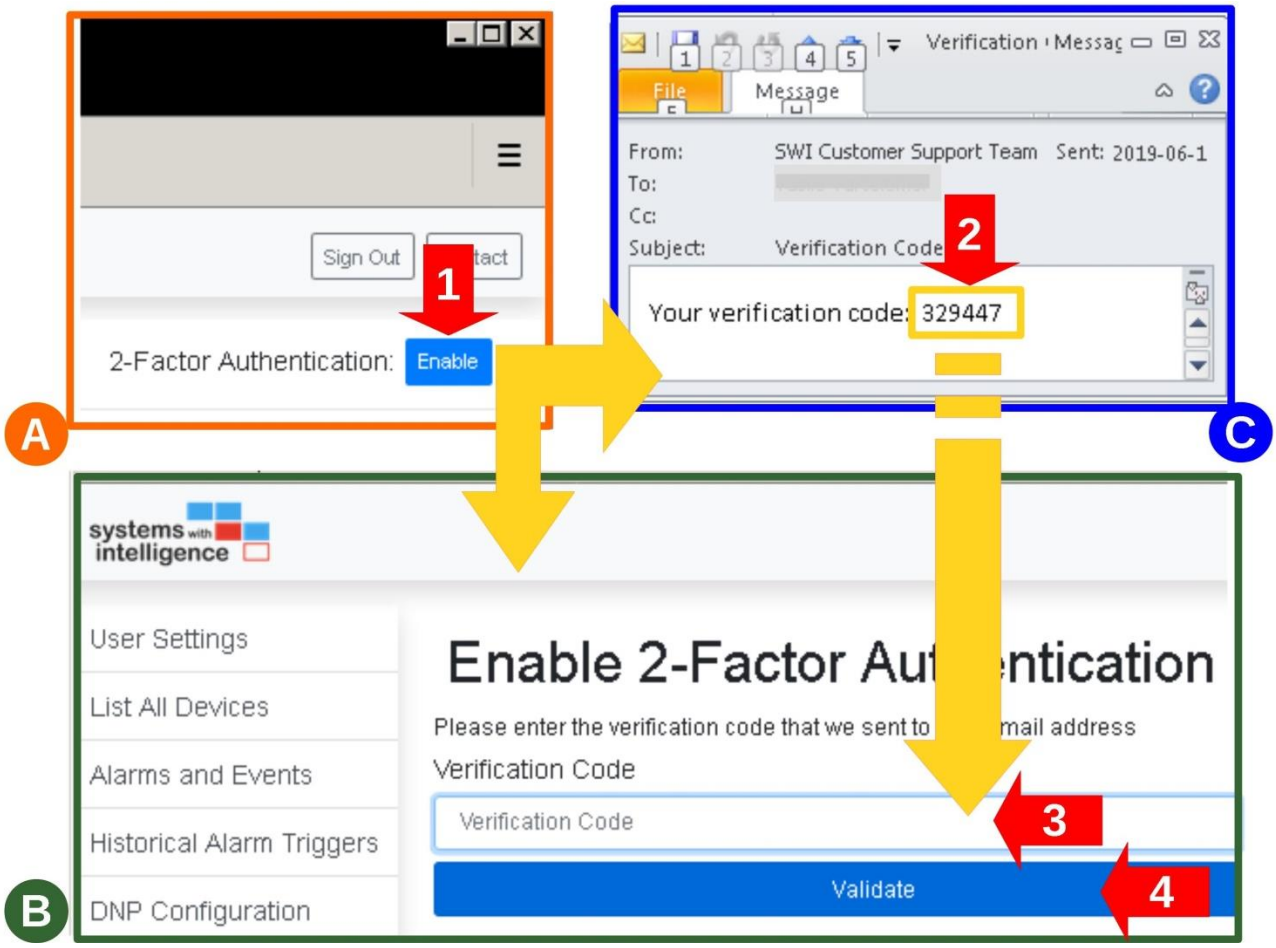

Figure 6-10 Enable 2-Factor Authentication

Follow the instructions in Figure 6-10 to enable this feature:

1. Click the "Enable" button on the top right of the window.
2. A verification code is sent to your e-mail. You will receive a new code for each new log-in.
3. Enter the "Verification Code".
4. Press the "Validate" button.

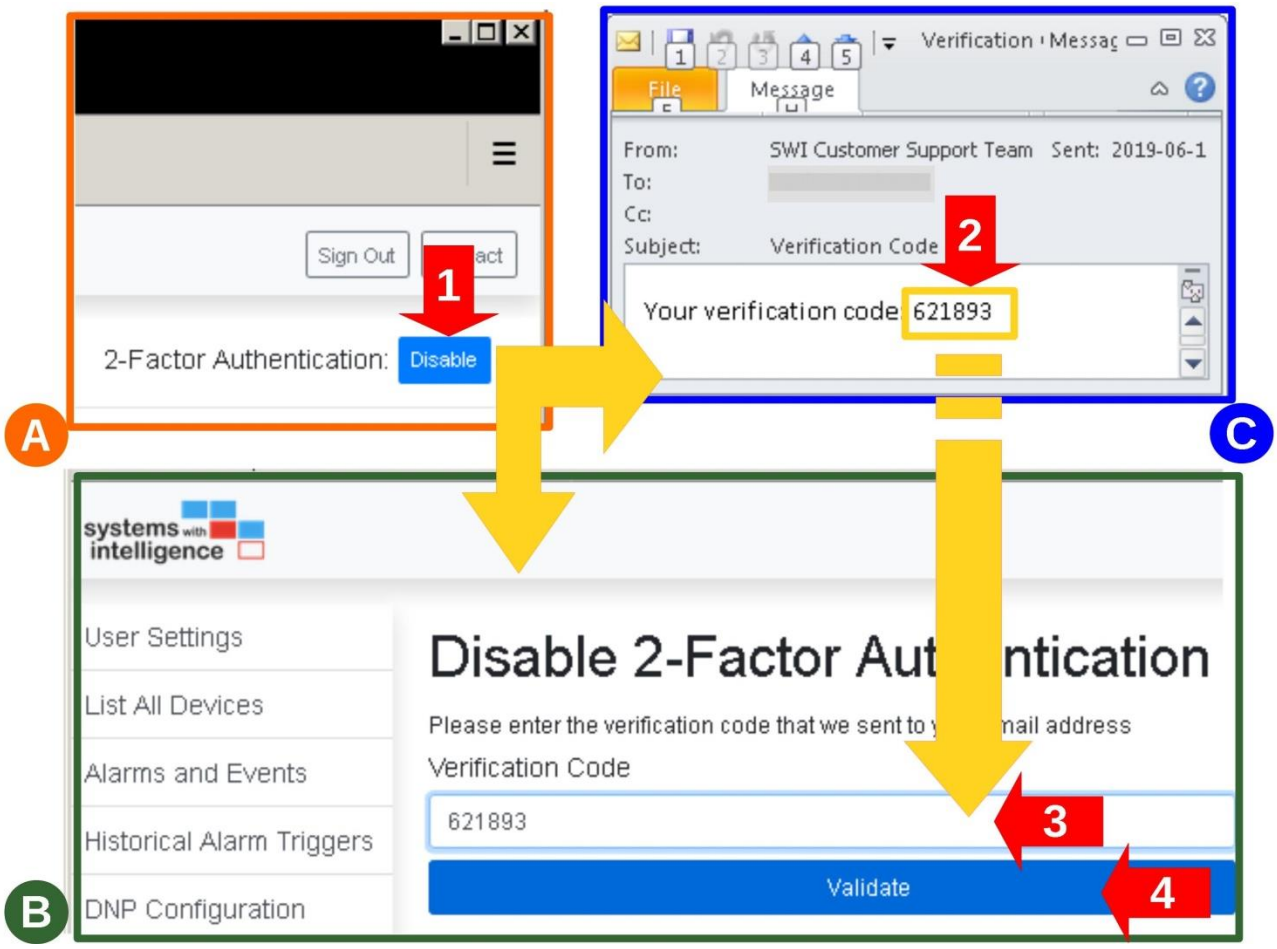

Figure 6-11 Disable 2-Factor Authentication

Follow the instructions in Figure 6-11 to disable this feature:

1. Click the "Disable" button on the top right of the window.
2. A verification code is sent to your e-mail.
3. Enter the "Verification Code" in the "Disable 2-Factor" window.
4. Press the "Validate" button. From this moment on only the password is required for log-in.

6.12 Contact Us

For a quick and convenient way to send us a message use the "Contact Us" button on the top right of the window. Fill in the form displayed in Figure 6-12:

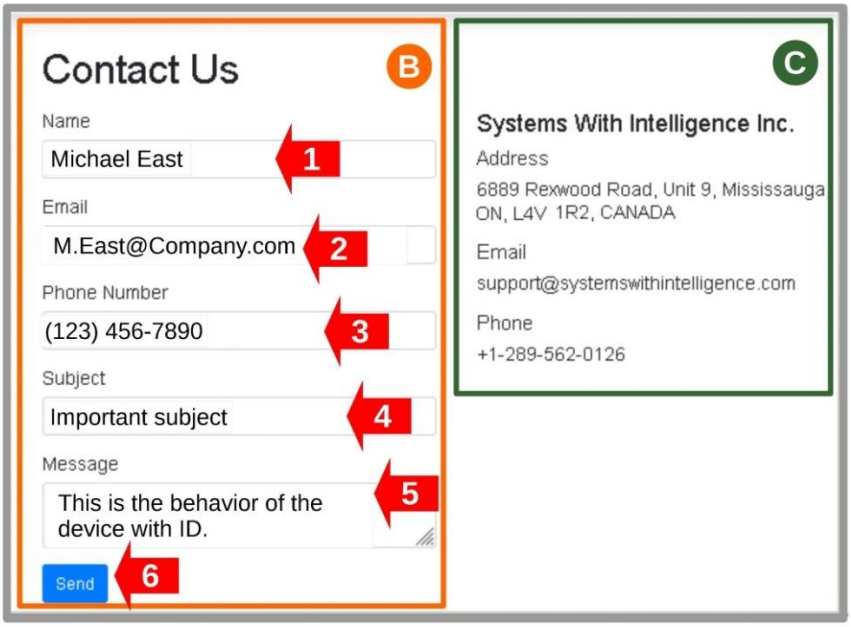

Figure 6-12 Contact Us

6.13 Snapshot Limit Alert

In Figure 6-13 is shown an e-mail where the 80% limit was reached. It is important to note that by default each device has a data limit of 62 snapshots per month; you could increase this number by upgrading your data package. You are notified by e-mail when you reach a configurable usage warning threshold (75%-95%) - see Figure 8-1. Also, you will receive an e-mail when the 100% limit is reached (Figure 6-14). The current usage is displayed on the Dashboard and described in Section 7.3. The temperature measurements and alarm monitoring will continue to operate but no snapshots will be recorded.

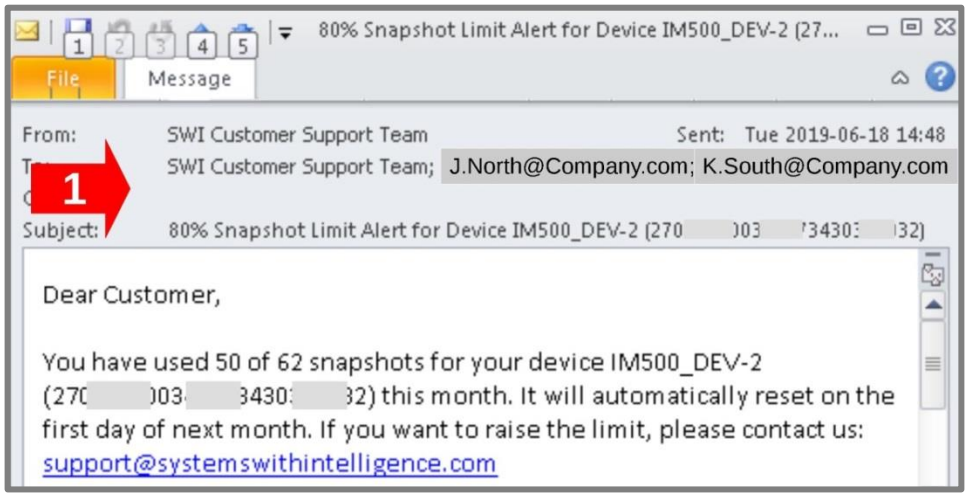

Figure 6-13 Snapshot Limit Alert

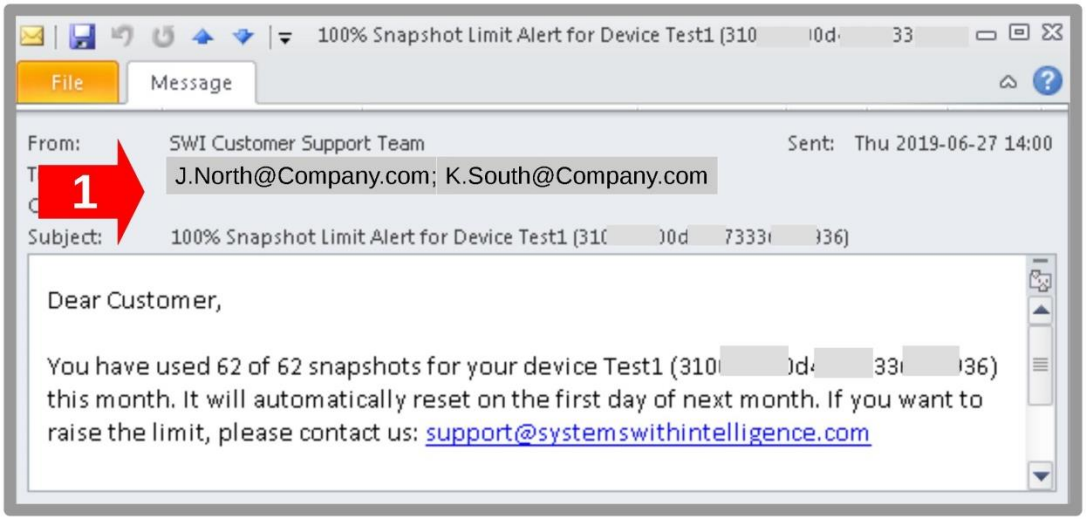

Figure 6-14 Snapshot Limit Reached

6.14 Notifications of Organization Change

All administrators receive e-mail notifications if a user is leaving or if a new user is joining your organization (see Figure 6-15).

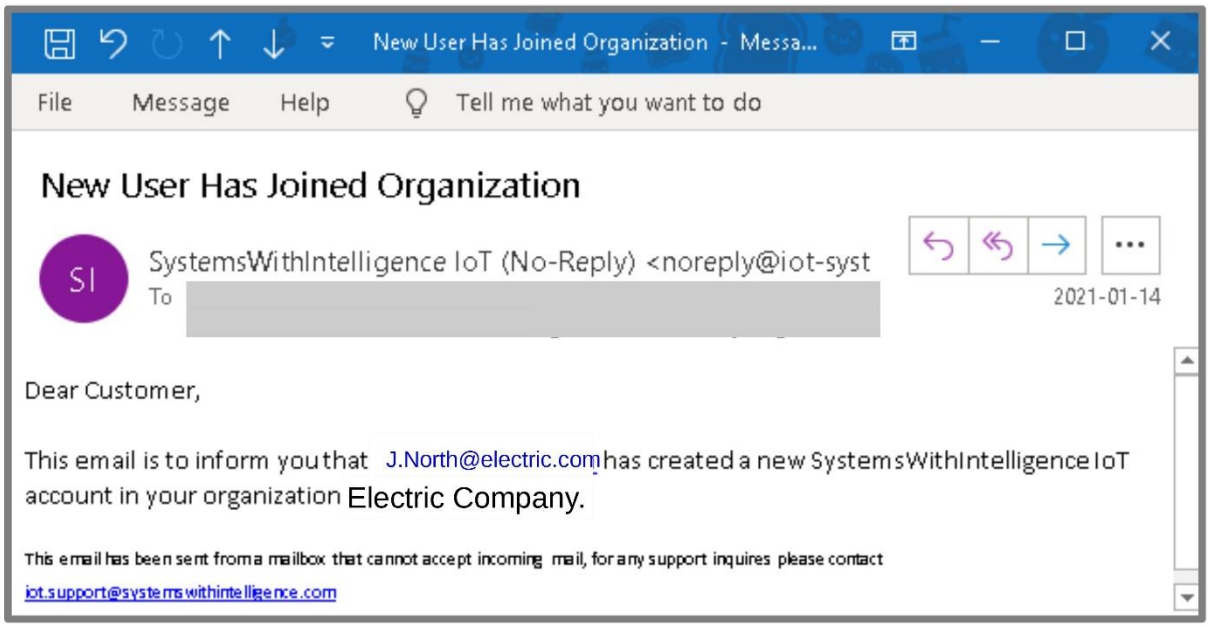

Figure 6-15 Organization change notification

7 Everyday operation

In this section you will learn how to quickly view data, measurements and alarms using the Dashboard interface. It is recommended that you log in as Operator when performing daily tasks.

7.1 Log-in

To access the data open in your browser https://www.iot-systemswithintelligence.com. A Log-in page will be displayed – see Figure 7-1. You fill in the information for your Operator account and have the option to allow the browser to save your credentials and have a quick log-in next time. A successful log-in will open the main page shown in Figure 7-2.

Best practice: Is good practice to use Operator credentials for day-to-day operations even if you are an Administrator.

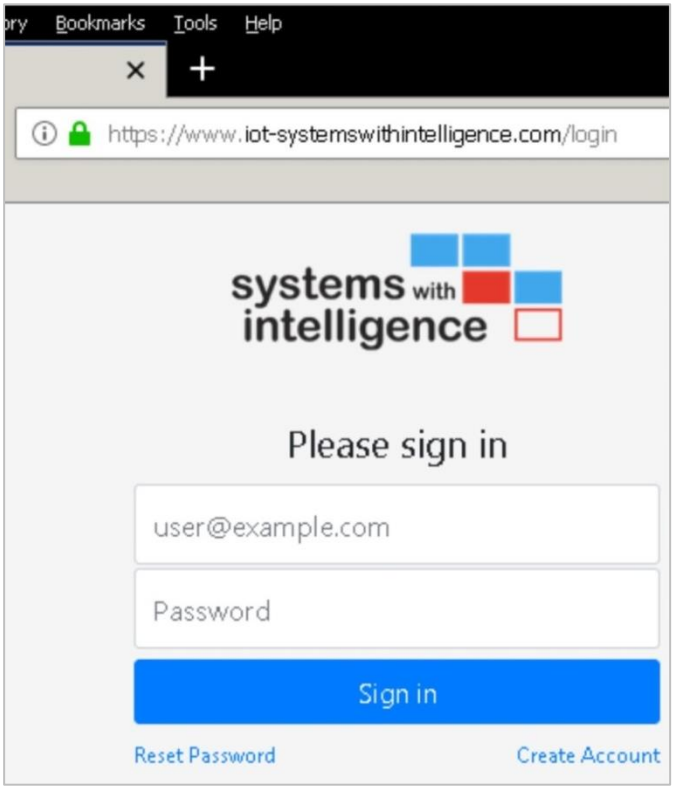

Figure 7-1 Log-in

7.2 List All Devices - Main Page

The "Device List" shown in Figure 7-2 is the main page displayed. It is divided in three areas based on functionality:

A. The **Menu** is located on the left side of the page (Area A) and it is used for quick access to configuration and events history.
B. The **Device List** is in the center (Area B) and lists all the units that are configured.
C. The **Map** is located to the right of the page (Area C) and presents the locations of all configured devices. Click on the "+"/"-" buttons (arrow 4) to zoom in or out.

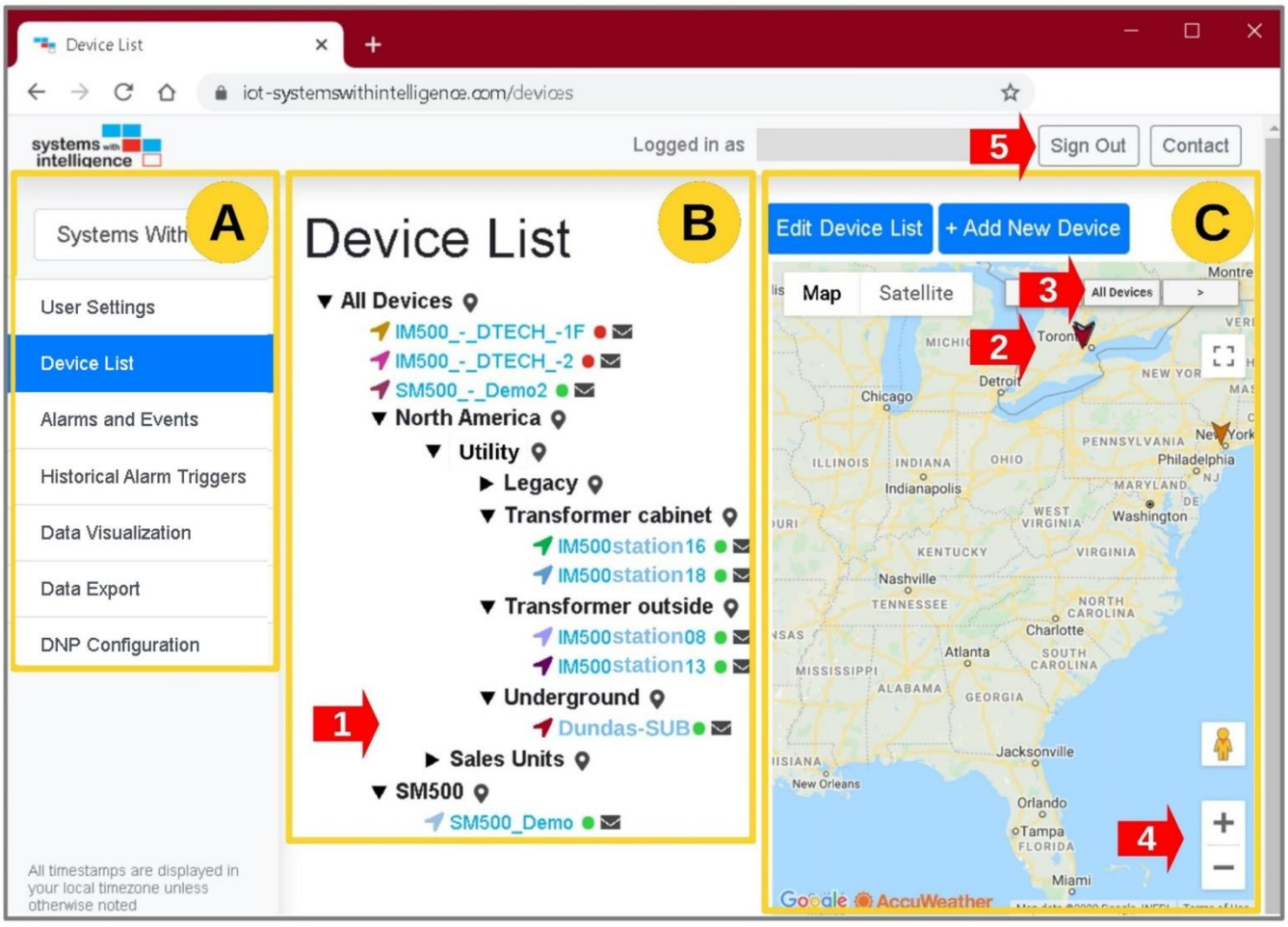

Figure 7-2 List All Devices

There are three ways to navigate to display the **Device Page** (Figure 7-4) of a specific unit:

1. Click on the name in the list or use step 2 and 3.
2. Click on the map the triangle that points the location of the device. Use the +/- to zoom in and select if there are more than one in the same location or use step 1 and 3.
3. Click on the "All Devices" button to zoom out and show all units. Use the "<" and ">" to circle until you find the specific unit to display. Pressing "All Devices" zooms out the map and displays all units.

7.3 Unit status

The Dashboard allows you to quickly know the status of all devices by inspecting the color of the circle located at the right of the unit's name. To obtain more details place the mouse over the envelope or circle as shown in Figure 7-3. Legend:

1. **Green** – indicates that the unit is online. E.g. "Last comm: 31 minutes ago"
2. **Red** –indicates that unit is offline. E.g. "Last comm: a day ago"
3. **Black** – indicates the unit was registered and never sent any message. E.g. "Last comm: Not known".

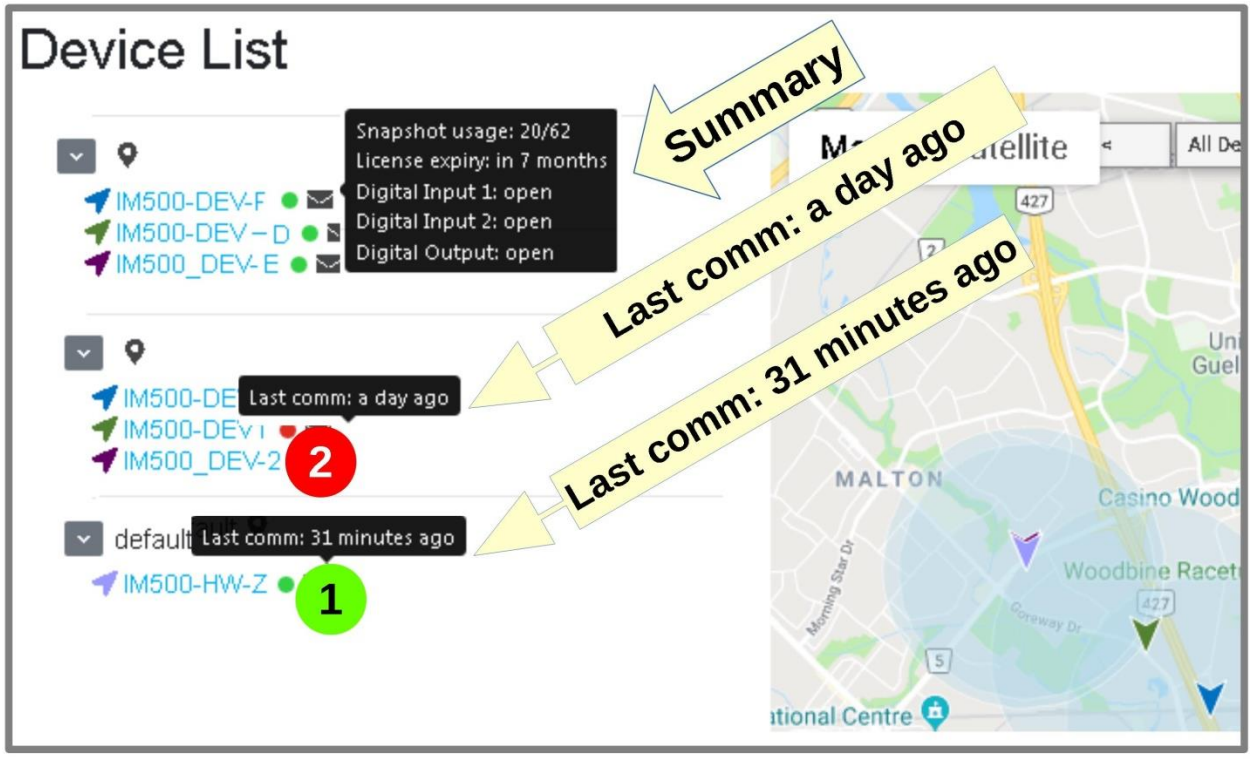

Figure 7-3 Unit Status

The **Summary** will turn red when there is an active alarm (closed digital input or output), license expiry soon (within 3), or the snapshots limit is reached.

7.4 Device Page

This "Device Page" shown in Figure 7-4 displays all the information pertaining to selected unit. The page is divided in in four functional areas:

A. Area A – Title, quota and setup buttons.
B. Area B – Historical data graphed and customization controls.
C. Area C – The latest snapshots; detailed description in section 7.5.4 and 7.5.5.
D. Area D – The latest temperature measurements and status of the Digital Input/output – see section 7.7.

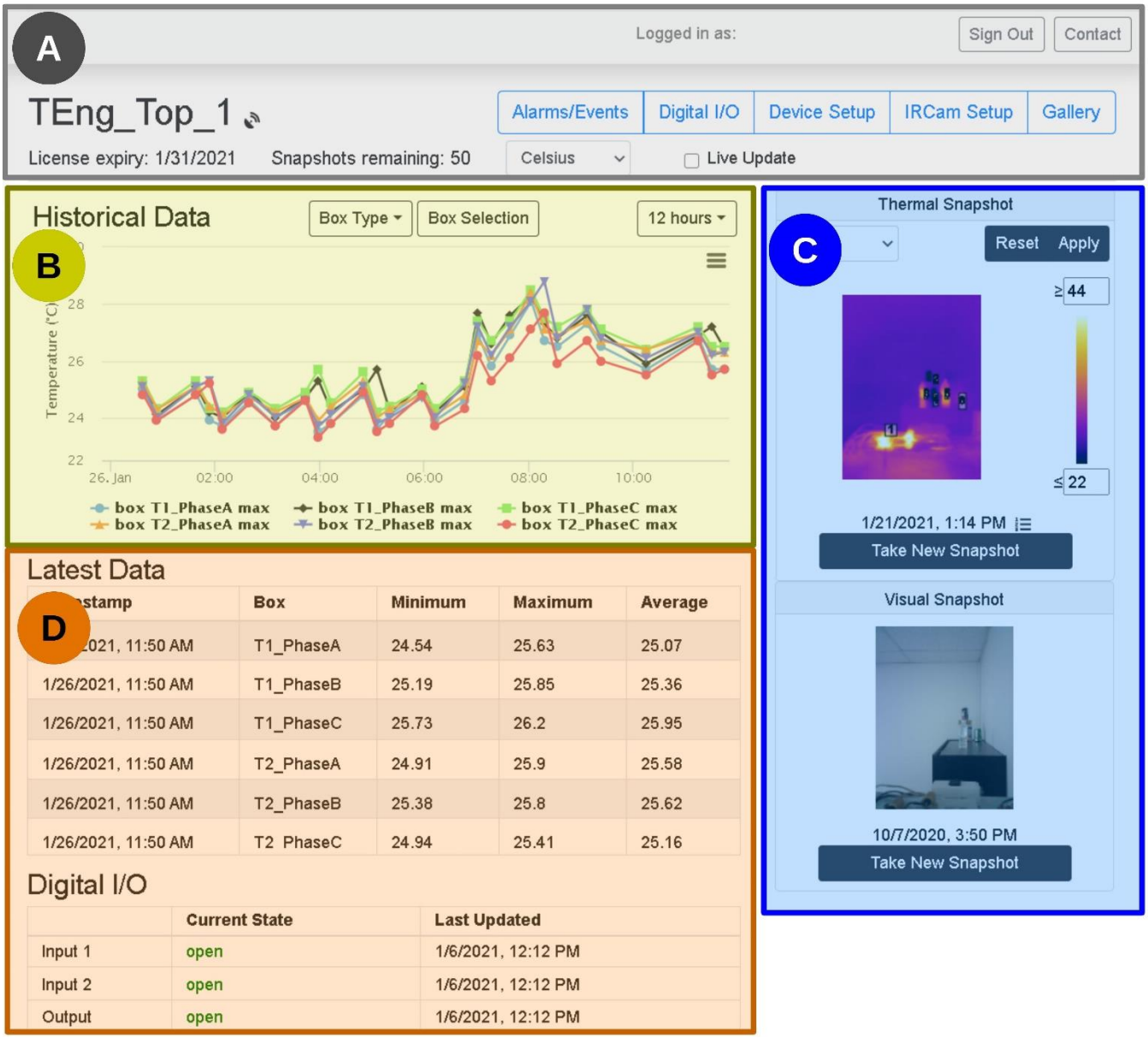

Figure 7-4 Device Page

7.5 Title, quota and setup buttons

Figure 7-5 legend:

1. The name of the unit - see section 8.1 for configuration.
2. The ping icon – see section 7.5.1 for instructions.
3. Quota – number of snapshots left.
4. Alarms/Events – see section 8.5 for detailed description.
5. Digital I/O – see section 7.7 for detailed description.
6. Device Setup – see section 8.1 for configuration.
7. IRCam Setup – see section 8.2 for configuration.
8. Gallery – see section 7.8.
9. Sign Out – press this button to log out of the Dashboard.
10. Select the measuring unit: Celsius or Fahrenheit.
11. Check the "Live Update" box to receive data from the site continuously, according to the polling interval and update time.

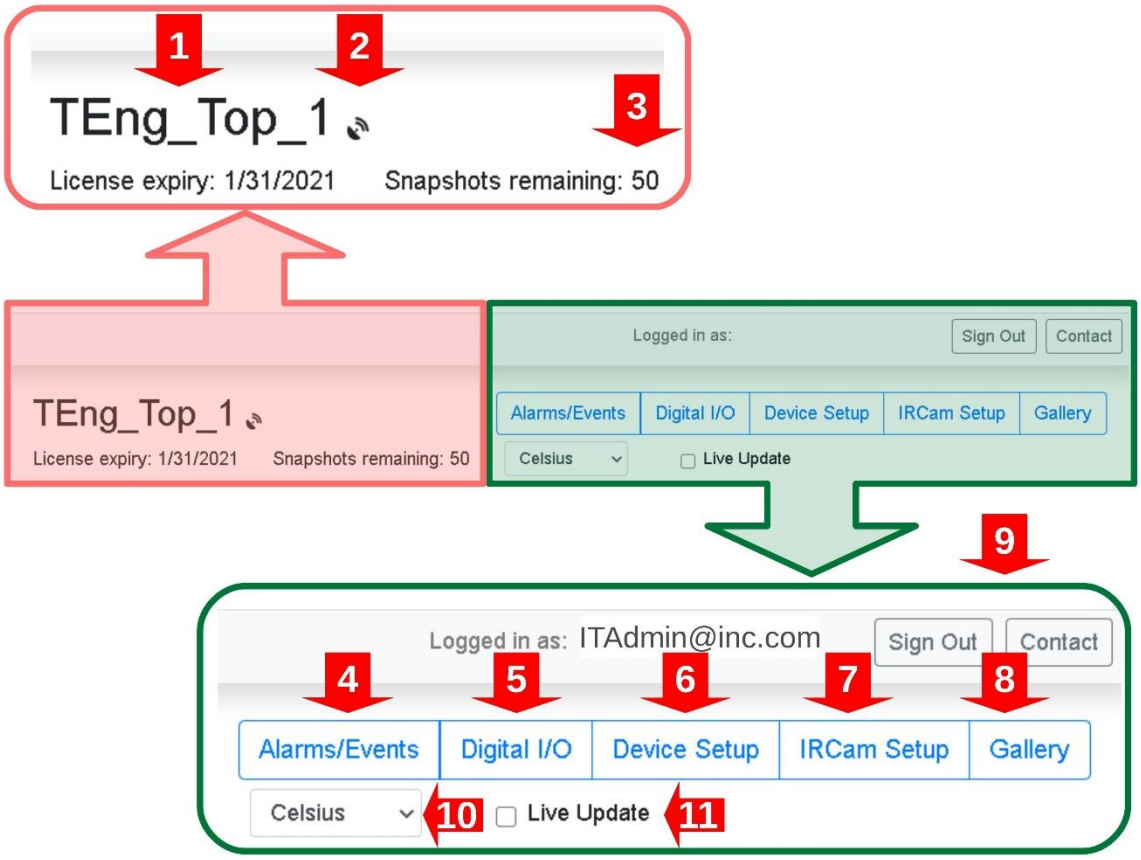

Figure 7-5 Title and Setup Buttons

7.5.1 Device Status - Ping Device

The Dashboard gives you the ability to check the status of the IM500 unit. In the "Device Page" click the ping icon located at the right of the name of the unit – arrow 1 in Figure 7-6.

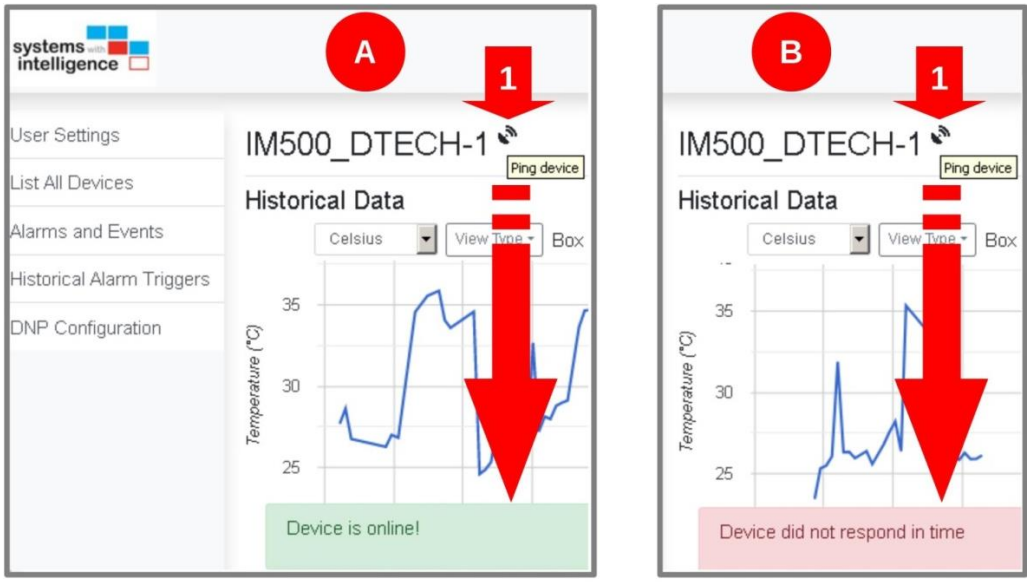

Figure 7-6 Ping device

Possible replies:

A. The "Device is online!" message is displayed at the bottom of the page after 5-15 seconds - Figure 7-6 A (left).
B. The "Device did not respond in time" message is displayed at the bottom of the page after 30 seconds - Figure 7-6 B (right).

7.5.2 Historical data

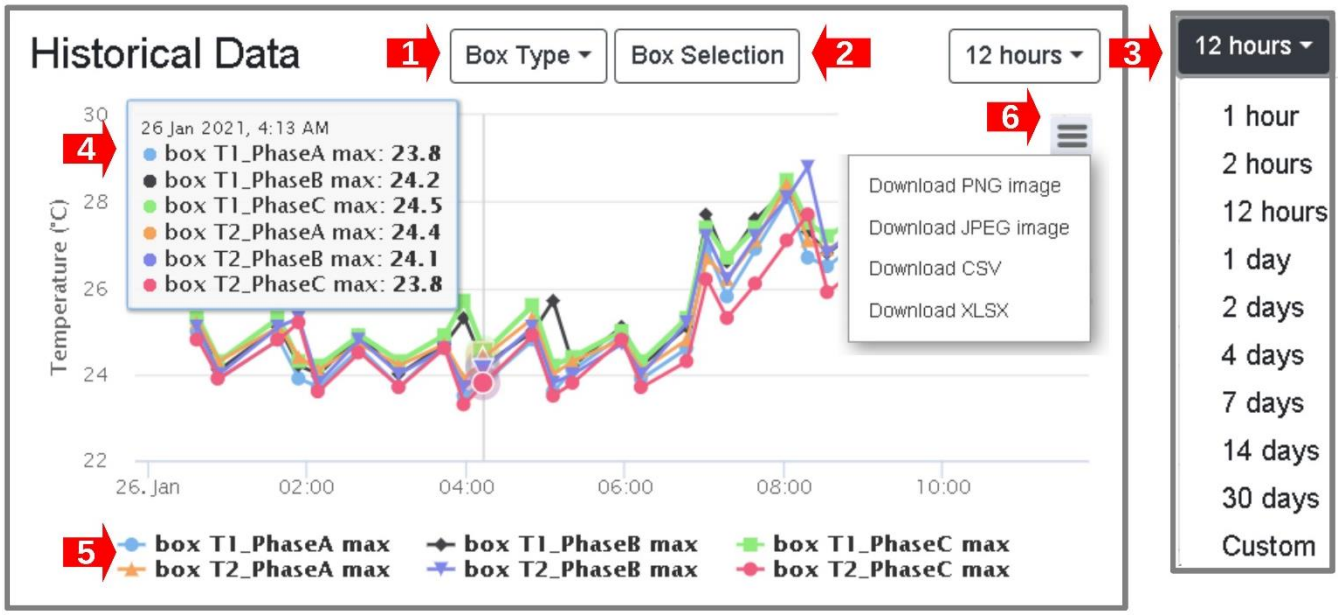

Figure 7-7 Graphed Data

The graphed historical data (Area B - Figure 7-4) is shown in Figure 7-7 and contains the controls to customize the view:

1. Select what measurements to be displayed in the graph: Minimum, Maximum and Average. You can select all or any combination.
2. Click the "Box Selection" and select boxes to be displayed, follow 7.5.3.
3. Select the time frame of historical data that will be displayed – 12 hours is the default. Selections available: 1h, 2h, 12h, 1 day, 2 days, 4 days, 7 days, 14 days, 30 days or custom (select start and end date).
4. Tthe mobile details box is displayed when the mouse is placed over the graph.
5. Legend of the measurements.
6. The "Menu**"** button allows you to save the data on the local PC/Laptop. There are two main options:
   a) Download image in PNG or JPEG format.
   b) Download the data in CSV or XLXS format. Press the "Download CSV" button and the "Save File" dialog box will open – see Figure 7-8. Click the "Save File" box and click OK. Browse to the folder where to save the file and click OK.

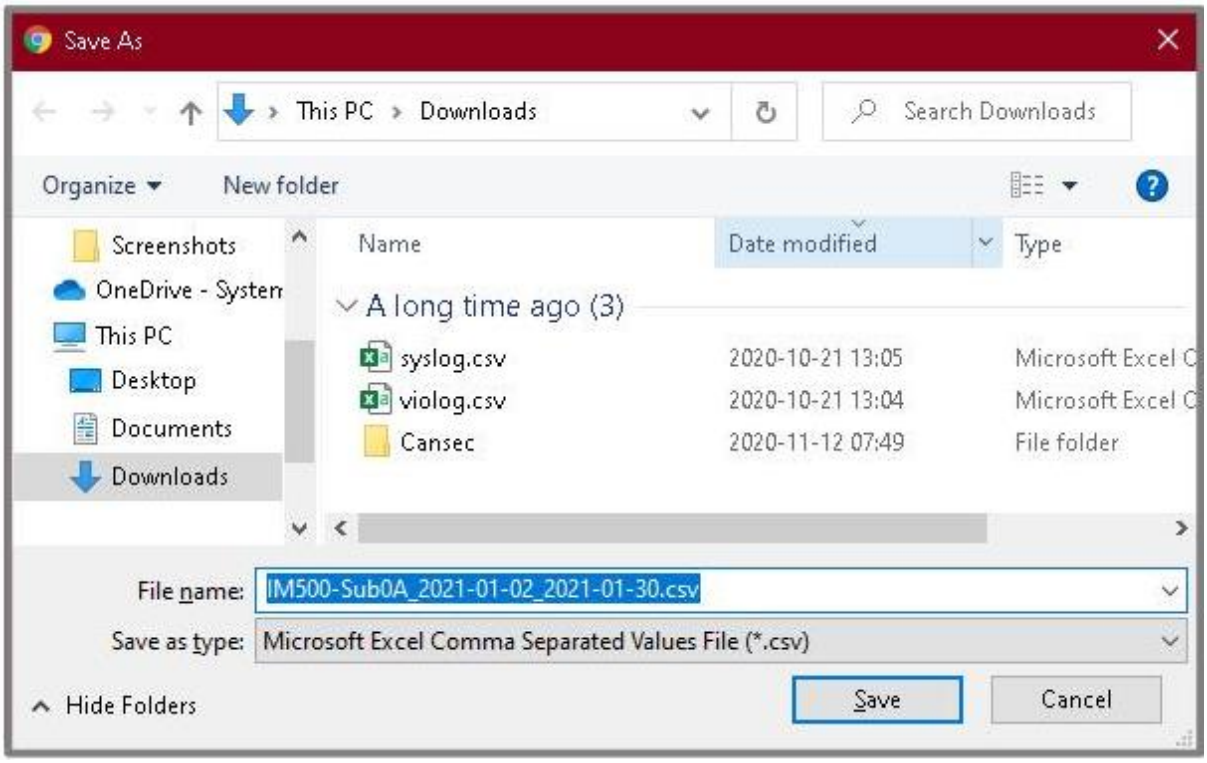

Figure 7-8 Export Data

The file is saved as text in a format commonly known as CSV – Comma Separated Values. To view the file you can use a Text Editor (Notepad) or a Spreadsheet Editor (Excel).

```
"Feb 26, 2019, 1:27:35 PM",-10.48,-2.09,-6.24,-10.61,-1.08,-5.55,-9.88,-1.41,-4.6,-3.08,9.32,6.15,-
"Feb 26, 2019, 1:32:36 PM",-10.31,-2.87,-6.57,-10.05,-2.03,-5.76,-9.42,-2.39,-5.1,-3.14,8.69,5.54,-
"Feb 26, 2019, 1:37:34 PM",-12.48,-3.11,-7.58,-11.56,-2.48,-6.53,-10.95,-2.75,-5.59,-2.87,8.55,5.4,-
"Feb 26, 2019, 1:42:36 PM",-15.66,-4.64,-9.72,-16.35,-3.94,-8.74,-15.63,-4.7,-8.32,-4.34,6.55,3.48,-
"Feb 26, 2019, 1:47:34 PM",-20.98,-4.95,-12.39,-19.95,-4.15,-10.47,-18.55,-4.89,-9.5,-4.64,6.36,3.08,-
```

Figure 7-9 CSV Data

7.5.3 Graph temperature difference

It is possible to view a graphic form the temperature difference between two boxes. Click on the "Box Selection" Figure 7-7 arrow 3 and follow instructions in Figure 7-10:

Figure 7-10 Box Selection: Comparison

1. Click on the "Box Comparison".
2. Select the first box in the drop-down list.
3. Select the second box in the drop-down list.
4. Click the "**+**" to graph the difference between other pair of boxes.
5. Click the "**X**" to remove this line.
6. Click the "Save" button and dialog box will close and the graph will be similar to the one shown in Figure 7-11.

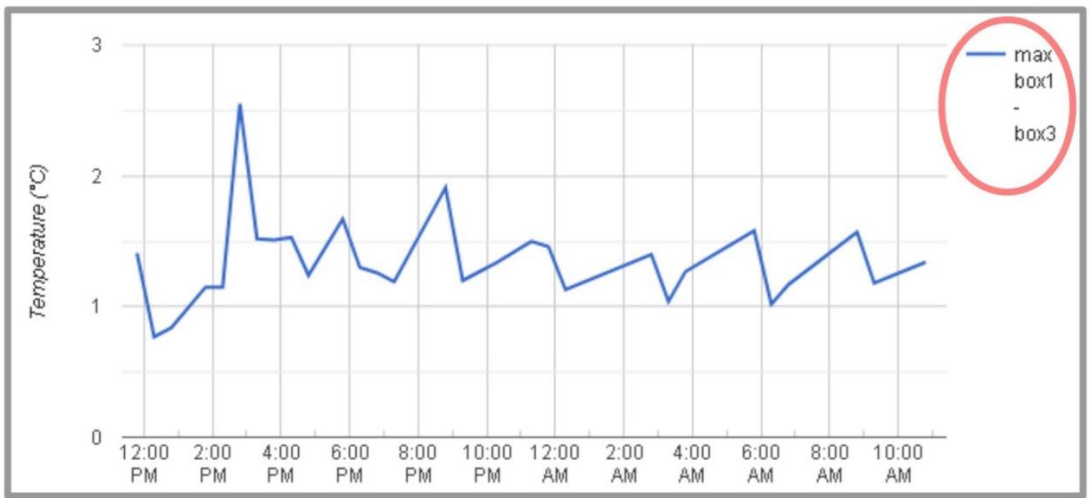

Figure 7-11 Temperature Comparison

To return to temperature viewing, click on the "Box Selection" Figure 7-7 arrow 3 and follow instructions in Figure 7-12.

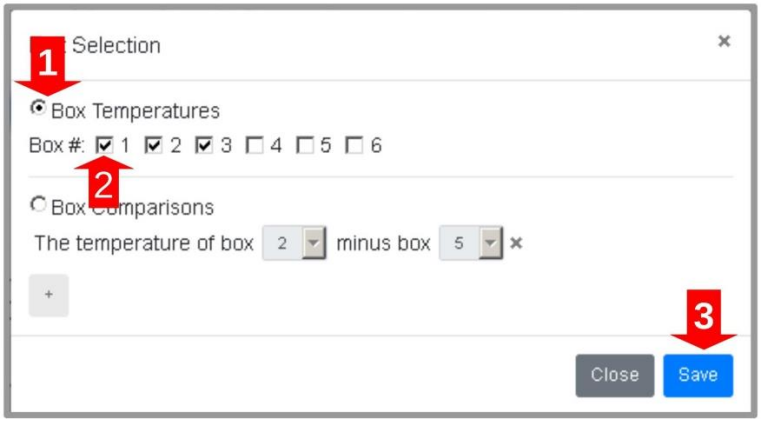

Figure 7-12 Box Selection: Temperature

7.5.4 Thermal Snapshot

The **Thermal Snapshot** shown in Figure 7-13 displays the last captured image received. The snapshot contains thermal measurements that can be displayed by placing the mouse on top of the desired point on the image (arrow 2). The buttons on the top-right (arrows 3-7) are displayed only when the mouse cursor is above the image.

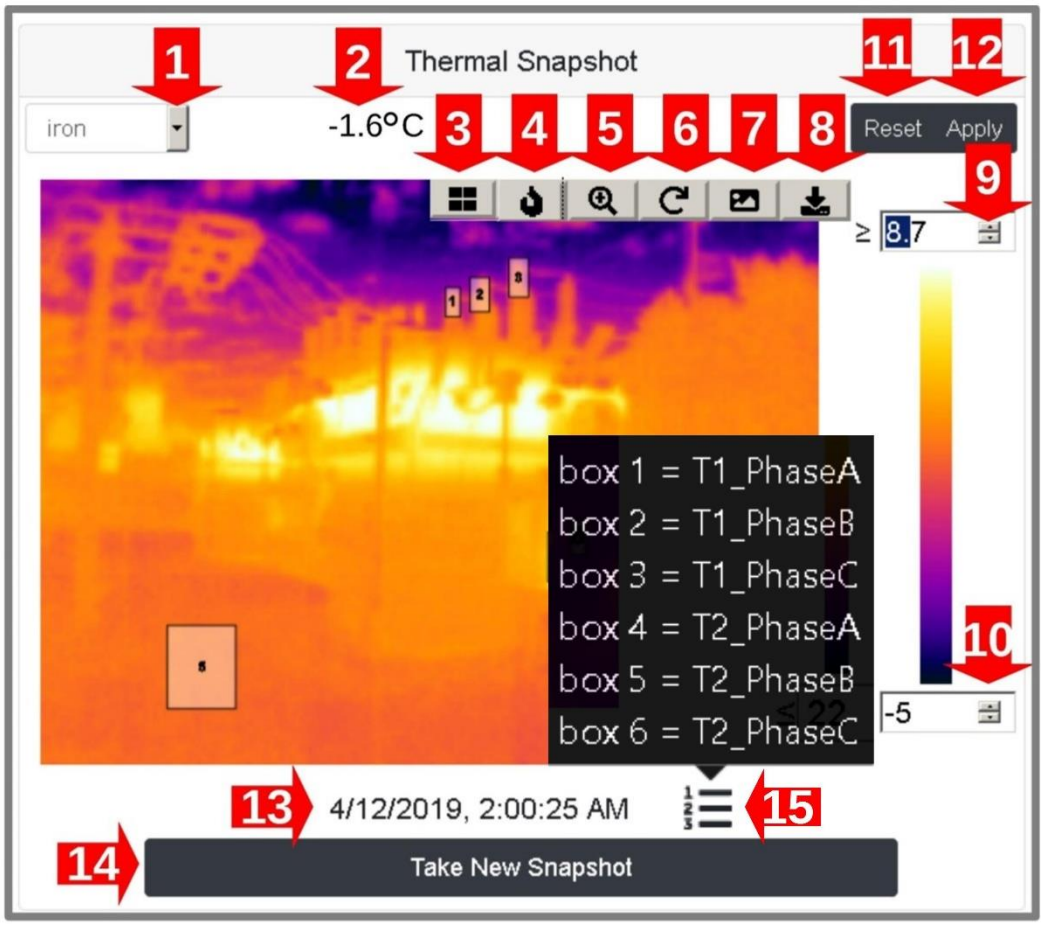

Figure 7-13 IR Snapshot

These are the controls available for the "Thermal Snapshot":

1. Color scheme selections: iron, rainbow and grayscale.
2. Temperature of the pixel where the mouse cursor is pointing.
3. Toggles all thermal boxes visible or not.
4. Toggle the hot-spots functionality.
5. Zoom in/out.
6. Rotates the image 90 degrees clockwise after each button pressed.
7. Opens the image in a new tab.
8. Download the image in "png" format. Press this button and a new dialog box will prompt you to select a location for the file; the file name includes the device ID and the timestamp. The file can be opened with a photo viewer (Paint).

Customize the temperature visualization:

a. Manual: press the up and down buttons on the Maximum temperature (arrow 9) and Minimum temperature (arrow 10) to select the desired range; you can type the values. Pres the "Apply" button (arrow 12) and the thermal snapshot will be update.
b. Automatic: press the "Reset" button (arrow 11) to auto-range the Maximum and Minimum temperature.

13. The time stamp is displayed at the bottom of the image.
14. Press the "Take New Snapshot" button to take and retrieve a new snapshot.
15. Place the mouse over the legend icon to display the names of the boxes.

7.5.5 Visual Snapshot

The visual snapshot is shown in Figure 7-14. The buttons on the top-right (arrows 1-4) are displayed only when the mouse cursor is above the image.

Legend for arrows 1 to 6 in Figure 7-14:
1. Zoom in / out.
2. Rotates image 90 degrees for each button pressed.
3. Opens the image in a new tab.
4. Download the image in "png" format. Press this button and a new dialog box will prompt you to select a location for the file; the file name includes the device ID and the timestamp. The file can be opened with a photo viewer (Paint).
5. Shows the time stamp.
6. Press the "Take New Snapshot" button to take and retrieve a snapshot.

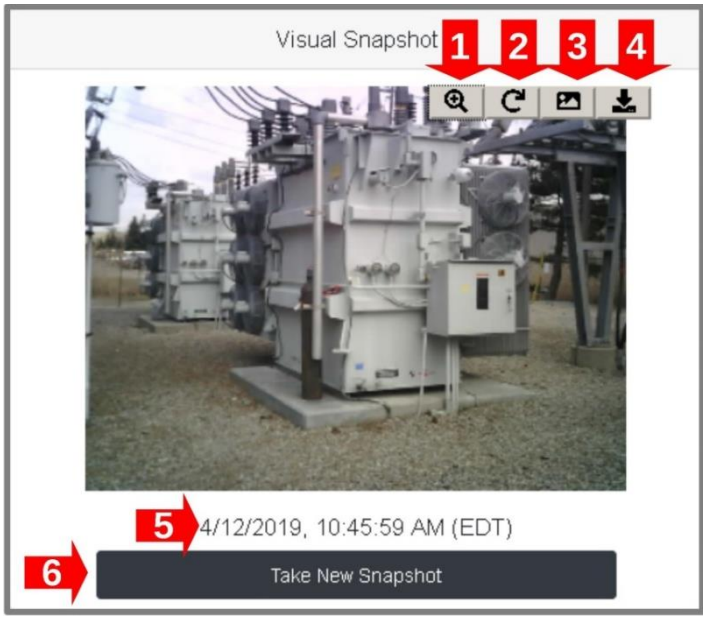

Figure 7-14 Visual Snapshot

7.5.6 Data and Digital I/O Status

Area D in Figure 7-4 is shown in Figure 7-15 displays the latest temperature measurements and the status of the Digital I/O.

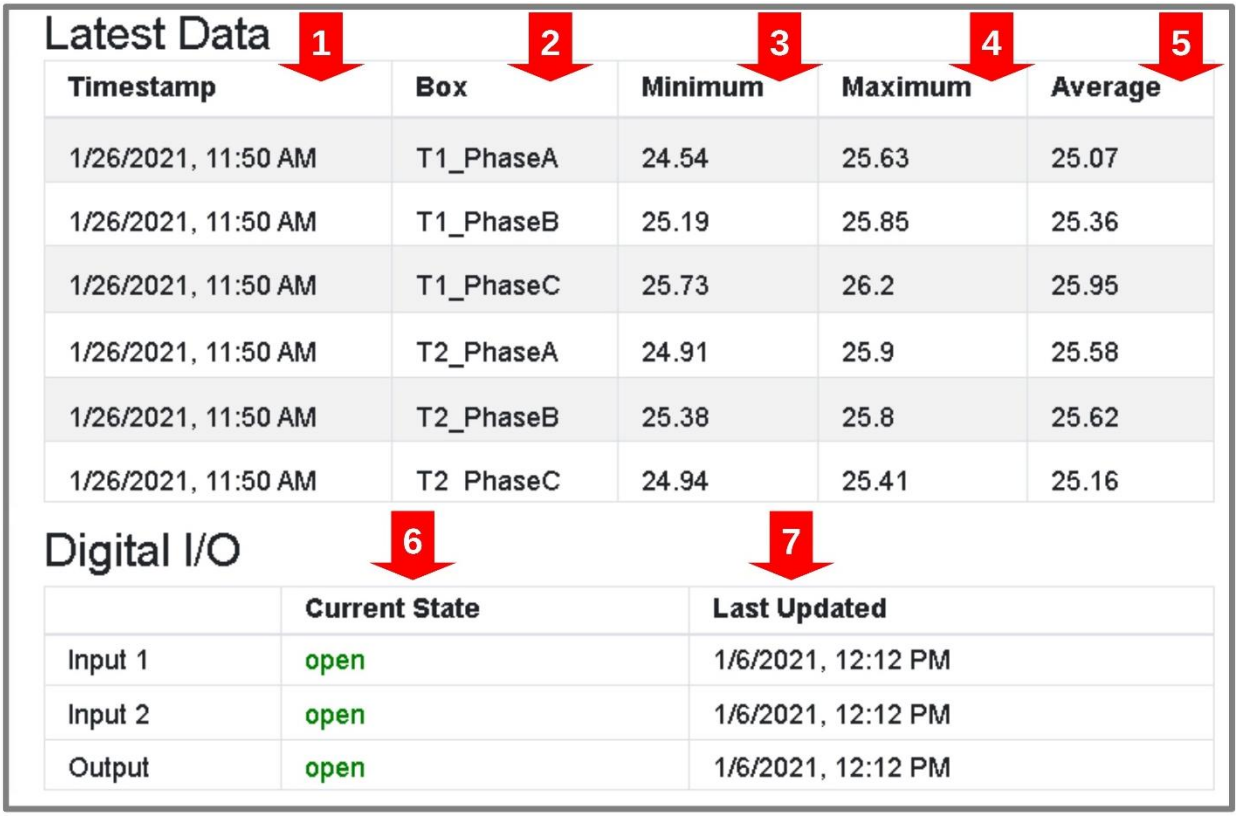

Figure 7-15 Digital I/O Status

Legend for arrows 1 to 7 in Figure 7-15:

1. This column indicates the time and date of the temperature acquisition.
2. This column contains the names of box 1 to 6.
3. Minimum temperature.
4. Maximum temperature.
5. Average temperature.
6. This column indicates the current status of the digital input and output.
7. This column contains the time stamp of the last acquisition.

7.6 Historical Alarm Triggers

Click on the "Historical Alarm Triggers" located in the left menu to launch the main window as shown in Figure 7-16. The list shows all the alarms for all devices.

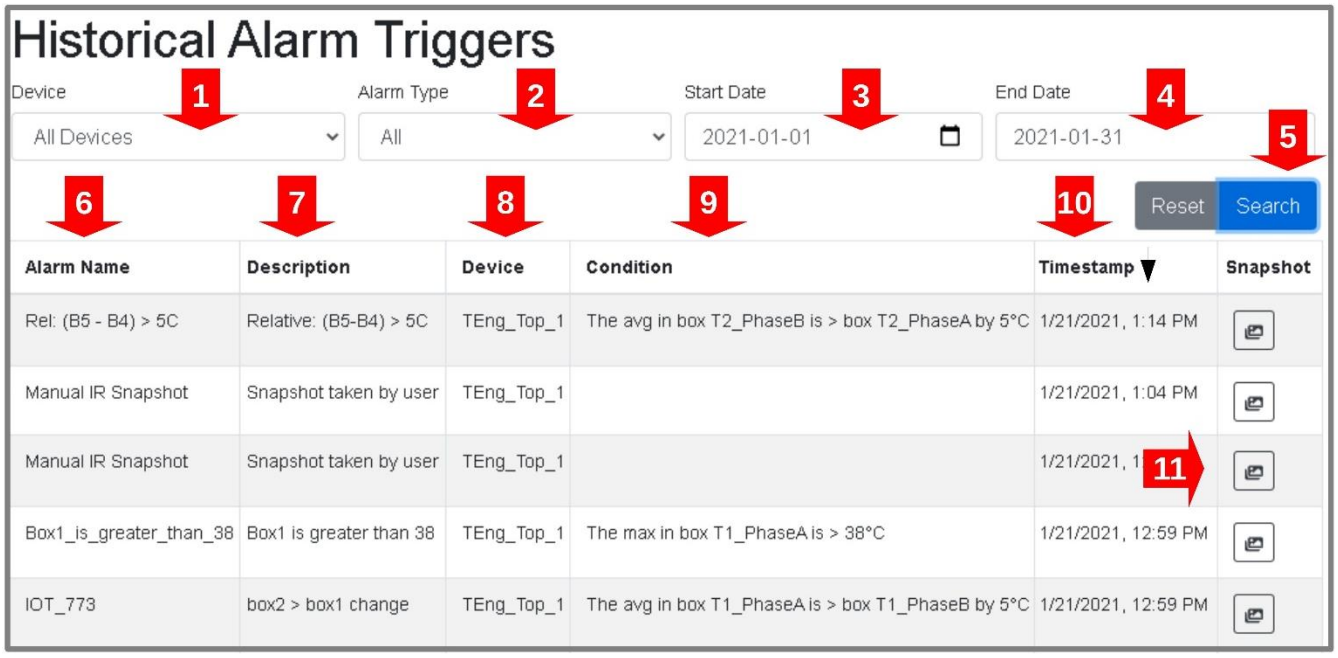

Figure 7-16 Historical Alarm Triggers

At the top of the Historical Alarm Triggers you can customize the search using the following parameters: Device, Alarm Type, Start Date and End Date - follow Figure 7-16:

1. Click the Device drop-down list and select the device of interest; default is "All Devices".
2. Click the "Alarm Type" drop-down list and select the alarm of interest; default is "All". Alarm type: All, Thermal Alarm, Interval Snapshot, Daily Snapshot or Digital I/O.
3. Enter the start date in the format "yyyy-mm-dd" (year-month-day) or click on the calendar icon. The calendar dialog box will allow you to select the desired date. The default is yesterday.
4. Enter the end date in the format "yyyy-mm-dd" (year-month-day) or click on the calendar icon. The calendar dialog box will allow you to select the desired date. The default is today.
5. Press the "Search" button and the main window will display the results.
6. This column displays the "Alarm Name"; you could click to sort them alphabetically.
7. This column displays the "Description" of the alarm.
8. This column displays the "Device" name.
9. This column displays the "Condition".
10. This column displays the "Time stamp" of the alarm; you could click to sort them chronologically.
11. Click on the snapshot and the dialog box will display the picture taken.

7.7 Digital I/O

Press the "Digital I/O" button and a dialog box as shown in Figure 7-17 is displayed:

- Top-area (arrows 1, 4 and 5): relay configuration and execution.
- Left-area (arrow 2 and 3): assign names to DI and DO.
- Right-area (arrows 6 and 7): status of DI1 and the DI 2 both are open (arrow 6). Status of digital output is shown as closed – arrow 7.

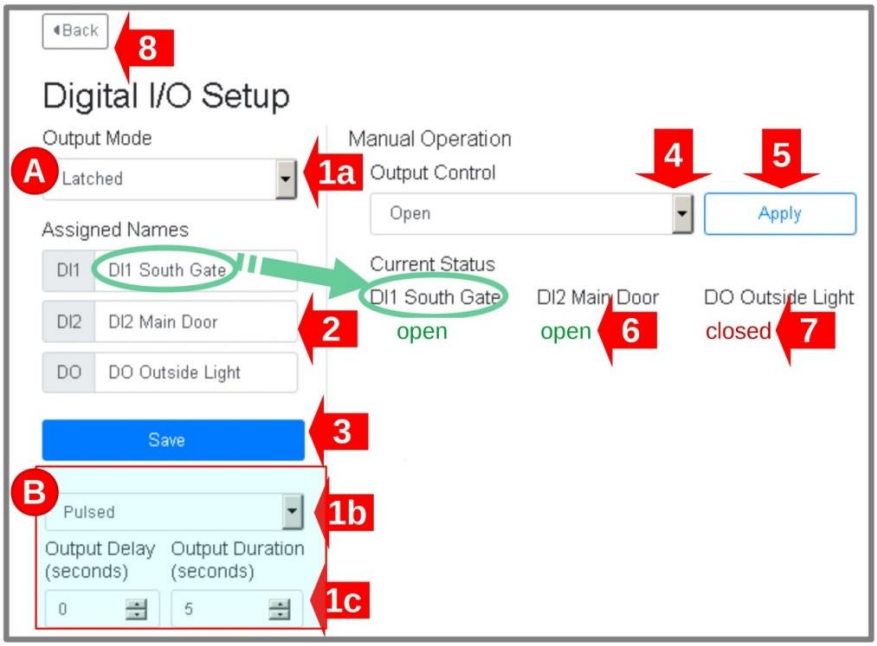

Figure 7-17 Digital I/O Setup

In addition to status is possible to execute a manual relay command (operation). Follow these steps:

1. Select the relay "Output Mode" in the drop down list. There are two options:
   A. arrow 1a – Latched output keeps the state open /closed of the last command; this is the default setting.
   B. arrow 1b - Pulsed output is active based on the set durations (arrow 1c) – default 5 seconds. The default "Output Delay" is 0 seconds and can be adjusted using the up/down buttons if this is required by the application.
2. In the "Assigned Names" column you can enter a description for each DI and DO.
3. Press the "Save" button to preserve this configuration.
4. Select the "Output Control": open or close. In this example the output is already closed and open is selected.
5. Press the "Apply" button and the command will be sent.

7.8 Gallery

On the Gallery page you could search for snapshots based on date – see Figure 7-18.

1. Enter the date or press the calendar icon to select the desired date.
2. Press the search button.
3. Press the Back button to return to the Device page.

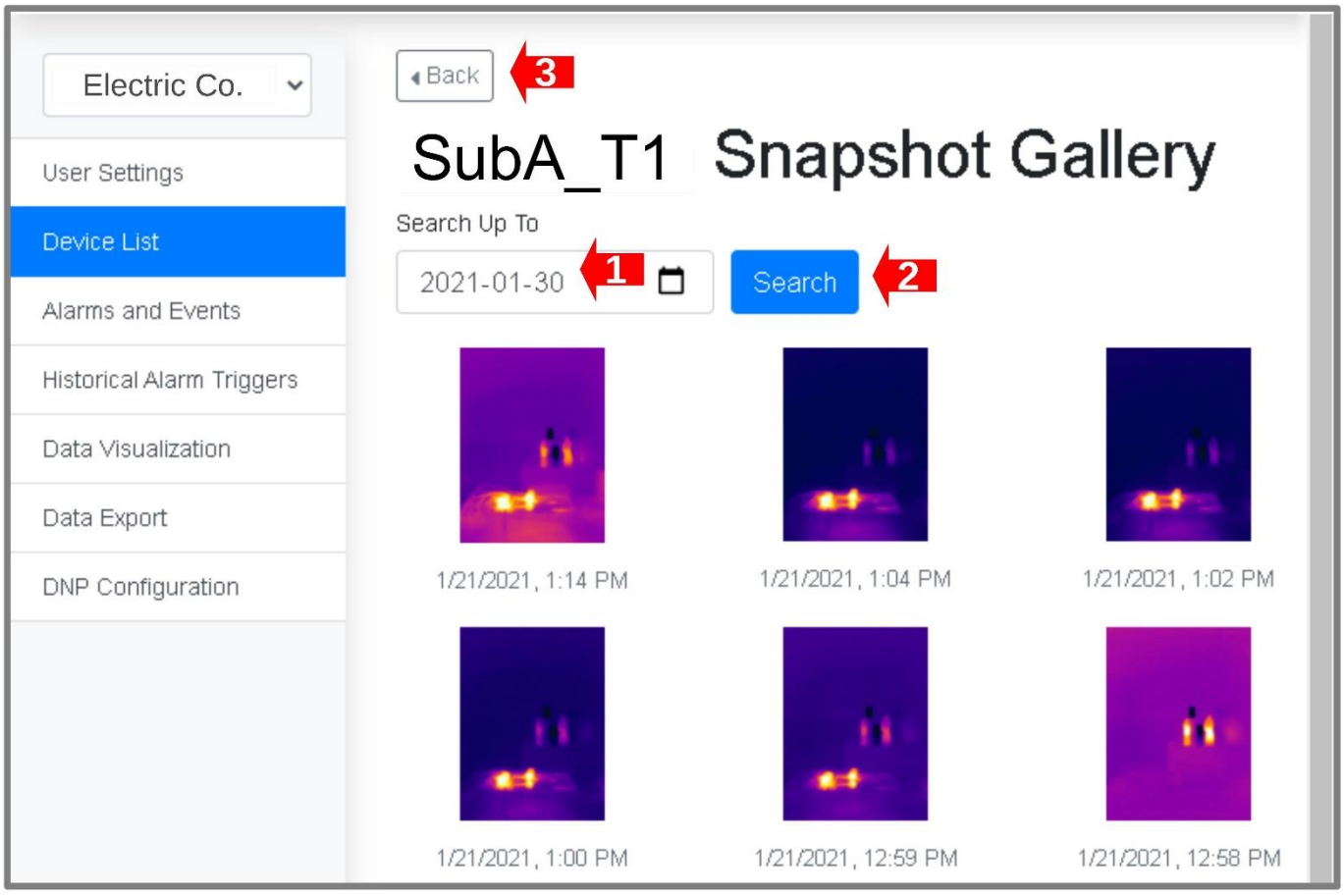

Figure 7-18 Gallery

7.9 Data Export

On the "Data Export" page you can export the data of one or more IM500 devices.

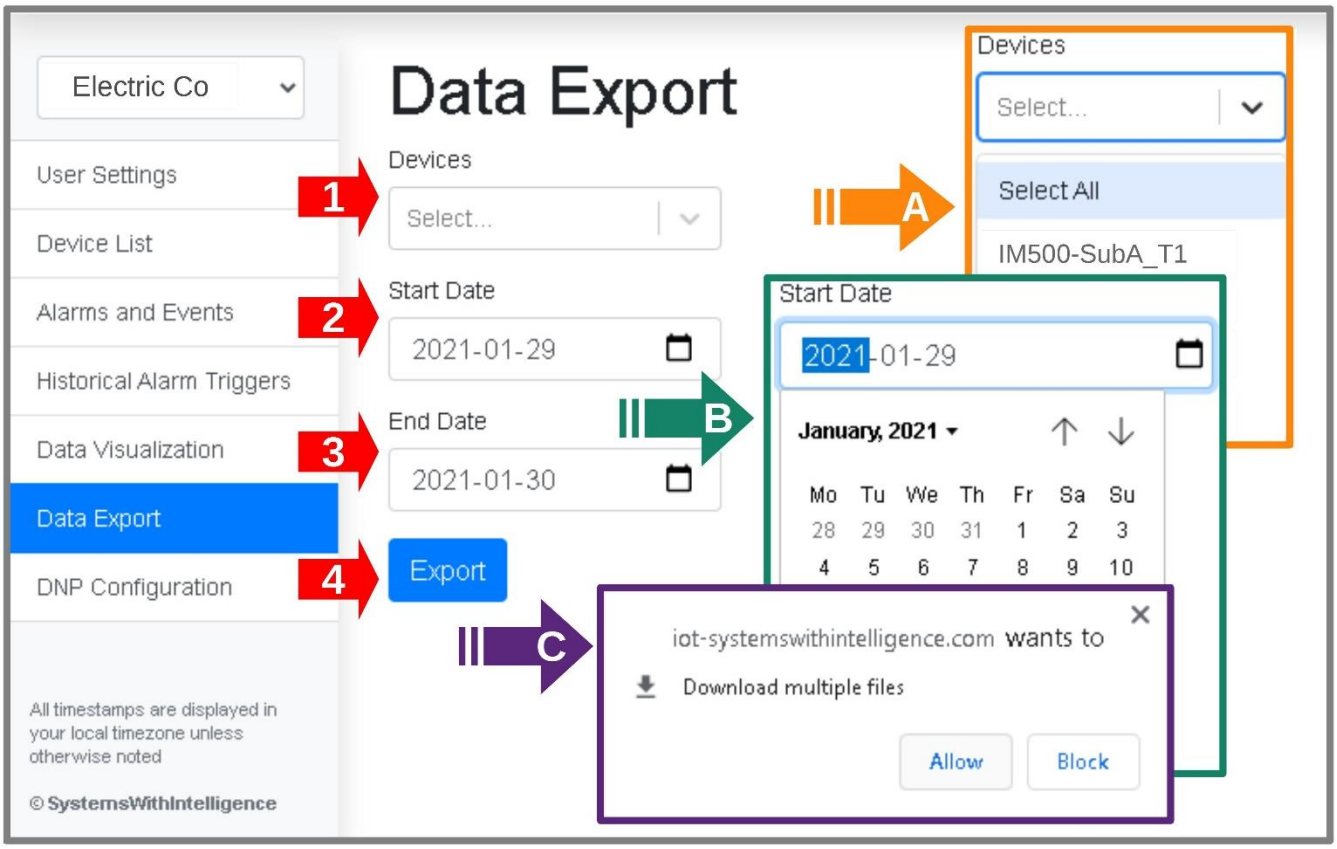

Figure 7-19 Data Export

Navigation – follow Figure 7-19:

1. Devices – click on "Select All" or select individual devices as shown in (A).
2. Start Date – enter the date or click the calendar icon to select the date (B).
3. End Data – enter the date or click the calendar icon to select the date.
4. Press the "Export" button and after few seconds the dialog (C) asks for confirmation. Press the "Allow" button and then the standard "Save As" dialog box asks for the name and location – see Figure 7-8.

Note: The maximum start-end date range is one month and the data is saved in CSV format – see Figure 7-9.

7.10 E-mail Alarm Notification

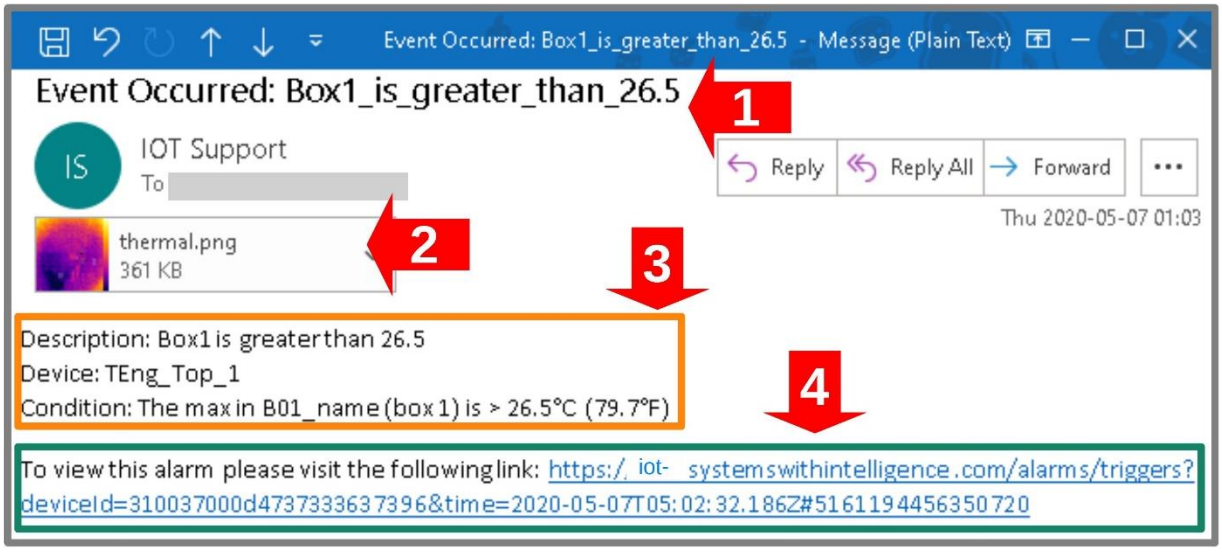

Figure 7-20 Alarm Notification

As part of everyday operation, you will receive alarm notification as seen in Figure 7-20.

1. The subject of the e-mail contains the description of the alarm.
2. The thermal snapshot is attached, and you can downloaded to your local PC/laptop and view it using an image viewer application.
3. This section contains the "Description", the "Device" and the "Condition".
4. This section contains a link to the image that you could see by clicking on it.

8 IM500 Configuration

In this section you will learn how to customize and fine tune the IM500 configuration to meet the needs of your application. There are two types of configuration:

1. One-time settings include: change the password (optional) and set the location.
2. Periodical settings include: redefine rules for the thermal camera and change snapshot interval.

8.1 Device Setup

In this section you will configure the name and the location of the IM500 unit. In the "Device Page" (Figure 7-4) press the "Device Setup" button located at the top-right of the page. The "Device Setup" page shown in Figure 8-1 is displayed and you must enter this information:

1. "Device ID": information only – the SIM number.
2. "Device Name": enter a name that will identify the location or the installation. E.g. "Sub.Green_T1" identifies the substation on Green Street. Add installation details if more IM500 units are installed at the same location. E.g. Transformer, Bushings, Feeder 1, etc.
3. "Snapshot Rotation": use this setting to rotate the image if the IM500 is mounted side-ways or upside-down. Click on the drop-down list to select a rotation angle; selections – 0 (default), 90, 180 and 270 degrees.
4. "Snapshot Usage Warning": use this setting to select the usage threshold that will trigger a warning e-mail. Selections: disable (default), 75%, 80%, 85%, 90% and 95%.
5. "GPS Override": check this box and enter the coordinates of the installation.
6. Optional – "Street Address": click and enter the address. By default the IM500 is using the location provided by the cell towers.
7. "Connection Status Subscription": lists the users that are notified via e-mail when the device is online or offline.
8. "Configure Access Permission": click this button and the dialog box shown in Figure 8-2 is displayed. Follow the instructions in Figure 8-2 to select the users that are allowed to see and configure this unit.
9. "Save": press the button at the bottom of the page for the settings to take effect.

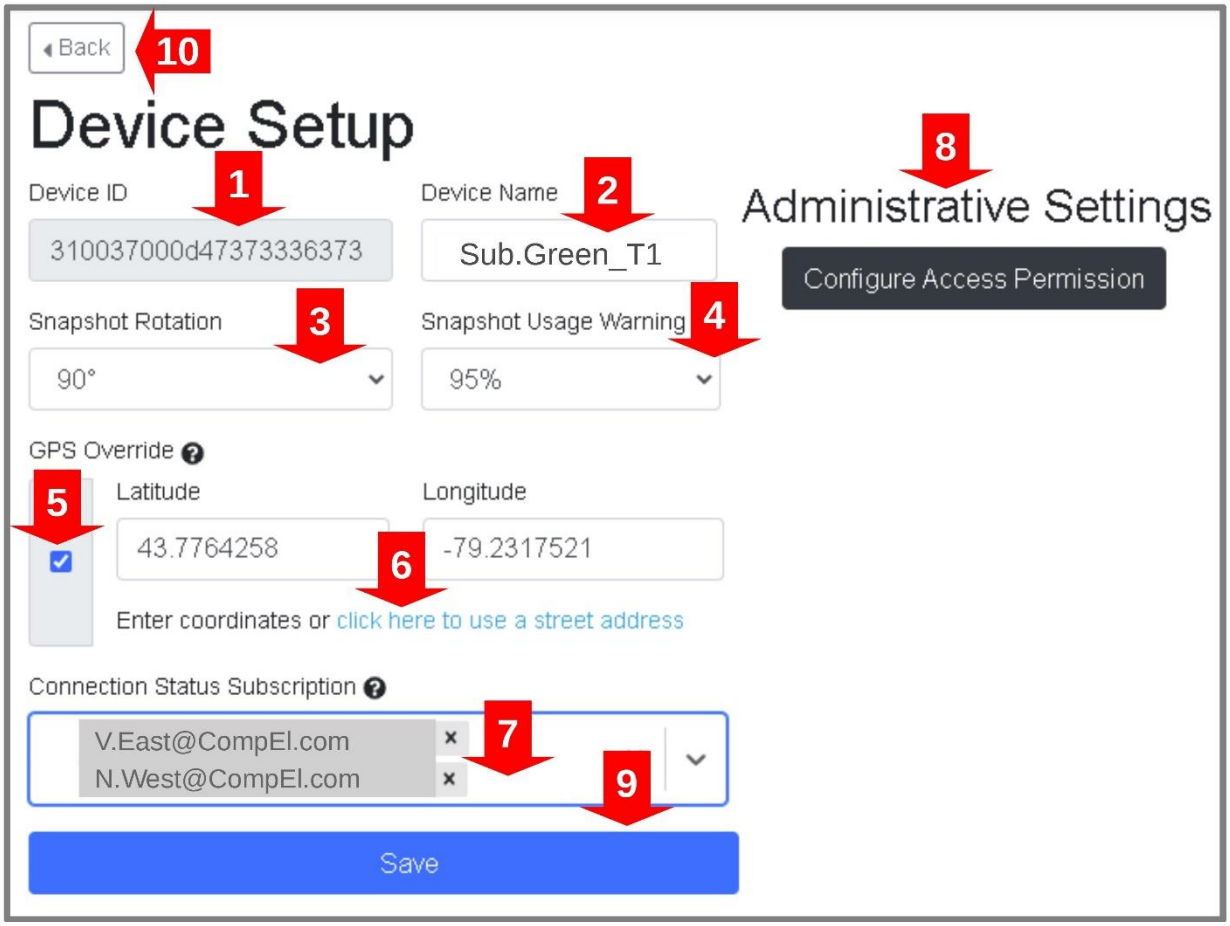

Figure 8-1 Device Setup

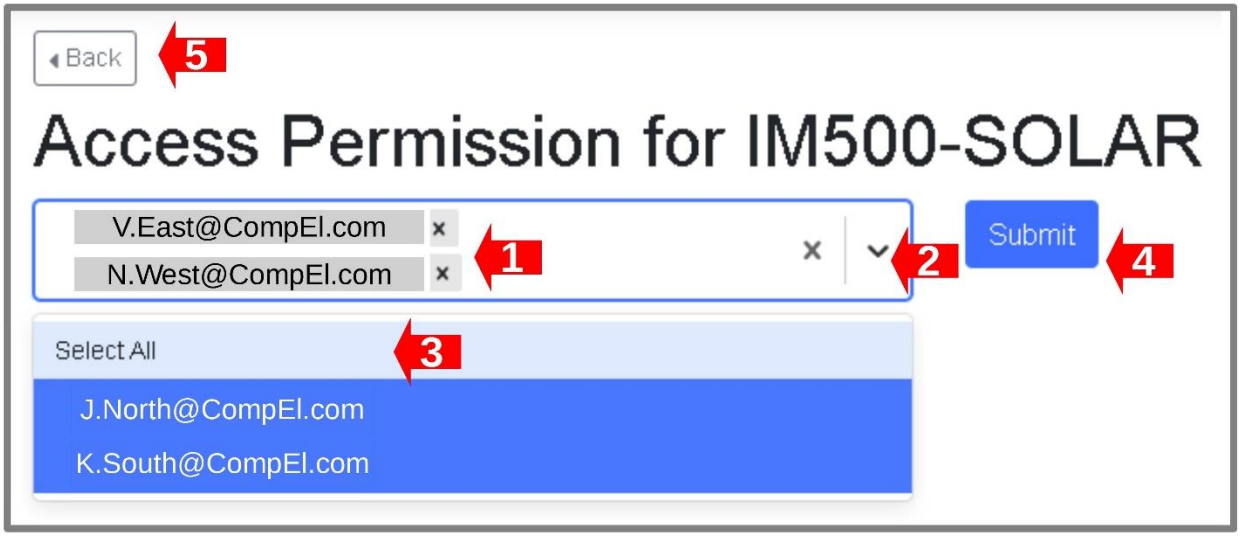

Figure 8-2 Access Permission

8.2 Edit Device List

The "Device List" page is the main page that shows the IoT units in a tree view and their position on the map. The IoT units could be organized by location, functionality, or any other criteria you consider. In Figure 8-3 is shown an example where the units are organized based on location. There are two substations, one on Blue Street (A) and one on the Green Street (B). The three-view can be organized in four levels deep as seen in (A):

1. Level 1 - Substation.Blue.
2. Level 2 - Transf_110kV.
3. Level 3 – Bushings.
4. Level 4 - contains the IoT unit "Tranf.B_IN".

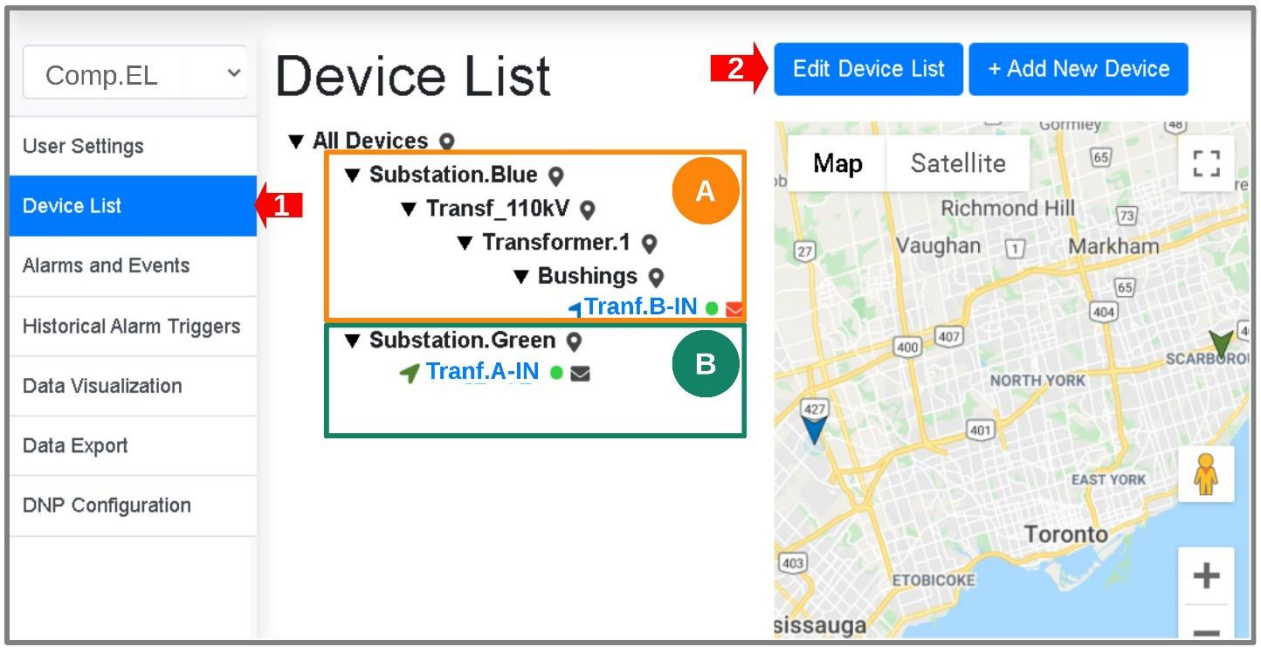

Figure 8-3 Device List

Best practice: It is recommended that you define your organizational pattern and follow the instructions in Figure 8-4 to edit the tree-view. Press the "Edit Device List" button – arrow 2 in Figure 8-3 and the "Edit Device List" page is opened.

Note: Empty labels are not displayed in in the tree-view.

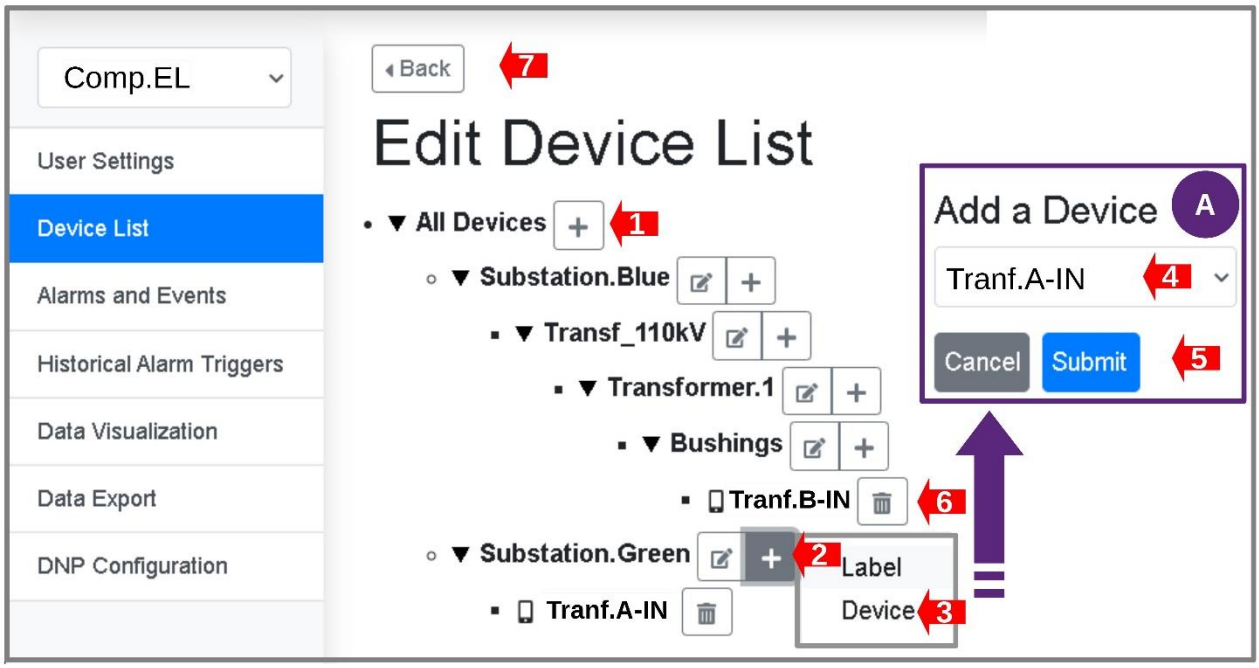

Figure 8-4 Edit Device List

Navigation – follow Figure 8-4:

1. Click the "**+**" icon and select Label. Type the name of the location – in this example is "Substation.Green".
2. Click the "**+**" icon and the dialog box will display two options: Label and Device.
3. Select "Device" and the "Add a Device" field is shown (A).
4. In the "Add a Device" drop-down list select the device of interest.
5. Click the "Submit" button and the tree will be updated. Repeat steps 1 to 5 for all devices.
6. To move a device to a different branch, click the "Trash" icon to right of the device. This deletes the entry, then repeat steps 2 to 5 to add the device to desired branch.
7. Click the "Back" button to return to main page.

8.3 Change Password

The following instruction shows you how to change the password.

1. Click the "User Settings" on the left menu to view the User Profile page.
2. Enter the current password.
3. Enter the new password minimum 8 characters.
4. Retype the new password.
5. Press the "Update Password" button.

8.4 Thermal Sensor Setup

The main functionality of the IM500 unit is based on measuring, monitoring and analyzing the temperatures in specific areas, named "Thermal Boxes" – maximum six. In this section you will learn how to draw, name and configure the thermal boxes.

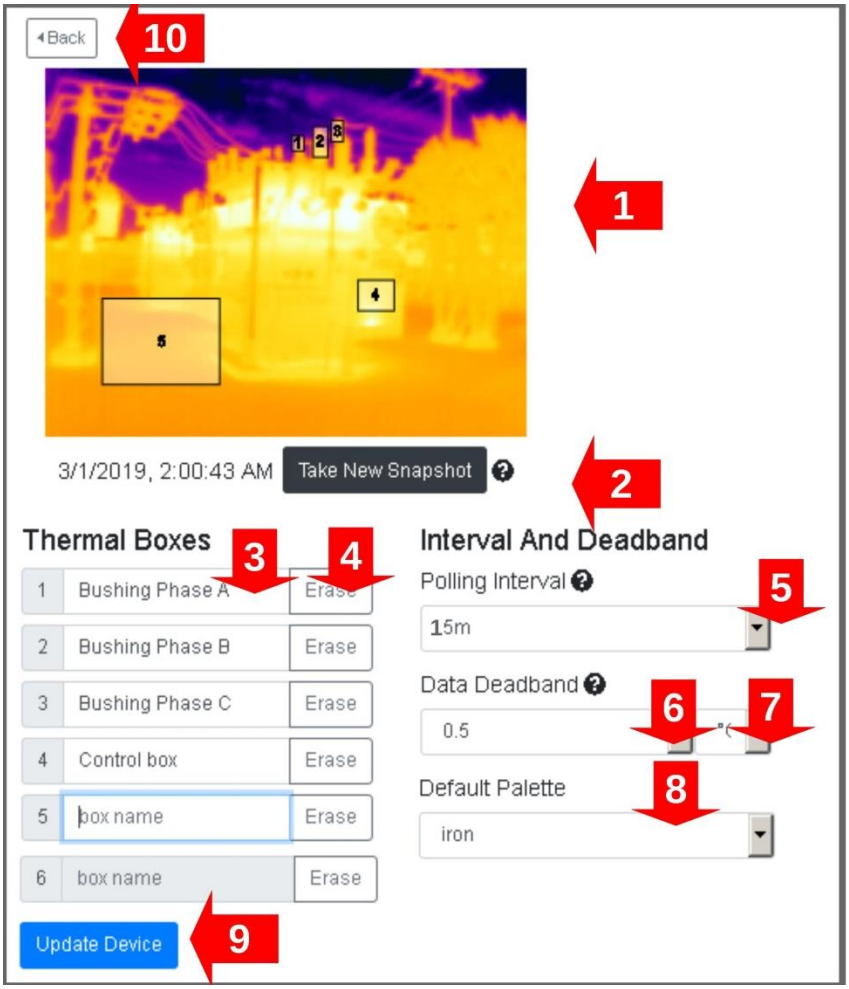

Figure 8-5 IRCam Setup

Click and drag on the image to draw thermal boxes over regions of interest. Ensure the snapshot is up to date so drawings are accurate. Optional: you can press the "Take New Snapshot" button to retrieve a new image. Note that the minimum size of the box is 3 x 3 pixels and is automatically adjusted for smaller boxes.

8.4.1 Draw A New Box

Follow these instructions to draw a new box:

a) In the Snapshot area, arrow 1 Figure 8-5, place the mouse-pointer on any corner of the rectangle you intend to draw (top-left/ right, bottom-left/right).
b) Click and drag the mouse towards the diagonal opposite corner of the rectangle (bottom-right/ left; top-right/left).

c) Release the button and the box is displayed on the screen.
d) If the rectangle is fitting the area of interest move to step e), else press the "Erase" button (arrow 4) to remove the box and redraw the box (start at step a).
e) In the dialog box marked by arrow 3 type the name that easily identifies this area. E.g. "Phase A – Bushing".

8.4.2 Thermal Sensor Common Settings

Figure 8-5 legend:

1. Snapshot area.
2. Press the "Take New Snapshot" button to update current view.
3. Enter a name for the box.
4. Delete the box.
5. Polling Interval: time period in-between two consecutive readings. Longer intervals are more power efficient. Available values: 15m, 30m, 1h, 2h, 6h, 12h, 24h (m=minutes and h=hours).
6. Data Deadband: minimum temperature change for the measured temperature to be recorded.
7. Unit Celsius [C] or Fahrenheit [F]. The sensor measures in Celsius but will display data in the unit.
8. Click the "Update Device" button after all boxes are drawn or the settings were changed.

Note: The thermal boxes are drawn in sequential order, with first available index allocated to the newly drawn box. E.g. If you delete box 2, the next box drawn will be marked 2.

Radiometry Parameters

These parameters are located on the right of the main window of the Thermal Sensor setup as shown in Figure 8-6 . The area marked by arrow A shows the installation and arrow B points to the time the image was received. The visual snapshot can be used as reference for drawing the thermal boxes. Optional: you can press the "Take New Snapshot" button to retrieve a new image.

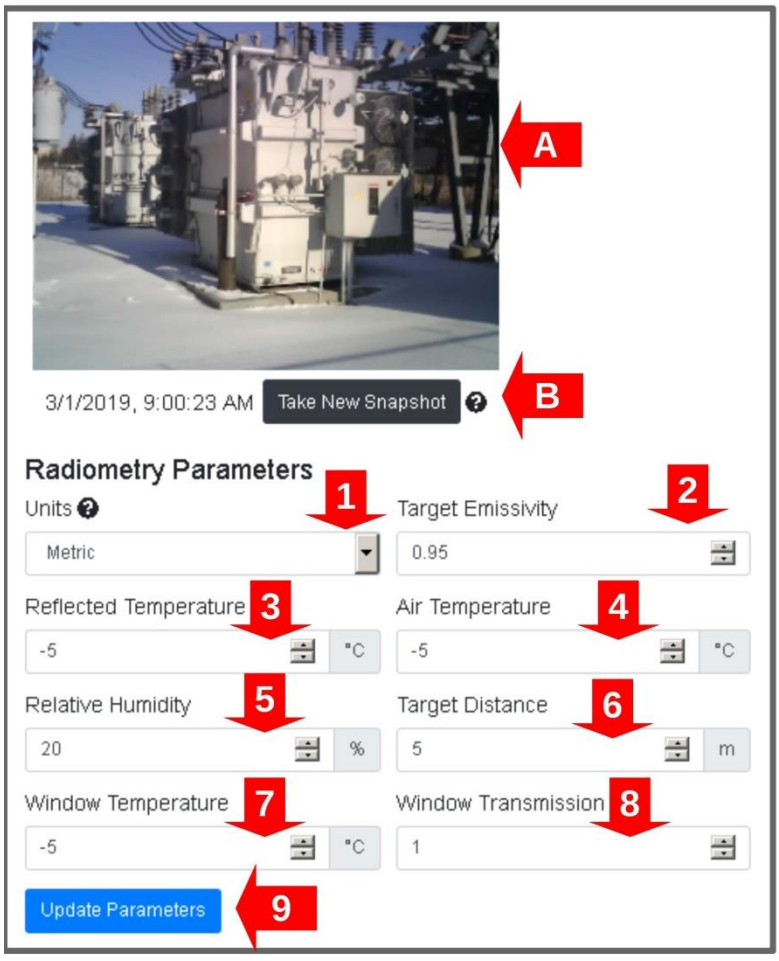

Figure 8-6 Radiometry Parameters

These parameters must be customized for each installation in order to take into account the climate and the surrounding elements of the site. Parameter description:

1. Units selection: Imperial (feet, F) or Metric (meters, C).
2. Reflected Temperature represents the background temperature.
3. Relative Humidity is used to compute the atmospheric transmission.
4. Window Temperature – represents the temperature of the physical window in front of the sensor.
5. Target Emissivity is the emissivity of the source.
6. Air Temperature is used to compute the atmospheric transmission.
7. Target Distance measured from IM500 to the source; used to compute the atmospheric transmission.
8. Window Transmission - fraction of IR radiation passed through the window.
9. Press "Update Parameters" to save the configuration.

The Window temperature and Window transmissions compensate for external viewing window.

8.5 Setup Alarms and Events

This section is specific for configuring Alarms and Events for the IM500. Section 9.5 contains instructions specific for the SM500 Setup of Alarms and Events.

In the "Alarms and Events" window (Figure 8-7) you can setup the thermal alarms, configure DI, interval snapshot and daily snapshots.

1. In the drop-down list select the device that will be configured. The list shows all existing configured alarms.
2. Click to add a new "Thermal Alarm"; details in section 8.6.
3. Click to configure digital inputs; details in section 8.7.
4. Click to add an "Interval Snapshot"; details in section 8.8.
5. Click to add a "Daily Snapshot"; details in section 8.9.
6. To edit an existing alarm place the mouse over it and the "Edit" button will be displayed to right of the window.
7. To completely remove an existing alarm click on the "Delete" button.

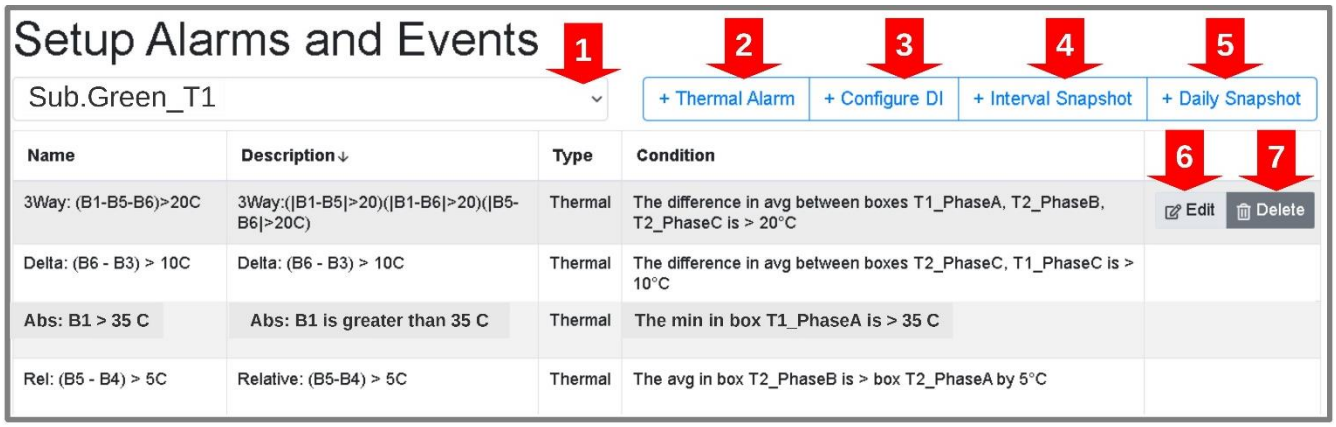

Figure 8-7 Setup Alarms and Events

8.6 Configure Thermal Alarm

The thermal configuration is closely related to the equipment that is monitored. It is very important that you have a good understanding of the system you are monitoring and you should configure the IM500 based on that information. In this section you will learn how to configure the thermal monitoring. There are three types of alarms that can be configured.

a. Absolute comparison
b. Relative comparison
c. Relative delta
d. Three way delta

8.6.1 Absolute Comparison

The "Absolute comparison" rule will trigger an alarm if the temperature in the box is bellow or above a temperature threshold.

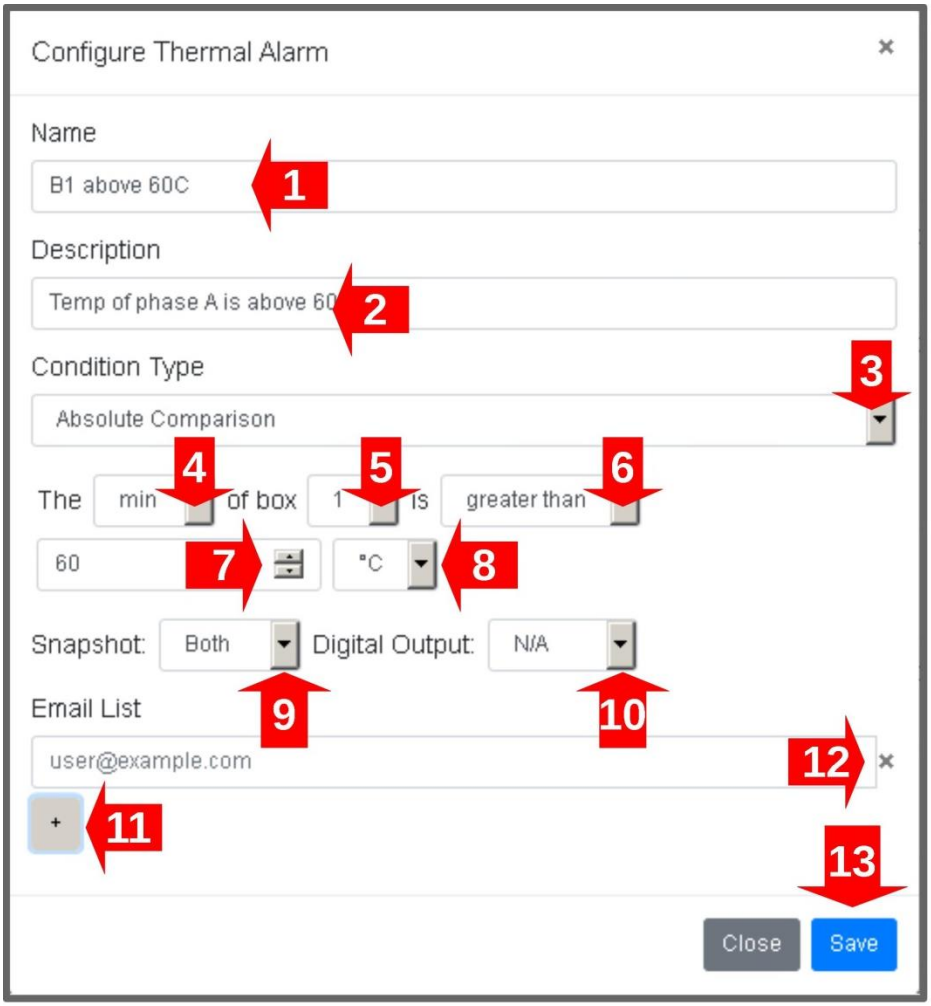

Figure 8-8 Absolute comparison

The rule of "Absolute comparison" in this example will trigger an alarm if: the "minimum" temperature in "Box 1" is "greater than "60C". These are the configuration steps – follow Figure 8-8:

1. Type a name for this alarm; "B1 above 60C"
2. Optional: add a detailed description.
3. Click on the "Condition type" drop-list and select "Absolute Comparison".
4. Select "min" in the drop-box list. Also available: "maximum" and "average".
5. Select the box of interest: Box 1.
6. Select the condition: "greater than" or "less than".
7. Type the value of the temperature or use the up/down buttons to adjust.
8. Select the measuring unit: C or F.
9. Select Both, Visual or IR snapshot.

10. Optional: you can configure the "Digital Output" to be activated when this condition is detected. In this example is set to "N/A" (No Action).
11. Press the "Save" button to preserve this configuration or press "Cancel" to discard (no alarm will be saved).

Optional: you can configure the system to send one or more e-mails when this alarm is triggered. Press the "+" sign (arrow 11) and type the e-mail address in field pointed by arrow 12. For multiple e-mails press the "+" again and type the new recipient.

8.6.2 Relative Comparison

The "Relative Comparison" rule will trigger an alarm if the temperature difference between two boxes is above or below a temperature threshold.

Figure 8-9 Thermal Alarm: Relative Comparison

In the following example you will configure a "Relative Comparison" alarm that triggers when Box 1 exceeds box 2 by 10C. These are the configuration steps – follow Figure 8-9

1. Type a name for this alarm; "b1 > b2".
2. Optional: add a detailed description; "Box 1 exceeds box 2 by 10C".

3. Click on the "Condition type" drop-list and select "Relative Comparison".
4. Select "max" in the drop-box list. Also available: "minimum" and "average".
5. Select the first box of interest: Box 1.
6. Select the condition: "greater than". Second option: "less than".
7. Select the second box: Box 2.
8. Type the value of the temperature or use the up/down buttons to adjust.
9. Select the measuring unit: C or F.
10. Select IR snapshot, Visual or None.
11. Optional: you can configure the "Digital Output" to be activated when this condition is detected. In this example is set to "N/A" (No Action).
12. Press the "Save" button to preserve this configuration or press "Cancel" to discard (no alarm will be saved).

Optional: you can configure the system to send one or more e-mails when this alarm is triggered. Press the "+" sign (arrow 12) and type the e-mail address in field pointed by arrow 13. For multiple e-mails press the "+" again and type the new recipient.

8.6.3 Relative Delta Comparison

The "Relative Delta" comparison rule will trigger an alarm if the temperature in one box is below or above the temperature of another box by set threshold.

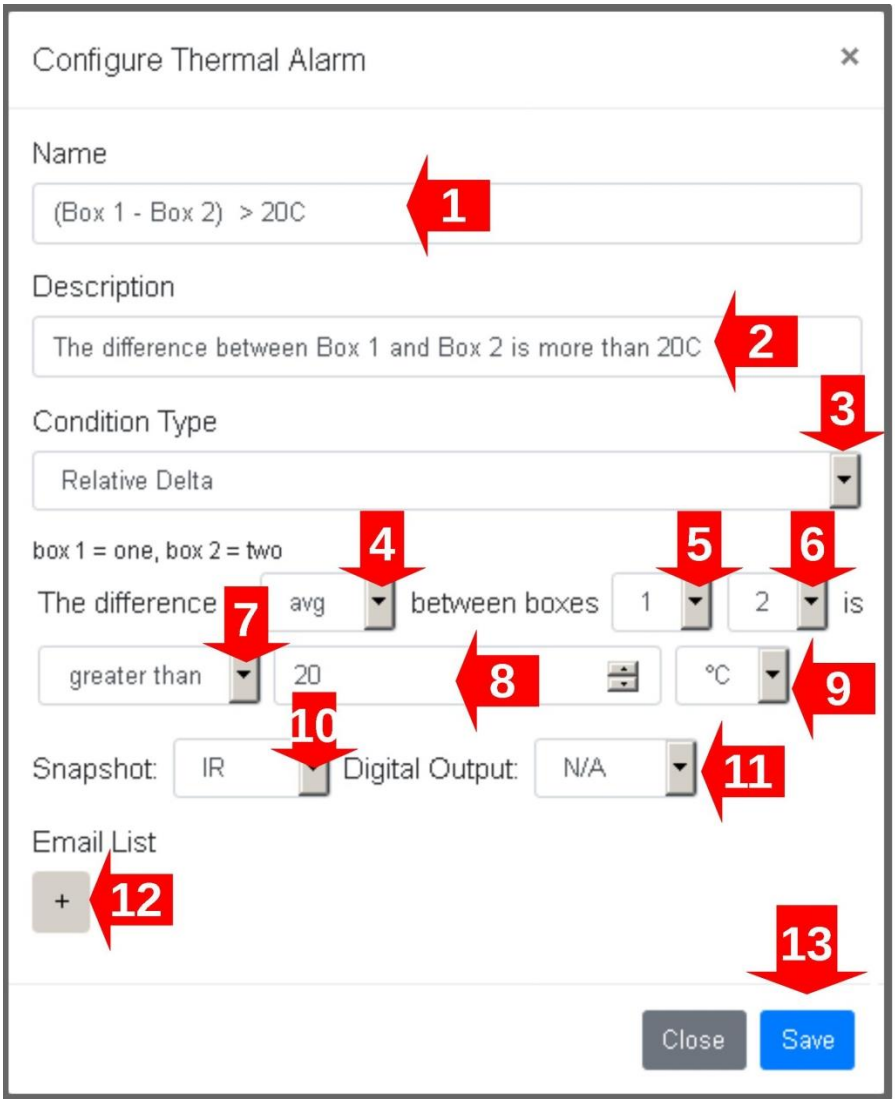

Figure 8-10 Thermal Alarm: Relative Delta

In the following example you will configure a relative delta alarm that triggers when the difference between average temperature of the box 1 and box 2 is greater than 20C. These are the steps – see Figure 8-10:

1. Type a name for this alarm; "(Box1 – Box2) > 20C".
2. Optional: add a detailed description.
3. Click on the "Condition type" drop-list and select "Relative Delta".
4. Select "avg" in the drop-box list. Also available: "min" and "max".
5. Select the first box of interest: Box 1.
6. Select the second box: Box 2.

7. Select the condition: "greater than" or "less than" in the drop-down list.
8. Type the value of the temperature or use the up/down buttons to adjust.
9. Select the measuring unit: C or F.
10. Select IR snapshot, Visual or Both.
11. Optional: you can configure the "Digital Output" to be activated when this condition is detected. In this example is set to "Trigger".
12. Optional: you could configure the system to send one or more e-mails when this alarm is triggered. Press the "+" sign (arrow 13) and type the e-mail address in field pointed by arrow 12. For multiple e-mails press the "+" again and type the new recipient.
13. Press the "Save" button to preserve this configuration or press "Cancel" to discard (no alarm will be saved).

8.6.4 Three Way Delta

This type of condition is designated to monitor three temperatures in an installation. E.g. 3-phase equipment: buss-bar, ties, switches, etc.

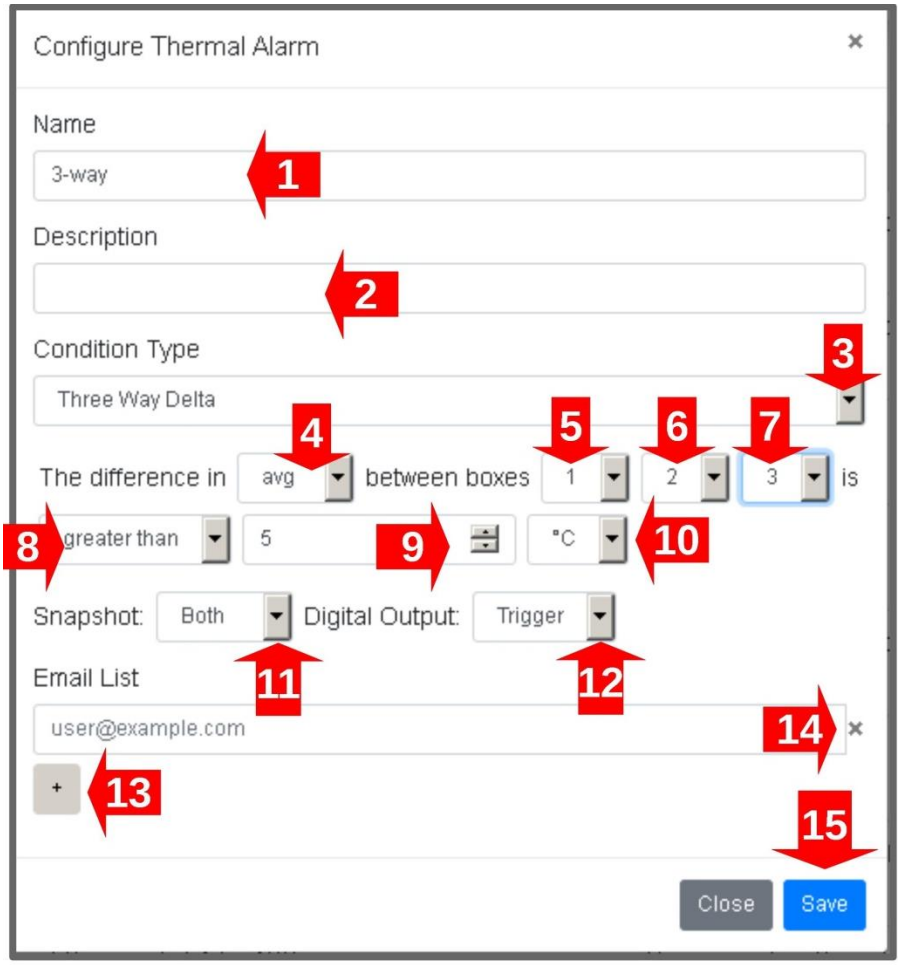

Figure 8-11 Thermal Alarm: Three Way Delta

In the following example you will configure a three-way delta alarm that triggers when the difference between average temperature of the box 1, box 2 and box 3 is greater than 5C. These are the steps – see Figure 8-11:

1. Type a name for this alarm; "3-way".
2. Optional: add a detailed description.
3. Click on the "Condition type" drop-list and select "Three Way Delta".
4. Select "avg" in the drop-box list. Also available: "min" and "max".
5. Select the first box of interest: Box 1.
6. Select the second box: Box 2.
7. Select the third box: Box 3.
8. Select the condition: "greater than" or "less than" in the drop-down list.
9. Type the value of the temperature or use the up/down buttons to adjust.

10. Select the measuring unit: C or F.
11. Select IR snapshot, Visual or Both.
12. Optional: you can configure the "Digital Output" to be activated when this condition is detected. In this example is set to "Trigger".
13. Press the "Save" button to preserve this configuration or press "Cancel" to discard (no alarm will be saved).

Optional: you could configure the system to send one or more e-mails when this alarm is triggered. Press the "**+**" sign (arrow 13) and type the e-mail address in field pointed by arrow 12. For multiple e-mails press the "**+**" again and type the new recipient.

8.7 Configure Digital Input Alarm

The digital input must be wired to the IM500 before it is configured. In this example there is a micro-switched installed at the South Gate and is connected to DI1 (digital input 1). Configuration:

1. Type the name.
2. Type the description; in this example the switch is located at the South Gate.
3. Select the interface; in this example the micro-switch is wired to DI1.
4. Select the snapshot action: Both, Thermal, Visual or None.
5. Select a "Digital Output" action; there are three options: N/A, Trigger and Reset. The Digital Output is a relay that can be turned on (Triggered) or off (Reset).
6. Optional: you could configure the system to send one or more e-mails when this alarm is triggered. Press the "+" sign (arrow 6) and type the e-mail address in field pointed by arrow 7.
7. Press the "Save" button to preserve the configuration. Press the "Cancel" button to discard these settings.

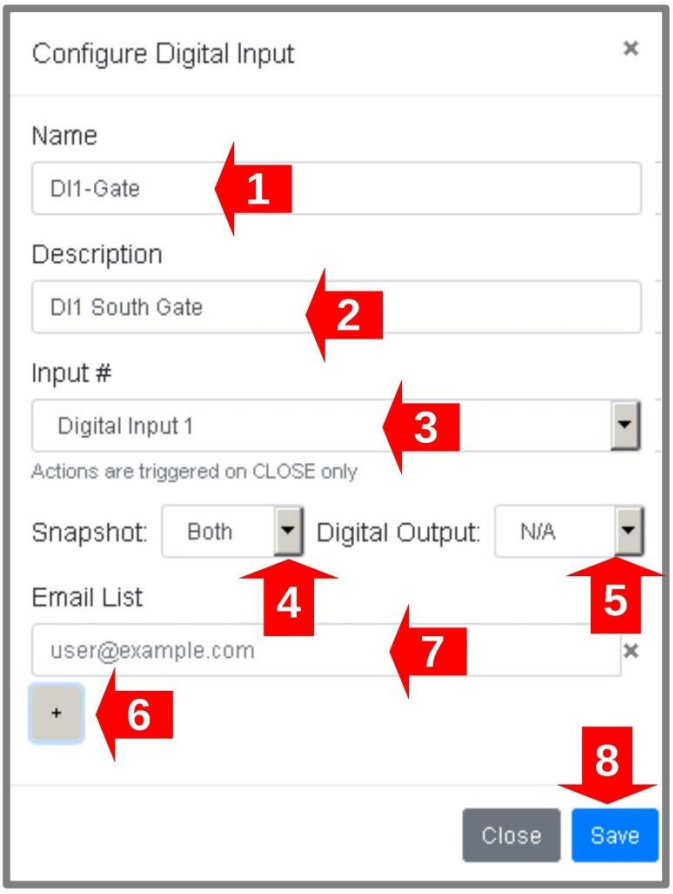

Figure 8-12 Configure Digital Input

8.8 Configure Interval Snapshot

This configuration instructs the IM500 to take a snapshot at a predefined interval.

1. Type a name to identify this event.
2. Optional: add details of the event.
3. Select the interval from the drop-down box. Available settings: 1, 2, 4, 6, 8 and 12 hours.
4. Snapshot selection: IR, Visual or Both.
5. Optional: The Digital Output can execute a command.
6. Email List: click on "**+**" marked by arrow 6 to add an entry in the "Email List". Type the email address in the new field.
7. Press the "Save" button to preserve the configuration. Press the "Close" button to discard the changes.

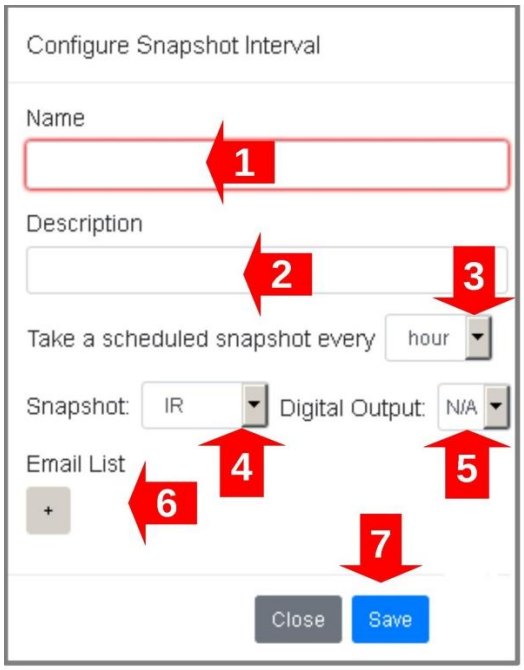

Figure 8-13 Configure Interval Snapshot

8.9 Configure Daily Snapshot

This configuration instructs the IM500 to take a snapshot every day at a specific time.

1. Type a name to identify this event.
2. Optional: type a description.
3. Scheduled time: click on the drop down list and select the time.
4. Select the time zone.
5. Snapshot selection: IR, Visual or Both- default.
6. Optional: operate the digital output. Default: No Action.
7. Email List: click on the "**+**" marked by arrow 7 to add an entry in the "Email List".
8. Type the e-mail address in the field marked by arrow 8.

Press the "Save" button (arrow 8) to send the data to the unit. Press the "Close" button to discard the settings.

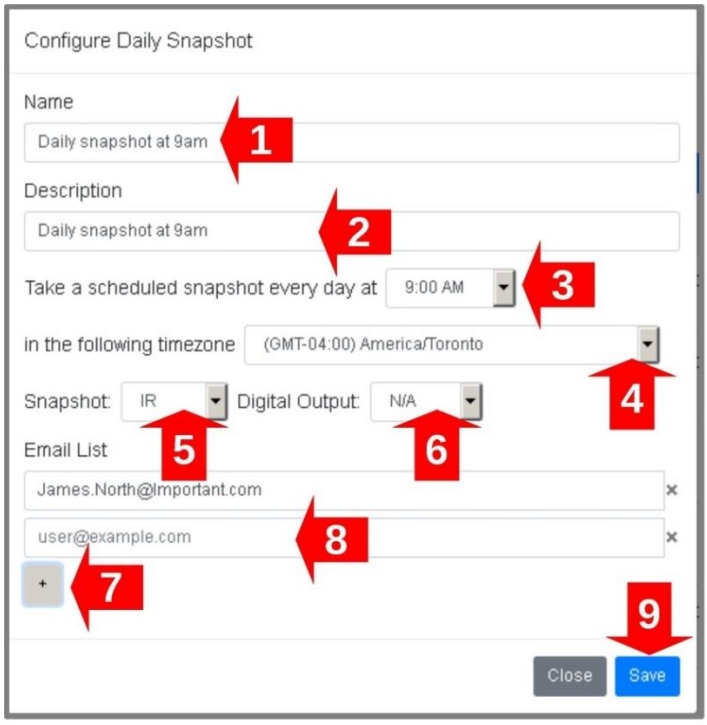

Figure 8-14 Configure Daily Snapshot

Troubleshooting: Check your "Spam/ Junk" folder if you do not receive any emails. White list the emails sender - mark it "Not spam".

9 SM500 Configuration

The SM500 is a data concentrator and protocol converter equipped with a wireless communication that collects data from remote sensors and makes it available for online viewing and SCADA integration. In this section you learn how to configure the SM500 and benefit from all the features. The instructions in this guide created the dashboard shown in Figure 9-1.

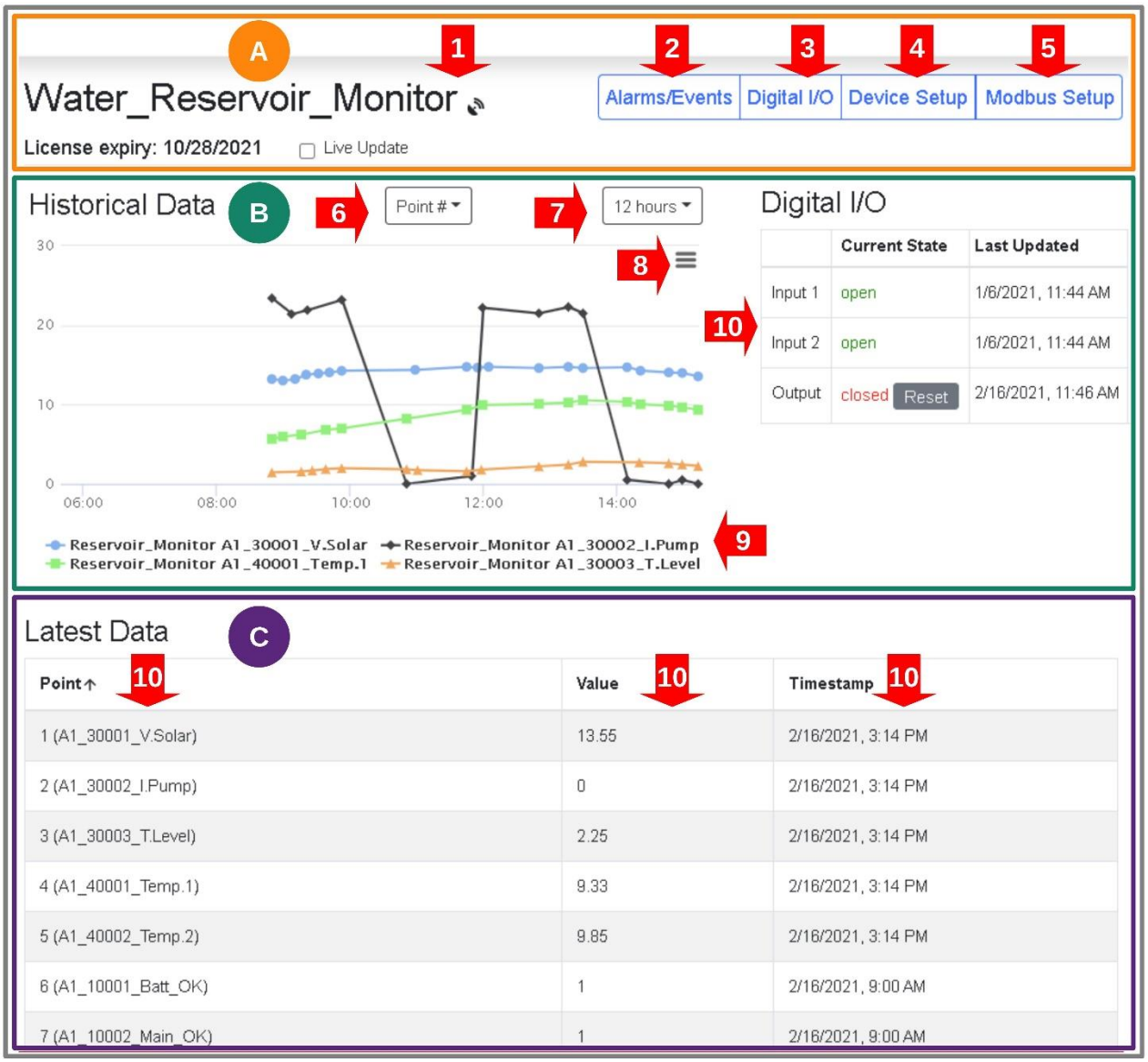

Figure 9-1 SM500 Device Page

You must complete four configuration stages in order to have a functional data concentrator:

1. Add new SM500 - section 9.2.
2. Configure communication - section 9.3.2.
3. Configure Points - section 9.4.
4. Setup Alarms and Events – section 9.5.

9.1 Introduction

The SM500 is designed to collect data from Modbus devices equipped with serial communication (RS485) and sent wirelessly to the SWI IoT Cloud. The data is available via the Dashboard to monitor from anywhere. Also, data could easily be integrated with SCADA via the DNP3 protocol. The SM500 can retrieve a maximum of 64 Modbus points and the supported functions see Table 9-1.

Table 9-1 Modbus support

#	Function code	Function Description	Register Size	Register address	Address space
A	0x01 0x05	Read 1-bit coil Write 1-bit coil	1-bit	0-9999	1-9999
B	0x02	Read discreate input	1-bit	0-9999	10001-19999
C	0x04	Read input register	16-bit signed/unsigned	0-9999	30001-39999
D	0x03 0x06	Read holding register Write holding register	16-bit signed/unsigned	0-9999	40001-49999

9.1.1 General Application

For the purpose of this manual a simple water reservoir installation is used to guide you through the configuration process. The diagram of this installation is shown in Figure 9-2.

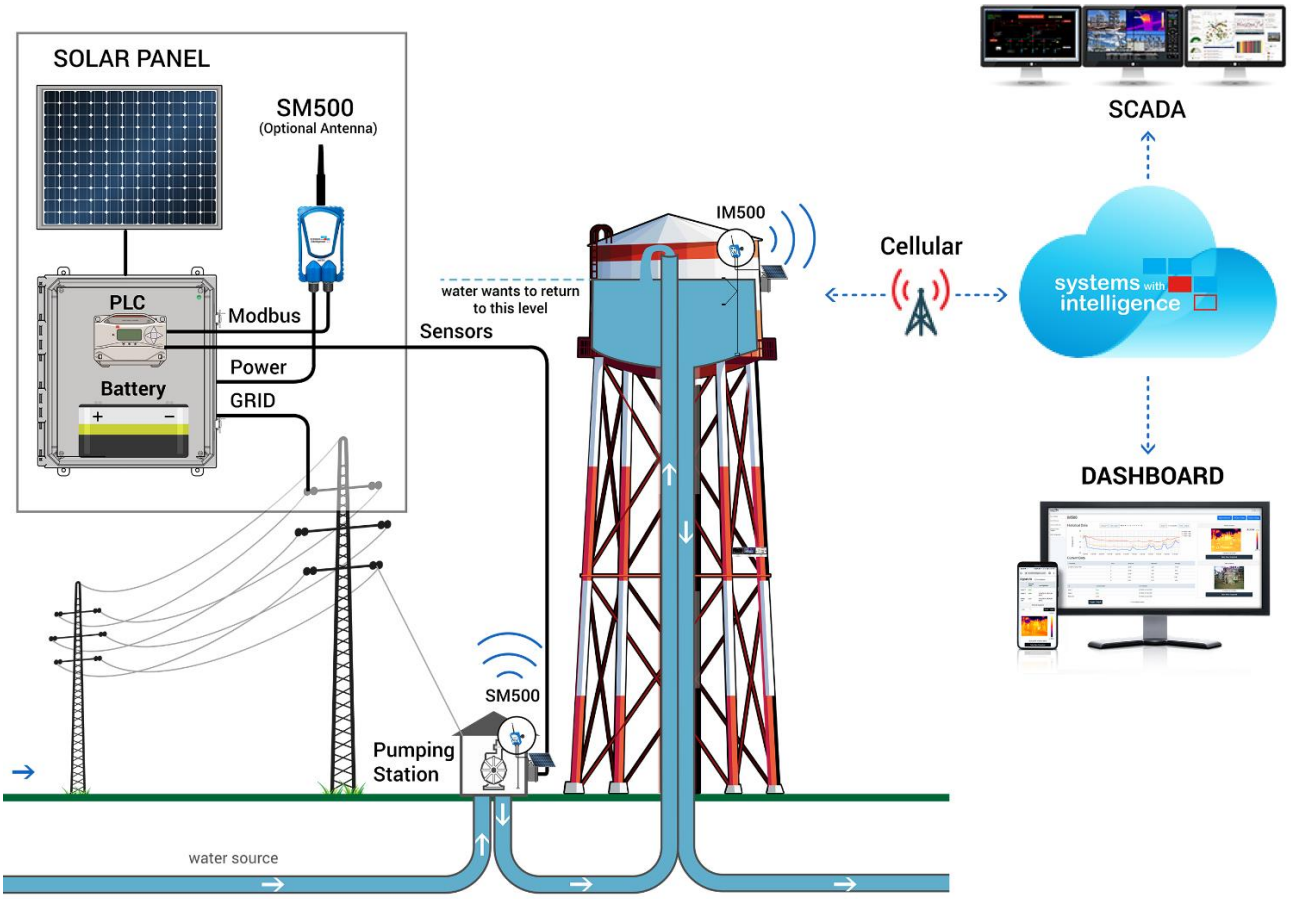

Figure 9-2 General Application

A reservoir is filled by a pump with water extracted from a well and the system is controlled by a PLC (Programmable Logic Controller). The water level is monitored, and the pump is turned on when the level is below the minimum threshold and turned off when it reaches the maximum threshold. The system also monitors the temperature of the water in the tank and sets an alarm when it is close to freezing. The power supply main line is monitored, and a solar panel and battery provides backup. The sensors and the PLC associated Modbus Register address are listed in Table 9-2.

Table 9-2 Water Tank Installation

#	Installation Element	Function description	PLC Input Sensor	Modbus register Type / Address
1	Water tank	Measure the water pressure in the water reservoir and convert it to water level	Analog Input [4-20mA]	Analog Input 30003
2	Water tank	Measure the temperature of the water	PT-100 RTD with transducers [4-20mA]	Holding register 40001
3	Water pump	Measure the consumption of the water pump	Split current transformer and transducers [4-20mA]	Analog Input 30002
4	Control house	Measure the temperature of the control house	PT-100 RTD with transducers [4-20mA]	Holding register 40002
5	Solar panel	Measure the output voltage of the solar panel	Analog Input [0-10V]	Analog Input 30001
6	Battery state	Output from the battery charger indicates that the battery is OK or Discharged	Digital Input Low=0V, High=12Vdc	Discrete Input 10001
7	Main power state	Output from the power supply indicates the presence of the main power: OK/ Loss	Digital Input Low=0V, High=12Vdc	Discrete Input 10002
8	Pump control	PLC output controls the pump	PLC internal Digital Status that indicates pump is ON/OFF	Coil 1
9	Fan control	PLC output controls the fan of the control house	PLC internal Digital Status that indicates light is ON/OFF	Coil 2

9.1.2 Mapping

In Table 9-3 is presented the points that will be configured in this section. You need to consult the manual of your device in order to procced with the configuration.

Table 9-3 Mapping Preparation

Index SM500	Function description	Modbus Register type	Modbus Register address	Instructions
1	Solar panel voltage	16-bit unsigned Analog Input	0	Section 9.4.4
2	Pump current	16-bit unsigned Analog Input	1	
3	Water tank level	16-bit unsigned Analog Input	1	
4	Tank temperature	16-bit unsigned Holding register	0	Section 9.4.5
5	House temperature	16-bit unsigned Holding register	1	
6	Battery state	1-bit Discrete Input	0	Section 9.4.3
7	Main power state	1-bit Discrete Input	1	
8	Pump control	1-bit Coil	1	Section 9.4.2
9	Fan control	1-bit Coil	2	

9.2 Stage 1: Add New SM500 Device

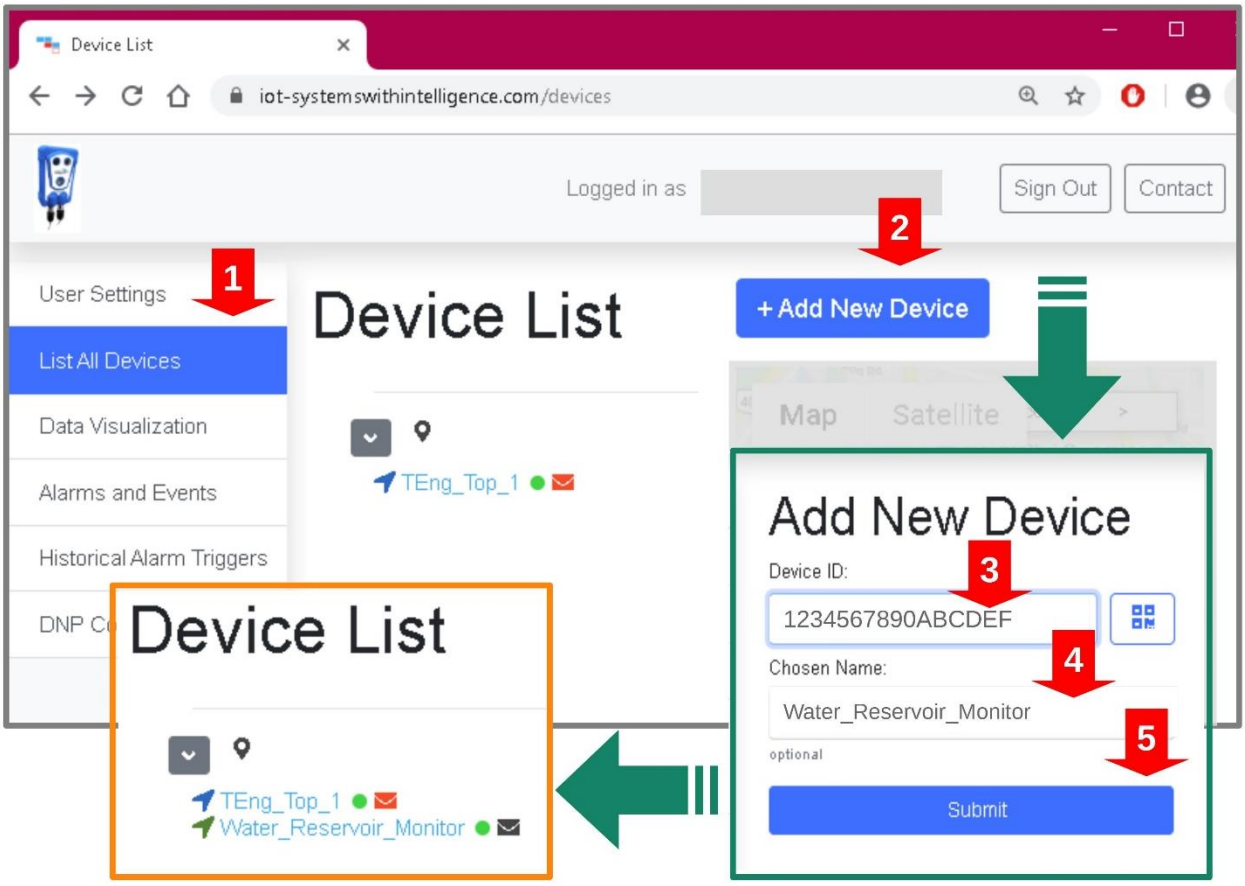

Figure 9-3 Add new device

In this chapter you will add the SM500 unit to your organization using the ID of the device. An alternate method requires the use of the build-in video camera of your PC/laptop and is described in section 6.2.

This setup is required only once per device and you must be log-in with Administrator credentials and the device can be off-line (not powered). Follow instructions shown in Figure 9-3

1. Click the "List All Devices" menu to reach the page where the "Add New Device" button is available.
2. Click on the "Add New Device" button located on top right and a new page is displayed.
3. Enter the Device ID; this information is printed on the label located on the back of the device.
4. Enter a name that will easily identify the device; in this case "Water Reservoir Monitor".
5. Click the "Submit" button and the new unit will be listed in the "Device List" page.

Once you complete this task the device is shown on the "List All Devices" page and you could proceed to section 9.3.

9.3 Stage 2: Device Setup

This setup requires that the SM500 is powered and on-line (connected to SWI IoT Cloud). You could do this configuration as Operator or Administrator.

9.3.1 SM500 Setup Page

Click the "List All Devices" button in the left menu and then click the name of the device that will be configured. The main page for setting the SM500 device will be displayed as in Figure 9-1 and the elements of top of the page are shown in Figure 9-4:

1. Name of the device entered in section 9.2 (Add New Device).
2. Alarms/Events button - see section 9.5.
3. Digital IO button – see section 9.6.
4. Device Setup button – see section 9.3.2.
5. Modbus Setup button – see section 9.4.

Figure 9-4 SM500 Setup Page

9.3.2 Communication Setup

This is the second stage in the setup. On the SM500 Setup Page (Figure 9-4) press the Device Setup button (4) and a new page is displayed – see Figure 9-5.

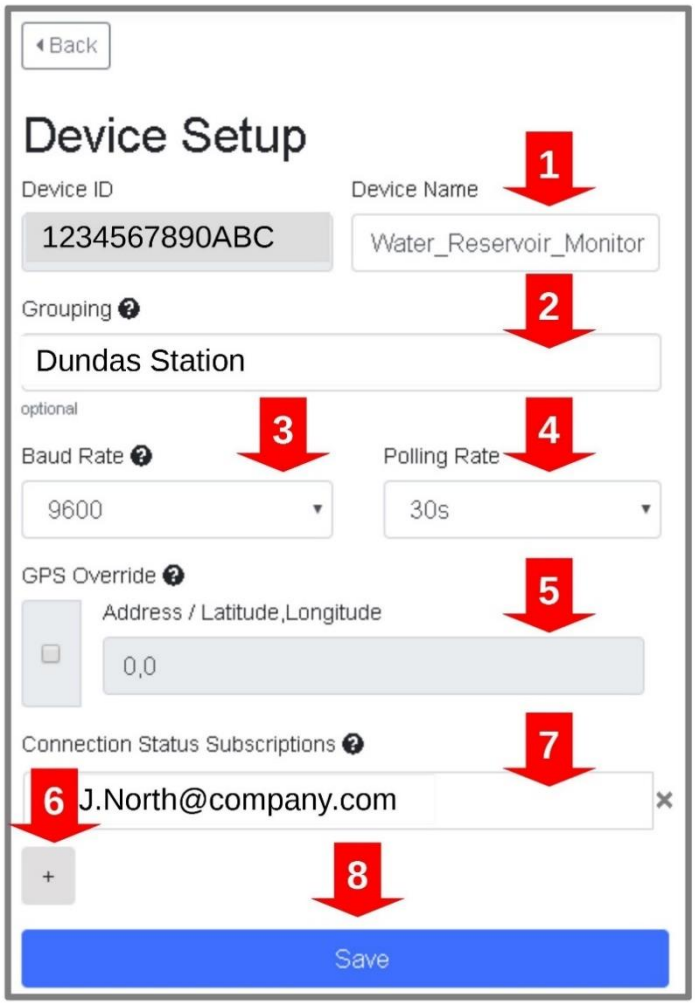

Figure 9-5 Device Setup

1. Enter a Device Name that will identify the unit function or location.
2. Optional: Grouping, will place together units that have same location/ function.
3. The Baud Rate must match the PLC configuration. Available selections: 1200, 2400, 4800, 14400, 19200, 38400, 57600bps.
4. Polling Rate: 30s, 1m, 3m, 5m, 10m, 15m, 30m. This represents the interval between Modbus requests.
5. The GPS Override allows you to enter a specific location instead of the GPS.
6. Optional: press the '**+**' to add an e-mail that will receive notifications regarding the Connection Status.
7. Optional: enter the recipient e-mail. To remove an e-mail field, press the '**X**'.
8. Press the Save button to preserve the settings. Press the Back button to discard the changes and return to previous page.

9.4 Stage 3: Modbus Setup

This setup requires that the SM500 is powered and on-line (connected to SWI IoT Cloud). You could do this configuration as Operator or Administrator.

9.4.1 Add New Points

At this stage you will learn how to configure the SM500 in order to retrieve the measurements from the Modbus slave. To start click on the left menu "List All Devices" button then click on the device name (link) and you will reach the SM500 main page (see Figure 9-4).

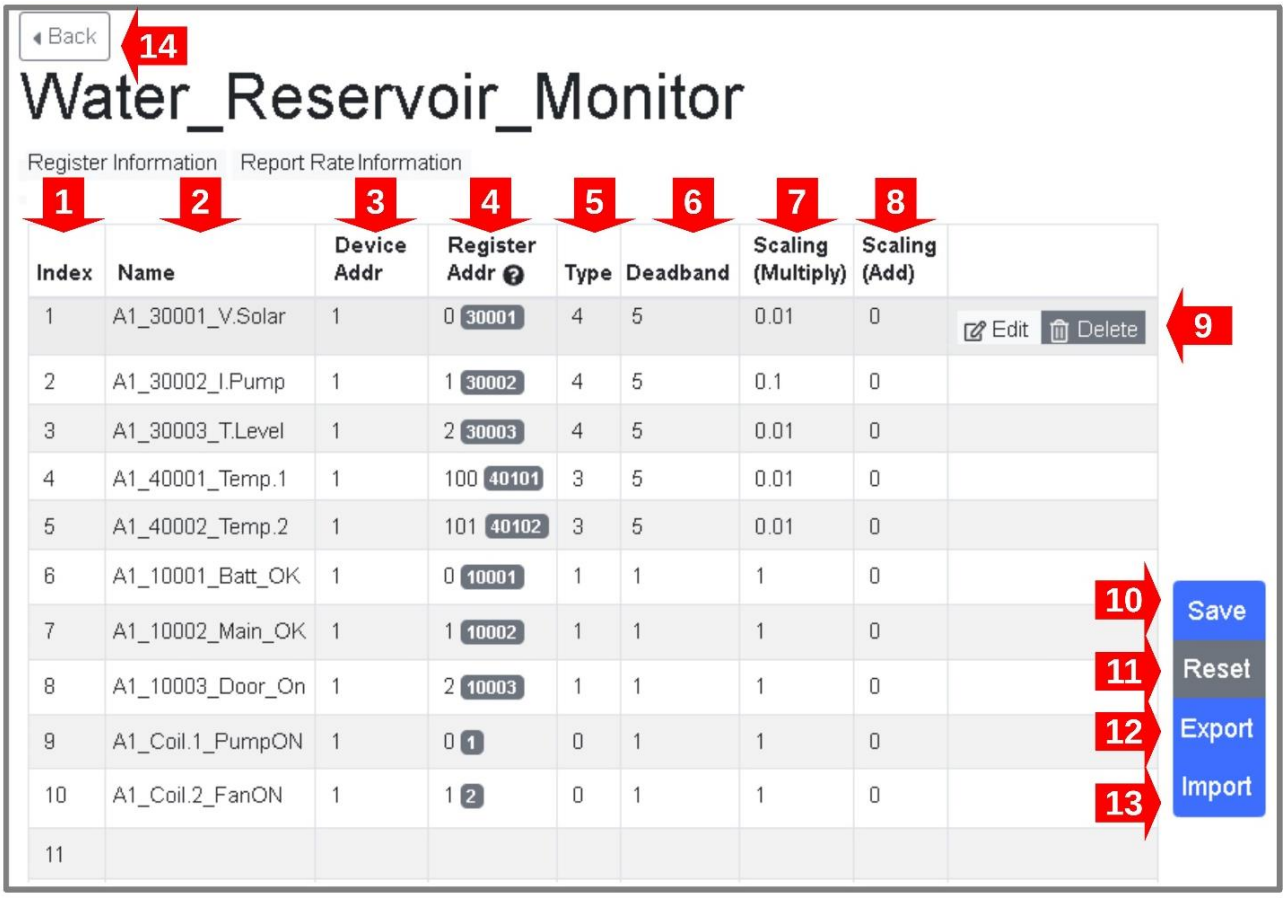

Figure 9-6 Modbus Setup

Figure 9-6 legend:

1. Index of the point in the SM500 list. There are a total of 64 points.
2. Name – you add this information for each point to easily identify.
3. Device address – the address of the Modbus device you will communicate.
4. Register address – the location of the Modbus register to be retrieve.
5. Register Type – allocated in the device. These type can be retrieved by the IoT SM500:
   - 1 bit coil (0x01, base address 1)
   - 1 bit discrete input (0x02, base address 10001)
   - 16 bit holding register signed or unsigned (0x03, base address 40001)
   - 16 bit input register signed or unsigned (0x04, base address 30001)

6. Deadband – defines the smallest input change before the value is reported.
7. Scaling (Multiply) – to display in the dashboard the engineering values the SWI IoT application provides two coefficients: "Scaling (Multiply)" and "Scaling (Add)". The scaled values are used only for the Data Visualization page; the collected data is sent unaltered to SCADA via DNP3.
8. Scaling (Add) – used for scaling the reading to engineering units. See Scaling example below.
9. Edit – press this button to configure a new point or edit an existing one. Optional, you can press the Delete button to remove this entry from configuration.
10. Save – must press this button for the changes to take effect.
11. Reset – press this button to return to the last saved configuration.
12. Export – press this button to save the configuration as a file to your PC/Laptop. It is strongly recommended not to alter the file using a text editor.
13. Import – press this button to use a previously exported configuration. The file can be used as a restore point and/or to configure multiple sites that have the same setup.

Scaling example: The current sensor is reporting the measured value in milliamperes: 10m A= 1 count. A reading of 423 represents: 423 x 10mA = 4230mA.
To display the values in engineering units [Amperes] you will use a multiplying factor of:
(10mA/count)/1000 = 0.01

The display will show 423 x 0.01 = 4.23A

The configuration windows contain these generic buttons:

- **Cancel** – press this button to discard any changes and return to previous page.
- **Confirm** – press this button to preserve this configuration and return to previous page. You must press the "Save" button on the Point Setup page for the configuration to take effect.

9.4.2 Coil Register [1 – 9999]

In this section you will learn how to configure a "coil register". A writing to this register activates a relay and, in this example, it controls the pump: turn on and off. In the SM500 Setup Page (Figure 9-4) press the "Edit" button marked (5) located to the right of the page and the generic Configure Modbus Point is displayed. Follow the instructions below:

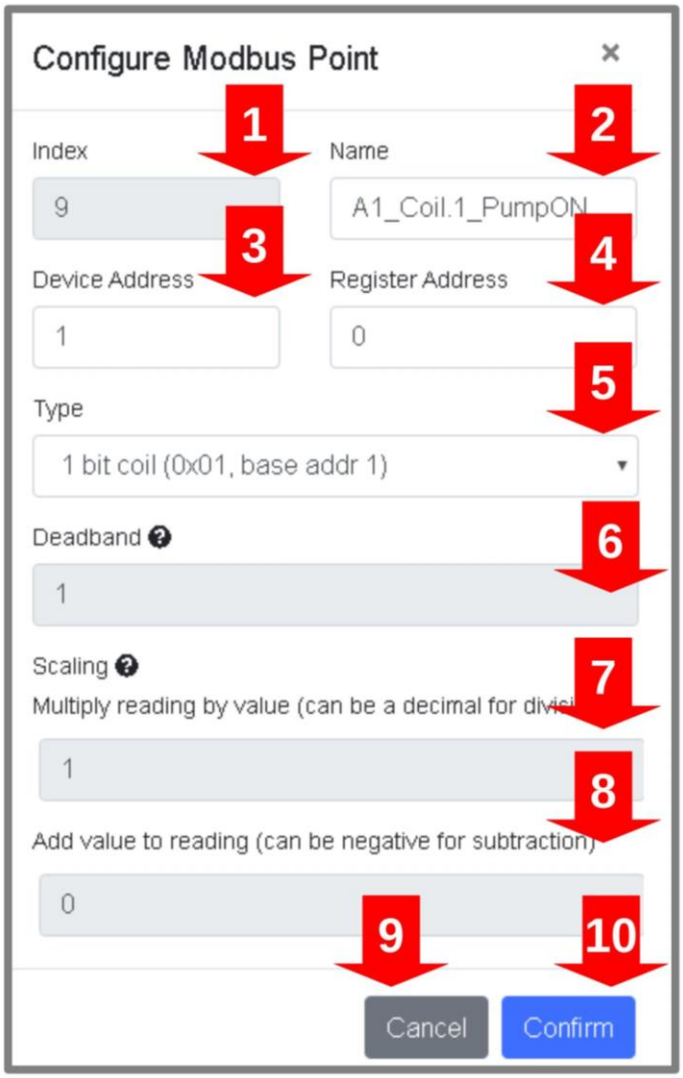

Figure 9-7 Configure Coil

1. Index: displays the automatic value allocated in the table.
2. Name: enter an identifier of the function. In this example the name includes "Coil" and "PumpON".
3. Device Address: enter the address of the device. In this example is 1.
4. Register Address: enter the value of the address. In this example is 0 (zero).
5. Type: select "1 bit coil" in the drop down list.
6. Scaling Multiply – not available for this type.
7. Scaling Addition – not available for this type.
8. Cancel: press this button to discard the configuration and return to previous page.
9. Confirm: press this button to save the configuration.

9.4.3 Discrete Input Registers [10001 – 19999]

In this section you will learn how to configure a "Discrete Input Register". This is a read only register and reflects the status of switch/electrical contact. In this example, the system provides the status of the battery using a discrete input register. In the Points Setup page (Figure 9-4) press the "Edit" button marked (5) located to the right of the page and the generic Configure Modbus Point is displayed. Follow the instructions below:

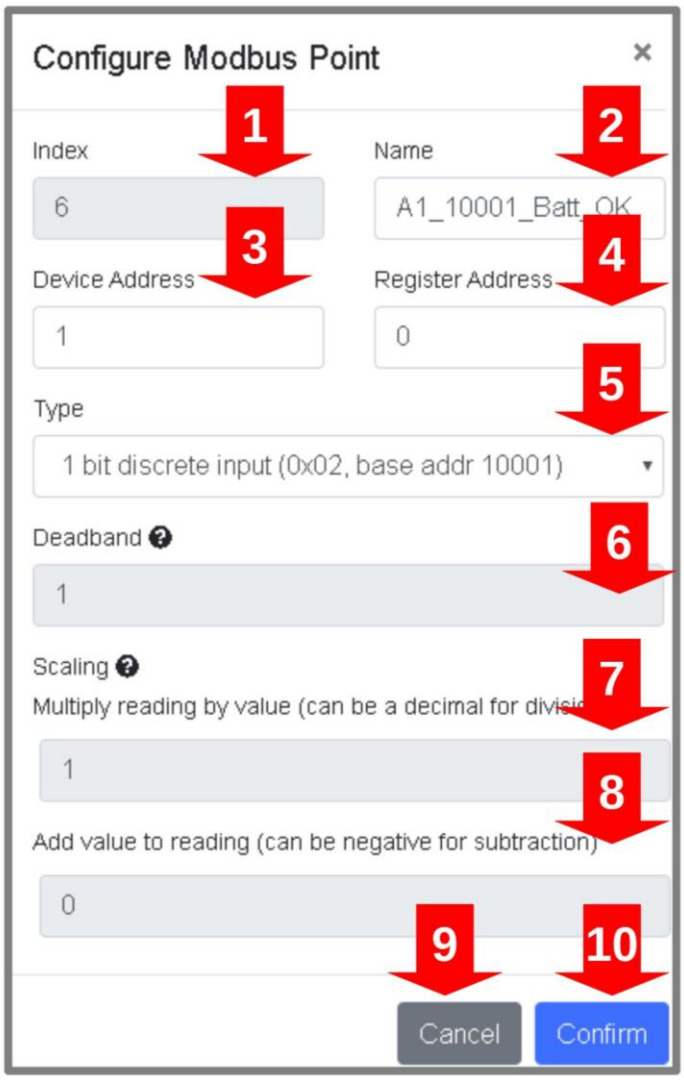

Figure 9-8 Configure Discrete Input

1. Index: displays the automatic value allocated in the table.
2. Name: enter an identifier of the measurement. In this example the name includes the register address and "Batt OK".
3. Device Address: enter the address of the device. In this example is 1.
4. Register Address: enter the value of the address. In this example is 0 (zero).
5. Type: select "1 bit discrete input" in the drop down list.
6. Scaling Multiply – not available for this type.
7. Scaling Addition – not available for this type.
8. Cancel: press this button to discard the configuration and return to previous page.
9. Confirm: press this button to save the configuration.

9.4.4 Input Registers [30001 – 39999]

In this section you will learn how to configure an "input register". This register holds the measurement of an analog input and, in this example is the voltage of the solar panel. In the SM500 Setup Page (Figure 9-4) press the "Edit" button marked (5) located to the right of the page and the generic Configure Modbus Point is displayed. Follow the instructions below:

Figure 9-9 Configure Analog Input Register

1. Index: displays the automatic value allocated in the table.
2. Name: enter an identifier of the measurement. In this example the name includes the register address and "V. Solar".
3. Device Address: enter the address of the device. In this example is 1.
4. Register Address: enter the value of the address. Example - 0 (zero).
5. Type: select "16 bit input register" in the drop down list.
6. Deadband: minimum change required for the value to be reported.
7. Scaling Multiply: default value 1. This coefficient is used to scale the value displayed in the "Visualization" page.
8. Scaling Addition: default value 0. This coefficient is used to scale the displayed value in the "Visualization" page.
9. Cancel: discard and close.
10. Confirm: saves the configuration.

9.4.5 Holding Registers [40001 – 49999]

In this section you will learn how to configure a "holding register". This is a read and write register and it stores an analog value. In this example, it stores the temperature reading from a sensor. In the SM500 Setup Page (Figure 9-4) press the "Edit" button marked (5) located to the right of the page and the generic Configure Modbus Point is displayed. Follow the instructions below:

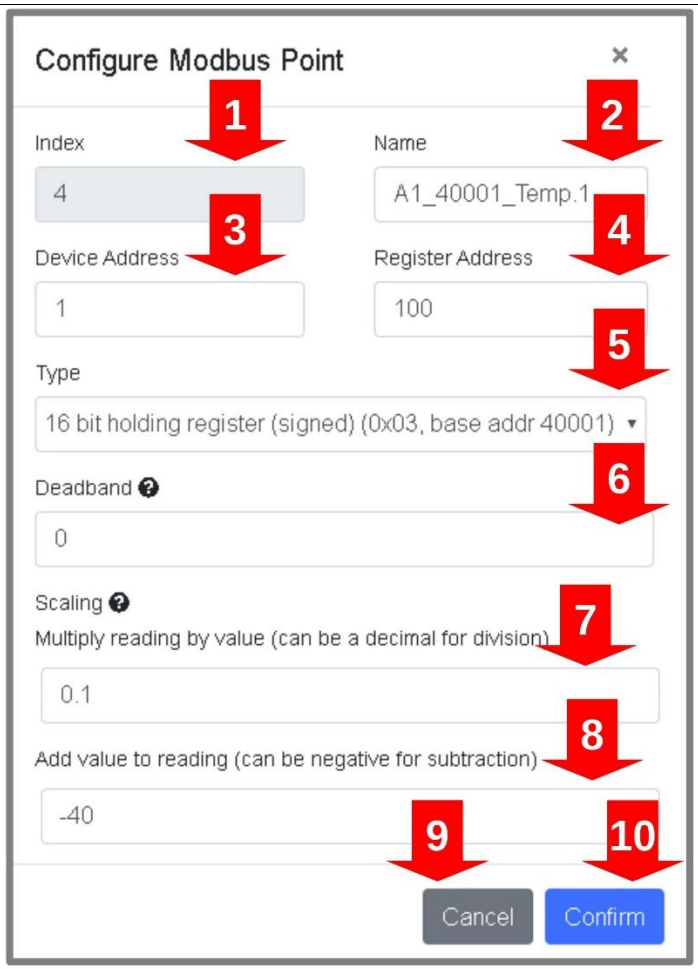

Figure 9-10 Configure Holding Register

1. Index: displays the automatic value allocated in the table.
2. Name: enter an identifier of the measurement. In this example the name includes the register address and "Temp.1".
3. Device Address: enter the address of the device. In this example is 1.
4. Register Address: enter the value of the address. E.g. 100 .
5. Type: select "16 bit input register" in the drop down list.
6. Deadband: minimum change required for the value to be reported.
7. Scaling Multiply: default value 1. This coefficient is used to scale the value displayed in the "Visualization" page.
8. Scaling Addition: default value 0. This coefficient is used to scale the displayed value in the "Visualization" page.
9. Cancel: discard and close.
10. Confirm: saves the configuration.

9.5 Stage 4: Setup Alarms and Events

This setup requires that the SM500 is powered and on-line (connected to SWI IoT Cloud). You could do this configuration as Operator or Administrator.

Press the "Alarms/Events" button (2) in "Figure 9-4 SM500 Setup Page" and the "Setup Alarms and Events" is displayed as seen in Figure 9-11.

The SWI IoT application is processing the collected data based on the conditions you configure in this section. The alarms and events are stored in the log and you can analyze to fine tune your installation. These are few examples for this application:

- Events: log when the pump is turned on and when is turned off.
- Alarm: monitor the pump current and log if it goes beyond a specified threshold. This may indicate that the pump needs maintenance. Also, you can be notified by e-mail when this condition is detected.

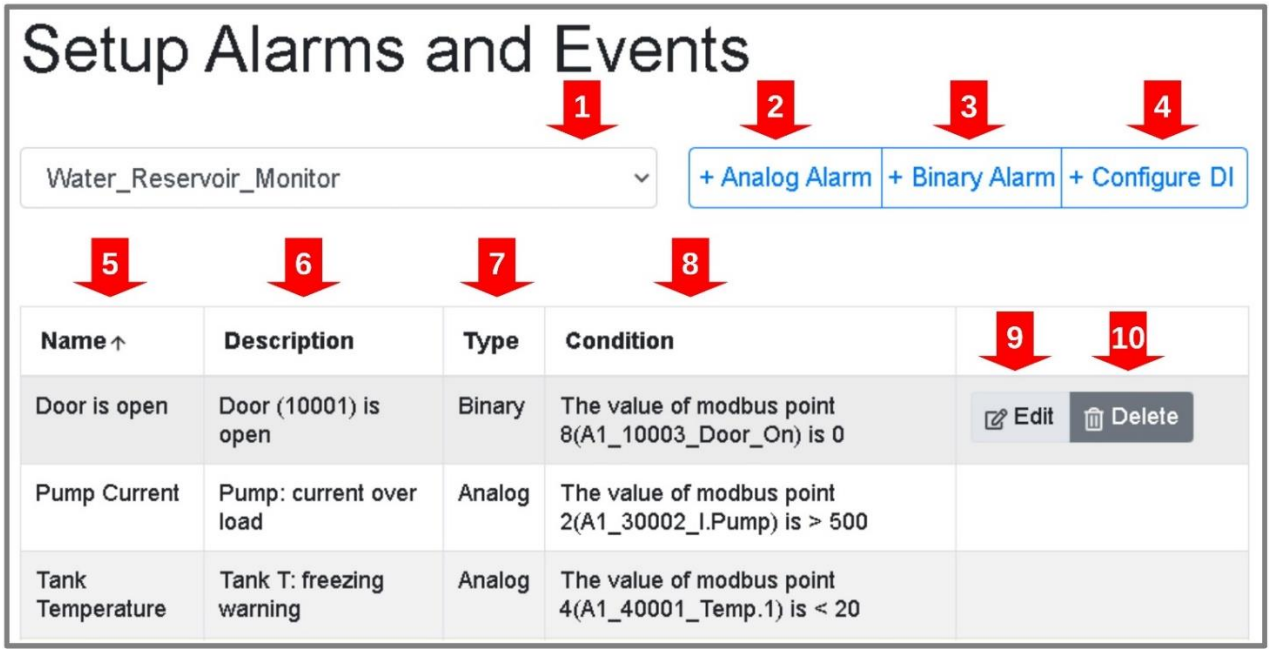

Figure 9-11 Setup Alarms and Events

The top of the page contains the buttons to access the configuration:

1. Device selection: the drop-down list allows you to select the unit you want to configure.
2. Analog Alarm – instructions in section 9.5.1
3. Binary Alarm – instructions in section 9.5.2
4. Configure DI – instructions in section 9.5.3

The header of the list contains the following columns:

5. Name – identifier of function and/or location.
6. Description – additional information to complement the name.

7. Type – Analog (temperature, pressure, current, etc.) or Binary (switch, relay).
8. Condition – definition of the state that activates the alarm.
9. To edit an existing alarm place the mouse over it and the "Edit" button will be displayed to right of the window.
10. To completely remove an existing alarm click on the "Delete" button.

9.5.1 Analog Alarm

Any continuous measurement can be associated with an analog alarm. Example: a temperature reading, pressure, water level etc. can be configured to trigger an alarm if the value goes beyond a threshold. Follow instruction in Figure 9-12

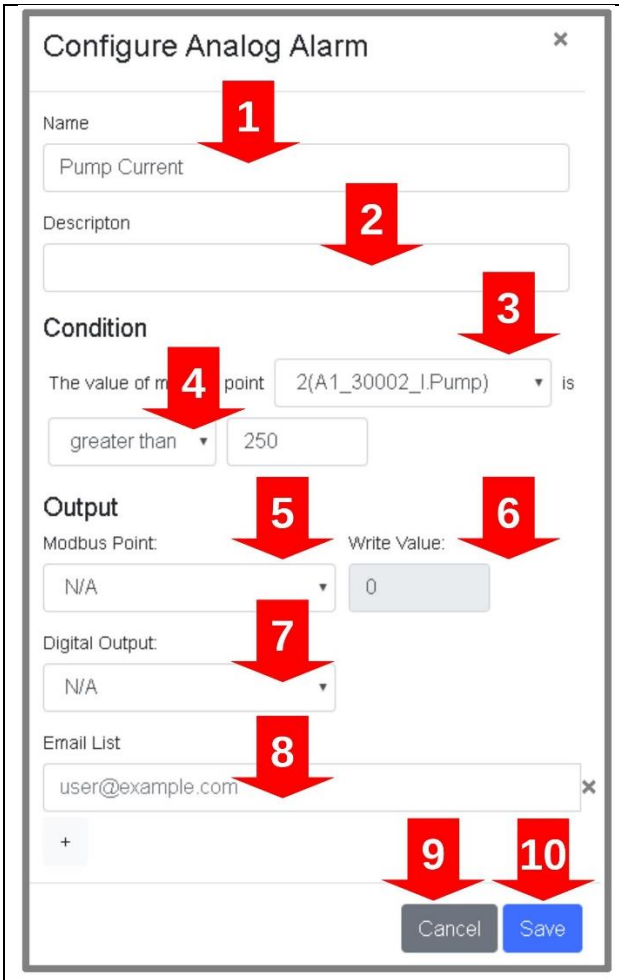

Figure 9-12 Configure Analog Alarm

1. Name: enter a short string that identifies the measurement and the condition.
2. Description: optional, additional information.
3. Modbus Point: select the measurement that will be monitored.
4. Condition and Threshold: select "greater than" or "less than" and enter the value used for comparation.
5. Optional: Output Modbus Point
6. Optional: Output Write Value
7. Optional: Digital Output
8. Optional: press the '+' to add an e-mail field; type the address where the notification is sent.
9. Cancel: press this button to discard the configuration and return to previous page.
10. Save: press this button to confirm the settings.

9.5.2 Binary Alarm

Any digital (discrete) reading can be associate with a binary alarm. Example: state switch On/Off, door Open/Close, power OK/Failed etc. It can be configured to trigger an alarm if the value is changing state: [0->1] or [1->0]. Follow instruction in Figure 9-13

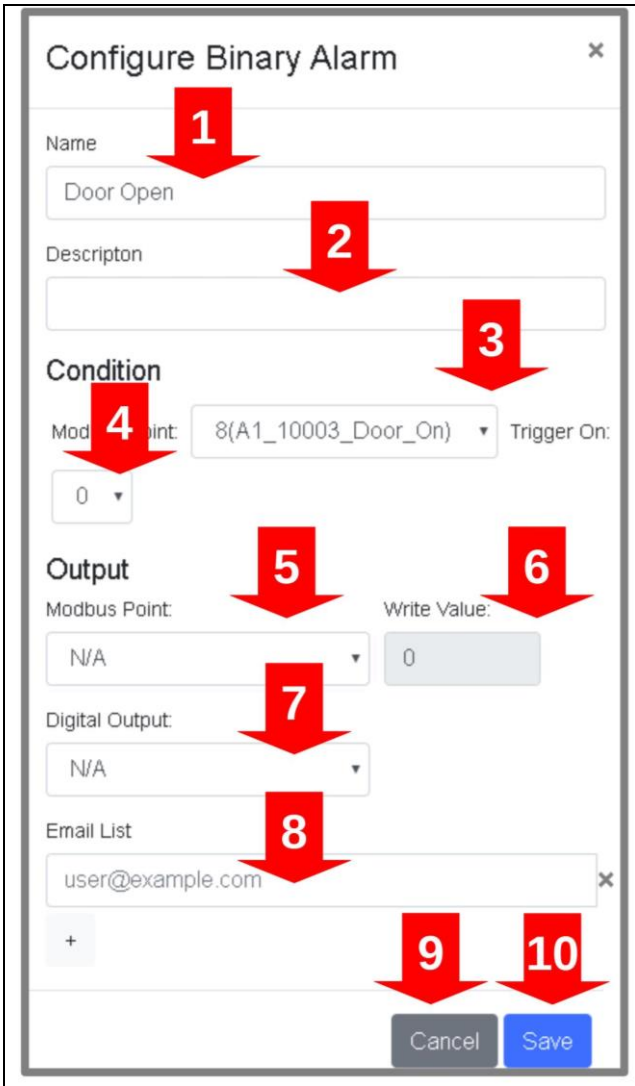

Figure 9-13 Configure Binary Alarm

1. Name: enter a short string that identifies the measurement and the condition.
2. Description: optional, additional information.
3. Modbus Point: select the point that will be monitor.
4. Trigger On: select "0" or "1"; indicates digital input (switch) is open or close.
5. Optional: select an "Output Modbus Point" where a value can be written.
6. Optional: type the "Output Write Value" to be sent.
7. Optional: select if the Digital Output should be activated – 0 or 1.
8. Optional: press the '+' to add an e-mail field and type the address where a notification is sent.
9. Cancel: press this button to discard the configuration and return to previous page.
10. Save: press this button to confirm the settings.

9.5.3 Configure DI

The SM500 is equipped with two built-in Digital Inputs (DI) that are configured following instructions in Figure 9-14.

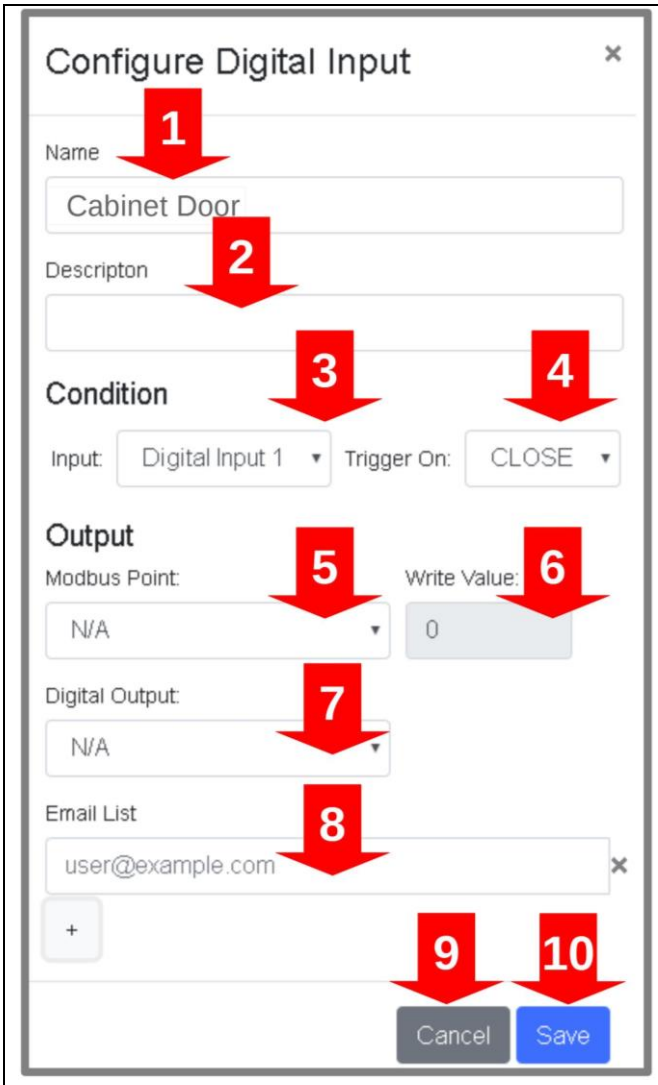

Figure 9-14 Configure Digital Input

1. Name: enter a short name that identifies the measurement and the condition.
2. Description: optional, additional information.
3. Input selection: chose one of the two Digital Inputs (1,2) available on the SM500.
4. Trigger On: CLOSE or OPEN
5. Output Modbus Point
6. Output Write Value
7. Digital Output
8. Optional: press the '+' to add an e-mail filed and type the address where the notification is sent.
9. Cancel: press this button to discard the configuration and return to previous page.
10. Save: press this button to confirm the settings.

9.6 Digital I/O

The configuration of the Digital I/O is detailed in section 7.7.

10 Data Visualization

Data Visualization is the tool that you use to customize how you view the data. In Figure 10-1 you could see an example of a substation that displays data using a gauge (A), a table (B), and a line-chart (C).

You choose to display data in a table, line-chart, or gauge. The table gives you data with time stamp, the line-chart gives you the trend of multiple measurements over a time range and the gauge gives a quick view. You select how to display data from multiple units and multiple sites. For example, you could customize a Data Visualization page to show measurements from three IM500 units on the same site: temperatures of phase A, B, C on bushings of Feeder 1 on the same line-chart as phase A, B, C on bushings of Feeder 2. In this section you will learn how to configure and use all features.

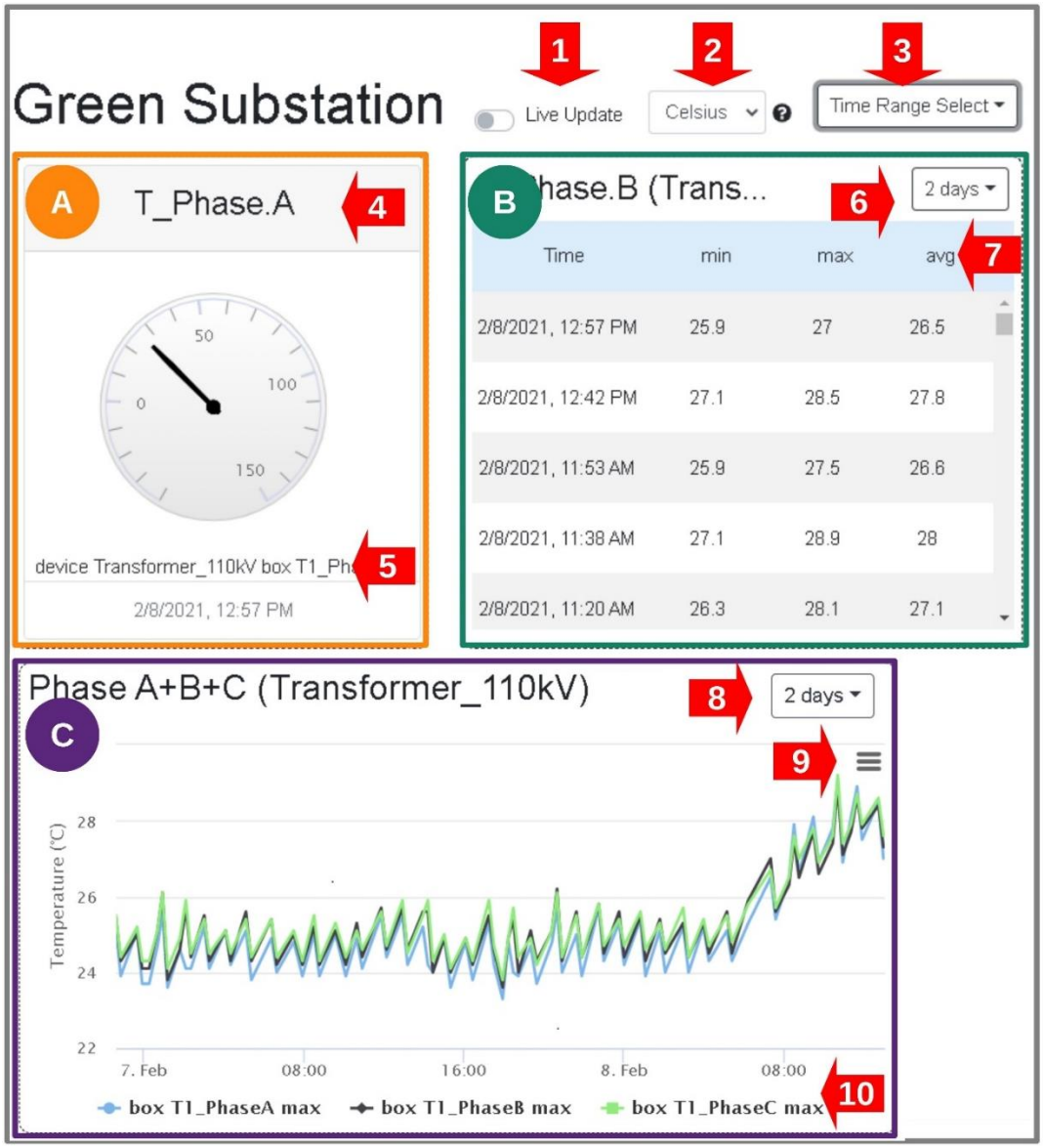

Figure 10-1 Dashboard view

The Visualization page presents the following elements – see Figure 10-1:

1. Live Update – slide the button and data will be refreshed based on the polling rate.
2. IM500 only: select between Celsius and Fahrenheit.
3. Time range drop-down list selection: 1/ 2/ 12 hours, 1/ 2/ 4/ 7/ 14/ 30 days and Custom. This setting is changing the range for all tables and line-charts in the current dashboard.
4. (A) Gauge view - Name of the measurement.
5. (A) Gauge view – Device, measurement and time stamp of the value reported.
6. (B) Table view – Range of data.
7. (B) Table view – header: time stamp, minimum, maximum and average.
8. (C) The Line-chart view displays multiple measurements for a specified time range on the same scale. This is a great tool for seeing trends over time.
9. (C) Line-chart view menu allows you to save the data offline as a picture or spreadsheet.
10. (C) The Line-chart legend displays the how each measurement is plotted.

Please note that you can view only the measurements that you configured following the instructions in section 9.

10.1 Start: New View

In this section you will learn how to build a Visualization page. The first step is to create an empty Visualization page as shown below in Figure 10-2 . The second step is to add the measurements by following the instructions in sections 0 to 0.

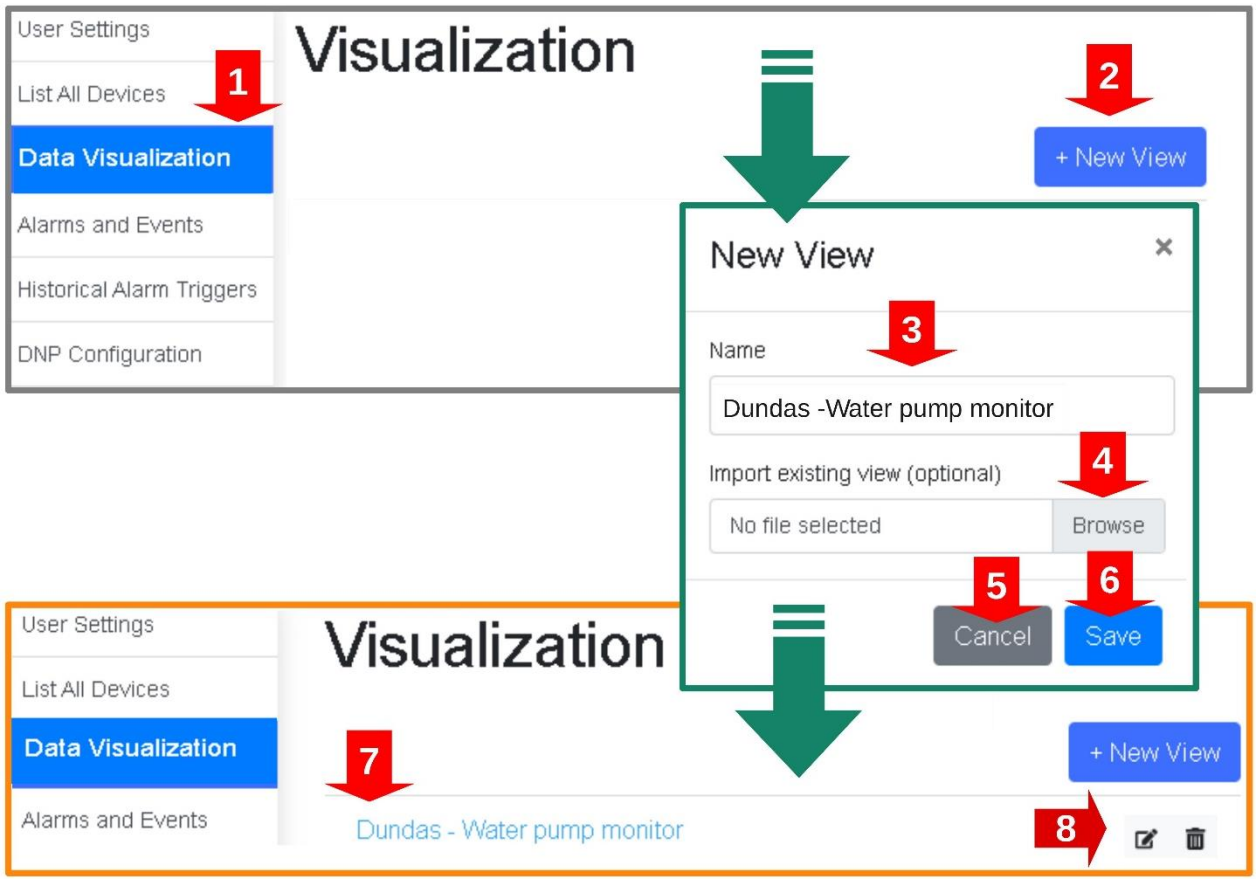

Figure 10-2 New View

Follow instructions in Figure 10-2 to create the empty page:

1. Press Data Visualization button located on the left menu.
2. Press the "New View" button located on the right of the Visualization page.
3. Enter the name in the edit box.
4. Optional – "Browse": press this button to import an existing configuration file saved by following the instructions in section.
5. Press "Cancel" button to discard and return to previous page.
6. Press "Save" button to keep the configuration and return to previous page.
7. Press the newly created link and proceed to section 10.2.
8. Optional: you could click the edit icon to change the name of page. Also, you could click the trash icon to completely delete the page.

10.2 Type: Display Box

The Display Box is the most common view – it shows the last received reading with time stamp and in Figure 10-4 is shown the typical dashboard.

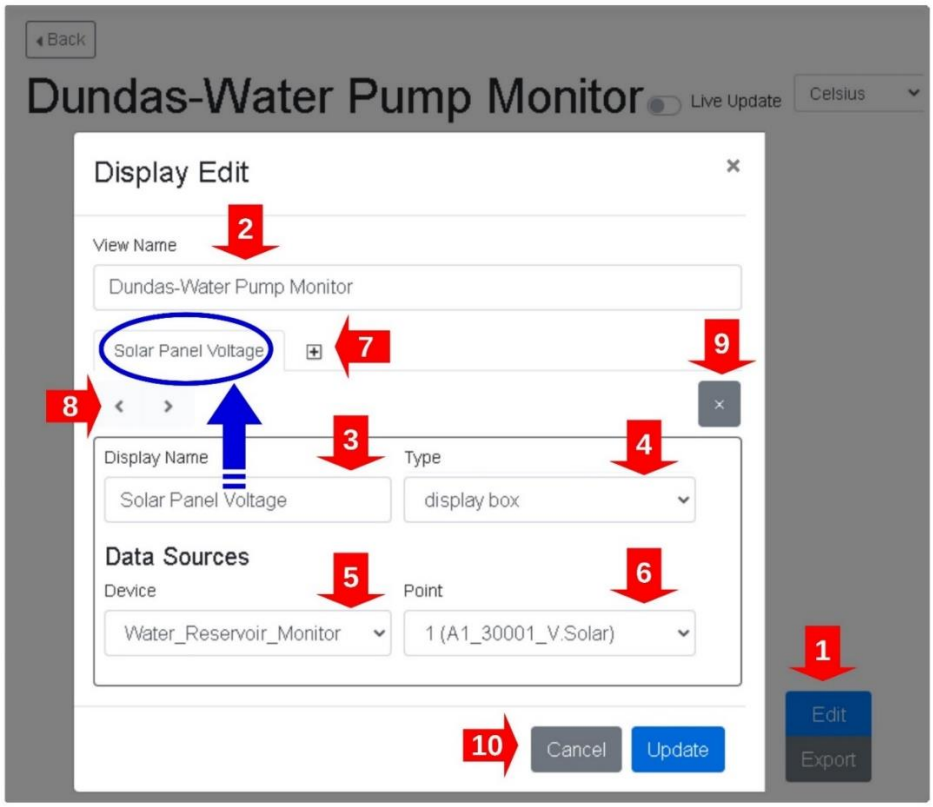

Figure 10-3 Configuration of the Display Box

Start by clicking the "Data Visualization" in the left menu, then the name of the page you created in section 10.1and then press the Edit button on the right menu (arrow 8 in Figure 10-4). Follow instructions in Figure 10-3:

1. Press the "Edit" button located at the bottom-right on the visualization page.
2. Optional: you can rename the page after the page was created creation.
3. Type the name associated with the measurement. E.g. Solar Panel Voltage, this is displayed in the tab above.
4. Select in the Type drop-down list: "display box".
5. Select in the Device drop-down list the unit that collects the data.
6. Select in the Point drop-down list the measurement. E.g. V.Solar.
7. Press the "**+**" New" button to add a new configuration display box.
8. Press the arrow left or right to navigate to another tab to update the configuration.
9. Press "**x**" if you want to delete this entry.
10. Press the "Update" button to preserve the configuration and return to previous page. To discard the changes press the "Cancel" button.
11. Repeat steps 3 to 7 to add all measurements of interest.

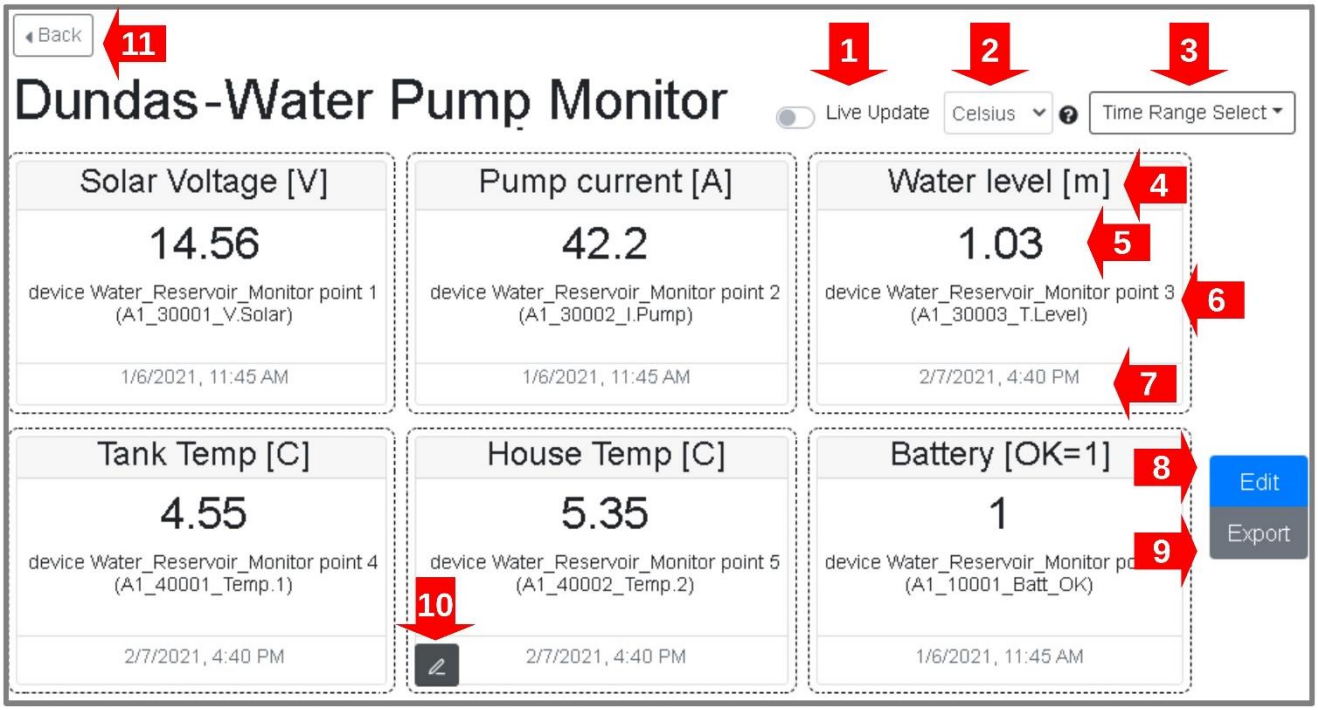

Figure 10-4 Typical Display Box Data Visualization

After you complete the configuration of the page using Display Boxes you will get a Data Visualization like the one shown in Figure 10-4. These are the actions you can perform in the dashboard page:

1. Live Update – slide the button and data will be refreshed based on the polling rate.
2. IM500 only: select between Celsius and Fahrenheit.
3. Time range drop-down list selection: 1 hour to 30 days, days and Custom. This is selection applies for the entire page and affects only the table and the line-chart.
4. Name of the measurement.
5. Last reported value after is scaled.
6. IoT Device name, point number and point name.
7. Time stamp of the last reported value.
8. Press the "Edit" button to make changes to this visualization page and continue the configuration of the dashboard, follow direction in Figure 10-3.
9. Press the "Export" button to preserve this configuration in the local computer.
10. Press the edit icon to make changes to this specific display.
11. "Back" – press this button to return to previous page.

10.3 Type: Table

The Table view presents the readings and the acquisition time in two columns as seen Figure 10-6.

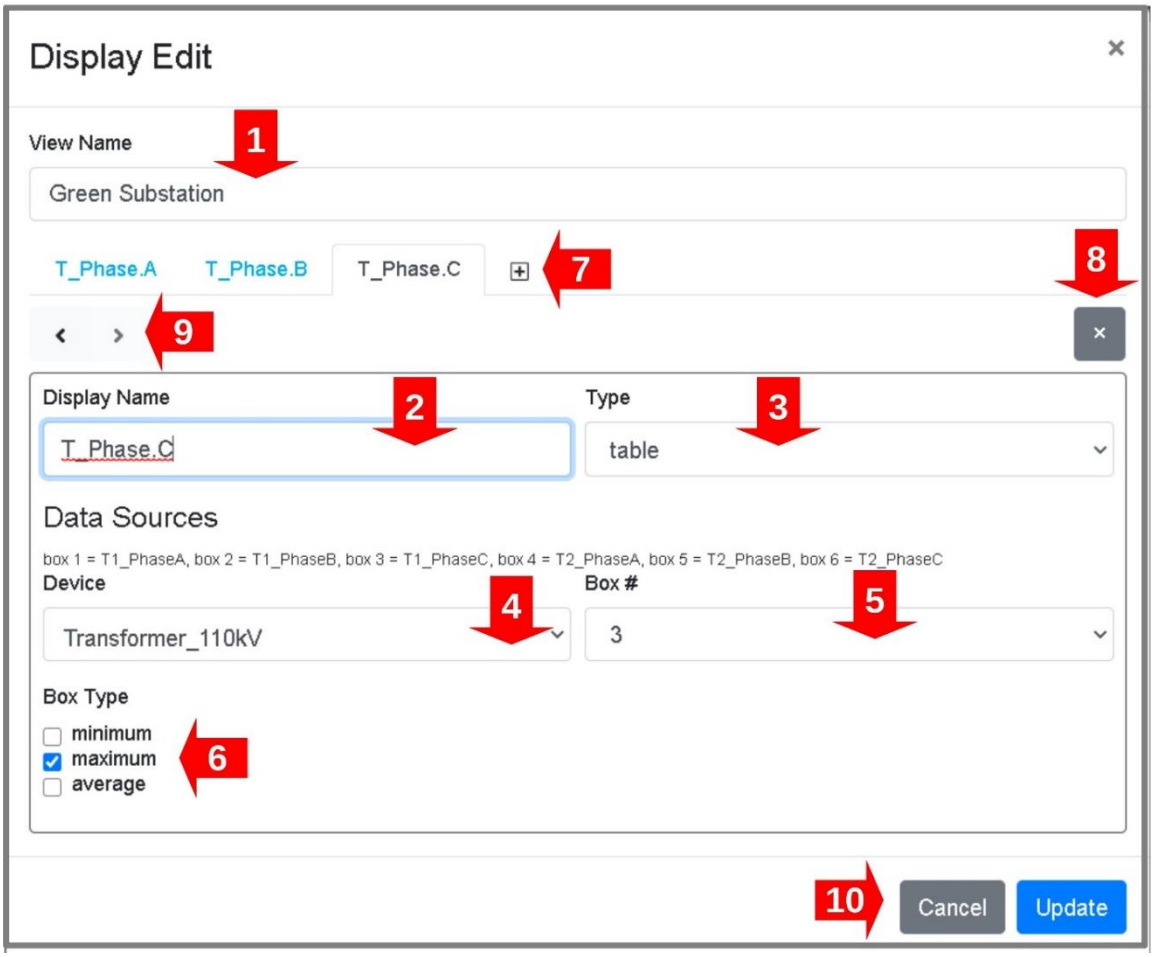

Figure 10-5 Configure: Table

Start by clicking the "Data Visualization" in the left menu and then click on the name of the page you created in section 10.1. Press the Edit button on the right menu (arrow 8 in Figure 10-4) then follow instructions in Figure 10-5:

1. Optional: Rename the dashboard.
2. Type the name of the measurement. E.g. T_Phase.C, Water Level [m].
3. Select in the Type drop-down list: "table".
4. Select in the Device list the unit that collects the data. E.g. Transformer_110kV.
5. Select in the Point drop-down list the measurement to be displayed. E.g. Box #3
6. Check which measurement to be displayed in the table.
7. Click the "**+**" icon to add a new display; repeat steps 2 to 6.
8. Click the "**x**" icon to remove this tab.
9. Use the left-right arrow to navigate to previous/next tab.
10. Press the Update button to save the changes and return to main page. Press Cancel to discard the last changes.

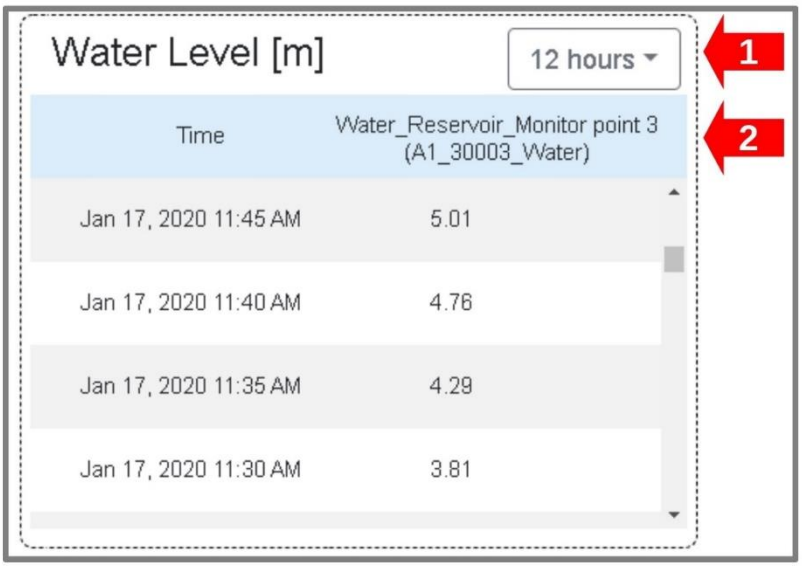

Figure 10-6 View: Table

In In Figure 10-6 is shown the Table view for the SM500 Water Level Monitor:

1. Select in the drop-down list the period that will be plotted.
2. Header: left column displays the acquisition date and time; right column shows the data.

10.4 Type: Digital I/O

The Digital I/O is a dedicated view for the hardware of the IoT: two digital inputs and one digital output.

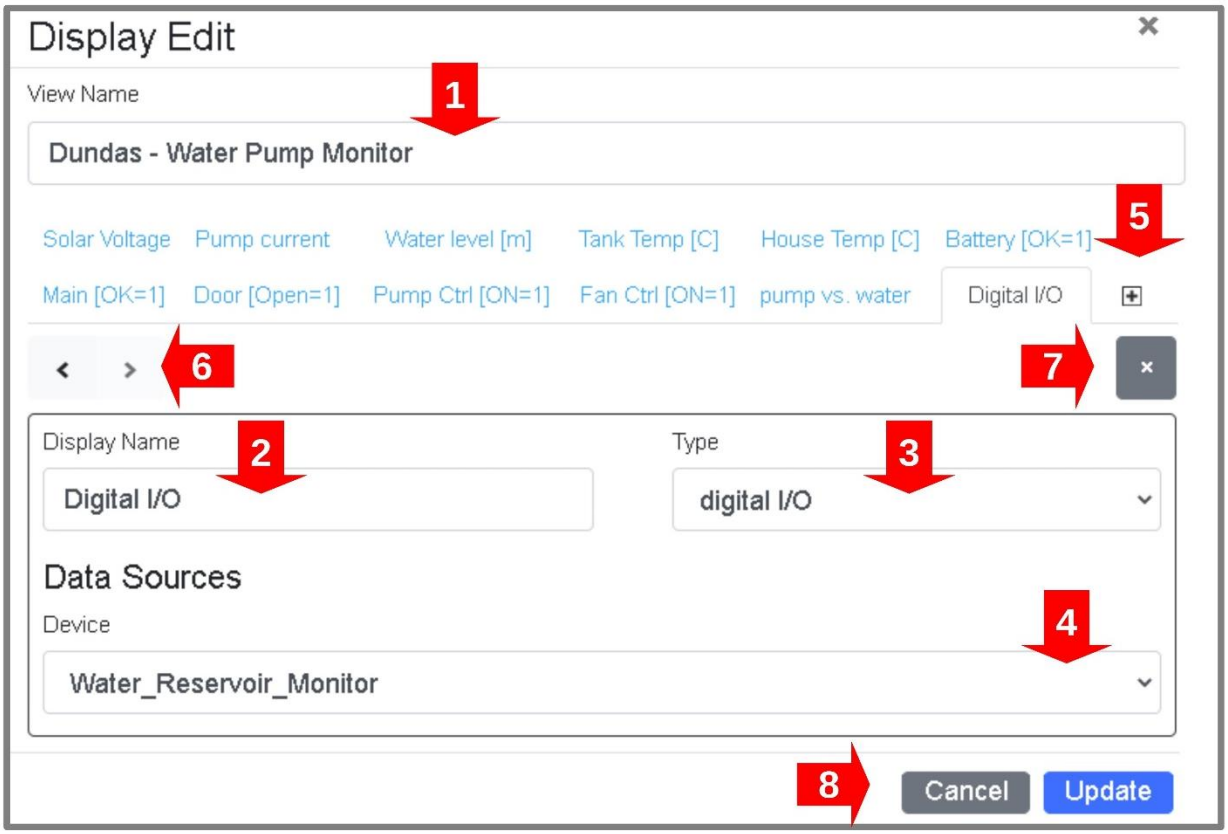

Figure 10-7 Configure Digital I/O

Start by clicking the "Data Visualization" in the left menu and then click on the name of the page you created in section 10.1. Press the Edit button on the right menu (arrow 8 in Figure 10-4) then follow instructions in Figure 10-7:

1. Optional: you can rename the page after the page was created creation.
2. Type the name associated with the measurement. E.g. Digital In/Out
3. Select in the Type drop-down list: "digital I/O".
4. Select in the Device drop-down list the unit that collects the data.
5. Press the "**+**" button to add a new configuration tab.
6. Press the arrow left or right to navigate to another tab to update the configuration.
7. Press "**x**" if you want to delete this entry.
8. Press the "Update" button to preserve the configuration and return to previous page. To discard the changes, press the "Cancel" button.

10.5 Type: Gauge

The gauge gives a quick view of the data that shows where the last reading is positioned in reference to the minimum and the maximum levels you set.

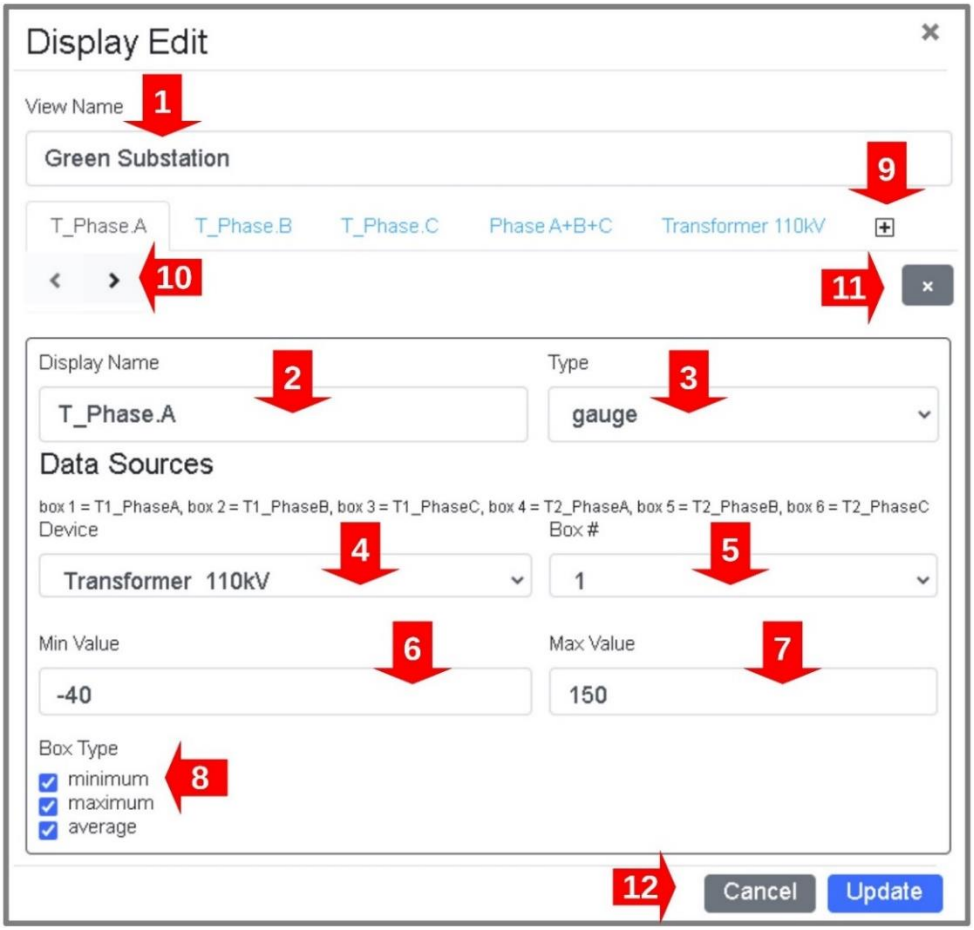

Figure 10-8 Configure: Gauge.

Start by clicking the "Data Visualization" in the left menu and then click on the name of the page you created in section 10.1. Press the Edit button on the right menu (arrow 8 in Figure 10-4) then follow instructions in Figure 10-8:

1. Optional: you can rename the page after it was created created.
2. Type the name associated with the measurement. E.g. T_Phase.A
3. Select in the Type drop-down list: "gauge".
4. Select in the Device drop-down list the unit that collects the data.
5. Select in the Point drop-down list the measurement. E.g. Box #1.
6. Enter the minimum value that the measurement could reach.
7. Enter the maximum value that the measurement could reach.
8. Select which calculation to be displayed: min, max, avg.
9. Press the "**+**" icon to add a new configuration tab.
10. Press the left/right arrow to navigate to another tab.
11. Press "**x**" if you want to delete this entry.

10.6 Type: Line chart (IM500)

The Line chart view allows you to plot up to five data points on a graph to view correlations between measurements and analyze trends over a time range. In Figure 10-11 you can see an example that plots three thermal measurements. Note: this view is recommended for analog measurements.

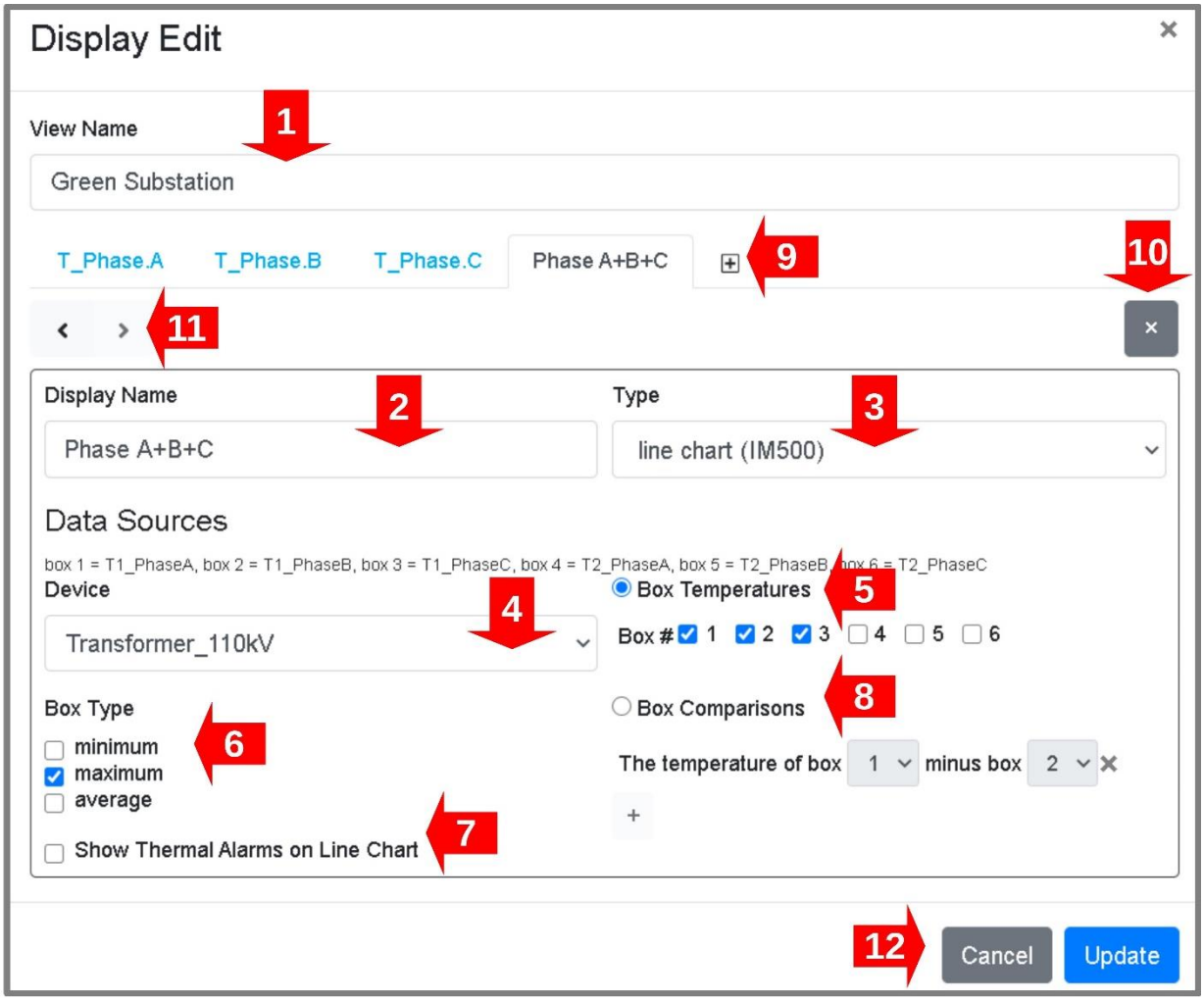

Figure 10-9 Configure: Line Chart (IM500)

Start by clicking the "Data Visualization" in the left menu and then click on the name of the page you created in section 10.1. Press the Edit button on the right menu (arrow 8 in Figure 10-4) then follow instructions Figure 10-9:

1. Optional: Retype the name of the dashboard view.
2. Enter the Name to be displayed for this graph (E.g. "Phase A+B+C", "pump vs. water")
3. Select "line chart" in the drop-down list based on the IoT type: IM500 or SM500.
4. Select in the "Device" drop-down list the unit that collects the data.
5. Check the Box Temperature numbers for the values to be plotted.
6. Select which measurement will be plotted.
7. Optional: the thermal alarm could be display on the line-chart.

8. Optional: you could display the difference between two readings.
9. Click the "**+**" icon to add tab and edit a new display.
10. Click the "**x**" icon to delete this tab.
11. Use left/right arrows to navigate to previous/next tab.
12. Press the "Update" button to preserve the configuration and return to previous page.
    Press the "Cancel" button to discard all the last changes.

10.7 Type: Line chart (SM500)

The Line chart view allows you to plot up to five data points on a graph to view correlations between measurements and analyze trends. In Figure 10-11 you can see an example that plots two analog values. Note: this view is recommended for analog measurements.

Figure 10-10 Configure: Line-chart (SM500)

Start by clicking the "Data Visualization" in the left menu and then click on the name of the page you created in section 10.1. Press the Edit button on the right menu (arrow 8 in Figure 10-4) then follow instructions in Figure 10-10:

1. Optional: Retype the name of the dashboard.
2. Enter the Name to be displayed for this graph. E.g. "pump vs. water".
3. Select "line chart (SM500)" in the drop-down list.
4. Select in the "Device" list the unit that collects the data: "Water Reservoir Monitor".
5. Select in the "Point" drop-down list the reading to be plotted: "I.Pump"
6. Click the "**+**" to add another reading to the plot.
7. Select in the "Device" list the unit that collects the data: "Water Reservoir Monitor".
8. Select in the "Point" drop-down list the second reading to be plotted: "T.Level".
9. Optional: Press the "**x**" to delete this data from the graph.
10. Press the "**+**" icon to add another tab and configure.
11. Use left/right arrows to navigate to previous/next tab.
12. Optional: Press the "**x**" to delete this tab from the dashboard.
13. Press the "Update" button to preserve the configuration and return to previous page. Press the "Cancel" button to discard the last changes.

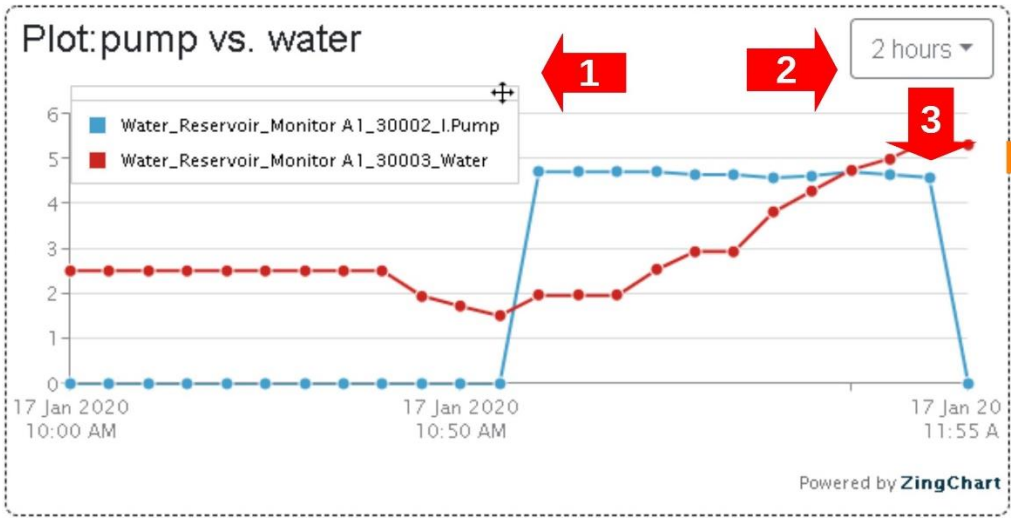

Figure 10-11 View: Line Chart

In Figure 10-11 is shown the SM500 Water Tank Monitor line-chart view:

1. Place the mouse over the legend (top-left) and drag to a desired location.
2. Select in the drop-down list the period that will be plotted.

10.8 Type: Write box (SM500)

The "Write box" is suitable for sending a value to a "Holding Register" or a "1-bit coil" output. In this example the control of the pump is configured - follow instructions in Figure 10-12.

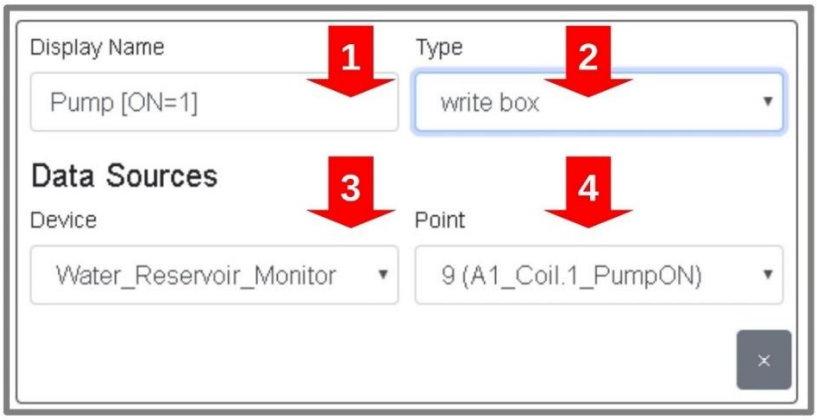

Figure 10-12 Configure: Write Box

1. Type the name of the control. E.g. Pump [ON=1].
2. Select in the Type drop-down list: "write box".
3. Select in the Device drop-down list the unit that controls the point.
4. Select in the Point drop-down list the control point.

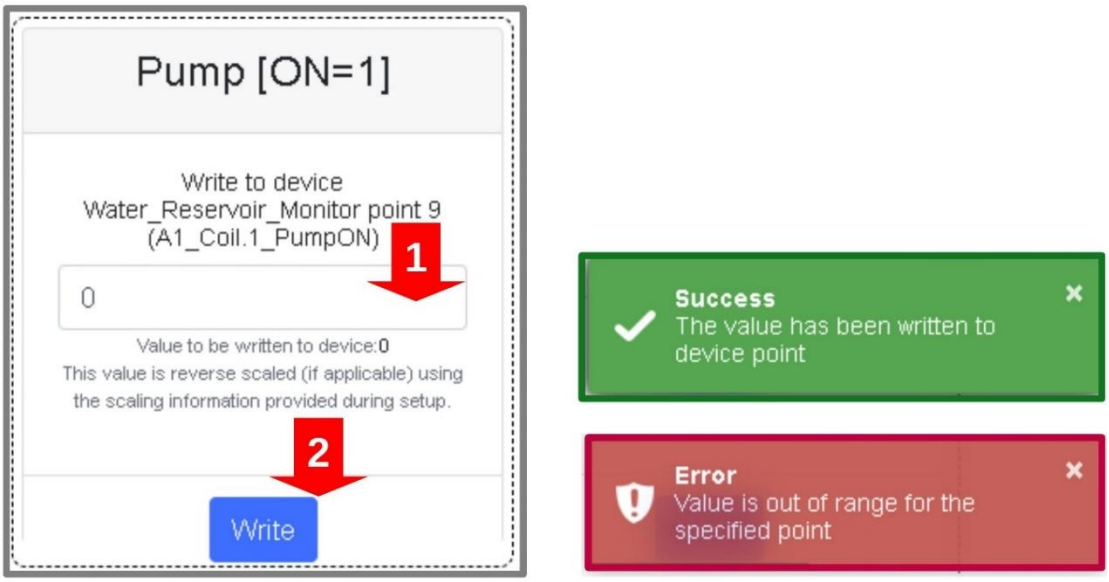

Figure 10-13 View: Write Box

In Figure 10-13 is shown the Write Box view:

1. Enter the value that will be written. For a coil (relay) use: 0 and 1.
2. Press the "Write" button to send the value to the unit. A message will be displayed at the bottom of the page to show the result of the operation: Success or Error. The Error message is return when the value is set to "-1".

10.9 Type: Snapshot (IM500)

The Snapshot-IM500 view allows you to view the last shot side by side with other relatable data: temperatures in a line-chart, snapshot from other IM500.

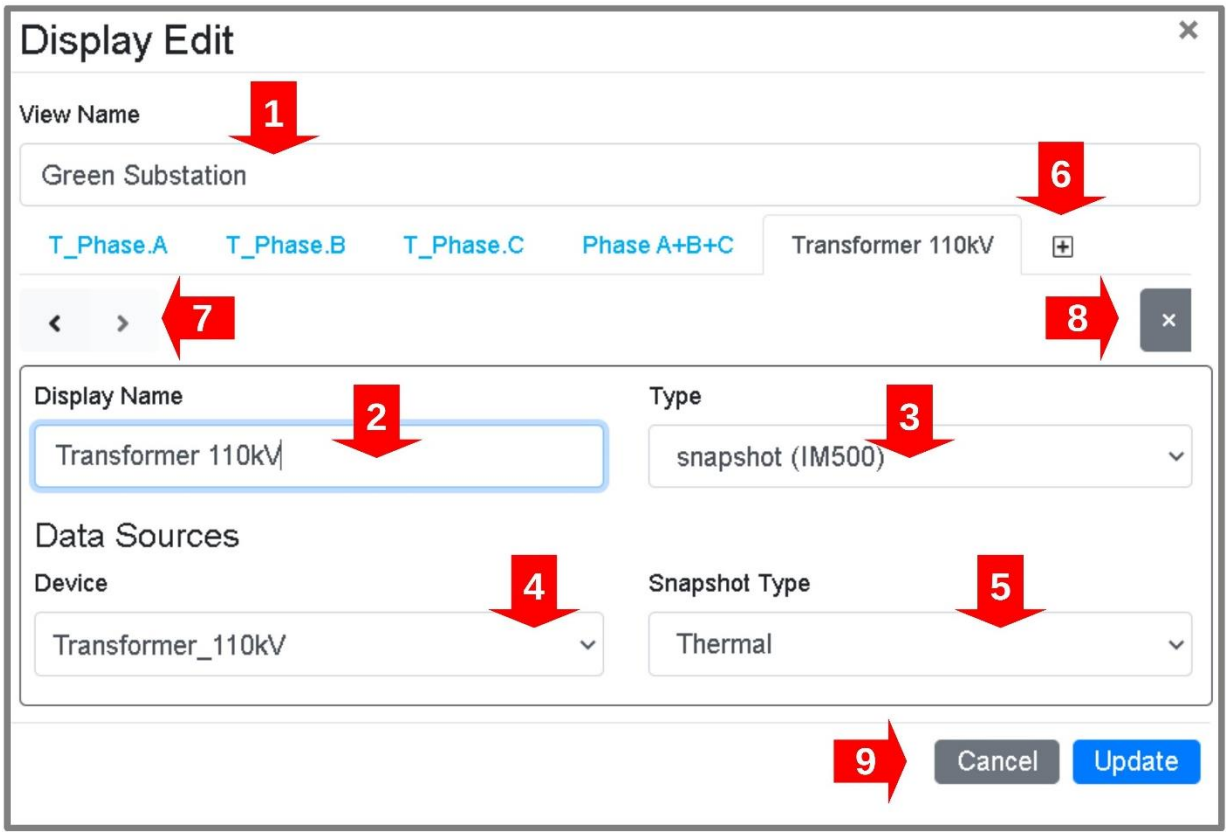

Figure 10-14 Configure: Snapshot Box

Press the Edit button on the right menu (arrow 8 in Figure 10-4) then follow instructions Figure 10-14:

9. Optional: you can rename the page after the page was created creation.
10. Type the name associated with the measurement. E.g. Transformer_110kV
11. Select in the Type drop-down list: "snapshot (IM500)".
12. Select in the Device drop-down list the unit that collects the data.
13. Select the Snapshot Type: Thermal or Visual.
14. Press the "**+**" button to add a new configuration tab.
15. Press the arrow left or right to navigate to another tab to update the configuration.
16. Press "**x**" if you want to delete this entry.
17. Press the "Update" button to preserve the configuration and return to previous page. To discard the changes, press the "Cancel" button.
18. Repeat steps 2 to 6 to add all measurements of interest.

10.10 Export to file

The "Export" feature allows you save the configuration into a file in your local PC/laptop. This file can later be use to restore a changed page.

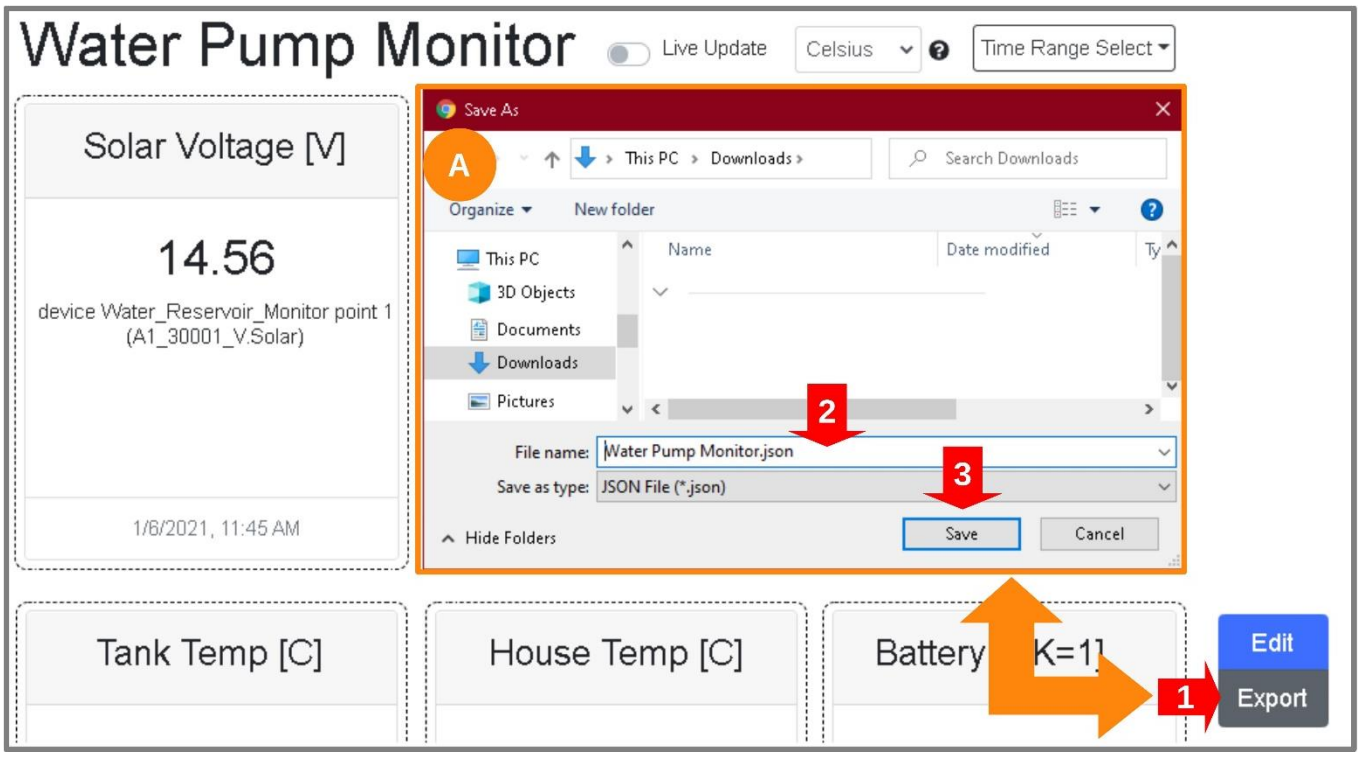

Figure 10-15 Export to file

Follow the instructions below and see Figure 10-15:

1. Press the "Export" button and the "Save" file dialog box will open.
2. Type the name of the file and select the location of the file.
3. Press the "Save" button and you will return to the main page.

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