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ABB MEASUREMENT & ANALYTICS | 2106521MNA

Configure MQTT How to Guide

RMC-100

Additional information

Additional free publications for the device are available for download at www.abb.com/totalflow.

Table 0-1: Related documents

Document	Document number
Digital Oilfield User Manual	2106300
RMC-100 User Manual	2105552

Cyber security

This product is designed to be connected, and communicate information and data, via a network interface. All Totalflow products should be connected to a secure network. It is the customer's sole responsibility to provide and continuously ensure a secure connection between the product and the customer network or any other network (as the case may be). The customer shall establish and maintain appropriate measures (such as, but not limited to, the installation of firewalls, application of authentication measures, encryption of data, or installation of antivirus programs) to protect this product, the network, its system and interfaces against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB Inc. and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Although ABB provides functionality testing on the products and updates that it releases, the customer should institute its own testing program for any product updates or other major system updates (to include, but not limited to, code changes, configuration file changes, third party software updates or patches, hardware change out) to ensure that the security measures that the customer has implemented have not been compromised and that system functionality in the customer's environment is as expected.

Malware Prevention

Recommendation: As with any downloaded software, scan ABB embedded software packages using a malware prevention solution.



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1 Overview

This guide provides basic steps to enable a Totalflow device for connection to an MQTT broker/server. MQTT brokers may be on a service provider cloud or on a private network. Totalflow devices support Standard MQTT for service provider's clouds and Sparkplug protocols for private network implementations. Consult with your system administrator for specific requirements and configuration based on your implementation.



NOTICE – Cybersecurity risk: MQTT-enabled Totalflow devices are not designed to connect directly to the Internet. ABB strongly recommends that the devices connect to MQTT brokers through an Edge gateway and firewall-protected corporate network.

2 Prepare for configuration

Consider the prerequisites listed in [Table 2-1](#) to prepare for configuration. Obtain required configuration values from your administrator.



IMPORTANT NOTE: The Digital Oilfield User Manual ([2106300](#)) has additional details on the MQTT functionality and device configuration. It also provides details for the ABB Digital Oilfield application for customers configuring the device for connection to the Azure cloud.

Table 2-1: Prerequisites

Field Device	Laptop	Cloud or private MQTT broker
Update to MQTT-ready OS/flash. For RMC-100: 2105452-032 or later.	Download and install Chrome version 49 or higher.	Obtain IP address /Hostname.
Configure with valid IP parameters.	Configure with valid IP parameters compatible with field network.	Determine authentication method.
Determine or obtain unique Device ID.	Have valid device authentication certificates ready (Root certificate, Client Certificate, Client Key).	Obtain authentication credentials if needed.
Be sure device is registered on the cloud if using Azure as service provider.	PCC 7.67 or later	Obtain URL for Digital Oilfield. Interface

3 Enable MQTT functionality on the device

The MQTT functionality is disabled by default. There are two ways to enable MQTT depending on the software build:

- To enable MQTT in RMC-100s with software versions prior to 2105452-034 refer to section [3.1 Enable MQTT from terminal mode](#).
- To enable MQTT in RMC-100s with software versions 2105452-034 (which contains Flash version 2105457-031) or later, see section [3.2 Enable MQTT from PCCU Communication Services tab](#).

3.1 Enable MQTT from terminal mode

Enable from the PCCU terminal mode. Terminal mode is available from PCCU after connection with the device. Use the USB port for local connection.



IMPORTANT NOTE: The terminal mode does not issue a confirmation message after MQTT is enabled. It takes 5 to 7 seconds for the change to take effect.

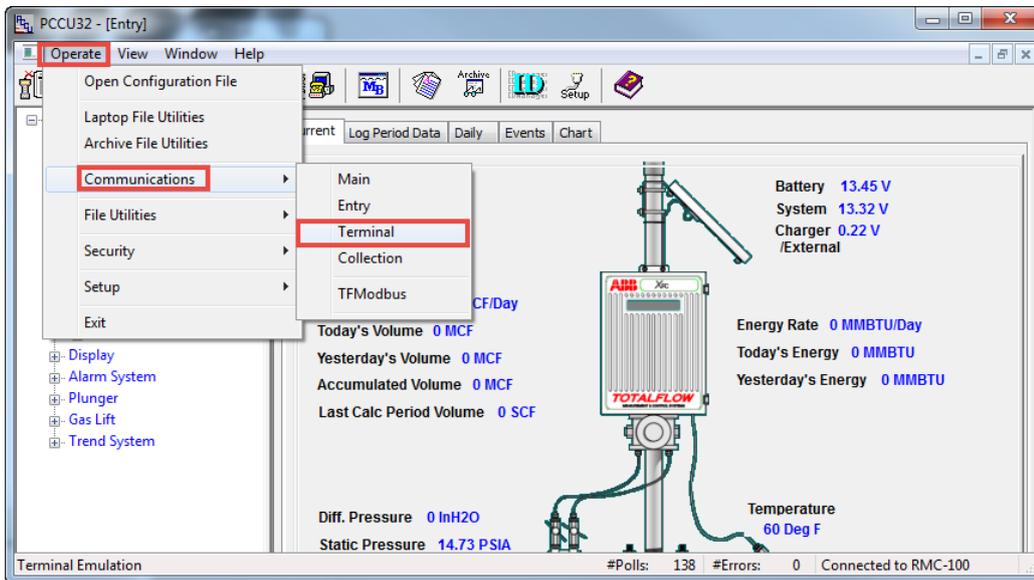
Enabling MQTT on the device also enables the MQTT configuration interface.

To enable MQTT on the device:

1. Connect the laptop to the USB port on the device.

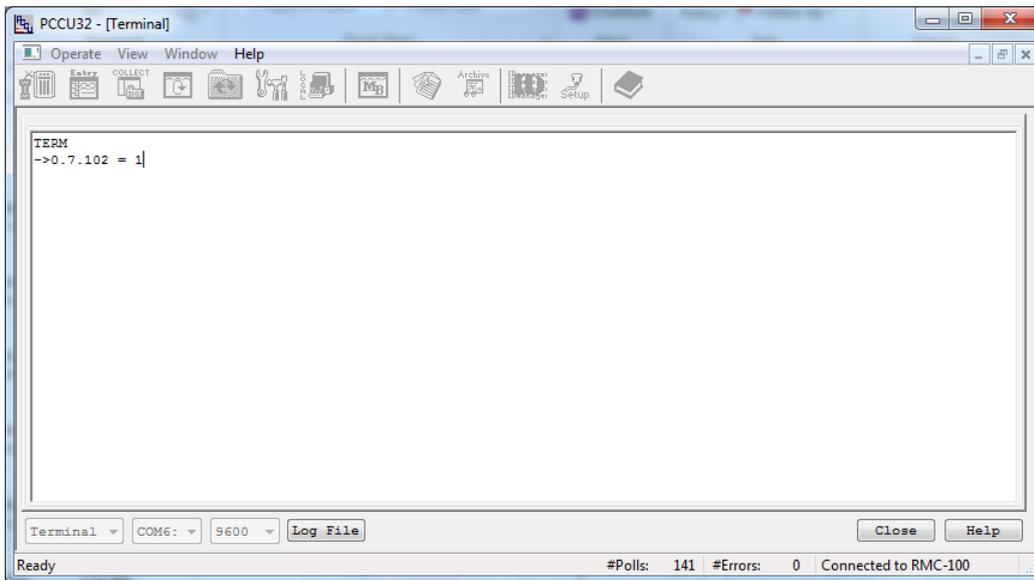
2. Start PCCU.
3. Click the Entry icon to connect with the device.
4. Select **Operate** > **Communications** > **Terminal** from the top menu to go to terminal mode.

Figure 3-1: Access terminal mode on device



5. To enable MQTT, type **0.7.102 = 1** at the prompt, then press **Enter**.

Figure 3-2: Enable MQTT functionality from terminal mode



6. Click **Close** to exit terminal mode.

3.2 Enable MQTT from PCCU Communication Services tab

This procedure is applicable to RMC-100s with customer software package version 2105452-034 (which contains Flash version 2105457-031) or later.

This procedure enables the MQTT services from the Services tab. The MQTT services are separated into 2 options:

- Enable the MQTT process managing the connection to the MQTT brokers
- Manage the user access to the MQTT configuration interface on the device

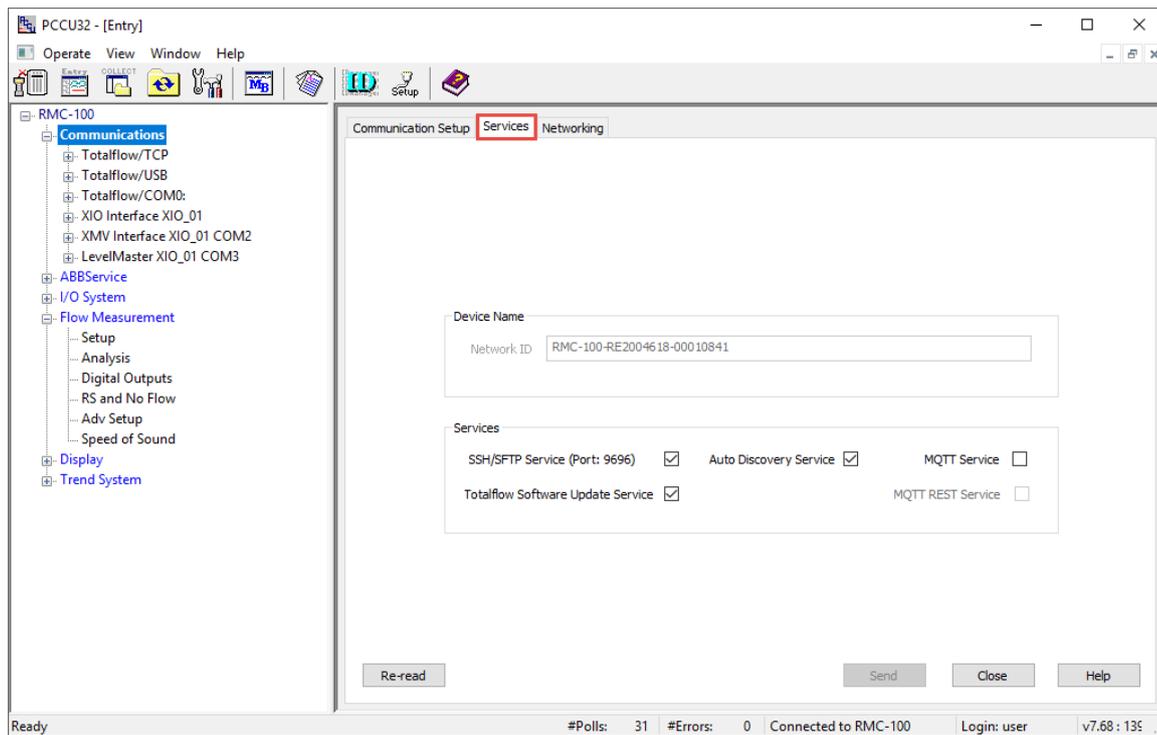
The MQTT configuration interface is separate from PCCU. All MQTT-related configuration must be completed from the MQTT interface.

The MQTT Service should always be enabled if the device is managed from the private or public cloud. The MQTT REST server can be enabled for configuration and verification purposes only but can be disabled after configuration is complete. Disabling the REST MQTT Service depends on your security requirements.

To enable MQTT on the device:

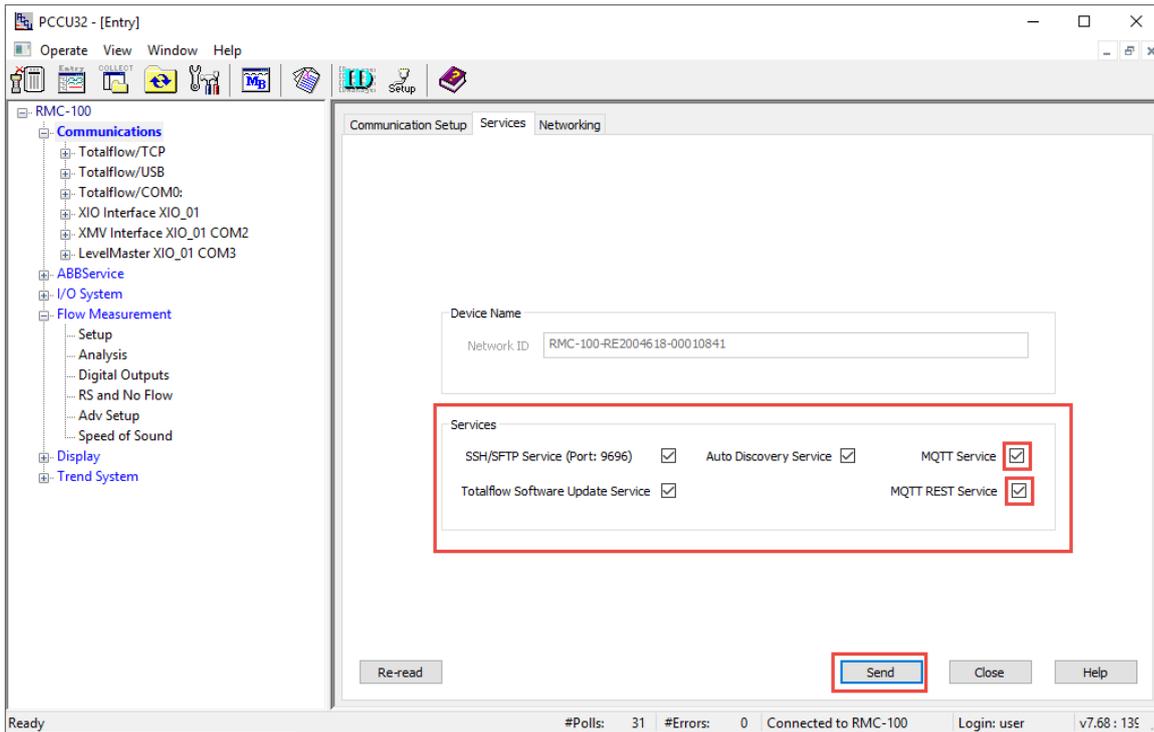
1. Connect the laptop to the USB port on the device.
2. Start PCCU.
3. Click the Entry icon to connect with the device.
4. On the navigation tree, select **Communications**. The Communication Setup screen displays.
5. Select the **Services** tab.

Figure 3-3: Communication Services tab on the RMC-100



6. In the Services section ([Figure 3-4](#)):
 - a. Select **MQTT Service**. The MQTT REST Service activates.
 - b. Select **MQTT REST Service**.
7. Click **Send**.

Figure 3-4: Enable MQTT and REST Services from PCCU Communications Services tab



4 Access the MQTT configuration interface

The MQTT configuration interface supports only configuration for MQTT-related parameters. Perform all other device and application configuration from PCCU.

IMPORTANT NOTE: Local access to the MQTT configuration interface requires that both the laptop and the device are connected to the field network (through Ethernet). Both must be configured with valid IP addresses for this communication. MQTT parameters cannot be configured using USB. You must have the IP address of the device to connect with it.

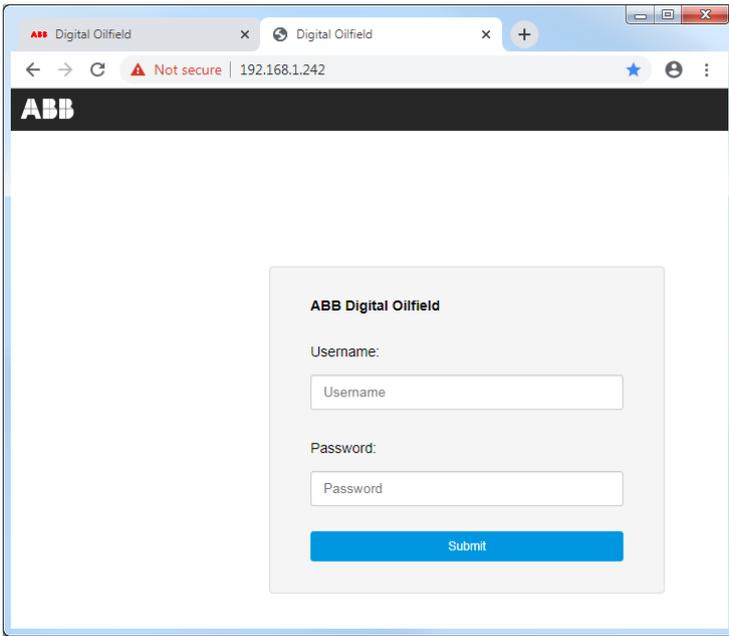
To access the MQTT configuration interface:

1. Connect the laptop and the device to the local field network (Ethernet).
2. On the laptop, start the Chrome browser.
3. Go to the URL address: **https://<Totalflow Device's IP address>:443**. For example, **https://10.127.133.220:443**. A security warning displays.

IMPORTANT NOTE: Security warnings displays at first-time login when the device does not have valid certificates ([Figure 4-1](#)). The "Not secure" warning in the URL field displays because the browser does not establish the connection on secure mode. To configure the browser for secure mode, and prevent this warning from reappearing, refer to the Digital Oilfield user manual ([2106300](#)).

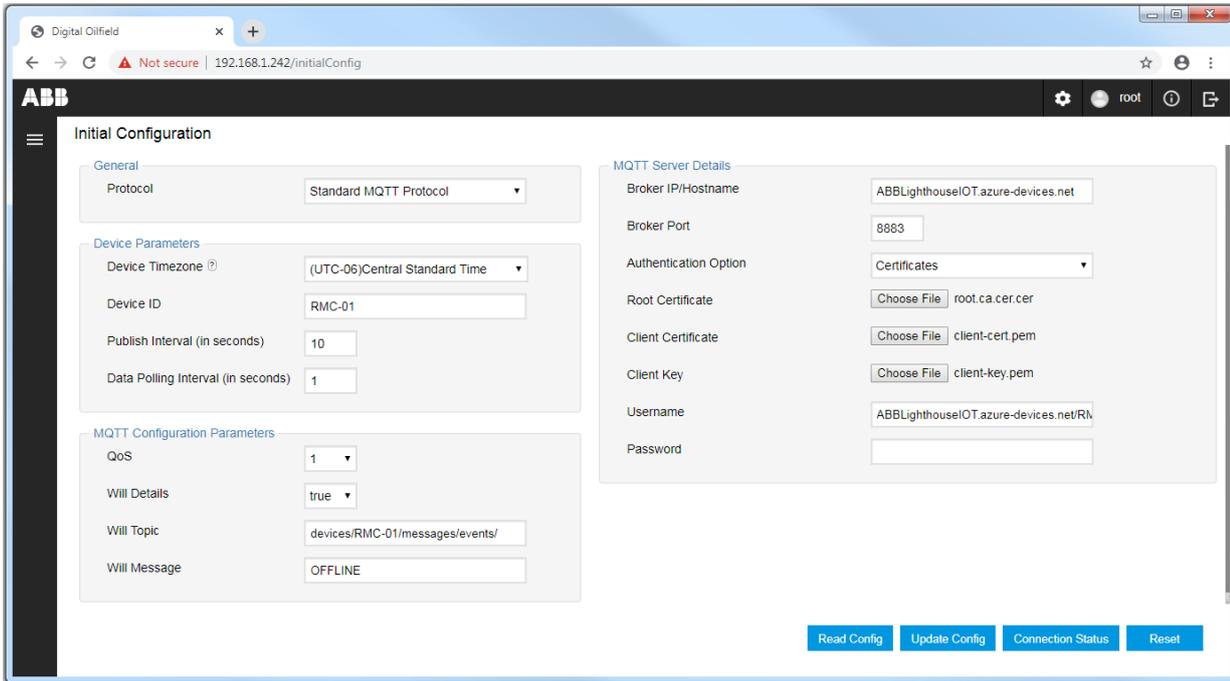
4. Click **Advanced** at the bottom of the screen. Additional security information displays. A link to the device is provided to proceed.
5. Click **Proceed to <device IP address>**. The login screen displays.

Figure 4-1: Device MQTT configuration interface login screen



6. Type **root** into the Username field. Type the default root password, **root@123**, into the Password field.
7. Click **Submit**. The Initial Configuration screen displays.

Figure 4-2: Initial Configuration page – factory defaults



5 Configure parameters

The parameters in the Initial Configuration screen set the device for authentication and connection with the MQTT broker. This procedure assumes you have all the required values for those parameters and authentication certificates or credentials.



IMPORTANT NOTE: When configuring for connection to a service provider cloud, the device must be registered on the cloud before attempting configuration or connection. Ensure your administrator has registered the device and determined the authentication preferences.



IMPORTANT NOTE: When using authentication certificates, certificate and key files are copied from the laptop to the device during this procedure. These files reside in the device and ensure automatic re-authentication in case of disconnection from the broker. Files do have expiration dates and must be maintained.

On the Initial Configuration screen:

1. Select protocol from the protocol drop-down list.
2. Configure Device parameters.



IMPORTANT NOTE: When connecting to the MQTT broker on the Azure cloud, make sure that the Device ID in the topic matches the Device ID value configured in the Device Parameters section (highlighted in [Figure 5-1](#)).

Figure 5-1: MQTT configuration parameters for Standard MQTT protocol

The screenshot shows the ABB Initial Configuration web interface. The browser address bar shows '192.168.1.242/initialConfig'. The page title is 'Initial Configuration'. The 'General' section shows 'Protocol' set to 'Standard MQTT Protocol'. The 'Device Parameters' section includes 'Device Timezone' set to '(UTC-06)Central Standard Time', 'Device ID' set to 'RMC-01', 'Publish Interval (in seconds)' set to '10', and 'Data Polling Interval (in seconds)' set to '1'. The 'MQTT Configuration Parameters' section, highlighted with a red box, includes 'QoS' set to '1', 'Will Details' set to 'true', 'Will Topic' set to 'devices/RMC-01/messages/events/', and 'Will Message' set to 'OFFLINE'.

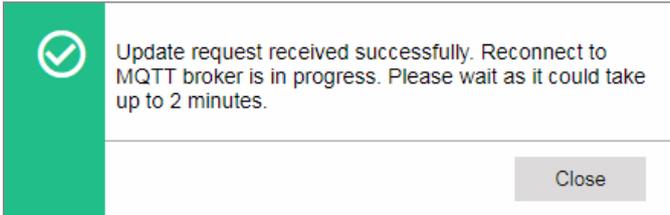
3. Configure MQTT parameters. Make sure that the Device ID in the Will topic matches the Device ID configured in the Device Parameters section (highlighted in [Figure 5-1](#) above).
4. Configure MQTT server details.
 - a. Configure the MQTT broker details based on your implementation.
 - b. Select the authentication method from the **Authentication Option** drop-down list.



IMPORTANT NOTE: For Certificates, click **Choose File** to locate and upload each required file: Root Certificate, Client Certificate, and Client Key. These files are required when connecting to the MQTT broker on the Azure cloud.

5. Click **Update Config**. Wait for update confirmation.

Figure 5-2: Update factory default configuration



6. Click **Close** when the update request completes successfully.
7. Verify the device-broker connection next.

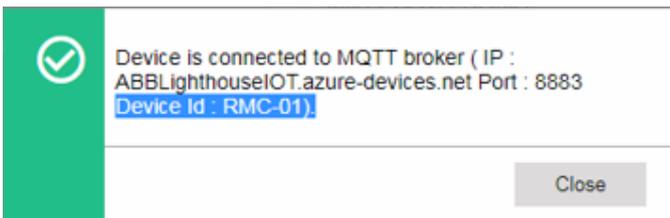
6 Verify device-broker connection status

Verify that the device can connect with the broker after Initial configuration update.

On the Initial Configuration screen:

1. Click **Connection Status**.
2. Wait for status verification.
3. Verify the status message. The message for a successful connection identifies that the device is connected to the MQTT broker and identifies the broker's hostname, the TCP port and the device ID. The message for a failed connection attempt indicates that the device is not connected to the MQTT broker.

Figure 6-1: Verify device-broker connection status



4. When the connection is successful, proceed to section [7 Configure applications](#), then proceed to section [8 Configure registers](#).



IMPORTANT NOTE: A successful device-broker connection is required to continue with the application and register configuration in the next sections. Device-broker connection failure prevents display of the application and register configuration screens.

7 Configure applications

Configure the applications that the device publishes data for. The device transfers or sends application data through the broker. Data is kept on the service provider or private network database(s) depending on the implementation.



IMPORTANT NOTE: The procedure in this section assume that the required applications are already instantiated, configured, and enable on the device. Use PCCU to add and configure additional applications or instances if necessary. The device application configuration in this section does not provide the ability for full application configuration.

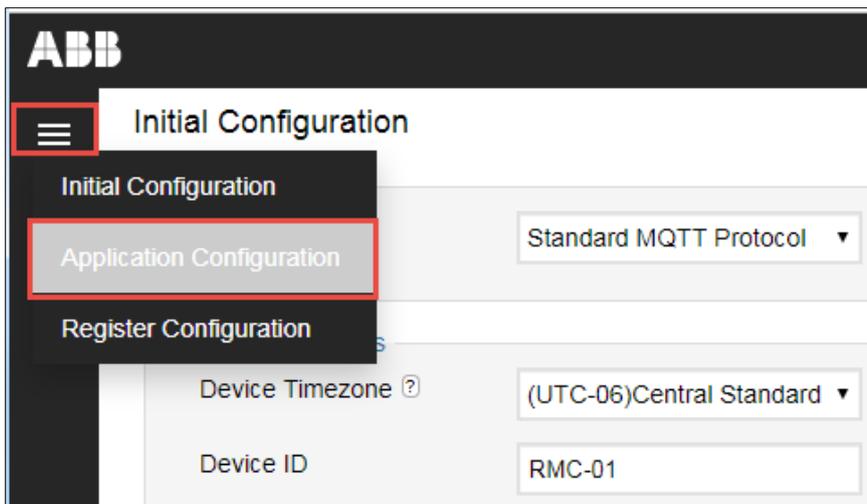


IMPORTANT NOTE: The Application Configuration web page does not display unless the device has established connection with the MQTT broker.

To select applications data is published for:

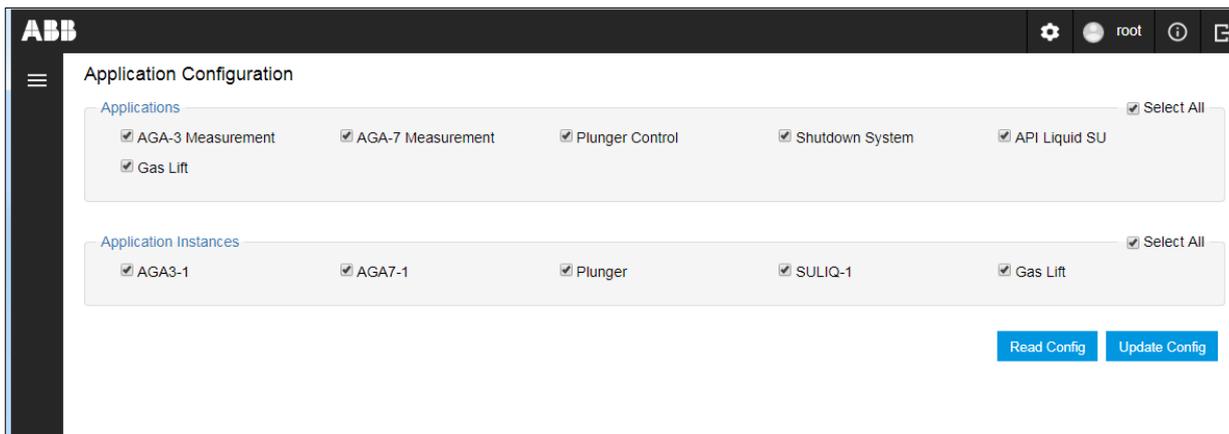
1. Click the menu icon on the left of the Initial Configuration screen and select **Application Configuration**.

Figure 7-1: Navigate to Application Configuration



2. On the Application Configuration screen, select specific application and instances or click **Select All**.

Figure 7-2: Application Configuration page



3. Click **Update Config**. A confirmation for the update displays.
4. Click **Close** when the configuration update is successful.

8 Configure registers

Configure the registers that the device publishes data for. The device sends specific application register data through the broker. Data is kept on the service provider or private network database depending on the implementation.

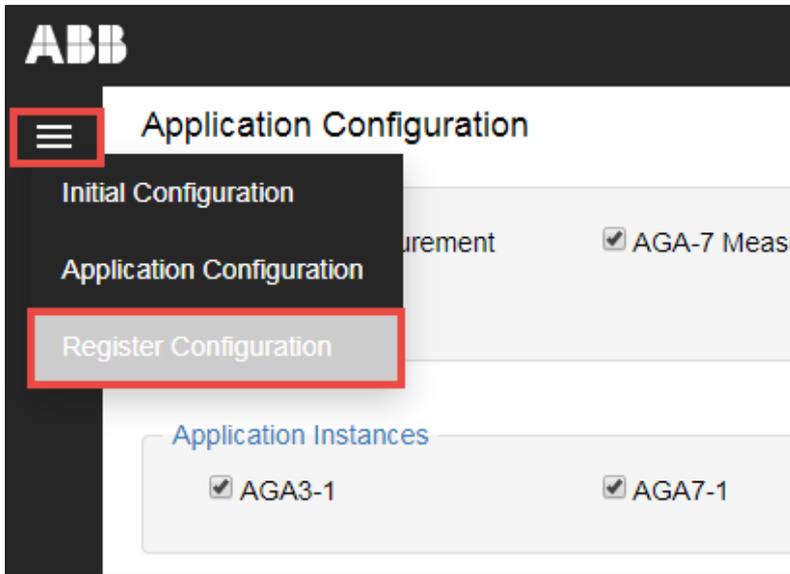


IMPORTANT NOTE: The Register Configuration web page does not display unless the device has established connection with the MQTT broker.

To select registers data is published for:

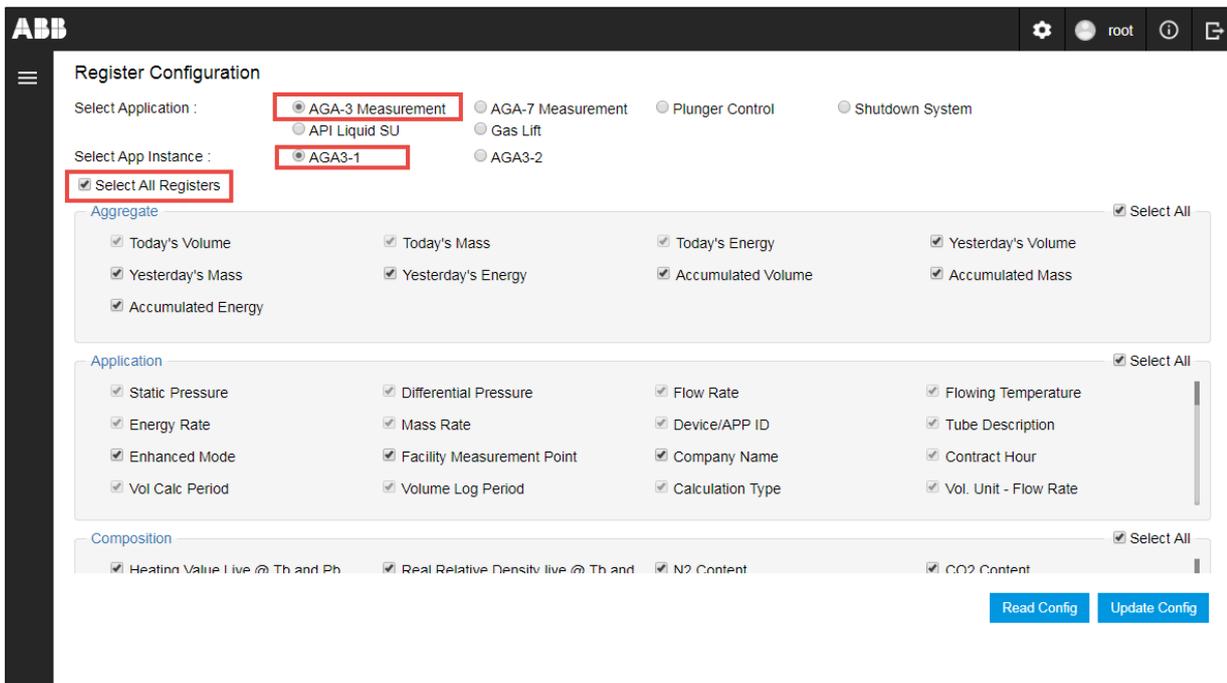
1. Click the menu icon and select **Register Configuration** ([Figure 8-1](#)).

Figure 8-1: Navigate to Register Configuration



2. On the Register Configuration page ([Figure 8-2](#)), select the application and instance.
3. Select specific registers or click **Select All**.
4. Repeat steps 2-3 for each application instance.

Figure 8-2: Register Configuration page



9 Verify device displays on the service provider cloud (for ABB Digital Oilfield users only)



IMPORTANT NOTE: This procedure assumes that the device connects to a service provider cloud. It does not apply to private networks. It is included in this guide as an example of how to verify the device is visible from the ABB cloud service once MQTT is enabled. For private Sparkplug-based implementations follow appropriate procedures and consult vendor documentation.

ABB's Digital Oilfield application provides access to the device and its data on the cloud. When the device connects successfully to the provider's broker, the device should display on the Digital oilfield.



IMPORTANT NOTE: You must have login credentials to access the Digital oilfield on the service provider cloud. Obtain your digital oilfield web address (URL) and credentials from your administrator.

To view the device from the Digital Oilfield application:

1. Open another tab on the browser.
2. Go to the URL provided by your administrator. The Login prompt displays.
3. Sign in or type credentials. The main Digital Oilfield screen displays.
4. Verify that the device displays in the List of Devices and its status indicator is green.

Figure 9-1: Digital Oilfield screen

Name	Location	IP Address	Date Time	Status
RMC-01	Measurement and Control	192.168.1.41	10/25/2019 03:01:55 AM	●
SYS_TEST_PRO2	Measurement and Control	192.168.1.56	10/26/2019 05:02:49 PM	●

5. Click the menu icon ([Figure 9-2](#)) and then the devices and applications icon ([Figure 9-3](#)).

Figure 9-2: Digital Oilfield application menu icon

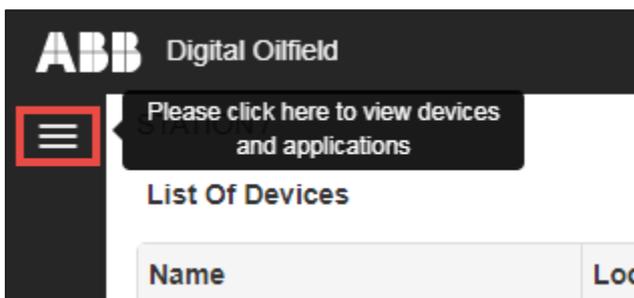
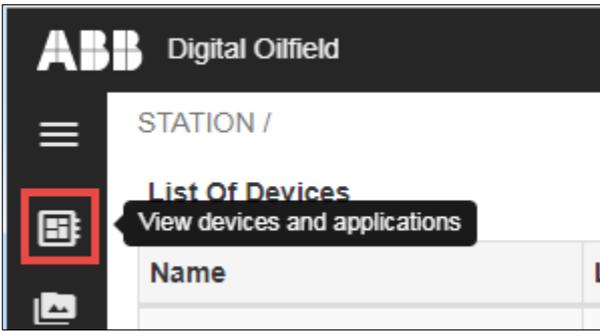
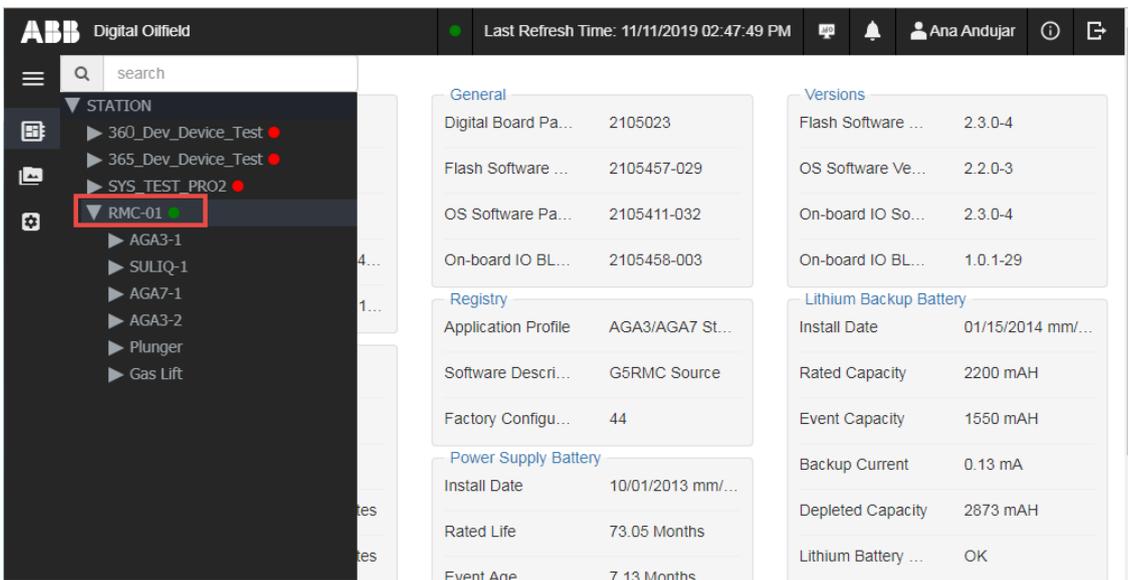


Figure 9-3: Digital Oilfield application device and application icon



6. Locate the device and view the device applications as needed ([Figure 9-4](#)).

Figure 9-4: Device and its applications



10 Change default login configuration credentials

Once you have verified that the device-broker connection is successful, secure your device's configuration login credentials with private passwords before leaving the field.

To configure private passwords on default user accounts:

1. Navigate to the Initial Configuration page.
2. Click the settings icon and then **User Management** from the drop-down list.

Figure 10-1: Access User Management

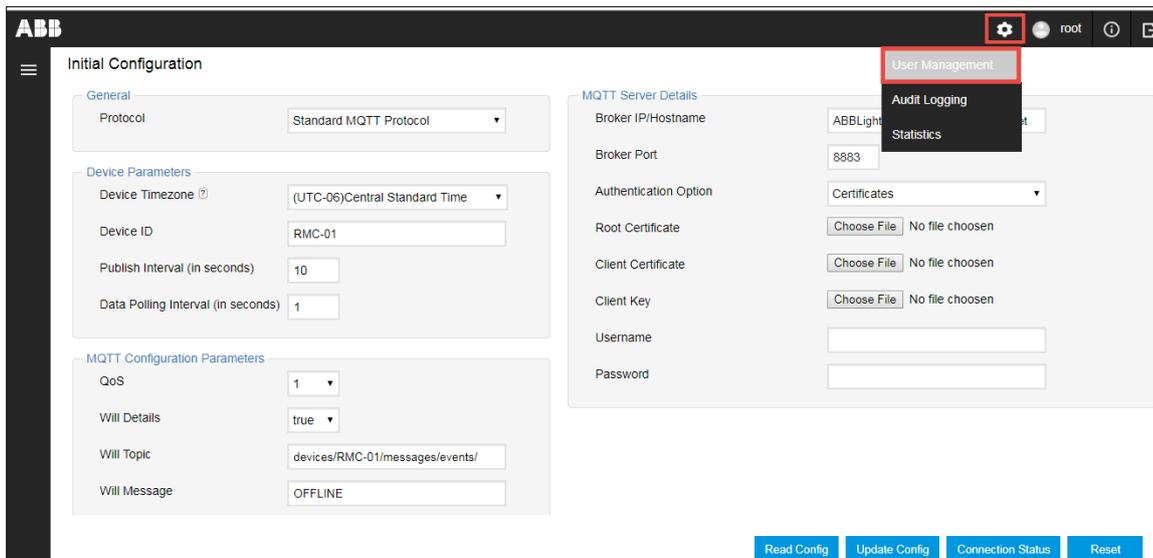
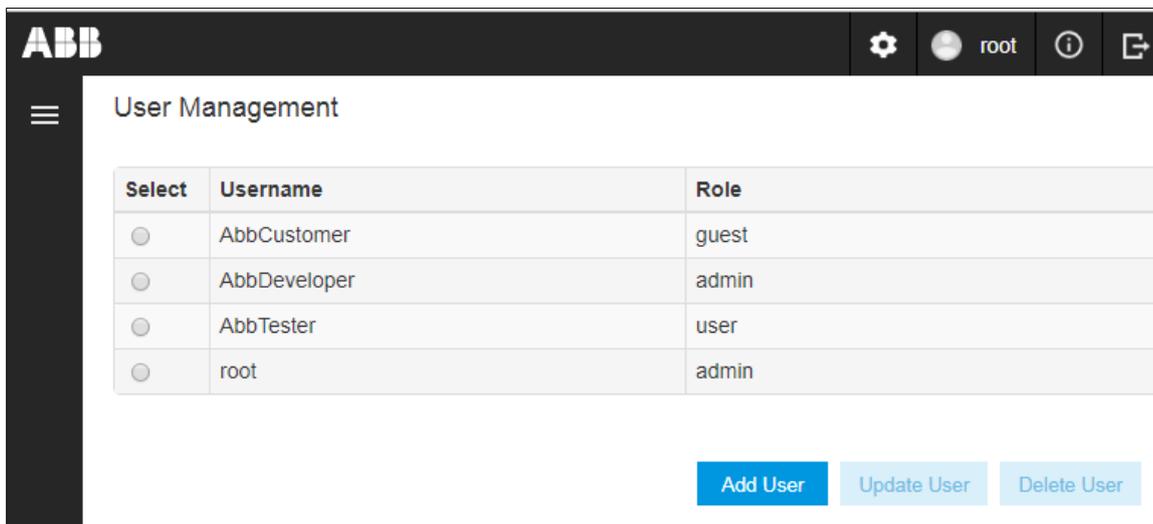


Figure 10-2: MQTT configuration interface- User Management



3. Select the user from the list on the User Management web page. The **Update User** and **Delete User** buttons activate.
4. Click **Update User**.
5. Update the password at the Update User dialog box. Use a private password known only to authorized users. Take note of the password used.
6. Click **Update**.
7. Repeat steps 3-6 for each default user.



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